

EXECUTIVE SUMMARY

This report describes the inception activities of the consultancy work for Package- 04 (Saghata Upazila of Gaibandha District and Sariakandi Upazila & Sonatola Upazila of Bogra District) of the 'Preparation of Development Plan under Preparation of Development Plan for Fourteen Upazilas' Project under Urban Development Directorate (UDD) of the Government of the People's Republic of Bangladesh. The report is being submitted in pursuance of the agreement signed between the client Urban Development Directorate (UDD) and Modern Engineers Planners and Consultants Ltd. (MEPC) on 24th December 2014.

The core objective of the project is preparing planning packages to ensure the future growth and development of the project area in a planned and organized way. The current project would emphasize over those activities focusing on all relevant social and physical infrastructure services and facilities including the national level communication network. It would emphasize over the economic development in and around the project area and also livelihood of the local people, who are very much depended on local economic activities. The current project would also emphasize over the change in land category, land use and livelihood pattern.

This report is the 2nd footprint followed by Mobilization Report to achieve goal and objectives of the project. The Inception Report describes the inception of project activities in full extend. The report contains purpose of the study, objectives and scope of services and activities to be performed, review of the Sixth Five Year Development Plan, review of Perspective Plan, MDG, review of Urban Management Policy, review of Land Use Policy and so on, review of the work plan, time schedule, input and management plan, analysis and findings from reconnaissance survey, review of all relevant reports, documents and other materials, assessment of all additional data collected and survey works to be carried out for completion of the database, development of methodology for each component of the structure plan as per ToR by consultants in fulfilling the for Package- 04 of the 'Preparation of Development Plan under Preparation of Development Plan for Fourteen Upazilas' Project.

Package-04 comprises with three Upazila namely Saghata Upazila of Gaibandha District and Sariakandi Upazila & Sonatola Upazila of Bogra District. Saghata Upazila of Gaibandha District and Sariakandi Upazila & Sonatola Upazila of Bogra District are three adjacent Upazila of the Northern part of Bangladesh. All three Upazilas are highly vulnerable to natural disaster. Almost each year the three Upazilas are affected by flood and river erosion resulting from Jamuna River.

Saghata Upazila is a flood prone area located at Gaibandha district under Rangpur Division. The Upazila is adjacent to four others Upazila namely Islampur Upazila (Jamalpur district) at east, Gobindogonj Upazila (Gaibandha district) at west, Gaibandha Sadar Upazila at north and Sonatola Upazila (Bogra District) at south. Most of the business, economic and administrative activities are based on Bonarpara Union and the office of the Upazila Parishad is also located at Bonarpara. The total area of Saghata Upazila is 231.02 square kilometer with a total population covering 2,67,819 (Source: BBS, 2011). The whole Upazila is covered by 118 Mouzas. The major rivers of the area are Jamuna and Bangali. Jamuna River runs along the eastern part of the Upazila adjoining to Bhartkhali, Saghata and Haldia Union. The Upazila has 329.93 acre khas land and 08.27 acre abandoned land. The sandy land area, homogeneous topography, Char area, moderate moisture etc are the common geographical characteristics of the study area.

Sonatola Upazila is a flood prone area located at Bogra district under Rajshahi Division. The Upazila is adjacent to four others Upazila namely Sariakandi Upazila (Bogra district) at east, Shibganj Upazila (Bogra district) at west, Gobindoganj Upazila (Gaibandha district) at north and Gabtoli Upazila (Bogra District) at south. Most of the business, economic and administrative activities are based on the Sonatola municipal area.

The total area of Sonatola Upazila is 156.75 square kilometer with a total population covering 1,86,778 (Source: BBS, 2011). The whole Upazila is covered by 101 Mouzas and the number of village is 131. The major rivers of the area are Jamuna and Bangali. Jamun River runs along the eastern part of the Upazila adjoining to Tekani Chukainagar, Pakullah and

Inception Report

*Preparation of Development Plan
under "Preparation of Development Plan for Fourteen Upazilas" Project- Package-04*

Jorgachha Union from north to south. The Upazila has 331.61 acre khas land. The sandy land area, homogeneous topography, Char area, moderate moisture etc. are the common geographical characteristics of the study area.

Sariakandi Upazila is a flood prone area located at Bogra district under Rajshahi Division. The Upazila is adjacent to four others Upazila namely Madarganj Upazila (Jamalpur district) at east, Gabtali Upazila (Bogra district) at west, Sonatola Upazila (Bogra district) at north and Dhunat Upazila (Bogra District) at south. Most of the business, economic and administrative activities are based on the Sariakandi municipal area. The total area of Sariakandi Upazila is 432.60 square kilometer with a total population covering 2,70,720 (Source: BBS, 2011). The whole Upazila is covered by 122 Mouzas and the number of village is 216. The major rivers of the area are Jamuna and Bangali. Jamun River runs over the middle part of the Upazila adjoining to Kazla, Sariakandi, Karnibari, Chandan Baisha and Bohail Union from north to south. The Upazila has 4048.82 acre khas land. The sandy land area, homogeneous topography, Char area, moderate moisture etc are the common geographical characteristics of the study area.

In order to prepare the Inception Report, the consultant team had performed Reconnaissance Survey along with client team. The activities done during the Reconnaissance Survey are meeting with the Upazila Chairman, Upazila Nirbahi Officer (UNO), Local leaders and Local peoples of three Upazila. To draw the stakeholder's viewpoints reconnaissance survey also conducted to collect the basic information and all field data of the study area based on that data and information of three Upazila.

It is understood that the deficiency in infrastructure of the project Upazilas is currently holding back the faster progress in development. This can be improved substantially, if planned development of the areas is ensured through Sub-Regional Plan, Structure Plan, Urban Area Plan, Rural Area Plan and Action Area Plan as visualized through the current project. Thus the commencement of the project under the Urban Development Directorate (UDD) is very relevant and timely in line with national policies and regional development strategies.

Table of Content

Content	page number
EXECUTIVE SUMMARY	1
TABLE OF CONTENT	3
LIST OF TABLES	7
LIST OF FIGURES	7
LIST OF MAPS	7
LIST OF PHOTOGRAPHS	7
LIST OF ABBREVIATIONS AND ACRONYMS	8
1. SECTION-I: INTRODUCTION	9
1.1. BACKGROUND OF THE PROJECT	9
1.2. OBJECTIVES	9
1.3. SCOPE OF THE SERVICES	10
1.4. SCOPE OF WORK IN INCEPTION PERIOD	10
1.5. DESCRIPTION OF THE PROJECT AREA	10
1.4.1. Shaghata Upazila	10
1.5.2. Sariakandi Upazila	13
1.5.3. Sonatola Upazila	16
1.6. ORGANIZATION OF THE INCEPTION REPORT	19
2. SECTION-II: APPROACH AND METHODOLOGY	20
2.1. METHODOLOGY OF FIELD SURVEY & PLAN PREPARATION	20
2.2. REVIEW OF NATIONAL DEVELOPMENT PLANS & POLICIES	20
2.2.1. Introduction	20
2.2.2. Rationale of Relating National and Local Plan	20
2.2.3. The Perspective Plan (2010-2021)	20
2.2.4. Sixth Five Year Plan	22
2.2.5. Poverty Reduction Strategy Paper (PRSP)	27
2.2.6. Urban Management Policy	27
2.2.7. Millennium Development goal (MDG)	27
2.2.8. Sustainable Development Goals (SDG)	29
2.2.9. National Plan for Disaster Management (2010-2015)	30
2.2.10. Other Sectorial Policies and Acts related to Land use Planning	33
2.2.1.1. Land use Policy	33
2.2.1.2. Housing Policy	34
2.2.1.3. Transportation Policy	34
2.2.1.4. Agricultural Policy	35
2.2.1.5. Environmental Policy	36
2.2.1.6. Industrial Policy	37
2.2.11. Linkage of National Plans and Policies with Development Plans of 14 Upazilas Project	38
2.3. COLLECTION OF RELEVANT DOCUMENTS	38
2.4. COLLECTION OF MAPS, BASIC STATISTICS AND INFORMATION	38
2.5. PREPARATION OF BASE MAP USING GIS AND MOUZA MAP	40
2.5.1. Collection of Mouza Maps	40
2.5.2. Selection of Ground Control Point (GCP)	40
2.5.3. GCP Survey on Mouza Maps	40
2.5.4. Scanning of Mouza Maps	41
2.5.5. Raster Geo-referencing of Mouza Maps/Sheets	42
2.5.6. Digitization of Mouza Maps	42
2.5.7. Preparing the Manuscript	43
2.5.8. Preparation of workstation coverage of study area map	48
2.5.9. Edit Plot Checking of Digitized Coverage	48
2.5.10. Demarcating the Project Area/Boundary	48
2.6. PREPARATION OF BASE MAP USING SATELLITE IMAGE AND PHOTOGRAMMETRIC METHOD	48
2.6.1. Collection of Satellite Image	48
2.6.2. DTM/DEM/TIN/Contour Generation	49
2.6.3. 3D satellite image processing	49

Inception Report

Preparation of Development Plan
under "Preparation of Development Plan for Fourteen Upazilas" Project- Package-04

2.6.4.	Ortho-rectification of Images.....	49
2.6.5.	Mosaicking of Ortho-photo.....	49
2.6.6.	Geo-referencing of Mouza Maps	50
2.6.7.	Preparation of mosaic Maps & Demarcating the Project Boundary.....	50
2.6.8.	Preparation of Project Area Map	50
2.6.9.	Super-imposing project area map prepared by mouza map and satellite image.....	50
2.7.	DATA BASE PREPARATION	51
2.7.1.	Development of GIS Data Base.....	51
2.7.2.	GIS Mapping (Preparation of Workstation Coverage and Map Lay Out in ArcView).....	53
2.8.	FIELD SURVEY USING RTK GPS BASED ADVANCED SURVEY TECHNIQUE	53
2.8.1.	Use of Differential Global Positioning System (DGPS).....	54
2.8.2.	Installation of Ground Control Point (GCP) Survey	55
2.8.3.	Establishment of Reference Station for DGPS Survey.....	55
2.8.4.	Establishment of Bench Marks (BM)/Control Points (CP) Network	55
2.8.5.	Baseline Survey by RTK-GPS.....	56
2.8.6.	Development of Geoid Model for the Project Area	56
2.8.7.	DGPS Survey (Line, Point and Closed Boundary/Polygon Features).....	56
2.8.8.	RTK-GPS Fast Static Survey (Establishment of Control Points for TS Survey)	57
2.9.	SURVEY DATA PROCESSING (GPS AND TOTAL STATION DATA).....	58
2.10.	PREPARATION OF MAP LAYOUT AND LEGEND	58
2.11.	PHYSICAL FEATURE SURVEYS	58
2.11.1.	Method.....	58
2.11.2.	Deliverable.....	59
2.12.	TOPOGRAPHIC SURVEY.....	59
2.12.1.	Method.....	59
2.12.2.	Deliverable	59
2.13.	LAND USE SURVEY	59
2.13.1.	Method.....	60
2.13.2.	Deliverable.....	60
2.14.	HOUSEHOLD BASED SOCIO-ECONOMIC SURVEY	61
2.14.1.	Method.....	61
2.14.2.	Deliverable.....	62
2.15.	SURVEY OF EXISTING SOCIO-ECONOMIC FACILITIES.....	62
2.15.1.	Method.....	62
2.15.2.	Deliverable.....	63
2.16.	HOUSING, SLUMS AND SQUATTERS SETTLEMENT STUDY	63
2.16.1.	Method.....	63
2.16.2.	Deliverable.....	64
2.17.	INVESTMENT AND EMPLOYMENT STUDY	64
2.17.1.	Method.....	65
2.17.2.	Deliverable.....	66
2.18.	HYDROLOGICAL STUDY	66
2.18.1.	Method.....	66
2.18.2.	Deliverable.....	66
2.19.	AGRICULTURAL STUDY.....	67
2.19.1.	Method.....	67
2.19.2.	Deliverable.....	68
2.20.	TRANSPORT SECTOR STUDY	68
2.20.1.	Transportation Infrastructure and Facilities.....	68
2.20.2.	Transportation Fleets and Services	68
2.20.3.	Volume and Movement Patterns.....	69
2.20.4.	Analysis of Volume and Movement Patterns	69
2.20.5.	Origin Destination Survey.....	69
2.20.6.	Use of Four Step Model.....	70
2.20.7.	Major Features of the Model.....	70

Inception Report

Preparation of Development Plan
under "Preparation of Development Plan for Fourteen Upazilas" Project- Package-04

2.20.8.	<i>Four Step Model</i>	70
2.20.9.	<i>Model Application</i>	71
2.20.10.	<i>Model Outputs</i>	71
2.21.	STUDY ON DRAINAGE AND ENVIRONMENTAL ISSUES	71
2.21.1.	<i>Drainage Issues</i>	72
2.21.1.1.	Method	72
2.21.1.2.	Deliverable	72
2.21.2.	<i>Environmental Issues</i>	73
2.21.2.1.	Method	73
2.21.2.2.	Deliverables	73
2.22.	STUDIES ON DISASTER MANAGEMENT.....	73
2.22.1.	<i>Regional Morphotectonic and Neotectonic Mapping</i>	73
2.22.2.	<i>Engineering Geological Mapping</i>	73
2.22.3.	<i>Seismic Hazard Assessment</i>	74
2.22.4.	<i>Vulnerability Assessment</i>	74
	Method for vulnerability assessment.....	74
2.22.5.	<i>Damage and Risk Assessing</i>	74
2.22.6.	<i>Detailed Building Inventory Database Preparation</i>	75
2.22.7.	<i>Deliverables</i>	75
2.23.	STUDY ON UNAUTHORIZED ENCROACHMENT	75
2.24.	REVIEW OF RELEVANT PREVIOUS STUDIES AND PLANS.....	75
2.24.1.	<i>Implementation through Multi-Sectorial Investment Program</i>	75
2.24.2.	<i>Principle of MSIP</i>	75
2.24.3.	<i>Project Prioritization and Scheduling</i>	75
2.24.4.	<i>Funding Analyses</i>	76
2.24.5.	<i>Community Level Participation</i>	76
2.25.	APPROACHES TO PLANNING	76
2.25.1.	<i>Land Management Technique at Neighborhood Level</i>	78
2.25.2.	<i>Participatory Action Area Development Plan</i>	78
2.26.	ANALYSIS OF CURRENT SITUATION AND IDENTIFICATION OF CRITICAL ISSUES.....	79
2.27.	FORMULATION OF PLANNING STANDARDS	79
2.28.	REFERENCE TO RELEVANT PREVIOUS PLANS	80
2.29.	ANALYSIS OF EXISTING SITUATION, LOCAL DEMAND/ASPIRATION THROUGH PRA SESSIONS	80
2.29.1.	Method.....	80
2.29.2.	Deliverables.....	83
2.30.	MATCHING PRA ANALYSIS WITH TECHNICAL ANALYSIS.....	83
2.31.	PLANNING METHODOLOGY & DELIVERABLES	85
2.31.1.	<i>Preparation of Sub Regional Plan</i>	85
2.31.2.	<i>Preparation of Structure Plan</i>	87
2.31.3.	<i>Preparation of Urban Area Plan</i>	88
2.31.4.	<i>Rural Area Plan</i>	90
2.31.5.	<i>Action Area Plan</i>	91
2.32.	OUTPUT AND FORMAT	92
2.32.1.	<i>Data Management Structure</i>	93
2.32.2.	<i>Inventory</i>	94
2.32.3.	<i>Projection Parameter</i>	95
2.32.4.	<i>Conversion Factors</i>	95
2.32.5.	<i>Data Precision</i>	96
2.32.6.	<i>Data Precision of Survey Equipment</i>	96
2.32.7.	<i>Data Precision of Digitization of Mouza Maps</i>	97
2.32.8.	<i>Map Layout</i>	97
2.32.9.	<i>Map Legend</i>	98
2.32.10.	<i>Checklist for Survey and Studies</i>	99
2.32.11.	<i>Monitoring and Supervision of Project Activities</i>	99
2.32.12.	<i>Public hearing</i>	99

Inception Report

Preparation of Development Plan
under "Preparation of Development Plan for Fourteen Upazilas" Project- Package-04

2.32.13.	Gazette notification	99
2.32.14.	Institutional capacity building for plan implementation	99
3.	SECTION III: WORK PLAN	101
3.1.	GENERAL	101
3.2.	REVISED WORK PLAN	101
3.3.	IN- HOUSE TRAINING PROGRAM	101
3.4.	REPORTING SCHEDULE	101
4.	SECTION IV: PROGRESS OF WORK UPDATE	102
4.1.	COMPLETION OF MOBILIZATION REPORT	102
4.2.	COLLECTION OF MOUZA MAPS	102
4.3.	COLLECTION OF SATELLITE IMAGE	102
4.4.	ESTABLISHING FIELD OFFICE	102
4.5.	DEBRIEFING OF THE PROJECT IN PROJECT AREA	103
4.5.1.	Group Discussion	104
4.5.2.	Tea Stall Meeting	104
4.5.3.	Courtyard Meeting	105
4.5.4.	Preliminary Observations and Discussion	105
5.	SECTION V: CONCLUSION	109
5.1.	CONCLUSION	109
5.2.	WAY FORWARD	109
	REFERENCES	110
	ANNEXTURES	111

List of Tables

List of Tables	Page Number
Table 1. 1: Area and physical setting.....	11
Table 1. 2: Area and physical setting.....	14
Table 1. 3: Area and physical setting.....	17
Table 2. 1: Relevant Data, and their Sources of Collection	39
Table 2. 2: Specifications for Scanned Images	41
Table 2. 3: Nomenclature of Mouza Map Image.....	43
Table 2. 4: Physical Infrastructure Survey Format.....	51
Table 2. 5: Spot Level Survey Format	52
Table 2. 6: Features Covered and Recorded in Physical Feature Survey.....	59
Table 2. 7: Features Covered and Recorded in Topographic Survey	59
Table 2. 8: Categories of Landuse Survey.	60
Table 2. 9: Distribution of Sample for Household Based Socioeconomic Surveys by Upazillas	62
Table 2. 10: Distribution of Sample for Household Based Socioeconomic Surveys by Upazillas	63
Table 2. 11: Distribution of Sample for Household Based Socioeconomic Surveys by Upazillas	64
Table 2. 12: Distribution of Sample for Household Based Socioeconomic Surveys by Upazillas	65
Table 2. 13: Drainage survey format	72
Table 2. 14: Planning standard Considered for Utility Services.....	79
Table 2. 15: Distribution of PRAs by Upazila, Ups and Municipality.....	81
Table 2. 16: Characteristics of Participants for PRAs by UPs and Municipal Wards.....	82
Table 2. 17: Sequence of Activities and Duration of PRA Sessions	82
Table 2. 18: PRA and integrated planning framework	84
Table 2. 19: Data Precision of Survey Equipment	96
Table 3. 1: Time schedule to deliver the output.....	101

List of Figures

List of Figures	Page Number
Figure 2. 1: The Layer Based Approach of Spatial Data Structure.....	94
Figure 2. 2: Linking spatial and attribute data in GIS.....	95
Figure 2. 3: Map Layout.....	98
Figure 2. 4: Flow Chart of Institutional Capacity Development Process.....	100

List of Maps

List of Maps	Page Number
Map 1. 1: Shaghata Upazila Map	12
Map 1. 2: Sariakandi Upazila Map.....	15
Map 1. 3: Sonatola Upazila Map.....	18

List of Photographs

List of Pictures	Page Number
Pic 2. 1: TOPCON GTS-230 Series Total Station	54
Pic 4. 1: Saghata Site Office	102
Pic 4. 2: Sonatola Site Office	103
Pic 4. 3: Sariakandi Site Office	103
Pic 4. 4: Court yard meeting in Bharatkhal (Shagata) and FGD in UNO Office	106
Pic 4. 5: tea stall meeting in Guridah (Shagata) and Court yard meeting in saghata	106
Pic 4. 6: River erosion and road network in Sonatola	106
Pic 4. 7: Court yard meeting in balua & pakulla in Sonatola	107
Pic 4. 8: Group discussion with local NGO & UNO office	107
Pic 4. 9: Court yard and Group Discussion in Sariakandi	107
Pic 4. 10: Group Discussion in pourashava office and UNO office.....	108

Inception Report

Preparation of Development Plan
under "Preparation of Development Plan for Fourteen Upazilas" Project- Package-04

List of Abbreviations and Acronyms

AAP	: Action Area Plan
ADB	: Asian Development Bank
APSC	: Annual Primary School Census
BANBEIS	: Bangladesh Bureau of Educational Information and Statistics
BBS	: Bangladesh Bureau of Statistics
BDHS	: Bangladesh Demographic and Health Survey
BLS	: Bangladesh Literacy Survey
BMMS	: Bangladesh Maternal Mortality Survey
BTCL	: Bangladesh Telecommunication Company Limited
BTRC	: Bangladesh Telecommunication Regulatory Commission
BWDB	: Bangladesh Water Development Board
CS	: Cadastral Survey
DLRS	: Directorate of Land Record and Survey
DPE	: Department of Primary Education
GIS	: Geographic Information System
Govt.	: Government
GPS	: Global Positioning System
KM/ km.	: Kilometer
LDCs	: Least Developed Countries
MEPC	: Modern Engineers Planners & Consultants Ltd.
MICS	: Multiple Indicator Cluster Survey
NGO	: Non-Government Organizations
NMCP	: National Malaria Control Program
No.	: Number
PD	: Project Director
PDB	: Power Development Board
PM	: Project Manager
PMO	: Project Monitoring Office
PRSP	: Poverty Reduction Strategy Plan
PWD	: Public Works Department
R.F.	: Representative Fraction
RAP	: Rural Area Plan
RCC	: Reinforced Cement Concrete
REB	: Rural Electrification Board
RHD	: Roads and Highways Department
RS	: Revenue Survey
SoB	: Survey of Bangladesh
SP	: Structure Plan
SPSS	: Statistical Package for Social Science
Sq. Ft.	: Square Feet
Sq. Km.	: Square Kilometer
Sq. M.	: Square Meter
Sq. Mile	: Square Mile
SRP	: Sub-Regional Plan
SVRS	: Sample Vital Registration System
T & T	: Telephone and Telegram
TCP	: Temporary Control Point
TIN	: Triangulated Irregular Network
ToR	: Terms of Reference
UAP	: Urban Area Plan
UDD	: Urban Development Directorate
UGC	: University Grant Commission
UNO	: Upazila Nirbahi Officer
WB	: World Bank

Section-I: Introduction

1.1. Background of the Project

There is no denying of the fact that urbanization is the inevitable destiny of the human civilization. But, the way cities, both at home and abroad, are growing is not at all sustainable. Therefore it is imperative that governments across the globe should fundamentally rethink policies and approaches towards managing urbanization before it is too late. The town planners recognize community-wide needs, the significance of neighborhood and center, the need for personal involvement in community policy making, the fragile nature of the environment, and the necessity to consider future impacts in community and regional development for the present and the future.

By the year 2020, on the 50th year of our independence, total urban population in Bangladesh will increase up to 50 million (five crores) from 30 million now. And around half of them will be attracted or compelled to live in Dhaka and its conurbations alone unless a careful and well-thought-out urbanization policy is undertaken and implemented. So, special care should be given to ensure planning intervention in the secondary towns of Bangladesh for soundly distributed urban growth throughout the country.

The development of small towns should be given utmost importance in future urbanization of Bangladesh. These are towns at the urban-rural interface having some form of urban infrastructure and the rural populations have the most access to these towns. Therefore, the development of the towns/urban centers in terms of the improvement and expansion of ranges of the services will directly benefit the population of their hinterlands and at the same time will be more economically feasible.

A comprehensive development plan is required to address the required land use transformation which will not allow any unauthorized and unplanned development, either in urban area or in rural area. Due to lack of such plan, it is generally found that most of the Upazilas in Bangladesh have developed with least coordinated manner possessing very little development control. Measures for the adequate provision of infrastructure, service, utility and modern amenities for maintaining a minimum standard of life, considering environment and sustainability has to be taken. Moreover, in preparing such plan, development constraints and local development potentials are to be identified clearly, and plans should be formulated addressing such development constraints and potentials of the area to make the plan practicable.

1.2. Objectives

The core objective of the project is preparing planning packages to ensure the future growth and development of the project area in a planned and organized way. The objectives of the study could be summarized in two broad categories as below:

General Objectives:

- To understand the existing socio-economic, physical, environmental, topographical and rural-urban situation of the project area.
- To identify the problems of the project area and prioritize the core problems.
- To correlate the planning approach with the identified problems and find out the methodological approach to address the problems.
- To induce planning approach for ensuring sustainable growth and development of the project area.
- To undertake the activities and services as per specific guidelines from the client organization.

Specific Objectives:

- Preparation of a complete database of the project area including both attribute and spatial data in an organized manner and to be stored for future need.
- Preparation of Sub-regional Plan for the respective district, Structure Plan for the whole Upazila, Urban Area Plan for municipal are, Rural Area Plan for the area other than municipal area and Action Area Plan for each ward with report.
- Incorporate environmental and social issues with the planning activities.

1.3. Scope of the Services

The study of the works has a wide range of scope for the client, consultants and the beneficiary group from the output of the project. The traditional practice of Development Plan is to expand urban facilities, ignoring or suppressing the priority of agriculture, fisheries, forestry or ecology. The current project would emphasize over those activities focusing on all relevant social and physical infrastructure services and facilities including the national level communication network. It would emphasize over the economic development in and around the project area and also livelihood of the local people, who are very much depended on local economic activities. The current project would also emphasize over the change in land category, land use and livelihood pattern.

The consulting firm will provide support for arranging workshops/seminar and conduct other ancillary activities relating to the project activities as directed by the PD wherever necessary. The consulting firm shall provide in house training to UDD personnel on both 2-Dimensional and 3-Dimensional GIS and RS system for future up-gradation of database and upcoming action plan according to governmental desire. Thus, the client and beneficiary group will be directly and indirectly benefited from the service activities of the project.

1.4. Scope of work in inception period

The purpose of this inception period is to start and introduce the objective of this project to the local people and related local authorities. In this period there are required to allocate resources of survey work, conduct some in house training program with survey expert Photogrammetric expert, hydro geological expert, social expert, transport expert, survey expert, disaster and environmental expert, urban planner. The current project would emphasize over the change in land category, land use and livelihood pattern.

The following scope of the work in inception period:

- An introduction narrating the purpose of the study, objectives and scope of services and activities is performed.
- A brief of the Sixth Five Year Development Plan and PRSP, MDG, SDG with principal objectives of the development plan within the broad scope of Urban and Regional Planning, Water Supply and Housing Sector of the National Development Plan, provision of National Water Management Plan (NWMP), National Perspective Plan and other relevant national level plan, policy etc. is discussed.
- A Review of the work plan, time schedule, input and management plan.
- An assessment of the actual provision of inputs in relation to the expected outputs.
- Analysis and findings from reconnaissance survey including problems and possible solutions to the survey activities and prospects of development. This would also include results of tea stall meeting, courtyard meeting and focus group discussion (FGD) in the project area.
- Review of all relevant reports, documents and other materials, which will form the base for the contract indicating those items already acquired and those requiring official assistance for acquisition.
- An assessment of all additional data collected and survey works to be carried out for completion of the database for the contract. This should be accompanied by a detailed program for the collection of the remaining data.
- Development of methodology for each component of the planning package (i.e., sub-regional plan, structure plan, urban area plan, rural area plan and action area plan)

1.5. Description of the Project Area

1.4.1. Shaghata Upazila

Saghata, the smallest upazila of Gaibandha Zila, in respect of both area and population came into existence in 1905 as a thana and was upgraded to upazila in 1984. Nothing is definitely known about the origin of the upazila name. It is said that in the past some Hindu Shah family settled in the present place of upazila adjacent to a Ghat of the river Jamuna. The place got prominent as a business centre due to the great contribution of that Shah family. Consequent upon the effect of these two words Shah and Ghat, the place was named as Saghata. It is generally believed that the upazila was named Saghata of the time of its creation.

Location, Area and physical setting

The upazila occupies a total area of 231.02 sq.km. It is located between 25°02' and 25°14' north latitudes and between 89°29' and 89°40' east longitudes. The upazila is bounded on the north by Gaibandha Sadar upazila, east by Fulchhari Upazila and Islampur Upazila of Jamalpur Zila, south by Saghata Upazila and Saghata Upazila of Bogra Zila and west by Gobindaganj Upazila and Palashbari Upazila.

Table 1. 1: Area and physical setting

Saghata Area Distribution	Area (sq. km.)
Total area	231.02
Land area	206.61
Reserve forest	0
Riverine area	19.16
Others	5.25

Source: BBS District Statistics 2011, Gaibandha District

Administration

The upazila consists of 10 unions, 116 populated mauzas and 130 villages. The 10 union consists of Bhartkhali Union, Bonar Para Union, Ghuridaha Union, Haldia Union, Jummerbari Union, Kachua Union, Kamaler Para Union, Padumsahar Union, Saghata Union, Saghata Union, Muktanagar Union. The total area of this upazila according to the BBS District statistics is 231.02 sq. km.

Population

According to Population and Housing Census 2011, the total population of the upazila is 267819 of which 130606 are males and 137213 are females. The sex ratio of the upazila is 95 which has remarkably decreased in 2011 as against 102 in 2001. The decadal population growth rate for the upazila is 7.01% and the annual compound growth rate is 0.67%.

Heritage and Historic site

There are only two historical site of saghata upazila. Those are varatkhali sri sri kali mondir and varatkhali jamindarbari. Both place are situated nearly 10 km north-eastern side of the rail station of Bonerpara. These place are historically and religiously most important place for this upazila.

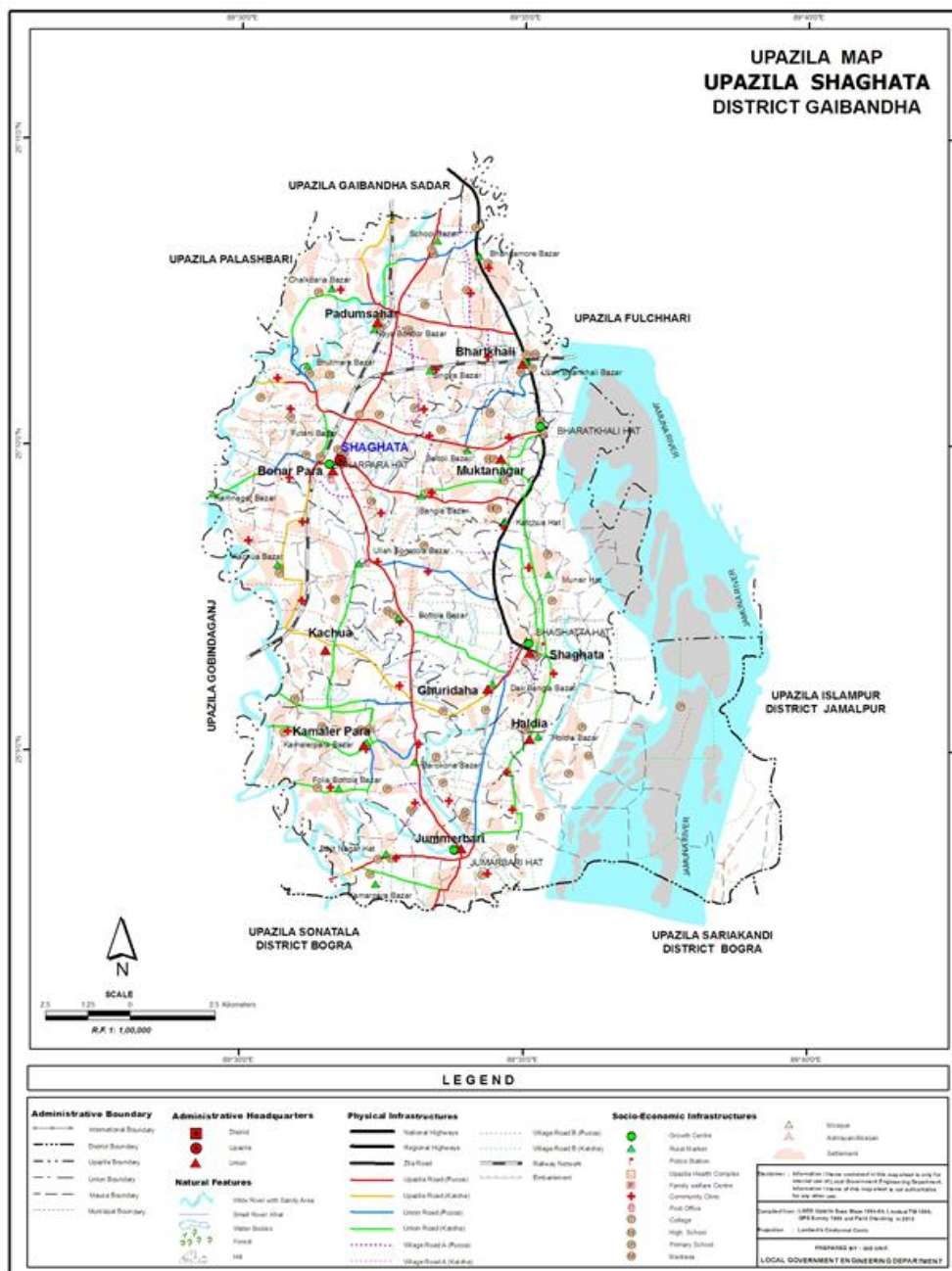
Saghata Regional & Sub-Regional Setting

Saghata upazila connected with three kinds of transport network. There are rail, water and road network to connect the other parts of the country. So this there have lots of possibilities to develop this area as an important hub of development. There are also lots of constraints in this upazila, it is disaster prone area. Almost every year flood indulge this area for few months and also river erosion swipe away its land when the river is flowing full.

There are lots of possibilities of developing this upazila as an agricultural growth center. The major agricultural items produced in this Upazila are paddy, green chili and brinjal. According to the BBS report based on population census 2011, the total production of rice in 2010-11 of the Upazila was 88917 metric ton. Besides, the production of wheat was 819 metric ton, production of jute was 4092 metric ton and production of sugarcane was 63 metric ton in the same year.

According to the Agricultural census 2008, the Upazila has 54740 acre arable land where 379 acre is used as permanent cropped area, 43990 acre is used as temporary cropped area and the remaining 11077 acre is used as others. This upazila is connected with rail, water and road network so there have great opportunity to connect this upazila with other part of the country in great extent.

Map 1. 1: Shaghata Upazila Map



Source: <http://www.lged.gov.bd/UploadedDocument/Map/RANGPUR/gaibandha/saghata/saghata.jpg>

Residential and Commercial Development

The area is mostly in rural characteristics. Most of the structure is katcha (87.6%), while pucca structure is only 1.3% and semi-pucca structure is only 10.1%. According to the BBS report based on population census 2011, total household of the Upazila is 68954. Average household size is 3.88 and population density per square kilometer is 1159 persons.

Transportation and Communication

The people of Saghata Upazila have been suffering with the problem of insufficient road network. Besides, among the existing road network, about 75% road network is not metaled (kacha). Narrow road network and poor surface quality of the road is also a major problem. River erosion and seasonal flood always is a cause of damaging the road network of the area.

According to the BBS report based on population census 2011, the Upazila has total 530 kilometer road of which 128 kilometer is metaled road and remaining 402 kilometer is un-metaled (kacha) road. The area has 20 kilometer railway connection with Bogra Sadar. It has 30 kilometer water way in monsoon (both river and canal). The area has 108 bridges, 1 baily bridge and 96 culverts. The total area has 2 railway stations and 3 bus stands.

Water Supply

In Saghata Upazila, 96.7% general household get the facility of drinking water from tube-well, 0.1% from tap and the remaining 3.2% household get water from other sources.

Electricity and Fuel

All the 10 unions of the upazila have brought under the Rural Electrification Program. However, a total of 31.3% general household reported to have electricity connection in the entire upazila in 2011 as against 8.3% in 2001. According to the BBS 2011 Bonar Para union has highest number of electricity connection 50.1% and Haldia union has only 5.8% electricity coverage.

Health Care Facilities

The available health facility of the area is so poor. The area has only one health complex and 36 (thirty six) community clinic.

Literacy and Educational Facilities

In Saghata Upazila, it is found that 40.6% population aged 7 years and over are literate. Saghata Upazila has a relatively low literacy rate compared with the national literacy rate. The current literacy rate of the Upazila is 40.6% (census 2011). The residents of the Upazila are now having education facility from 7 (seven) colleges, 3 (three) degree colleges, 39 (thirty nine) secondary schools, 160 (one hundred and sixty) govt. primary schools, 2 (two) community primary schools, 19 (nineteen) Madrasha and 28 (twenty eight) Abtedia Madrasha.

Low literacy rate (40.6%), poor access to the educational institution due to poor connectivity, lack of available educational center and odd distribution of educational institution depending on population density are the major problems with the education of Saghata Upazila.

Community Facilities

The community facilities of this area is very poor. The urban population of this area is 267819, but for this population and also for the entire upazila there are little community facilities. There is no Filling station and Fire brigade station, two Police station and camp, there is only one govt medical hospital. The sanitation facilities of this area is not satisfactory 66.8% has no sanitation facilities and only 33.2% has got sanitary facilities in this area.

River and Drainage Network and Environment

Jamuna and Bangali is the main river of Saghata Upazila. Jamuna River passes through the east side of the upazila. There are 10 km of navigable water network and 30 km of navigable network during the monsoon.

1.5.2. Sariakandi Upazila

Location, Area and physical setting

Sarikandi is an Upazila of Bogra district in the division of Rajshahi. Sariakandi is an old aged Upazila of Bogra district. People living in the Char area migrated from the eastern part to western part of the Upazila affecting by river erosion and flood and looked for the permanent settlement in and around of the municipal area. The large portion of the settlement of this Upazila was taken place as a result of in-migration from nearly Jmalpur, Sirajganj and Gaibandha district. The fertile land, available char area, communication facility over river way and excellent geography exerted a pull on people to live and conduct business here. Thus, settlement developed by the surrounding inhabitants and with the people of remote area as well.

Sariakandi Upazila is a flood prone area located at Bogra district under Rajshahi Division. The Upazila is adjacent to four others Upazila namely Madarganj Upazila (Jamalpur district) at east, Gabtali Upazila (Bogra district) at west, Sonatola Upazila (Bogra district) at north and Dhunat Upazila (Bogra District) at south. Most of the business, economic and

administrative activities are based on the Sariakandi municipal area. The total area of Sariakandi Upazila is 408.5 square kilometer with a total population covering 270719. The whole Upazila is covered by 122 Mouzas and the number of village is 216. The major rivers of the area are Jamuna and Bangali. Jamun River runs over the middle part of the Upazila adjoining to Kazla, Sariakandi, Karnibari, Chandan Baisha and Bohail Union from north to south. The Upazila has 4048.82 acre khas land. The sandy land area, homogeneous topography, Char area, moderate moisture etc are the common geographical characteristics of the study area.

Table 1. 2: Area and physical setting

Sariakandi Area Distribution	Area (sq. km.)
Total area	408.5
Land area	236.4
Reserve forest	3.64
Riverine area	168.46

Source: BBS District Statistics 2011, Bogra District

Administration

Sariakandi Upazila is divided into Sariakandi Municipality and 12 (twelve) Union Parishads namely Chaluabari, Hat Sherpur, Kazla, Sariakandi, Narchi, Fulbari, Karnibari Kutubpur, Bhelabari, Chandan Baisha, Kamalpur and Bohail Union. The Upazila sadar has declared as 'Pourashava' but still it has no own 'Pourashava Office'. The official activities of the municipality are performed through a rental house. The Upazila has one fire station, one telephone exchange office, 14 (fourteen) post office, 6 (six) bank branches, 5 (five) union land office, one municipal land office, one Upazila Server Station and so on.

Population

According to Population and Housing Census 2011, the total population of the upazila is 2, 70,719 of which 1, 35,266 are males and 1, 35,453 are females. The sex ratio of the upazila is 100.

Residential and Commercial Development

The area is mostly in rural characteristics. Most of the structure is katcha (85.13%), while pucca structure is only 1.98% and semi-pucca structure is only 12.41%. According to the BBS report based on population census 2011, total household of the Upazila is 75614. Average household size is 3.58 and population density per square kilometer is 663 persons.

Transportation and Communication

According to the BBS report based on population census 2011, the Upazila has total 501.1 kilometer road of which 86 kilometer is metalled road, 9.04 kilometer is semi metalled road and remaining 406.06 kilometer is unmetalled (kutch) road. The area has no railway connection. It has 20 kilometer water way in monsoon (both river and canal). The area has 12 bridges, 1 baily bridge and 182 culverts. The total area has only 4 bus stands.

The communication facility of Sariakandi Upazila is awfully poor. The Upazila is connected with the other parts of the country only through roadway. There is no railway connection of this Upazila. There only have a regional highway from Gabtali (Bogra) to Sariakandi and 3 (three) union roads to communicate in and around the project area. The existing 31.19 kilometer paved roadway enhances people to communicate with inter and intra Upazila area and also with the outer part of the country. But, the 30 kilometer semi-paved and 236.66 kilometer unpaved road is not favorable to the inhabitants in wet season as most of these go beyond public use. The total number of bridge culvert of the area is 10 some of which is very nominal in connection with public need. Besides, the Jamuna River could play an imperative role in developing communication with surrounding area through waterway.

Heritage and Historic Site

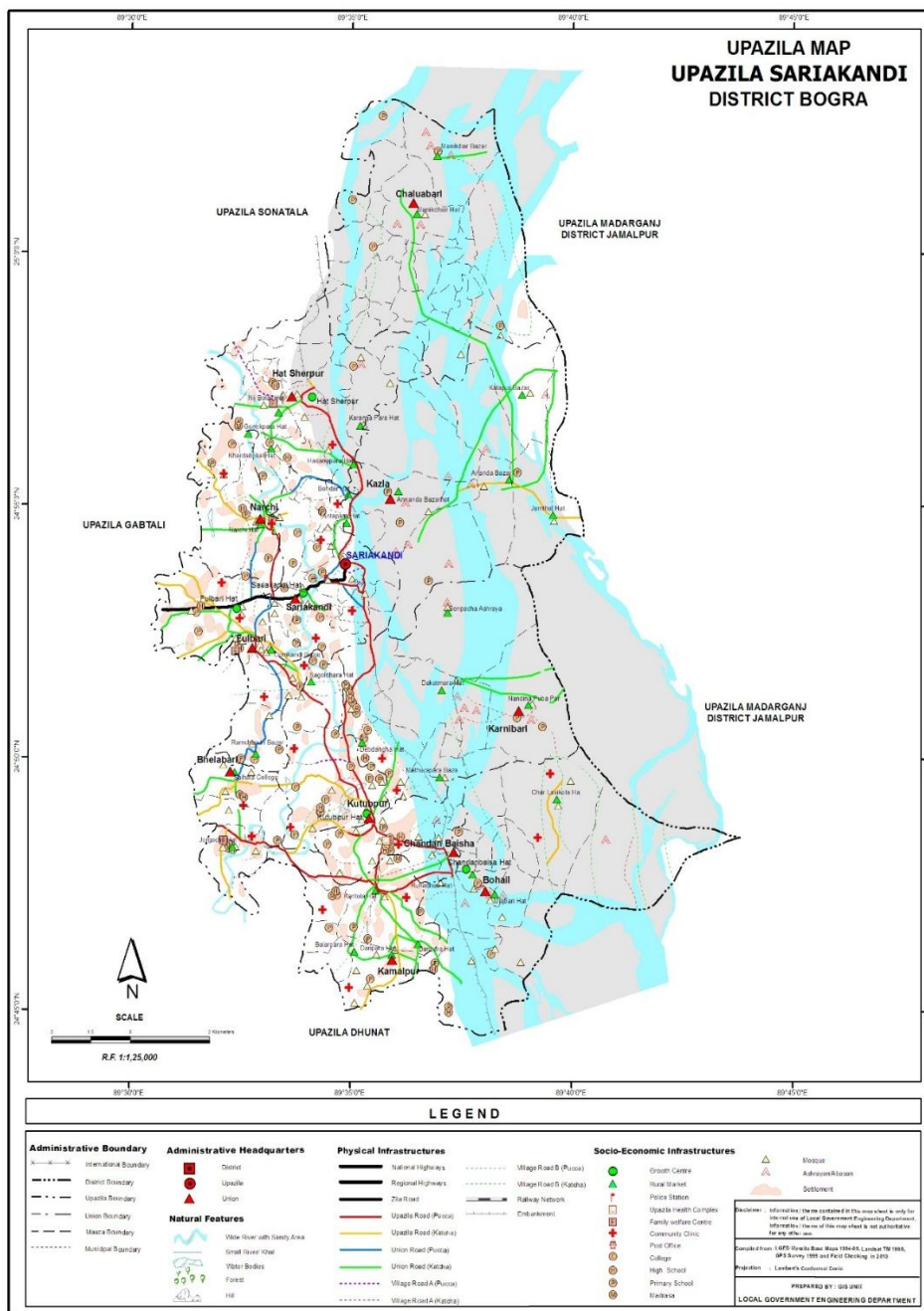
Archaeological heritage and relics Residence of zamindar Kashi Roy at village Harina under Fulbari union, remnants of Neelkuthi at the upazila sadar. Debdanga fish pass and sariakandi Pani Port also a place of heritage of this upazila.

Sariakandi Regional & Sub-Regional Setting

The economy of the Sariakandi Upazila is based on agricultural activities. The major agricultural items produced in this Upazila are paddy, green chili and brinjal. According to the BBS report based on population census 2011, the total production of rice in 2010-11 of the Upazila was 54598 metric ton. Besides, the production of wheat was 863 metric ton, production of jute was 10413 metric ton and production of sugarcane was 1663 metric ton in the same year. About 89.11% people engaged in agricultural activities. Every year flood, drought and river erosion catastrophe this upazila, though it has many constraints but it has possibilities to develop this area as an agricultural center.

The communication facility of Sariakandi Upazila is awfully poor. The Upazila is connected with the other parts of the country only through roadway. There is no railway connection of this Upazila. There only have a regional highway from Gabtali (Bogra).

Map 1. 2: Sariakandi Upazila Map



Source: <http://www.lged.gov.bd/UploadedDocument/Map/RAJSHAHI/bogra/sariakandi/sariakandi.jpg>

Water Supply

The urban area (Sariakandi Pourashava) of Sariakandi Upazila has little water supply facility. The major source of water of the residents is deep or shallow tube well. Moreover, high quantity of iron composition into the tube well water also is a problem faced by the inhabitants. From the BBS statistics there only 0.47% people got access to the tap water supply and rest of them rely on tube-well and other source of water.

Electricity and Fuel

The urban area (Sariakandi Pourashava) of Sariakandi Upazila has no street light facility. Besides, most of the areas of this Upazila has no electricity connection. Most people are taking the advantage of solar power system. From the BBS statistics 2011 we found that total 38.73% household get electricity connection. The municipal area get highest electricity connection then union level. The highest electricity connection is in ward no-05 (75.7%) while the lowest is in kazla union 0.7%.

Health Care Facilities

The available health facility of the area is not enough for the resident. The area has only one govt. hospital accommodating 50 (fifty) beds. There also have 29 (twenty nine) community clinic, 4 (four) union health and family welfare center in this Upazila. For recreation purpose, there has no park or playground into the area.

Literacy and Educational Facilities

Sariakandi Upazila has a relatively low literacy rate compared with the national literacy rate. The current literacy rate of the Upazila is 36.9% (census 2011). The residents of the Upazila are now having education facility from 5 (five) colleges, 29 (twenty nine) secondary schools, 83 (eighty three) govt. primary schools, 78 (seventy eight) private primary schools and 21 (twenty one) Madrashes. The literacy rate of this upazila is given below,

Community Facilities

The community facilities of this area is very poor. The urban population of this area is 18543, but for this population and also for the entire upazila there are little community facilities. There is one Filling station, one Fire brigade station, one Police station, there is only one govt medical hospital. The sanitation facilities of this area is moderately satisfactory 22.88% has no sanitation facilities and only 77.12% has got sanitary facilities in this area.

River and Drainage Network and Environment

According to the upazila website there are 85 sq km of river area situated here. Manash, Belai, Dakuria, Sukhdah, Bangali, Jamuna are the major river of this upazila. Besides this river there are Dubri beel, Dharaborsha Beel, Dewlir beel, Koier Beel, Molash Beel, Boro Morchar beel are famous of this area. According to the BBS of bogra district there are 17.4 km of navigable water network round the year and 20 km navigable water network only for the monsoon.

1.5.3. Sonatola Upazila

Location, Area and physical setting

Sonatola is a traditional Upazila of Bogra district. It was established as Thana in 1981 and converted as Upazila in 1983. The present Sonatola was a renowned business center from its ancient period. The settlement of this area was started centering the river 'Bangali'. The fertile land, communication facility over river way and excellent geography exerted a pull on people to live and conduct business here. Thus, settlement developed by the surrounding inhabitants and with the people of remote area as well. It is proverbial that the name 'Sonatola' was originated from the name 'Sona Bibi' who was the wife of Baro Vuiya chief Isha Khan. Isha Khan often visited this area along with his wife in sixteen century. The area has a lot of similarities with the historical 'Mahasthanagar'.

Sonatola Upazila is a flood prone area located at Bogra district under Rajshahi Division. The Upazila is adjacent to four others Upazila namely Sonatola Upazila (Bogra district) at east, Shibganj Upazila (Bogra district) at west, Gobindoganj Upazila (Bogra district) at north and Gabtoli Upazila (Bogra District) at south. Most of the business, economic and administrative activities are based on the Sonatola municipal area.

The total area of Sonatola Upazila is 156.73 square kilometer with a total population covering 186778. The whole Upazila is covered by 101 Mouzas and the number of village is 131. The major rivers of the area are Jamuna and Bangali. Jamun River runs along the eastern part of the Upazila adjoining to Tekani Chukainagar, Pakullah and Jorgachha Union from north to south. The Upazila has 331.61 acre khas land. The sandy land area, homogeneous topography, Char area, moderate moisture etc are the common geographical characteristics of the study area.

Table 1. 3: Area and physical setting

Sonatola Area Distribution	Area (sq. km.)
Total area	156.75
Land area	145.14
Reserve forest	0
Riverine area	11.61

Source: BBS District Statistics 2011, Bogra District

Administration

Sonatola Upazila is divided into Sonatola Municipality and 7 (seven) Union Parishads namely Pakullah, Balua, Jorgachha, Digdair, Tekani Chukainagar, Sonatola and Madhupur Union. Sonatola Municipality is subdivided into 9 wards and 16 mahallas. The area of Sonatola Municipality is 12.37 square kilometer which covers a population of 21,494. The Upazila has one fire station, one auditorium cum community center, one railway station, one Upazila Server Station and so on.

Population

According to Population and Housing Census 2011, the total population of the upazila is 186778 of which 92306 are males and 94472 are females. The sex ratio of the upazila is 98.

Residential and Commercial Development

The area is mostly in rural characteristics. Most of the structure is katcha (85.13%), while pucca structure is only 1.98% and semi-pucca structure is only 12.41%. According to the BBS report based on population census 2011, total household of the Upazila is 75614. Average household size is 3.58 and population density per square kilometer is 663 persons.

Heritage and Historic site

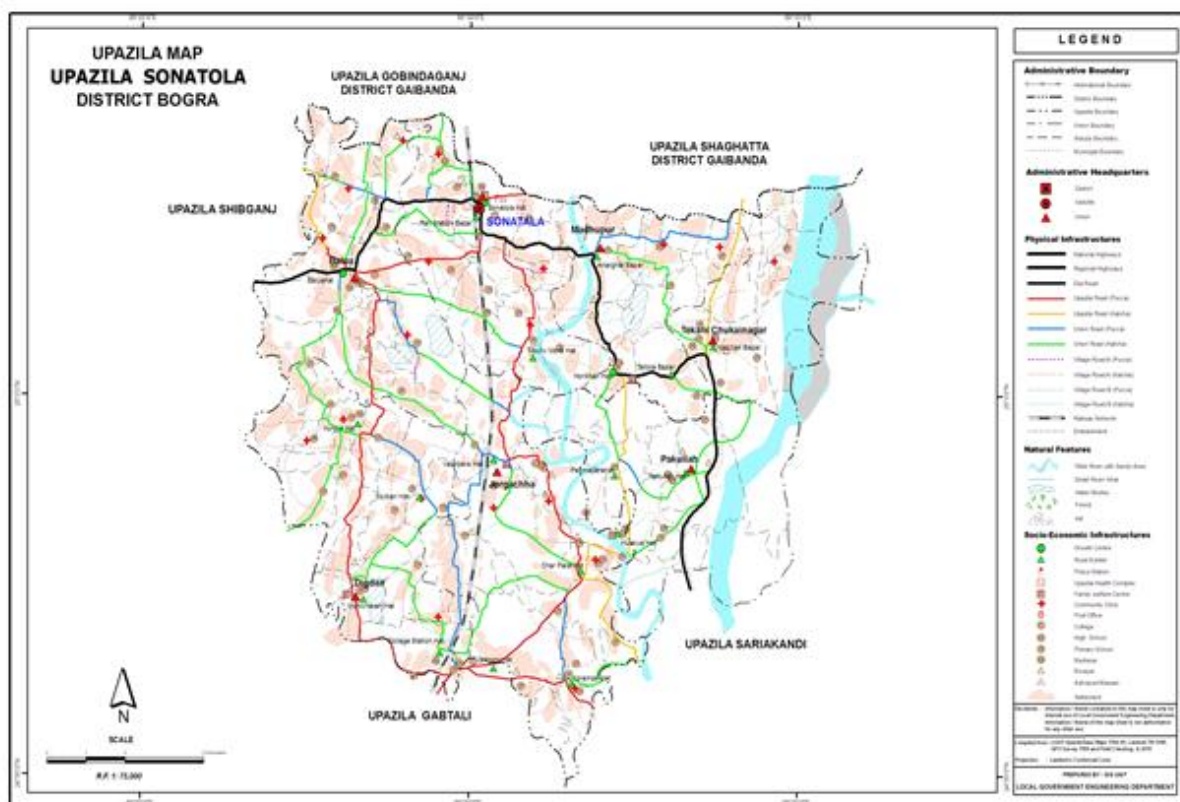
There are no famous heritage and historic site of this area. Sonakiania Gurvanga river bank also known as tematha is known as the locally tourist spot of this area.

Sonatola Regional & Sub-Regional Setting

Sonatola upazila connected with three kinds of transport network. There are rail, water and road network to connect the other parts of the country. So there have lots of possibilities to develop this area as an important hub of development. There are also lots of constraints in this upazila, it is disaster prone area. Almost every year flood indulge this area for few months and also river erosion swipe away its land when the river is flowing full.

There are lots of possibilities of developing this upazila as an agricultural growth center. The major agricultural items produced in this Upazila are paddy, green chili and brinjal. According to the BBS report based on population census 2011, the total production of rice in 2010-11 of the Upazila was 218920 metric ton. Besides, the production of wheat was 418 metric ton, production of jute was 6233 metric ton and production of sugarcane was 353 metric ton in the same year. This upazila is connected with rail, water and road network so there have great opportunity to connect this upazila with other part of the country in great extent.

Map 1. 3: Sonatola Upazila Map



Source: <http://www.lged.gov.bd/UploadedDocument/Map/RAJSHAHI/bogra/sonatola/sonatola.jpg>

Transportation and Communication

According to the BBS report based on population census 2011, the Upazila has total 421 kilometer road of which 106 kilometer is metalled road, 15 kilometer is semi metalled road and remaining 300 kilometer is unmetalled (katcha) road. The area has 14 kilometer railway connection with Bogra Sadar. It has 36 kilometer water way in monsoon (both river and canal). The area has 150 bridges, 5 baily bridge and 234 culverts. The total area has 3 railway stations and 8 bus stands.

Sonatola Upazila is connected with the other parts of the country through railway and roadway. The existing railway communication facilitates people for communicating with Gaibandha and Bogra district head quarter through Sonatola Municipality, Jorgachha and Digdair. Besides existing 131 kilometer paved roadway enhances people to communicate with inter and intra Upazila area and also with the outer part of the country. But, the 256 kilometer unpaved road is not favorable to the inhabitants in wet season as most of these go beyond public use. The total number of bridge culvert of the area is 436 some of which are very poor in condition. Additionally, the Jamuna River also plays an imperative role in developing communication with surrounding area through waterway.

Water Supply

The urban area (Sonatola Pourashava) of Sonatola Upazila has little water supply facility. The major source of water of the residents is deep or shallow tube well. Moreover, high quantity of iron composition into the tube well water also is a problem faced by the inhabitants. From the BBS statistics there only 1.39% people got access to the tap water supply and rest of them rely on tube-well and other source of water.

Electricity and Fuel

The urban area (Sonatola Pourashava) of Sonatola Upazila has no street light facility. Besides, most of the areas of this Upazila has no electricity connection. Most people are taking the advantage of solar power system. From the BBS statistics 2011 we found that total 40.66% household get electricity connection. The municipal area get the highest electricity connection then union level. The highest electricity connection is in ward no-07 (76.3%) while the lowest is in Tekani Chukaina union 9.3%.

Health Care Facilities

The available health facility of the area is not enough for the resident. The area has only one govt. hospital accommodating 50 (fifty) beds. There also have 26 (twenty six) community clinic, 56 (fifty six) satellite clinic, 5 (five) union family welfare center and 2 (two) union health center in this Upazila. For recreation purpose, there has no park or playground in the area.

Literacy and Educational Facilities

Sonatola Upazila has relatively low literacy rate compared with the national literacy rate. The current literacy rate of the Upazila is 43.2% (census 2011). The residents of the Upazila are now having Education facility from 2 (two) colleges, 2 (two) degree colleges, 6 (vocational) colleges, 21 (twenty one) secondary schools, 121 (one hundred and twenty one) govt. primary schools, 1 (one) community primary schools, 9 (nine) Madrasha and a PTI institute.

Community Facilities

The community facilities of this area is very poor. The urban population of this area is 24720, but for this population and also for the entire upazila there are little community facilities. There is one Filling station, one Fire brigade station, one Police station, there is only one govt medical hospital. The sanitation facilities of this area is not satisfactory 44.42% has no sanitation facilities and only 55.58% has got sanitary facilities in this area.

River and Drainage Network and Environment

Bangali and jamuna is the main river of this upazila. Total navigable waterway round the year is 24 km and 35 km only in the monsoon period.

1.6. Organization of the Inception Report

Section-I: Introduction: This section provides a very brief overview of the project, scope and background of the project, Objectives, Scope of the Services, Scope of work in inception period, project area profile etc.

Section-II: Approach and Methodology This section provides a brief description of the Review of National Development Plans & Policies Linkage of National Plans and Policies with Development Plans of 14 Upazilas Project, Preparation of Base Map using GIS and Mouza Map, Preparation of Base Map using Satellite Image and Photogrammetric Method, Data Base Preparation, Field Survey Using GPS Based Advanced Survey Technique, Survey Data Processing (GPS and Total Station Data), Preparation of Map Layout and Legend, Existing Physical Infrastructure and topographic survey, Land Use, socio economic, Hydrological, Agricultural, Transport, Drainage and Environmental Issues, Disaster Management studies, Determination of Planning Principles, Formulation of Planning Standards, Demographic Analysis and Population Forecasting, Matching PRA Analysis with Technical Analysis, Output and Format etc.

Section-III: Work Plan This section provides the work plan of the future work of this project. These includes revised work plan, Activity Schedule and Network Diagram, in- house Training Program, Reporting Schedule

Section-IV: Progress of Work Update This section includes project progress so far and work update, these includes Collection of Mouza Maps, Collection of Satellite Image, Establishing Field Office, Debriefing of the Project in Project Area.

Section-V: Conclusion this is the concluding part of the report remarking the activities to be done in survey period.

Section-II: Approach and Methodology

2.1. Methodology of Field Survey & Plan Preparation

A comprehensive methodology as per the study procedures shortly given in the ToR will be followed in detailed form to accomplish the proposed evaluation. The methodology includes: a) Data gathering from the concerned government officials, development partners, civil society and others with a carefully formulated instrument/format; b) Collection of all relevant documents, reports, recent studies to get relevant information; c) Assessing the indicators of the progress with qualitative and quantitative methods; d) Study reports of the sample sectors, if any; e) Cross cutting issues across the sectors receiving aids; f) Data validity through cross check and counter check at the operational level; and g) others.

Furthermore the detailed work plan will present the effective and detailed works of the project. It is mentioned that the activities of methodology somehow may overlap the activities of the detailed work plan.

2.2. Review of National Development Plans & Policies

2.2.1. Introduction

Sustainable urbanization is crucial for achievement of sustainable development. The concept of sustainable urbanization is a dynamic, multi-dimensional process and it embraces relationships between all human settlements. Several policies associated with national planning already exist in the context of Bangladesh. National level policies for development prepared in the national context. So the policy measures to be formulated in the plan have to consider those directives carefully and make sure the policies prepared are congruent with those national level guidelines.

This chapter has addressed to review the important policy like urban management, land use, housing, population, transportation, agriculture, environment, industry and health. Important urban related acts like Urban Management Policy, Land use Policy, The Perspective Plan (2010-2021), Sixth Five Year Plan, Poverty Reduction Strategy Paper (PRSP), Millennium Development goal (MDG), and National Plan for Disaster Management (2010-2015) etc. are discussed in a brief in the following subsections.

2.2.2. Rationale of Relating National and Local Plan

In this development project there need to prepare structure plan, Sub Regional Plan, Urban Area Plan, Rural Area Plan, Action Area Plan. To prepare those plans there should propose different plan policies for that area, those plans should be rationale with the national plan and policies. The aim of the review is to highlight the special features of the relevant legal documents and to expose the major limitations and point out necessary areas of revisions to make them effective facilitators in future Upazila development.

2.2.3. The Perspective Plan (2010-2021)

The Perspective Plan provides the road map for accelerated growth and lays down broad approaches for eradication of poverty, inequality, and human deprivation. Specific strategies and the task of implementation will be articulated through the two five-year plans: Sixth Five Year Plan (2011-2015) and the Seventh Five Year Plan (2016-2020). The expectation is that by 2021, the war against poverty will have been won, the country will have crossed the middle income threshold, with the basic needs of the population ensured, and their basic rights respected, when everyone is adequately fed, clothed and housed, and have access to health care. And all this is achieved on a sustainable basis without damaging the environment. Furthermore, this progress will be ensured in an environment where every citizen has the opportunity fully and positively to contribute to the economy and society and equitably share the benefits from progress achieved.

The salient features of this plan discuss briefly below:

Institutional foundations of stability and prosperity: The principal dimensions of governance or institutional quality may include: voice and accountability, political stability and absence of violence, government effectiveness, and regulatory quality, rule of law and control of corruption. In this perspective plan there are providing strategy to ensure those institutional foundations stability and prosperity.

Strategy for food security: agriculture and rural development: to enhance agriculture production and ensuring food security, by 2021, food deficiency will be eliminated and the country will attain self-sufficiency in food production enabling to meet nutritional requirement of the population. To establish a powerful autonomous local government body. This is imperative to initiate and provide coordination among private and public rural development institutes. To ensure the rural development.

Transport and communication for the future: The vision of the perspective plan is to establish a safe, low cost, modern and technologically dependable, environmentally friendly inter-modal transport system with a view to reducing the financial cost and time for both commercial traffic, cargo and for public transportation.

The main policy objectives taken by this plan for the transport and communication are,

- Meeting the transport demand generated by higher rate of growth of GDP.
- Introduction of modern technology for increasing capacity and improving quality and productivity
- Development of the two sea ports. Establishment of effective railway linkages between the east and west zones of the country.
- Re-orientation of the development strategy for rural transport for efficient external access through optimal integration of road and inland water transport and off-road internal accesses.
- Efforts will be made to develop some of the critical inter-modal transport network that allows connectivity of neighboring countries to the two sea ports of Bangladesh.
- Efforts will also be made to fully participate in global and regional transport connectivity initiatives that help develop the land route links between South Asia and East Asia through Bangladesh.
- Improvement in resource mobilization will be made through introduction of user charges and fees.
- Provision of required incentive packages for the private sector for greater participation will be ensured, not only in transport services, but also for infrastructure building.
- Transport development strategy framework will be broadened by incorporating the vital urban transport dimension starting with improvement in transport services of greater Dhaka city.
- Adequate care will be taken while developing transport network and service so that these do not cause environmental pollution and affect ecological balance.

Rural Transport

It is important to give attention to ways that the rural transport infrastructure, particularly the physical infrastructure, can support rural economies. Roads, waterways, or both serve most of rural markets and growth centers. The long-term goals of the perspective plan with respect to rural roads are (i) to provide all weather access to all growth centers, all union parishad complexes, most rural markets and other rural service delivery centers, and (ii) to improve rural accessibility to facilitate agricultural production and marketing. The strategies may be adoption of a Rural Road Master Plan and Maintenance Plan with priority accorded on maintenance over new construction, and more involvement of LGIs in ensuring utilization and maintenance of constructed facilities.

Addressing the urban challenge: Bangladesh has been experiencing rapid increase in its urban population ever since its independence in 1971. Urban population as a percentage of total population increased from around 8.8 % to nearly 23 % during 1974-2001 period. It is estimated that by the year 2021 nearly one-third or 33% of the population of Bangladesh will be living in urban areas. Urban development Policies and Strategies has taken based on, Patterns and Process of Urbanization, Urban Governance, Urban Economic Development, Urban Environmental Management, Urban Housing, Urban Transportation, Urban Land Management and Planning, Infrastructure and Services, Urban Poverty.

Addressing challenge of poverty eradication: The main elements of the poverty reduction strategy in Bangladesh 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;
- stimulate women's participation in the labor force;
- 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
- mitigate the adverse consequences of climate change

2.2.4. Sixth Five Year Plan

The sixth five year plan is the first phase of the perspective plan 2010-2021. The fundamental task of the Sixth Five Year Plan is to develop strategies, policies and institutions that allow Bangladesh to accelerate growth and reduce poverty. In sixth five year plan there are taken strategy and policy for agricultural productivity, diversifying exports and developing a dynamic manufacturing sector, energy development plan, efficient transport services, managing the urban transition, boosting the knowledge economy for higher productivity, education, training, sports, culture and religion, health, population and nutrition sector development programs, reaching out the poor and the vulnerable population, environment, climate change and disaster risk management. As a planning perspective here giving review of some important strategies that related with this plan. Important targets set for the economy are:

- Secure and sustain an annual level of GDP growth of 8 percent by 2013 and raise it to 10 percent from 2017;
- Bring down the percentage of disadvantaged people living below the poverty line to 15 percent by 2021;
- Ensure a minimum of 2,122 k. cal/person/day of food to all poor people and standard nutritional food to at least 85 percent of the population by 2021;
- Ensure 100 percent net enrolment at primary level by 2010, provide free tuition up to the degree level by 2013, attain full literacy by 2014, and ensure that Bangladesh is known as a country of educated people with skills in information technology;
- Achieve self-sufficiency in food by 2012;
- Ensure living accommodation for the entire population by 2015, supply of pure drinking water for the entire population by 2011, and bring each house under hygienic sanitation by 2013;
- Eliminate all kinds of contagious diseases and increase life expectancy of citizens to 70 years by 2021;
- Reduce maternal mortality to 1.5 percent, raise the use of birth control methods to 80 percent, and bring down infant mortality to 15 per thousand live births by 2021;
- Change the sectorial composition of output with the shares of agriculture, industry, and services standing at 15 percent, 40 percent, and 45 percent respectively in 2021;
- Reduce underemployment rate to 15 percent along with changing employment shares of agriculture, industry, and services to 30 percent, 25 percent, and 45 percent respectively in 2021;
- Generate 7,000 megawatt of electricity by 2013, raise it to 8,000 megawatt in 2015, and make provision to meet the expected demand for power of 20,000 megawatt in 2021.

Managing the urban transition

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. Here given some strategies that have taken for managing the urban transition:

- Institutional reforms and decentralization of responsibilities and resources to local authorities;

- Participation of civil society including women in the design, implementation and monitoring of local priorities;
- Building capacity of all actors (institutions, groups and individuals) to contribute fully to decision-making and urban development processes; and
- Facilitating networking at all levels
- Support small, medium and micro-enterprises (SMMEs) and enforce a regulatory framework that creates an environment conducive to investment.
- Attract private investment through investments in infrastructure and utilities that reduce production and distribution costs within economies.
- To improve land and property valuation, better tax collection through improvements in property tax administration, and setting prices for urban services with due regards to cost.
- To meet the housing needs of the lower income households the House Building Finance Corporation will be restructured and housing finance in the private sector for lower income households will be encouraged.
- Facilitating NGO Involvement in Housing
- to deal with urban poverty will promote equal access to and fair and equitable provision of services in urban areas

Education

An approach to induct academically competent people to teaching in primary schools (as well as extended compulsory grades and secondary schools) and to keep them in the profession would be to introduce education courses in the general education degree program and to offer education as a subject in at least one well-equipped degree colleges in each district.

Given the need of increased globalization, the SFYP emphasizes the importance of introducing a 'third language' at the secondary level in addition to the mother tongue Bengali and second language English.

Special attention has to be given to some 2000 villages identified by the Ministry of Primary and Mass Education as lacking a primary school. These villages are generally in areas with difficult communication and dispersed habitations such as *haors*, *chars*, coastal areas and hills where schools built according to standard criteria of population still leave these inaccessible to small children.

Improving Education Service Delivery through Better Governance and Management

Teachers have to be supported by administrators, supervisors, and various types of specialists. The new Education Policy (2010) has two crucial recommendations regarding system governance and coordination: a) establishing a permanent national education commission to review policy implementation and guide policy review and modification as needed, and b) adopting an overall education law to serve as the legal framework for fulfilling the constitutional obligations and state commitments regarding education and human resource development.

Environment, climate change and disaster risk management

The agenda for attaining a sustainable environment for the long-term is daunting and it can hardly be over-emphasized. The focus of the Sixth Plan's environmental protection strategy would be the conservation and maintenance of natural resources, reducing air and water pollution, and liberating encroached rivers, water bodies, forest areas and khas land. Effective steps must be explored and adopted in collaboration with the international community within the Sixth Plan period to mitigate the adverse consequences of climate change. An acceptable and workable collaboration strategy must include fair and just burden sharing for mitigation as well as adaptation strategies across nations. The Government is undertaking the following policies, strategies and programs for the environment sub-sector during the SFYP:

- National Environment Council headed by the Prime Minister and executive committee of National Environment Council headed by the Minister for Environment and Forests would be activated.
- Environment committees at Division, District and Upazila levels will be activated with the participation of all stakeholders.
- Existing environmental laws and regulations will be amended to address new environmental issues.

- Department of Environment will be strengthened in the light of existing Environment Policy, Environmental Act, Rules and Environment Management Action Plan in order to coordinate, monitor and implement these activities.
- Enhance whole of government's capacity to mainstream poverty-environment-climate nexus in the development project design, budgetary process, project implementation and monitoring process.

Efficient transport services

The main elements of the overall transport strategy for the Sixth Plan for the local town development are as follows:

- Railway linkages will be established between the east and south west zones of the country. Expansion of line capacity by double tracking of major rail corridors, rehabilitate/upgrade & replace old aged railway track, bridges, signaling and other assets, acquiring modern rolling stocks to provide speedy, environment friendly and cost effective transport facilities to the national, regional and international traffic will be made.
- The development strategy for the rural transport will be reoriented for efficient external access through optimal integration of road and inland water transport and off-road internal accesses.
- Efforts will also be made to fully participate in global and regional transport connectivity initiatives that help develop the land route links between South Asia and East Asia through Bangladesh.
- Improvement in resource mobilization will be made through introduction of user charges and fees by the agencies in all areas of transport and for all use of transport network.
- Identification and implementation of preventive, emergency and post-disaster mitigation measures will be made.
- Adequate care will be taken while developing transport network and service so that these do not cause environmental pollution and affect ecological balance.
- Attention will be given to improve transport safety standards including specific attention to women safety in all means of transportation with a view to substantially reducing the incidence of accidents; and
- Provision of duty-free or import of engines and spares at low duty for mechanization of country boat will be made.

Agricultural productivity

For the development of crop sector there are taken some strategy in SFYP. Those are:

- For increasing crop production food inter-cropping will be emphasized.
- For crop intensification, the coastal zone, the Sylhet region and the char areas must receive priority in crop sector development plans.
- Reduce the number of middlemen from the marketing chain. In this context, formation of cooperative for the growers and construction of special growth center only for the actual growers could be a way out of this problem.
- Strategy, policy and action should be formulated to convert the single crop land into double crop land, double crop land to triple crop land.
- The plan emphasizes on the importance of farm mechanization.
- Fragmented land structure is a hindrance to mechanization of agriculture in Bangladesh. On the other hand, mechanization would generate surplus labor released from agriculture, which would need employment elsewhere. Policies to engage such laborers will be taken into account.
- Measures to encourage surface irrigation e.g. dredging of rivers, canals, sluice gate etc. will be taken.
- In order to maintain soil fertility use of organic fertilizer will be popularized.

Water Resources

The following strategies would be followed in the SFYP plan (2011-2015) period:

- River dredging would be carried out in a systematic and comprehensive way and that has to be done in combination with river bank protection for non-destructive, easy and smooth passage of flood flow of river system. Such a planned activity would help to protect the river banks from erosion, which is also a major vector of rural poverty. BWDB would take the lead role in this context.
- Such an approach would be followed in all water resources sector projects right from the identification up to monitoring and evaluation. The approach is mandatory for all public sector institutions.

- BADC, BMDA and BWDB would continue to pursue command area development activities in surface water irrigation project and to explore expansion of irrigation.
- The issue would be assessed on a realistic scale and then the effects of the issue on water resources sector would be addressed with reasonable care. BWDB, BHWDB, WARPO, IRRI, IWM, JRC, BMDA, BADC and CEGIS would take joint effort in this field with WARPO taking the lead.

Health, population and nutrition sector development

The strategies and policies for realizing the Vision 2021 and achieving the targets of the Sixth Plan for the health subsector build on the lessons of experience of the implementation of the past health policies. It takes a comprehensive approach to improving the health sector service delivery including stronger partnership with private sector. The main elements of the health sector strategy adopted in the HPNSDP are elaborated below.

Public Health Service Delivery Strategy

The roles of the Upazila health complexes and union health and family welfare centers are of key importance to the delivery of primary health care in rural areas. It has been recognized that proper and effective curative care greatly influences the process of the people's acceptance of preventive and promotive health care. Without active support of the former, the latter cannot be geared up to a significant extent, particularly in the existing socio-economic conditions of rural Bangladesh. What is primarily needed is effective curative care with adequate provision of preventive, promotive services with health education.

Strategy for Strengthening Health Inputs

A major strategy to ensure better health would be to promote public health through better health public awareness, Nursing and midwifery services, easy access to essential drugs at fair prices, production of appropriate skill-mixed workforce, removing threat to health of the citizens from substandard and/or adulterated food, emergency health supplies and their stockpiling, safeguard and enhance national as well as global public health security, encourage establishment of network of evenly spread specialist and super-specialist services through private investment for patients who can pay.

Strengthening Public Service Delivery Capacity and Accountability

Several measures will be taken to improve the governance and management of the health care system. Important reforms include:

- Improved management
- Better governance
- Transparency, accountability and stakeholder participation
- Sectoral reforms
- Stewardship role of the Ministry of Health and Family Welfare
- Strengthening human resources
- Improving supply management

Strengthening Access to and Utilization of Public Health Services for the Poor and Needy

To be effective, health services should be available, accessible and affordable. But mere availability of health facilities does not result in their utilization. Accessibility has a number of dimensions, which include:

- Physical Accessibility (distance, travel time and travel costs);
- Economic Accessibility (cost of medicine, cost of consultation, cost of hospitalization, cost incurred with respect to tests/investigations);
- Social and cultural context (Gender) affecting accessibility;
- Perceived quality of services: (i) availability of doctors; (ii) availability of medicine; and (iii) attitudes of doctors/nurses.

Rural Development

The Plan will include the following strategies:

- The rural infrastructure development/improvement will be planned and implemented based on the findings of Effect/Benefit/Impact Studies carried out by LGED in respect of rural infrastructure development projects and the principles/elements as included in the National Strategy for Accelerated Poverty Reduction, October, 2005.
- Government approved Rural Road Master Plan will be followed for infrastructure development projects covering Upazila and Union roads including bridges/culverts, bridges/culverts on village roads and development of growth centers/markets, ghats and Union Parishad HQ etc.
- Rural road improvement which will contribute in a better way towards increasing agricultural production, promoting transport and trading activities, providing access to other socio-economic services and facilitating employment generation will be given priority.
- For sustainability of rural infrastructure, adequate maintenance system and a viable funding mechanism based on local resources and emphasizing local participation and ownership will be arranged.
- Since maintenance needs are increasing, the Government and the local bodies will make special efforts to fully fund these needs and LGED will make continuous efforts to improve maintenance efficiency and ensure local participation.
- The labor-based construction techniques for road improvement will be adopted to enhance employment opportunity, sustainability and affordability.
- There are competing needs for various types of rural infrastructure, such as, Upazila Roads, Union Roads, Markets, Ghat facilities etc. and even for roads alone, there is need for improvement maintenance and bridging gaps. At the spatial level, there are competing needs for different geographical regions. A guideline for investment prioritization and selectivity will be developed and calculation of economic rate of return will be adopted to guide the major investment decisions.
- The first priority will be to maintain all Upazila Roads, Union Roads and Village Roads which have so far been constructed under different projects implemented by LGED including bridges/culverts and upgrade growth centers having connection with railway and waterway in order to promote and integrate multimodal transport system.
- The second priority will be to improve/upgrade remaining Upazila Roads, Prioritized Union Roads and Village Roads-A including culverts/bridges which have strategic importance to connect railway and waterway.
- The third priority will be to improve Growth Centers and construction of ghat facilities at Growth Centers located on the bank of inland waterways to ensure better integration of road and water ways and thereby stimulating the rural transport and trading system. Also, construction of the Union Parishad Complex for local socio-economic and governance development will be included under this category of priority.
- The fourth priority will be to selectively add roads to the maintainable core road network through rehabilitation and reconstruction, including spot improvement of drainage and badly damaged road sections. Separate provisions will be made for reconstruction works required to keep lower quality roads open and serviceable.

Other implementation strategies for development of rural infrastructure will include the following:

- Priority will be given to the creation of macro and micro-level interactions, i.e. through close interactions between the central and the local government institutions.
- Proper decentralization of design, implementation and management of rural infrastructure programs will be adopted to have far-reaching implications for cost effectiveness, maintenance and provision for sustainable infrastructure services.
- To maximize the impact of decentralization, the rural infrastructure programs will focus on provision of basic economic and social services in collaboration with different local agencies, NGOs and the private sector based on sharing of responsibilities through experience and best practice examples.
- To realize the above, the overall responsibilities of Union Parishad will be enhanced to make them focal point of development within the policy framework of the government.

- In order to ensure efficient planning, implementation and operation and maintenance of rural infrastructure, a community participation process will be adopted with involvement of the local government institutions, NGOs, beneficiary groups, user communities, and the private sector.
- The road inventory data will be further upgraded to fully utilize HDM & DSS software for better Road Asset Management (RAM).
- Procurement functions and process and quality assurance including technical audit will be enhanced.
- Environmental and social dimensions will be incorporated into the engineering design after assessing their impact properly and adequate mitigation and enhancement measures will be undertaken.
- Road Safety activities for Upazila and Union Roads will be undertaken and gradually expanded.

2.2.5. Poverty Reduction Strategy Paper (PRSP)

In persuasion of achieving the MDGs, Poverty Reduction Strategy Paper (PRSP) was prepared in 2003. PRSP, thus prepared, covered the basic philosophy of FYP and ultimately took over the place of the five-year plans. The planning Commission under the ministry of finance initiated the interim poverty Reduction Strategy (IPRS) in March 2003 and a full blown poverty reduction Strategy (PRS) was prepared in 2005. PRS aims at targeting developmental activities under different sectors having main focus on poverty and on special priority basis.

UNDP & UNICEF assisted project on "Reduce Urban Poverty through Local Partnership" is under implementation, which is very relevant with the objectives of the PRS. The completion of the interim 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 (PRSs). PRSP is prepared for unlocking the potentials using government's own resources and by local experts; thematic reports are prepared by the ministries in their own areas to serve as background papers for the PRSP.

2.2.6. Urban Management Policy

The rapid urbanization in Bangladesh, both in the four major urban centers of Dhaka, Chittagong, Khulna, and Rajshahi as well as in smaller towns, warrants a higher level of investment and improvements in urban public service delivery. The National Perspective Plan 2010-21, has adopted some strategies for managing the urbanization in the country. It has given a major thrust on planned urban development and urban infrastructure management. The Government is committed to improve quality of life in cities and urban centers, particularly for the poor, to ensure that service delivery is commensurate with population density, and that over time, these urban centers become vibrant sources of opportunity, trade and economic growth.

The principal objective of an urban management policy is to ensure that investment choices and methods pertaining to urban services balance considerations of equity and efficiency to produce sustainable gains. The purpose of this policy statement is to improve upon and augment the existing policy statement, with a view towards efficient urban management and increased decentralization in the longer term. Plan, design, programs and projects are prepared with high civic participation and political involvement.

2.2.7. Millennium Development goal (MDG)

The United Nations (UN) global conferences of the 1990s, the United Nations Millennium Declaration 2000 marked a strong commitment to the right to development, to peace and security, to gender equality, to eradication of many dimensions of poverty and to sustainable human development. Embedded in that Declaration, which was adopted by 147 Heads of State and 189 States, were what have become known as the Millennium Development Goals (MDGs).

Here discuss about the eight goals of MDGs and their perspective achievements of Bangladesh:

Goal 1: Eradicate Extreme Poverty and Hunger:

Target 1.A: Halve between 1990 and 2015, the proportion of people below poverty line: *Bangladesh Achieve poverty reduction from 56.7(1992) to 31.5 (HIES 2010) & 26.2 (GED Estimate for 2013).*

Target 1.B: Achieve full and productive employment and decent work for all, including women and young people: *Bangladesh achieve Growth rate of GDP per person employed, 0.90pc in 1991 to 3.55pc (WB 2012).*

Target 1.C: Halve between 1990 and 2015, the proportion of people who suffer from hunger.

Goal 2: Achieve Universal Primary Education:

Target 2.A: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling: *Bangladesh Achieve Adult literacy rate of 15+ years old population, 37.2% in 1990/91 to 59.82% M: 63.89%, F: 55.71% (BLS 2010) 58.8% (SVRS 2011).*

Goal 3: Promote Gender Equality and Empower Women:

Target 3.A: Eliminate gender disparity in primary and secondary education preferably by 2005, and in all levels of education no later than 2015: *the Achievement of Bangladesh is, Share of women in wage employment in the non-agricultural sector is 19.10 in 1990/91 and 19.87, LFS 2010. Ratio of girls to boys in tertiary education is 0.37 in 1990-91 and 0.73 (BANBEIS 2012), 0.60 (BDHS 2011), 0.78 (UGC 2013). Ratio of girls to boys in primary education is 0.83 and 1.00 (APSC, DPE 2013), 1.07 (MICS 2012-2013), 1.10 (BDHS 2011).*

Goal 4: Reduce Child Mortality:

Target 4.A: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate: *the achievement of Bangladesh is, under five mortality rate (per 1,000 live births) is 146 in 1990/91 and 53 (BDHS 2011), 44 (SVRS 2011)*

Goal 5: Improve Maternal Health:

Target 5.A: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio: *Bangladesh Achieve in Maternal mortality ratio (per 100,000 live births) from 574 in 1990/91 to 194 (BMMS 2010), 209 (SVRS 2011), 218 (Sample census, 2011 BBS)*

Target 5.B: Achieve by 2015, universal access to reproductive health: *Contraceptive prevalence rate (%) was 39.7 in 1990/91 now it is 61.8 (MICS 2012-2013), 61.2 (BDHS 2011) 58.4 (SVRS 2011) in Bangladesh.*

Goal 6: Combat HIV/AIDS, Malaria and Other Diseases:

Target 6.A: Have halted by 2015 and begun to reverse the spread of HIV/AIDS: *HIV prevalence among population in 1990/91 was 0.005 now it is 0.1 (9th SS 2011)*

Target 6.B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it.

Target 6.C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases: *Prevalence of malaria per 100,000 population was 776.9 (2008) now it is 202 (MIS NMCP 2013)*

Goal 7: Ensure Environmental Sustainability:

Target 7.A: Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources.

Target 7.B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss.

Target 7.C: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation: *Bangladesh achieve 97.9 (MICS 2013), 98.2 (SVRS 2011) from 78 in 1990/91.*

Target 7.D: Halve, by 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers

Goal 8: Develop a Global Partnership for Development:

Target 8.A: Developed further an open, rule-based, predictable, non-discriminatory trading and financial system

Target 8.B: Address the special needs of the least developed countries (LDCs)

Target 8.C: Address the special needs of landlocked developing countries (LLDCs) and small island developing states (SIDS)

Target 8.D: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term

Net Official development assistance (ODA) received by Bangladesh (million US\$) in 1990/91 is 1,732 and 2,811 in 2013 (ERD 2013)

Target 8.E: In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries.

Target 8.F: in cooperation with the private sector; make available the benefits of new technologies, especially information and communications: Cellular subscribers per 100 population 75.81 (BTRC 2014), Internet users per 100 population 24.37 (BTRC 2014).

2.2.8.Sustainable Development Goals (SDG)

Each country has primary responsibility for its own economic and social development and the role of national policies, domestic resources and development strategies cannot be overemphasized. Developing countries need additional resources for sustainable development. There is a need for significant mobilization of resources from a variety of sources and the effective use of financing, in order to promote sustainable development. Rio+20 affirms the commitment to reinvigorating the global partnership for sustainable development and to mobilizing the necessary resources for its implementation. Good governance and the rule of law at the national and international levels are essential for sustained, inclusive and equitable economic growth, sustainable development and the eradication of poverty and hunger.

Sustainable Development Goals are accompanied by targets and will be further elaborated through indicators focused on measurable outcomes. They are action oriented, global in nature and universally applicable. They take into account different national realities, capacities and levels of development and respect national policies and priorities. They build on the foundation laid by the MDGs, seek to complete the unfinished business of the MDGs, and respond to new challenges. These goals constitute an integrated, indivisible set of global priorities for sustainable development. Targets are defined as aspirational global targets, with each government setting its own national targets guided by the global level of ambition but taking into account national circumstances. The goals and targets integrate economic, social and environmental aspects and recognize their inter linkages in achieving sustainable development in all its dimensions.

Sustainable Development Goals

- Goal 1 End poverty in all its forms everywhere
- Goal 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- Goal 3 Ensure healthy lives and promote well-being for all at all ages
- Goal 4 Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- Goal 5 Achieve gender equality and empower all women and girls
- Goal 6 Ensure availability and sustainable management of water and sanitation for all
- Goal 7 Ensure access to affordable, reliable, sustainable and modern energy for all
- Goal 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
- Goal 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- Goal 10 Reduce inequality within and among countries
- Goal 11 Make cities and human settlements inclusive, safe, resilient and sustainable
- Goal 12 Ensure sustainable consumption and production patterns
- Goal 13 Take urgent action to combat climate change and its impacts*
- Goal 14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- Goal 15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
- Goal 16 Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
- Goal 17 Strengthen the means of implementation and revitalize the global partnership for sustainable development

2.2.9. National Plan for Disaster Management (2010-2015)

The geographical location, land characteristics, multiplicity of rivers and the monsoon climate render Bangladesh highly vulnerable to natural hazards. The coastal morphology of Bangladesh influences the impact of natural hazards on the area. Especially in the south western area, natural hazards increase the vulnerability of the coastal dwellers and slow down the process of social and economic development. Natural and human induced hazards such as floods, cyclones, droughts, tidal surges, tornadoes, earthquakes, river erosion, fire, infrastructure collapse, high arsenic contents of ground water, water logging, water and soil salinity, epidemic, and various forms of pollution are frequent occurrences. Climate change adds a new dimension to community risk and vulnerability. Although the magnitude of these changes may appear to be small, they could substantially increase the frequency and intensity of existing climatic events (floods, droughts, cyclones etc.). Current indications are that not only will floods and cyclones become more severe, they will also start to occur outside of their "established seasons". Events, such as drought, may not have previously occurred in some areas and may now be experienced.

In the national disaster management plan there taken some strategies in different level of country's national, district, upazilla, and union level. Here discuss about different strategies taken in different level,

National plan for disaster management:

- Articulate the long-term strategic focus of disaster management in Bangladesh.
- Demonstrate a commitment to address key issues: risk reduction, capacity building, information management, climate change adaptation, livelihood security, issues of gender and the socially disadvantaged, etc.
- Show the relationship between the government vision, key result areas, goals and strategies, and to align priorities and strategies with international and national drivers for change.
- Detail a road map for the development of disaster management plans by various entities.
- Guide the DM&RD in the development and delivery of guidelines and programs.
- Illustrate to other ministries, NGOs, civil society and the private sector how their work can contribute to the achievements of the strategic goals and government vision on disaster management.
- Provide a framework within which to report performance and success in achieving goals and strategies.

District disaster management plan (DDMP):

- The areas in the District vulnerable to different forms of hazards and risks.
- Total resource requirements and the planned action for the District.
 - i. To take measures for prevention and mitigation of disasters by government agencies, NGOs, CBOs and the private sector within the District.
 - ii. Capacity building and preparedness measures to be taken by government agencies, NGOs, CBOs and the private sector.
 - iii. Strengthening emergency response management system plans and procedures in the event of a disaster.
- Recovery plans and procedures delineating damage assessment procedure, restoration of damaged public infrastructure, resumption of educational institutions, restoration of livelihood, rehabilitation of affected people, especially the disabled, and elderly women and children.
- The DDMP shall be reviewed and updated annually.
- The copies of the DDMP shall be made available to all District level stakeholders, Divisional Commissioners, etc.
- A copy of the DDMP will be sent to the Disaster Management Bureau and all relevant ministries and divisions.
- The DMB/NDMTI will provide technical advice and capacity building services to all DMCs.

Upazila disaster management plan (UzDMP)

- The areas in the Upazila vulnerable to different forms of hazards and risks.
- Total resource requirements and the planned action for the District.
 - I. To take measures for prevention and mitigation of disasters by government agencies, NGOs, CBOs and the private sector within the District.
 - II. Capacity building and preparedness measures to be taken by government agencies, NGOs, CBOs and the private sector.
 - III. Strengthening emergency response management system plans and procedures in the event of a disaster.
- The response plans and procedures in the event of a disaster, providing for:
 - I. Allocation of responsibilities to the departments of the government at District level and other DMC members
 - II. Procedure for mobilization of resources
 - III. Prompt response to disaster and relief thereof
 - IV. Procurement of emergency supplies
 - V. Operation of disaster shelters
 - VI. Restoration of emergency services, such as water supply, gas supply, power, telecommunication, road links
 - VII. Provision of emergency medical services
 - VIII. Burial of dead bodies
 - IX. Trauma counseling
 - X. The dissemination of information
- Recovery plans and procedures delineating damage assessment procedure, restoration of damaged public infrastructure, resumption of educational institutions, restoration of livelihood, rehabilitation of affected people, especially the disabled, and elderly women and children.
- The UzDMP shall be reviewed and updated annually.
- The copies of the UzDMP shall be made available to all Upazila level stakeholders and members of DDMCs.
- A copy of the UzDMP will be sent to the District Disaster Management Committee and DMB.
- The DMB/BIDMTR will provide technical advice and capacity building services to all DMCs.

Union disaster management plan (UDMP)

- Defining and redefining community risks to hazards utilizing both traditional and scientific knowledge.
- Total resource requirements and the planned action for the District.
 - i. To take measures for prevention and mitigation of disasters by government agencies, NGOs, CBOs and the private sector within the District.
 - ii. Capacity building and preparedness measures to be taken by government agencies, NGOs, CBOs and the private sector.
 - iii. Strengthening emergency response management system plans and procedures in the event of a disaster.
- The response plans and procedures in the event of a disaster, providing for:
 - i. Allocation of responsibilities to the departments of the government at District level and other DMC members.
 - ii. Procedure for mobilization of resources
 - iii. Prompt response to disaster and relief thereof
 - iv. Procurement of emergency supplies
 - v. Operation of disaster shelters

- vi. Restoration of emergency services, such as water supply, gas supply, power, telecommunication, road links
- vii. Provision of emergency medical services
- viii. Burial of dead bodies
- ix. Trauma counseling
- x. The dissemination of information
- Recovery plans and procedures delineating damage assessment procedure, restoration of damaged public infrastructure, resumption of educational institutions, restoration of livelihood, rehabilitation of affected people, especially the disabled, and elderly women and children.
- The UDMP shall be reviewed and updated annually.
- The copies of the UDMP shall be made available to all Union level stakeholders, UNOs and DCs.
- A copy of the UDMP will be sent to the Upazila Disaster Management Committee.
- The DMB/BIDMTR will provide technical advice and capacity building services to all DMCs.

Paurashava/city corporation disaster management plan

- The areas in the Pourashava/City Corporation vulnerable to different forms of hazards and risks.
- Total resource requirements and the planned action for the District.
 - I. To take measures for prevention and mitigation of disasters by government agencies, NGOs, CBOs and the private sector within the District.
 - II. Capacity building and preparedness measures to be taken by government agencies, NGOs, CBOs and the private sector.
 - III. Strengthening emergency response management system plans and procedures in the event of a disaster.
- The response plans and procedures in the event of a disaster, providing for:
 - I. Allocation of responsibilities to the departments of the government at District level and other DMC members
 - II. Procedure for mobilization of resources
 - III. Prompt response to disaster and relief thereof
 - IV. Procurement of emergency supplies
 - V. Operation of disaster shelters
 - VI. Restoration of emergency services, such as water supply, gas supply, power, telecommunication, road links
 - VII. Provision of emergency medical services
 - VIII. Burial of dead bodies
 - IX. Trauma counselling
 - X. The dissemination of information
- Recovery plans and procedures delineating damage assessment procedure, restoration of damaged public infrastructure, resumption of educational institutions, restoration of livelihood, rehabilitation of affected people, especially the disabled, and elderly women and children.
- The PDMP shall be reviewed and updated annually.
- The copies of the PDMP shall be made available to all Pourashava/city corporation level stakeholders, UNOs and DCs.
- A copy of the PDMP will be sent to the District Disaster Management Committee and Disaster Management Bureau.
- The DMB/ BIDMTR will provide technical advice and capacity building services to all DMCs.

Sectorial development plans incorporating disaster risk Reduction

Every Ministry/Division of the Government of Bangladesh prepares their respective Sectorial Development Plans. DM&RD with the participation of sectoral experts will prepare a general guideline to incorporate disaster risk reduction agenda for the sectors. DM&RD will also be responsible for overall monitoring and follow-up of the process to ensure that disaster risk reduction agenda are mainstreamed within the sectoral policies, plans and programmes. The development plans should address, among others, the following:

- a. Defining and redefining risk environment through hazard analysis, vulnerability assessment, risk evaluation, risk treatment options, and risk treatments.
- b. Managing the risk environment by developing programs and strategies that eliminate, or reduce the level of risk. Traditionally mitigation programs were viewed as engineering solutions to eliminate risk, but it is now accepted that all activities undertaken to eliminate or reduce risk are "mitigation" strategies (e.g. community education and awareness, planning activities, development of warning systems). This includes activities previously described as the PPRR Model- Prevention, Preparedness, Response and Recovery.
- c. Regularly review and update the plan; and
- d. Submit a copy of the plan, and of any amendment thereto, to appropriate authority including the DM&RD.
- e. Submit a copy of its disaster management plan, and of any amendment thereto, the concerned authority.

2.2.10. Other Sectorial Policies and Acts related to Land use Planning

2.2.1.1. Land use Policy

The ministry of land (MoL) has prepared the National Land Use Policy, 2001 (NLUP) to fill up an important policy gap in the country. The policy has aimed for:

- Minimizing loss of cropland;
- Stop indiscriminate use of land;
- Preparing guidelines for land use for different regions;
- Rationalizing land acquisition, and
- Synchronization of land use with natural environment

The NLUP deals with land uses for several purposes including agriculture (crop production, fishery and livestock), housing, forestry, industrialization, railways and roads, tea and rubber. The document basically identifies land use constraints in all these sectors. Some of the major ones include declining land productivity due to unplanned and improper uses of land and decreasing soil fertility, diminishing water land and aquatic bio-diversity, dwindling natural forest and environment.

Further to safeguard the use of land resources, particularly valuable agricultural land of the country, government in 2001 declared the National Land Use Policy of the country. The policy stressed on most intensive and best use of scarce land resources of the country. In one of its objectives (objective 'Kha'), the policy aimed to introduce 'land use zoning' based on particular characteristics of land, to make best use of land, prevent unplanned expansion of residential areas and control indiscriminate growth of industrial and commercial activities. The policy called for planned and best use of land.

Preparation and implementation of national land use plan in order to ensure best use of land is a major objective of land use policy. The plan is to be based on the criteria of land productivity and land capability and land suitability, use and requirement of land by agriculture, forestry, industrialization, urbanization and housing. Following are the aims of national land use plan.

- Execution of coordinated land conservation projects aimed at prevention of desertification in the northern region.
- Take up effective programs aimed at weathering of land, conservation of land fertility, development and conservation of land in coastal areas.
- Prevention of destroying the hilly landscape by earth cutting, excavation and removal of land. Appropriate measures to be taken against indiscriminate collection of earth and stone from hilly areas and disturbance ecological balance.

- Emphasis on watershed management.
- Formulation and effective execution of land use plan act and in order to ensure planned use of land.
- Payment of compensation to those who will be affected by land weathering and land acquisition by the government.
- Regular monitoring, survey and research on desertification in the northern region, land reclamation, prevention of weathering of land, multi-use of land, conservation and development of coastal area land and condition of watershed areas.

2.2.1.2. Housing Policy

The National Housing Policy (NHP) of Bangladesh was formulated in 1993 keeping in focus the basic objectives of providing housing to people at all strata, especially to the low and middle income groups and to those having no access to housing. The emphasis of the national housing policy was on land development, building inexpensive housing units for people in the low and middle-income groups in the cities, and multi-storied buildings for government employees, and hostels for working women, low cost housing in the coastal belts and inducting the private sector into the housing sector.

In objectives of the policy, it stressed (Article-3.3) on useful and effective strategy to tackle growth of unplanned and unhealthy habitations. The policy, in (Article-5.1.4), committed to encourage private developers in land development, infrastructure development and house construction. The policy also made commitment to provide government assistance on participatory housing infrastructure development involving the community, NGOs, CBOs, private developers and social welfare organizations (Article-5.2.7). It also committed to assist in introducing new infrastructure development method based on leasing. In Article-5.2.8, the policy declared to provide necessary assistance to local governments in recovering investments in infrastructure and services and provide necessary training to their staff and employees to increase their efficiency. About the roles and responsibilities of the government (Article-5.7), the policy said that in housing activities the government will continue to remain as a facilitator. The government will provide housing only to the poor and the rootless classes of the society (Article-5.7.1). The policy also made commitments to encourage private organizations, NGOs and CBOs in housing infrastructure development, income generation and environmental improvement under its policy and local level planning (Article-5.7.3). But despite formulation of policies, so far no effective programs and projects have been undertaken. National Housing Authority has been formed but it has yet to draw up any workable program to realize national housing policies.

2.2.1.3. Transportation Policy

Although a few detailed transport-planning studies have been conducted for urban areas specially for Dhaka; but none have effectively achieved the basic objectives of the planning of the transportation system in Bangladesh.

A policy for land transport at the national level has already been drafted and approval given by the government in April 2004. The National Land Transport Policy (NLTP) has been prepared for a long term vision of at least 30 years to make the role of transport in economic activities more significant and underpin continued economic and social development. Following are the policy objectives of NLTP:

- a) To provide a safe and dependable transport service;
- b) Removal of unnecessary control and formulation of laws and regulations conducive to providing service;
- c) Fare control.
- d) Determining the roles of the Government sector and the private sector;
- e) To maintain an economic and environmental balance;
- f) To ensure maximum utilization of Government funds;
- g) Expansion of the role of transport in the ever increasing economic activities;
- h) Reduction of transport cost of goods for export;
- i) Growth of traffic commensurate with economic development;
- j) Formulation of transport system for Dhaka city (Greater Dhaka);
- k) Introduction of an integrated transport system;
- l) Provision of alternate transport systems;
- m) Creating of awareness regarding better standard of life and safety;
- n) Poverty alleviation.

The policy makes discussion and recommendation of such issues as road, road transport and traffic, non-motorized traffic, railway and integrated issues. Strategic measures of the transport policy cover the following:

a) Greater private sector participation

Encourage greater private sector participation with national ownership of road and rail infrastructure; lease of infrastructure may be allowed on long term basis; encourage private sector in infrastructure development.

b) Effective co-ordination in transport

Better coordination to be established between the Ministries and Departments under its control; policy/rules & regulations will be formulated to achieve the goal of creating better working links between the Government and the public and private sectors.

Creation of discussion and consultation forums will be created for policy implementation.

Government to promote clearer objectives and responsibilities for each sector in order to create more integrated working relationships.

c) Promoting the role of the transport users

The Government will examine how best the interests of users can be represented within the existing national government and local authority system; The Government will establish a user role within its transport planning process.

d) Transport users should pay for the costs of services

The Government makes arrangements to realize cost of transport operation and road maintenance from road users through new fiscal policies; to protect public interest, the Government will regulate tariffs for passenger and goods both in road and rail transport.

e) Subsidies for transport services

The government should allow subsidy to the transport sector only on consideration of public interest.

f) Create public awareness for the policy

2.2.1.4. Agricultural Policy

Agriculture Policy of Bangladesh was framed in 1999. A new policy under the present government is under preparation. The following review is on the 1999 Agriculture Policy. The major issues dealt with in the policy are, seed, fertilizer, irrigation, pest management, agricultural research, extension services, marketing of agro-products, land use, education and training, environment and agriculture, women and agriculture, coordination of various agencies engaged in agricultural development.

The overall objective of the National Agriculture Policy is to make the nation self-sufficient in food through increasing production of all crops including cereals and ensure a dependable food security system for all.

Land Use

All possible steps will be taken to ensure optimum use of land. Although land is a privately owned property in general, its use has to be compatible with the overall social goals and utility. Moreover, it is important to consider that the interests of small arid marginal farmers and the sharecroppers are protected, as they constitute the majority of farmers.

Following steps will be taken to ensure planned utilization of land for crop production:

- Land zoning program will be taken up by the Soil Resources Development Institute (SRDI) on a priority basis. Integrated approach of SRDI will be further strengthened for this purpose.
- To ensure maximum utilization of land, bottom up planning through people's participation and its implementation will be started from the mouza or village level.
- In most areas the same land is suitable for more than one crop. Therefore, farmers will be encouraged to grow more profitable crops as an alternative to only rice-rice cropping pattern.
- Fertile agricultural land is going out of cultivation due to its use for non-agricultural purposes such as private construction, house building, brickfield, etc. Appropriate measures will be taken to stop this trend in the light of the Land Policy of the government.
- Maximum utilization of land will be ensured through promotion of inter-cropping with the main crops.
- Acquisition of land in excess of requirement for non-agricultural purposes will be discouraged.

- Programs will be taken up to motivate the landowners not to keep their land unused without any acceptable reason.
- Appropriate measures will be taken in the light of the Land Policy so that the interests of small and marginal farmers and the sharecroppers are protected and that the agricultural land is not kept fallow for a long period.

2.2.1.5. Environmental Policy

Government declared an environmental policy in 1992 with a view to safeguard the national environment. The main objectives of the policy are:

- To promote natural balance and overall development by means of conservation and development of environment;
- To save the country from natural disaster;
- To identify and control all sources of pollution and degradation;
- To ensure environment friendly development in all sectors;
- To ensure sustainable, long term and environment friendly use of all national resources;
- To get involved with all international initiatives on environmental issues.

The comprehensive environmental policy covers as many as 15 sectors of development namely, agriculture, industry, health and health promotion, energy, water resources, flood control and irrigation, land, forest, wild life and biodiversity, fish and animal resources, food, coastal and maritime environment, transport and communication, housing and urbanization, population, education and public awareness, science, technology and research, legal framework, institutional structure. It would be irrelevant to discuss all the above policies under the context of urban planning. The consultant, therefore, highlights only those sectors that have relevance to urban development and planning.

Industrial Sector

The environmental policy on industrial sector call for taking up following environmental measures:

Take up pollution control measures for selected polluting industries.

1. Potential polluting industries must incorporate control measures in its set up.
2. All industries must conduct EIA and take pollution control measures.
3. All industries in residential areas to be gradually shifted and new locations to be identified for planned industrial development.
4. The industries harmful for environment and producing non-biodegradable products must be gradually banned.
5. Any industries using harmful and toxic waste as raw materials must be banned.
6. Use heavy metals, like, mercury, chromium, lead should be discouraged in industries.
7. The industries producing pollutants should have their own system of pollution monitoring.
8. Introduce 'waste permit/consent order' to improve waste treatment and disposal system.
9. Recycling of waste in order to reduce the volume of waste.
10. Safeguard health of industrial workers.
11. The policy document also indicated the concerned agencies to take care of implementing the above issues.

Health and Health Sector

This sector emphasized on the following environmental issues:

Supply of safe drinking water in urban and rural areas and introduction of low cost healthy sanitation system.

Control of pollution in all kinds of water bodies by municipal, industrial and industrial waste and toxic materials.

Ban on carrying waste during day time and in open garbage trucks.

All steps to be taken to protect public health and environment from kinds of radiations including x-ray, nuclear waste, all equipment producing radiation, atomic reactor and research, and all activities harmful for human health.

Include environment in the academic syllabi.

Energy Sector

The energy sector recommended the following policies:

Take up large scale for introduction of improved cooker and wide dissemination of the technology to conserve energy and save environment.

Popularize use of coal, kerosene and petroleum in rural areas in order to save fire wood, agricultural waste and cow dung and use them in agriculture as compost.

Promotion of biogas, solar energy, mini hydroelectric unit and wind mill in rural areas as sources of energy.

Take up measures to reduce the amount of harmful elements in fuel including, sulfur in diesel and lead in petrol.

Increase research activities to invent alternative sources of energy.

Care has to be taken so that use and transformation of primary and commercial energy does not create any adverse impact on the environmental balance.

Appropriate measures have to be taken during extraction and distribution of different natural resources like, oil, gas coal, peat so that they do not create any adverse impact on air, water, land, hydrological balance and the eco-system.

Study the possibility of use environment friendly petroleum (free of lead).

Care has to be taken during giving fitness certificate to vehicles that emit black smoke. Mobile courts will have to be arranged to enforce the relevant legal provisions.

Transport and Communication Sector

Care to be taken to make the road infrastructure development congenial to environment and the development of roads does not impede drainage of water.

Appropriate measure to be taken so that the passengers and the transport do not endanger public health by indiscriminate throwing of solid waste and defecation.

The rail, road and water transport must adopt measures to control emission of excessive black smoke.

Creation of public awareness and take care about pollution of river water.

Control on water pollution to be ensured in inland river ports and dockyards.

Airports to be developed avoiding environmental degradation.

Care to be taken to reduce air and sound pollution by aircrafts.

Encourage railway rolling stocks that generate less pollution.

Forestation on both sides of railways and roads.

Population Sector

Conduct study on impact of population growth on environment and take appropriate measures to mitigate the problems of population growth.

Prepare manpower utilization plan to make planned and effective use of human resources congenial to environment.

Emphasize participation of women in environment conservation.

Mark population as No.1 problem of the country and take appropriate measures to curb population growth.

As the poor are mostly affected by environment degradation, appropriate measures are needed to safeguard their health and save them from the adverse effects of environment degradation.

2.2.1.6. Industrial Policy

The key objective of the Industrial Policy 2005 is to set up planned industries considering the real domestic demand, prospect of exporting goods abroad, and discouraging unplanned industries in the light of past experience.

Accept private initiatives as the main driving force of economic development and uphold the government's facilitating role in creating a favorable atmosphere in order to augment private investments.

Arrange for state-owned industrial enterprises to be sold/transferred/leased or administered in any other way by the Privatization Commission or concerned ministries in order to accelerate the privatization process.

Take necessary initiatives establish industries on state initiative in those sectors that are considered very important and essential because of national interest, where private entrepreneurs are not forthcoming.

Catering the needs for local and foreign market and also for consumer satisfaction of the local products; measures to be undertaken (a) produce world class quality products, (b) diversification of goods, (c) introduce cost-effective management in the production system, (d) more value addition in the industrial sector, and (e) provide support for enhancing productivity by using continuous, appropriate and advanced technology.

Provide inspiration for the speedy expansion of cottage industries and SMEs and for further investment in these sectors so that new employment opportunities are generated, unemployment reduced and poverty alleviation program made in the country.

Prioritize the expansion and development of agro-based and agricultural processing industries, and assist in the expansion of poultry, dairy and goat-sheep industry as agricultural industries.

Provide women entrepreneurs with all necessary assistance in establishing industries in various sectors.

Increase productivity at enterprise level; produce high-value added products step by step through development and application of appropriate technology and increase of export through export diversification.

Provide all necessary assistance for producing environment-friendly product with the objective for creating a pollution-free environment in the industrial sector.

Expand the local market and establish more backward linkage industries in order to accelerate the export of high value-added garments produced in the export-oriented garment industries and other relevant industrial sub-sectors.

Further enrich the industrial sector with the proper utilization of the country's various natural and mineral resources.

2.2.11. Linkage of National Plans and Policies with Development Plans of 14 Upazilas Project

The current project would emphasize over agriculture, fisheries, forestry and ecology activities focusing on all relevant social and physical infrastructure services and facilities including the national level communication network. It would emphasize over the economic development in and around the project area and also livelihood of the local people, who are very much depended on local economic activities. The current project would also emphasize over the change in land category, land use and livelihood pattern. In this circumstances, the review of different national plans and policies, we found that there are specific rules and regulations to develop this plan of these areas, which were discussed in the previous section elaborately.

2.3. Collection of Relevant Documents

To conduct this development plan including Sub Regional Plan, Structure Plan, Urban Area Plan, Rural Area Plan, Action Area Plan, there require huge different types of primary and secondary data to collect. The primary data of different kinds as like socio economic, environmental, drainage, physical feature, transportation data all are collected from field study. The secondary data and other relevant documents will collect from different government offices and government web portals.

2.4. Collection of Maps, Basic Statistics and Information

To conduct this development plan including Sub Regional Plan, Structure Plan, Urban Area Plan, Rural Area Plan, Action Area Plan, there require different kinds of maps and reports as like Geo-physical maps and reports (Geology, Hydrology, Soils major type) Topographical maps and reports as like Physical features, Infrastructure, Land use are prepare from different field survey and study.

There require different statistical data as like Number of inhabitants/households, differentiated according to income level/type/density and quality of housing, Production and employment (formal/informal, number and size of establishments, type of production/activity, income/education level), Public services (education, health, security etc.) and utilities (drinking water, sewerage/sanitation, garbage disposal, gas, electricity, telecommunication); administrative institutions, Commercial activities (shops, markets both formal and informal), Transportation facilities (roads, public transportation, parking facilities, waterways, railway, foot path) etc. these basic information and statistics will collect from different socio economic survey and secondary sources as like reports of bureau of statistics, economic review.

Table 2. 1: Relevant Data, and their Sources of Collection

Sl. No	Type	Description	To be collected from Secondary sources
1.	Collection of Mouza Map	The original C.S and R.S Mouza maps in the scale of 1:3960 (1"=330ft) will be collected from DLRS/DC office covering whole of project area three Upazila destined for Package-04.	DLRS/DC/Local offices
2.	Collection of Geo-physical Maps and Reports		
	Geology	<ul style="list-style-type: none"> The geological maps and reports will be collected from the office of the Geological Survey. Sedimentation and stratification Load bearing capacity of soils including old river valley and deeps filled with clays will be identified. Fault line map available will be collected and interpreted. 	Office of the Geological Survey
	Hydrology	<ul style="list-style-type: none"> Topographical and contour map of three Upazila will be collected from BWDB office in the scale of 1:10,000. Top-sheet containing contour lines, water courses, embankments and all other structures are available with survey of Bangladesh 	BWDB office Survey of Bangladesh
3.	Collection of Topographical Maps and Reports		
	Physical feature	<ul style="list-style-type: none"> Physical features (land/water, urban/rural, built-up/open, landmarks, bridge/culvert, and embankment/floodwall, sluice gate) 	Survey of Bangladesh
	Infrastructure	<p>The study of infrastructures includes the examination of maps and reports on drainage, roads, public Infrastructure transportation and utilities.</p> <ul style="list-style-type: none"> Maps and Reports on Drainage Maps and Reports on roads & Public Transportation 	Survey of Bangladesh
	Land use	Residential, industrial, commercial, agricultural, flood flow, etc. each differentiated according to density and quality	Survey of Bangladesh
4.	Collection of basic statistics (Present Activities)		
	Inhabitants and Households	<ul style="list-style-type: none"> Population and number of Household Union and ward wise density of population Union and ward wise data on quality of housing classified as Pucca, Semi-pucca, Kuthca, Thatched etc. Data on Income level 	BBS (Population Census Reports) 2011 Statistical Year Book.
	Production and Employment	<ul style="list-style-type: none"> Statistical data on production and employment Employment in formal and informal sectors. Data on number of Industrial establishment. 	BBS (Statistical Year Book) 2011
	Public Services	<p>Union and ward wise data on public services like,</p> <ul style="list-style-type: none"> Education, Health & Security etc Utilities like Water Supply, Sewerage, Sanitation, Garbage disposal, Gas and Electricity Telecommunication and Administrative institution. 	BBS(Statistical year book of Bangladesh) Upazila Office, Telephone exchange office, REB
	Commercial activities	Commercial Activities (shops, markets both formal and informal) and their impact on socio- economic developments of the respective area	Upazila Office

	Transportation	Data on Transportation facilities like- <ul style="list-style-type: none"> • Roads, Public transportation, Railway, Water way • Parking facilities and Foot-paths 	Upazila Office
--	-----------------------	---	----------------

2.5. Preparation of Base Map using GIS and Mouza Map

Base map shall be prepared with the help of photogrammetric system by using 3-D image (four band) with resolution 0.5m accuracy by the consulting firm under the supervision of PD. The base map shall be presented at the scale of 1: 3960. The consulting firm shall also digitize mouza map and geo-reference them by using RTK-GPS. The consulting firm shall geo-reference the base map, which would be prepared from image processing, with mouza map with the scale of 1: 3960/1980 as available from the source.

2.5.1. Collection of Mouza Maps

The Gazette Notification of these Upazila consists of 340 Mouzas. The original RS/CS Mouza sheets will be collected from the Directorate of Land Records and Surveys (DLRS) office. These sheets will be initially checked for the quality. Only the good quality sheets will be then submitted to the office of the PD for further verification and authentication. Detailed list of Mouza maps to be collected covering the entire Upazila area is presented in Appendix.

2.5.2. Selection of Ground Control Point (GCP)

Pillars covering the project area including approximately 5 km. grid in rural area. 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.

Forty three (43) numbers of Bench Marks (BM) pillars having three dimensional coordinates (Northing, Easting and Reduce Level in mPWD) will be constructed and established covering the three Upazila area as per the design specification to be provided by the PMO. One (3) Bench Marks (BM) pillar will be established in urban center of the Upazila and other twenty one (40) Bench Marks (BM) pillars will be established in rural area of these Upazila. Whole process of BM pillars establishment will be completed before fielded the survey teams. Establishment of BM pillars comprises the following item of works:

- Construction of BM pillars (pillar 10"X10", Base 3'X 3', height 5')
- Establishment of Coordinate of BM Pillars (x, y, z i.e. Northing, Easting and RL in mPWD).

Considering above, before selecting the location of BM, a comprehensive survey will be conducted in the Upazila area by the joint team comprising consultant's Survey Experts and Upazila Engineer.

2.5.3. GCP Survey on Mouza Maps

To geo-reference a map (shape file) the first step is to collect Ground Control Point. It is necessary to collect at least four GCP for Geo-referencing a map. These GCP will be collected using Total Station and RTK-GPS. Detail procedure of Geo-referencing have been described in the following steps

Mission Planning for RTK Survey

Prior the RTK Survey, we need to prepare an efficient plan for the total job. It is called Mission Planning regarding RTK-GPS Survey. Mission Planning allows us to know which GPS satellites should be visible from a given observation point on the surface of the Earth, and for a given period of time (max. 24 hours).

Deciding Satellite Curtains for RTK

It allows to edit curtains and to apply them to the observation point. A curtain is a pattern representative of the obstructions around the observation point and liable to disturb the reception of GPS signals at this point.

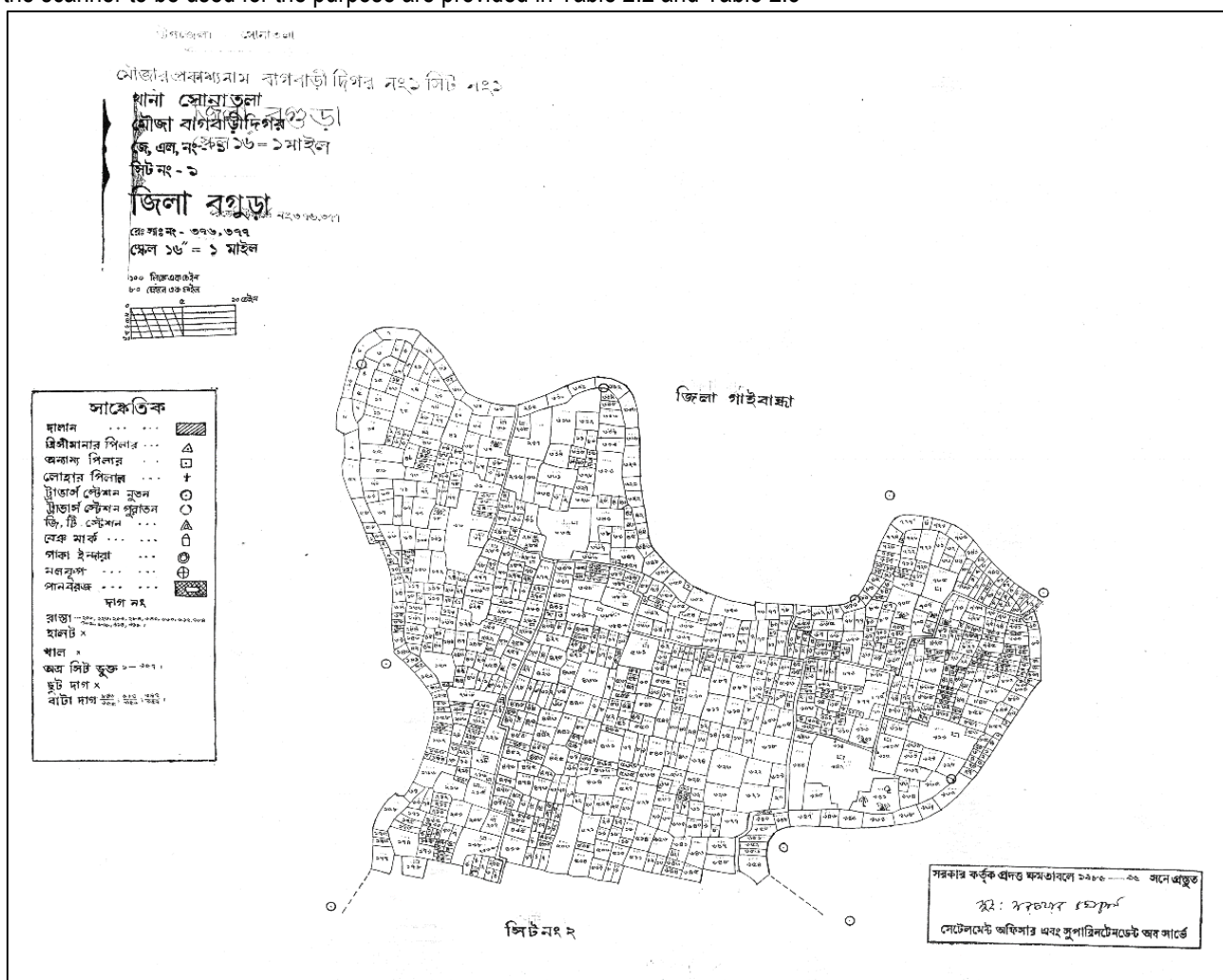
RTK Survey for Ground Control Point

RTK GCP survey will conduct simultaneously with the scanning and digitizing of Mouza Map. At least 3-5 Ground Control Points (GCP's) will select and identified on Mouza Sheets on the basis of permanent, well-established and suitably located features. Temporary Control Point (TCP) will also be selected on the Mouza Sheets for proper positioning of Map. At least 4 nos. of tentative Ground Control Points (GCP) will select on each Mouza map/sheet identical with the real field condition such as corners of permanent buildings, traverse points, sharp corner of the Mouza plots, road intersection, etc.

Coordinates (Latitude and Longitude) of these GCP are collected from field using RTK-GPS based fast static survey technique and are stored in WGS84 projection system.

2.5.4. Scanning of Mouza Maps

The scanning is a process, which is followed depending on the type of scanner used. In this work drum type roller scanner will be used. Before the actual scanning to be done, each sheet will be unfold and straighten, and cleaned. The sheet will be then set in the roller of the drum scanner and moved forward and backward several times. When it will be ensured that the sheet can move forward and backward through the scanner without any difficulty and smoothly the sheet will be brought to starting point of scanning and the scanning switch will be made on. As one sheet will be completed the machine will be stopped, and the same process will be followed for the next sheet. This way scanning of all sheets for the project area will be done. Each of the sheets will be scanned in drum scanner in 300 dpi or higher resolution. The technical specifications of the scanner to be used for the purpose are provided in Table 2.2 and Table 2.3



Map 2. 1: Scan Image of mouza map.

Table 2. 2: Specifications for Scanned Images

Image Type	Color or Grayscale
Image Format	JPEG
Image Resolution	300 dpi
Image Scale for Digitization period will be required Map unit & Display unit select inches from drop down Icon. Otherwise, when you will give the Mouza map sheet print as per same scale that time will not get the print copy of your mouza map scale.	(1:10-15)

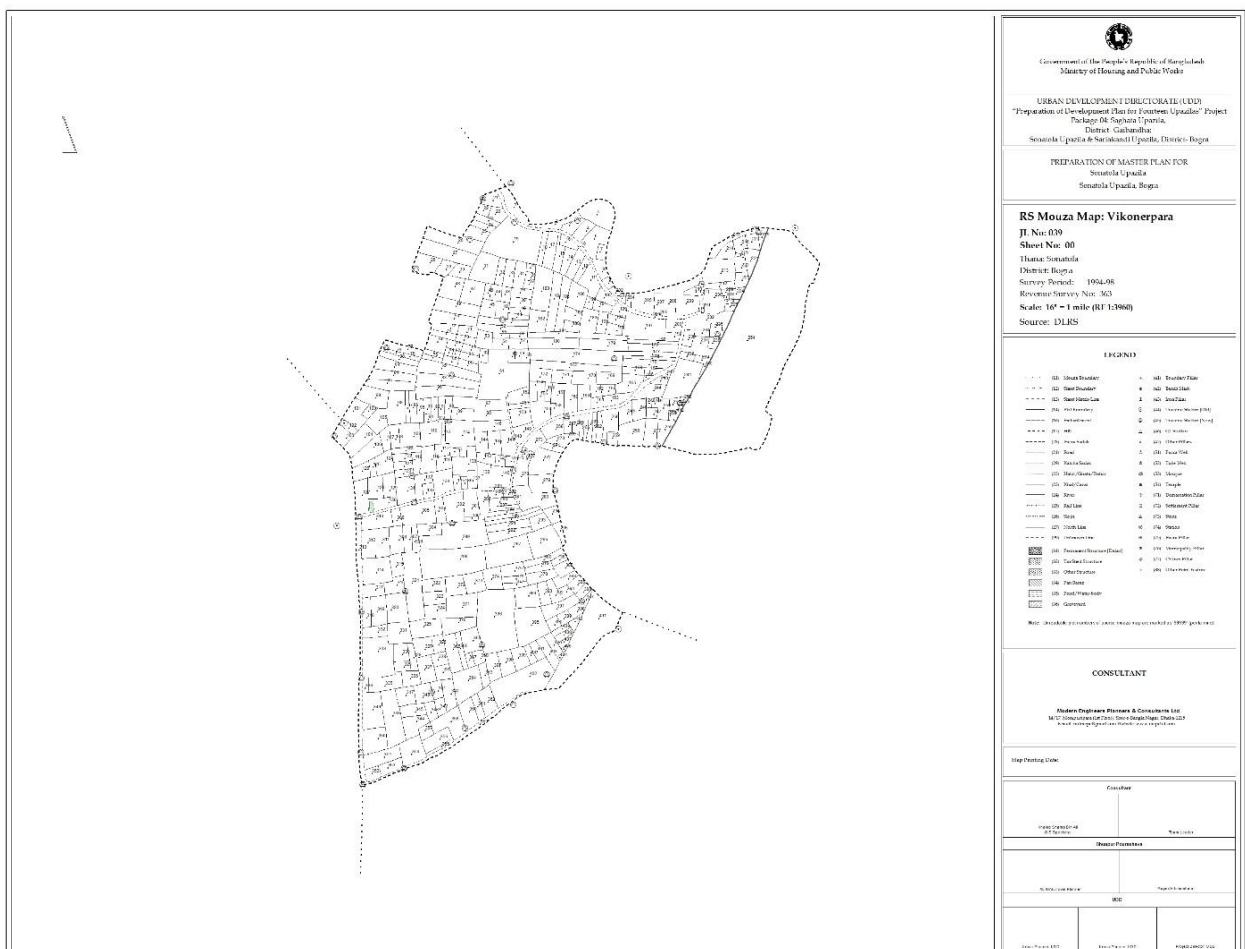
2.5.5. Raster Geo-referencing of Mouza Maps/Sheets

Geo referencing of digitized Mouza sheets/maps is the projection of the Mouza maps from digitized unit to real world coordinate units or transformation of coverage from digitized units to projected units. This projection process always involves some distortion of certain map parameters such as shape, area, distance, or direction. Different projection systems produce different distortions. The characteristics of each projection make them useful for some applications and not for others.

Digitized Mouza maps/sheets will have been geo-referenced with reference to the collected/ surveyed GCP values (Latitude and Longitude value) and will be projected to BUTM projection system.

2.5.6. Digitization of Mouza Maps

On screen digitization method will be used for digitization of Mouza maps. ArcGIS 10.1 software will be used for digitization and database built. All features will be stored in three different feature type (Line, Point, polygon) in ArcGIS Shape file with separate ID or code number. Polygons will be built with necessary attribute database of each Mouza maps. Manuscripts to be used for digitization of Mouza maps are presented in 2.5.7 to keep uniqueness of all features, the ID or code numbers of respective features will be finalized as per suggestion and discussion with PD.



Map 2. 2: Digitization of mouza map.

Table 2. 3: Nomenclature of Mouza Map Image

Location Path	Example: D:\Division(Rajshahi.div)\District(Rajshahi.dis)\Upazila(Sonatola)\Union_Ward(Bagbaridigar) D:\Division\Rajshahi.div\Rajshahi.dis\ Sonatola \ Bagbaridigar			
Drive: D:\	Division	First Double click on My Computer and go to Drive D:\ and create the Division folder under Division, District, Upazila and Union_Ward Name folder. If we prepare the union_Ward Map then we will make the Union_Ward folder otherwise the folder do not need of Union_Ward. Mouza Image will appropriately store up the mouza Image sheet under Union_Ward folder.		
	Rajshahi.div	2 nd time will create the Rajshahi.div and so on.		
File Name	BOG_SON_001_01			
		XXX		JL No. of the Mouza (3 digits)
			_	An underscore to separate JL No. and Sheet No.
			XX or xxx	Number of Sheet No of the mauza map. (2 or 3 digits)
Example: BOG_SON_001_01 or 01.....99 or BOG_SON_001_01.jpeg represents the image file in JPG format of Sheet no. 1 of Bagbaridigar Mouza having JL no. 01 of Sonatola Upazila of Bogra District.				

2.5.7. Preparing the Manuscript

Before starting the map digitization it is essential to develop feature wise manuscripts for storing all map features with a separate ID in GIS database. To keep the uniqueness of all Mouza features a common feature wise manuscript is prepared as per suggestion and guidelines of PMO. The feature wise manuscripts that followed in map digitization process are given below:

Digitization of Mauza map will be done in five layers/Coverage (two point shapefiles/Coverage, one line shapefile/Coverage and two polygon shapefile/Coverage) to capture all the features in the existing map. Name and attribute structure of these layers will be as follows:

1) Shape file\Coverage name: **PN_XXX_XX** or **XXX.shp** (PN = Plot Number)

Type: **Point**

This shape file\Coverage will contain dag number (plot number) of the Mouza maps as point features. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	No. of Decimal Places	Purpose of the field
Division	String	25	-	To put or Type name of the current Division.
District	String	25	-	To put or Type name of the current District.
Upazila	String	25	-	To put or Type name of the current Upazila.
Union	String	25	-	To put or Type name of the current Union.
Plot_No	Long Integer	-	-	To contain <i>dag</i> number (plot number)
MZ_Name	String	100	-	To contain name of the Mouza name
JL_No	String	3	-	To contain JL Number of the Mouza
Sheet_No	String	2	-	To contain sheet no the Mouza
Mouza_JL_S	String	100	-	To contain Mouza name+single space+JLno(3-digits)+single space+sheet no(2-digits)
MZ_Verion	String	6	-	To contain Mouza version of the mouza sheet E.g. CS, RS, BS and so on.
Scale	String	20	-	To contain scale of the mouza sheet.

Inception Report

Preparation of Development Plan
under "Preparation of Development Plan for Fourteen Upazilas" Project- Package-04

Revenue_No	String	100	-	To contain survey number of the mouza map
SV_Period	String	20	-	To contain survey period of the mouza map. E.g 1973-85
Plot_desc	String	20	-	To contain following plot types <ul style="list-style-type: none"> - "Plot" - "Katcha Road" - "Semi-Pucca Road" - "Pucca Road" - "Halot" - "Pond" - "Canal" - "River"
Remarks	String	100	-	To contain remarks, if any.

2) Shape file/Coverage name: **ML_XXX_XX or XXX.shp (ML = Mouza Line)**

Type: **Polyline**

This shape file/Coverage will contain all line features of the mauza map. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	No. of Decimal Places	Purpose of the field
Division	String	25	-	To put or Type name of the current Division.
District	String	25	-	To put or Type name of the current District.
Upazila	String	25	-	To put or Type name of the current Upazila.
Union	String	25	-	To put or Type name of the current Union.
Plot_No	Long Integer	-	-	To contain <i>dag</i> number (plot number)
MZ_Name	String	100	-	To contain name of the Mouza Name
JL_No	String	6	-	To contain JL Number of the Mouza
Sheet_No	String	6	-	To contain sheet no the Mouza
Mouza_JL_S	String	100	-	To contain Mouza name+single space+JLno(3-digits)+single space+sheet no(2-digits)
MZ_Ver	String	6	-	To contain Mouza version of the mouza sheet E.g. CS, RS, BS and so on.
Scale	String	25	-	To contain scale of the mouza sheet.
Revenue_No	String	100	-	To contain survey number of the mouza map
SV_Period	String	25	-	To contain survey period of the mouza map. E.g 1973-85
Line_Code	Long Integer	10	-	To contain feature code or unique ID of different line feature. For example 11, 12 and 14 are the codes for Mouza boundary, Sheet boundary and Plot boundary features respectively.
Line_Desc	String	30	-	To contain the type of plot boundaries and other line features such as <ul style="list-style-type: none"> - "Mouza boundary" - "Sheet boundary" - "Plot boundary" - "Katcha Road" - "Semi-Pucca Road" - "Pucca Road" - "Halot" - "Khal" - "Thoka/Adjacent line or Boundary" - "North line" - "Unknown line"
Remarks	String	100	-	To contain remarks, if any.

3) Shape file\Coverage name: MP_XXX_XX or XXX.shp (MP = Mouza Polygon)Type: **Polygon**

This shape file\Coverage will contain dag number (plot number) of the Mouza maps as point features. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	No. of Decimal Places	Purpose of the field
Division	String	25	-	To put or Type name of the current Division.
District	String	25	-	To put or Type name of the current District.
Upazila	String	25	-	To put or Type name of the current Upazila.
Union	String	25	-	To put or Type name of the current Union.
Plot_No	Long Integer	-	-	To contain <i>dag</i> number (plot number)
MZ_Name	String	100	-	To contain name of the Mouza name
JL_No	String	3	-	To contain JL Number of the Mouza
Sheet_No	String	2	-	To contain sheet no the Mouza
Mouza_JL_S	String	100	-	To contain Mouza name+single space+JLno(3-digits)+single space+sheet no(2-digits)
MZ_Verion	String	6	-	To contain Mouza version of the mouza sheet E.g. CS, RS, BS and so on.
Scale	String	20	-	To contain scale of the mouza sheet.
Revenue_No	String	100	-	To contain survey number of the mouza map
SV_Period	String	20	-	To contain survey period of the mouza map. E.g 1973-85
Layer_Code	Long Integer	10	-	To contain feature code or unique ID of different line features. For example 11, 12 and 14 are the codes for Mouza boundary, Plot boundary and Pond features respectively.
Layer_desc	String	20	-	To contain following plot types <ul style="list-style-type: none"> - "Plot Boundary" - "Katcha Road" - "Semi-Pucca Road" - "Pucca Road" - "Halot" - "Pond" - "Canal" - "River"
Remarks	String	100	-	To contain remarks, if any.

4) Shape file\Coverage name: PF_xxx_xx or xxx.shp (PF = Point Feature)Feature Type: **Point**

This shape file\Coverage will contain all line point features except the plot numbers of the mauza map. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Division	String	25	To put or Type name of the current Division.
District	String	25	To put or Type name of the current District.
Upazila	String	25	To put or Type name of the current Upazila.
Union	String	25	To put or Type name of the current Union.

Inception Report

Preparation of Development Plan
under "Preparation of Development Plan for Fourteen Upazilas" Project- Package-04

Plot_No	Long Integer	-	To contain <i>dag</i> number (plot number)
MZ_Name	String	100	To contain name of the Mouza Name
JL_No	String	6	To contain JL Number of the Mouza
Sheet_No	String	6	To contain sheet no the Mouza
Mouza_JL_S	String	100	To contain Mouza name+single space+JLno(3-digits)+single space+sheet no(2-digits)
MZ_Ver	String	6	To contain Mouza version of the mouza sheet E.g. CS, RS, BS and so on.
Scale	String	25	To contain scale of the mouza sheet.
Revenue_No	String	100	To contain survey number of the mouza map
SV_Period	String	25	To contain survey period of the mouza map. E.g 1973-85
Line_Code	Long Integer	10	To contain feature line code or unique ID of different line feature. For example 15, 16 and 17 are the codes for Mouza boundary, Sheet boundary and Plot boundary features respectively.
Point_Code	String	3	To contain the user ID of different point features. For example: 45 is the ID of Traverse Station (New)
Point_Desc	String	50	To contain Point description of point features such as - "Traverse Station [Old]" - "Traverse Station [New]" - GT Station, etc. And also to contain texts of label features such as "Sheet No. 2", "Shaktola No. 101", etc.
PF_Name	String	100	To put or type the Adjacent name of Mouza, JL No, Sheet No, River and so on.
Remarks	String	100	To contain remarks, if any.

5) Shape file/Coverage name: **ST_XXX_XX** or **xxx.shp** (ST = Structure)

Feature Type: **Polygon**

This shape file will contain all line area features such as Structures (Building), Waterbody (Pond), etc. of the mauza map. It must contain the field as described in the following table:

Field Name	Field Type	Field Width	Purpose of the field
Division	String	25	To put or Type name of the current Division.
District	String	25	To put or Type name of the current District.
Upazila	String	25	To put or Type name of the current Upazila.
Union	String	25	To put or Type name of the current Union.
Plot_No	Long Integer	-	To contain <i>dag</i> number (plot number)
MZ_Name	String	100	To contain name of the Mouza Name
JL_No	String	6	To contain JL Number of the Mouza
Sheet_No	String	6	To contain sheet no the Mouza
Mouza_JL_S	String	100	To contain Mouza name+single space+JLno(3-digits)+single space+sheet no(2 or 3 -digits)
MZ_Ver	String	6	To contain Mouza version of the mouza sheet E.g. CS, RS, BS and so on.
Scale	String	25	To contain scale of the mouza sheet.
Revenue_No	String	100	To contain survey number of the mouza map
SV_Period	String	25	To contain survey period of the mouza map. E.g 1973-85
OthersName	String	100	To put or type the Adjacent name of Mouza, JL No, Sheet No, River and so on.
ST_Code	Long Integer	6	To contain the user ID of different polygon features. For example: 31 is the ID of Permanent Structure (Dalan), 32 is for Tinshed Structure, etc.
ST_Desc	String	50	To contain type of features such as

Inception Report

Preparation of Development Plan
under "Preparation of Development Plan for Fourteen Upazilas" Project- Package-04

			<ul style="list-style-type: none"> - "Permanent Structure [Dalan]" - "Tinshed Structure" - "Other Structure" - "Pond/Waterbody" - "Pan Baraz" - "Graveyard"
Remarks	String	100	To contain remarks, if any.

Feature Codes

The following feature codes (Unique ID) will be used in mauza map digitization.

Feature Type/Item	Shape File/Coverage Name	Feature Code (ID)	
International Boundary	ML_XXX_XX or XXX	10	
Division Boundary		11	
District Boundary		12	
Upazila Boundary		13	
Union Boundary		14	
Mouza Boundary		15	
Sheet Boundary		16	
Plot Boundary		17	
Thoka/Adjacent/Match Line		18	
Embankment		19	
Hill		20	
Road		21	
Halot		22	
Khal (Canal)		23	
River		24	
Rail Line		25	
Slope		26	
North Line		27	
Pucca Road		28	
Semi-Pucca Road		29	
Katcha Road		30	
Unknown Line		99	
Permanent Structure [Dalan]		ST_XXX_XX or XXX	31
Tin Shed Structure			32
Other Structure	33		
Pan Baraz	34		
Pond/Water Body	35		
Graveyard	36		
Missing or not readable plot number	PN_XXX_XX or XXX	99999	
Boundary Pillar	PF_XXX_XX or XXX	41	
Bench Mark		42	
Iron Pillar		43	
Traverse Station(Old)		44	
Traverse Station (New)		45	
GT Station		46	
Other Pillars		47	
Pucca Well		51	
Tube Well		52	
Mosque		53	

Temple		54
Adjacent Mouza/Sheet		61
Otier Info		62
Demarcation Pillar		71
Settlement Pillar		72
Stone		73
Station		74
Pucca Pillar		75
Municipality Pillar		76
CS Iron Pillar		77
Other Point Feature		88
Plot Boundary	ML_XXX_XX or XXX	14
Katcha Road		30
Semi-Pucca Road		29
Pucca Road		28
Halot		22
Pond		14
Canal		23
River		24

2.5.8. Preparation of workstation coverage of study area map

All survey data will store and record in the TS and DGPS memory with separate ID or code number for each feature i.e. as Line, Point and Polygon. Later on the TS and DGPS data will transfer directly to the GIS database where the features will keep in separate layer wise as per specified code or ID, Names of Settlement, village, rivers, khals, lakes, roads, markets, etc. will also record during physical feature survey and incorporated in GIS database as attribute. During survey coding system has been used to ease the survey work. For example, while taking coordinates of a primary school, its coordinates has been coded as PS. GNSS Solution and MSCAD software are used for post-processing of RTK and Total Station based survey data. On the other hand, GIS based Arc/Info, Arc/GIS 10.2 are used to perform the survey data management and presentation and preparation of map layout.

2.5.9. Edit Plot Checking of Digitized Coverage

When the digitization of sheet is completed, edit plot checking of digitized coverage of the sheet will be then initiated. Edit plots will be produced containing all features in different colors. Then the digitized sheets/Mouza maps will be individually checked and verified by superimposing on the original Mouza sheets using light table. By the edit plot check all possible errors (missing arcs, dislocated arcs, wrong or missing polygon labels, Tic location and ID etc.) will be eliminated and corrected and final Mouza maps will be prepared. After completion of edit plot checking, the Mouza maps will be stored in computer file and in CD's and also in hard copies.

2.5.10. Demarcating the Project Area/Boundary

The latest Gazette of the Upazila will be taken for demarcation of present and extended Upazila boundary for the future growth and expansion considering 20 years growth planning. A consultation meeting will be conducted with participation of Pourashava Mayor, Councilors, Engineer, other staff and local elites to demarcate the existing Pourashava and Ward Boundary.

2.6. Preparation of Base Map using Satellite Image and Photogrammetric Method

2.6.1. Collection of Satellite Image

High resolution stereo satellite images for the whole project area (815 sq. km) will be collected for the given tasks assign in the terms of reference. Spatial resolution of those images for urban area will be 0.5 meter and 1.0 meter for rural area. Spectral resolution of both type of images having different spatial resolutions will be four including red, green, blue, and near infrared. Radiometric resolution for the images will be 16 bit. These stereo satellite images will be used for extracting different types of physical features having features' height and generating Digital Elevation Model (DEM) in the form of Digital Terrain Model (DTM) and Digital Surface Model (DSM).

2.6.2.DTM/DEM/TIN/Contour Generation

DEMs are an integral part of any Geospatial Analysis. They are required both for the description of the three dimensional surface and to orthorectify imagery used in mapping applications or for modeling purposes. There is a variety of DEM source data available, the suitability of which depends on the project specifications. DEMs can be produced by automatic DEM extraction from stereoscopic satellite images. There are two types of stereo products; Basic Stereo products delivered as full scenes that are uncorrected and ortho-ready stereo products that are area-based and geo-referenced to a map projection and constant base elevation. The stereo imagery is collected in-track, e.g. on the same satellite pass and supplied with a full set of metadata. These products are ideal for DEM generation along with 3D visualization and feature extraction applications. Ortho-Ready stereo pair of satellite imageries will be used to extract DEM using the rational polynomial coefficients (RPC) model and supplied full set of metadata in ERDAS Imagine Photogrammetry. RPC model will be setup first with the help of provided metadata from the image vendor. Then automatic DEM extract (ATE) tool of the given software platform will be applied to extract DEM by creating a block file. Later extracted DEM will be manipulated if requires to enhance its accuracy level. Accuracy of the extracted DEM will be checked and validated with the help of topographic data having higher accuracy collected from the primary survey or secondary survey.

Triangulated Irregular Network (TIN), Contour surface or lines are as of Digital Elevation Model, 3D information describing the topography of the project area. The TIN model represents a surface as a set of contiguous, non-overlapping triangles which will be made from a set of points called mass points. Mass points will be extracted from the DEM prepared using stereo satellite imageries for both urban and rural area. *The Delaunay Constrained Triangulation* will be developed to maintain the Delaunay nature of the final triangulation. On other hand, contour surface will be developed, both for urban and rural area separately. Contour intervals for these two surface will be different. To properly describe the earth surface, significant contour intervals both for urban area and rural area, will be applied. The whole process of triangulation and contour surface generation will be done in ERDAS Imagine and ArcGIS platform.

2.6.3.3D satellite image processing

ERDAS Imagine Photogrammetric Suite will be used to process stereo image and to extract different type of 3 dimensional physical features (point, line and polygon features) with the help of stereo glasses using 3D digitization and mapping technique. Extracted physical features will contain the actual height those features. This will be done on stereo satellite images in the session of on-screen 3D digitization in the aforementioned software platform. Satellite imageries will be zoomed at a reasonable scale where digitization errors will be negligible. Following the digitization session, the features will be converted into Line, Point and Polygon Layers.

2.6.4.Ortho-rectification of Images

Orthoimage is a satellite images which are geometrically corrected ("orthorectified") used to measure true distances as it is an accurate representation of the Earth's surface, having been adjusted for topographic relief, and sensor's tilt. In other words, orthorectification is the process of stretching the image to match the spatial accuracy of a map by considering location, elevation, and sensor information. The distortions are geometrically removed, creating a planimetric image at every location with consistent scale across all parts of the satellite image. The topographical variations in terms of undulation in the surface of the earth and the tilt of the satellite sensor affect the distance with which features on the satellite image are displayed. The more topographically diverse the landscape, the more distortion inherent in the image. To remove this kind of errors, orthorectification technique will be applied in the collected and georeferenced satellite images with the help of available secondary *Digital Elevation Model*, rational polynomial coefficients (RPCs) and associated RPC file, that is, the coefficient to the latitude, longitude, and height value of the pixel. These coefficients and will be collected from the image vendor which will provide a compact representation of a ground-to-image geometry allowing photogrammetric processing without requiring a physical camera model.

2.6.5.Mosaicking of Ortho-photo

A digital orthophoto consists of picture elements - pixels. To every pixel a greyvalue is attached - the pixelvalue. Normally this value is in the range 0-255 (= one 8-bit byte in a computer) covering a greyscale from black to white. The pixelvalue represents the amount of reflected light, from the area on the ground covered by the pixel. The thesis is that the grey tones in every photo is distorted systematically as a result of the sun-angle (time of day and year), flight-direction, atmosphere, etc. This means that every pixelvalue in the orthophoto can be described as a "true value S, related to the reflection of the groundsurface, plus a contribution from the distortion-surface. If all the types of variations were to be modelled the distortion-surface would be very complex and difficult to describe. This method implies that a simple polynomial surface-function might

be enough to describe the necessary corrections to be made in every image in order to produce a homogeneous image covering several photos.

2.6.6. Geo-referencing of Mouza Maps

A spatial reference system (SRS) or coordinate reference system (CRS) is a coordinate based local, regional or global system used to locate geographical features on the earth surface. A spatial reference system defines a specific map projection system as well as transformations between different spatial reference systems.

Bangladesh Universal Transverse Mercator (BUTM 2010) projection system is used in all the survey and mapping tasks for the project. BUTM 2010 projection System is developed by Survey of Bangladesh (SoB). The following are the projections parameters for BUTM 2010.

Projection Parameters	:	
Projection	:	Bangladesh Universal Transverse Mercator (BUTM 2010)
Spheroid	:	WGS 84
Central Meridian	:	90 Degree East Greenwich
Latitude of Origin	:	0 Degree (The Equator)
False Northing	:	0 Meters
False Easting	:	500,000 Meters
Scale Factor at the Central Meridian	:	0.9996
Coordinate System	:	Geographic Coordinate
System	:	WGS 84
Angular Unit	:	Degree (0.017453292519943299)
Prime Meridian	:	Greenwich (0.000000000000000000)
Datum	:	WGS 84
Spheroid	:	WGS 84
Semi Major Axis	:	6378137.000000000000000000
Semi Minor Axis	:	6356752.314245179300000000
Inverse Flattening	:	298.257223563000030000

All the mapping tasks of geo-referencing of Satellite Imageries, extracted different type of physical features, land uses and cartographic map composition will be performed using BUTM Coordinate System.

2.6.7. Preparation of mosaic Maps & Demarcating the Project Boundary

The latest Gazette of the Upazila will be taken for demarcation of present and extended Upazila boundary for the future growth and expansion considering 20 years growth planning. A consultation meeting will be conducted with participation of Pourashava Mayor, Councilors, Engineer, other staff and local elites to demarcate the existing Pourashava and Ward Boundary.

2.6.8. Preparation of Project Area Map

Physical features (road, building, waterbodies, embankment, etc.) along with administrative boundaries will be the base information for preparing base map. A standard map having a scale of 1:3960 will be composed showing the different physical features, administrative boundaries and project boundaries upon the feasible paper size preferably A1. A number of sheets for the base map will be produced at the given scale. All mapping, composing and printing tasks will be done in ArcGIS platform.

2.6.9. Super-imposing project area map prepared by mouza map and satellite image

Geo-referenced mouza maps will be superimposed on the administrative mouza maps from which we will be able to know the actual geographic boundary of the project. Necessary features from image e.g. roads, rivers, khals, homesteads, agricultural lands, etc. will be superimposed. More necessary layers will be append from different maps which have already been developed by other organizations.

The major task is to prepare a separate GIS coverage with topographical and physical infrastructure feature by fitting to mouza coverage and Compose and prepare Base Maps using the mouza and topographic & physical feature survey data in Mouza Map scale.

2.7. Data Base Preparation**2.7.1. Development of GIS Data Base**

The consultant will also initiate different survey activities after the inception of the report. The format of different survey questionnaire is as following:

Table 2. 4: Physical Infrastructure Survey Format

Sl. No	Physical Feature Name	Data Type			Z Value (Z measurement level)			Description
		Point	Line	Polygon	On Top	On Ground/ level	Not Required	
1A. Water bodies								
1	1. River Edge			x		x		
2	2. Khal Edge			x		x		
3	3. Drainage Channels			x		x		Name, width
4	4. River/ khal centreline		x			x		Name, width
5	5. Flow direction	x					x	
6	1. Ponds/Tanks/ Dishes			x		x		
7	7. Coastline		x			x		
B. Building/Structure		Pucca/ Semi pucca/ stories, Building area >15 sqm (Depending on map Scale)						
8	1. House			x	x			Residential Building
9	2. Industry			x	x			Industrial Building
10	3. Commercial			x	x			Commercial Building
11	4. Mixed			x	x			Mixed Use
12	5. Boundary Wall		x		x			Wall use as boundary
C. Roads								
13	1. Road Pucca		x	x		x		Asphalt Road
14	2. Road HBB		x	x		x		HBB Road
15	3. Road Katcha		x	x		x		Katcha Road
16	4. Path Pucca		x	x		x		Pucca Path
17	5. Path Katcha		x	x		x		Katcha Path
18	6. Traffic Island/ Divider		x	x		x		
19	8. Road/Path Centreline		x			x		Name, width
D. Railways								
20	1. Railway Row Line		x			x		
21	2. Railway centreline		x			x		
22	3. Railway Junction Points	x				x		
E. Other Structure and Flood works		Length, width, condition of abutments and wing-walls						
23	1. Bridge / Culverts			x	x			Type, area, Name
24	2. Embankments			x	x			Name, length
25	3. Pump Station for Flood			x		x		Name
26	4. Sluice Gates		x		x			Name
27	5. Bus/Trucks Terminals			x		x		Indicate right way and areas
28	Harbor/ Bathing/boat Jetty		x		x			Harbor, Boat jetty
F. Natural Features								
29	1. Forest			x	x			Area > 2500 Sqm
30	2. Group of trees			x	x			Area < 2500 Sqm
31	3. Group of Trees Point	x			x			
32	4. Wetlands / Bog/ Marshland/ Flood prone area			x		x		Area > 2500 Sqm
33	5. Sand/Sand Dunes			x		x		Area > 2500 Sqm

Inception Report

Preparation of Development Plan
under "Preparation of Development Plan for Fourteen Upazilas" Project- Package-04

34	Significant Single Tree	x				x		Easily identified single tree
E. Utility Services								
35	1. High voltage Electric Line		x			x		National/regional grid
36	2. Telephone Line		x			x		
37	3. Gas Line		x				x	
38	4. Utility Substation	x					x	Electric, Telephone exchange, Gas
39	5. Overhead Water Tank			x		x		Name, Capacity
40	4. Waste disposal and treatment points	x					x	A dustbin of municipality and other informal points
41	3. Water work			x			x	
42	5. Deep Tube well Stations	x					x	R.C.C DPHE and other deep tube well stations and output
F. Area Polygon								
43	Residential Area			x			x	Planned, Unplanned, Density (High, Middle, Low)
44	Commercial Area			x			x	Established markets with ancillary shop, groups of shops including small workshops
45	Institutional, Educational, Health Govt. office			x			x	School/college/madrasa, clinics, hospital, govt. office
46	Industrial (as classified by acts and rules)			x			x	Main activity, type of waste effluent
47	Agricultural Area			x			x	All types of agricultural uses
48	Recreation / sports			x			x	Parks/play/sports ground, indoor facilities, zoological garden. Stadium area
49	Religious / cemetery			x			x	Mosques, Temples, Church, Mazar and others
49	Graveyard. Cemetery			x			x	Sites
51	Historic Place			x			x	Sites
52	Borrow Pits			x			x	Areas cut for filling material
53	Vacant Land			x			x	Vacant land with no apparent use
54	Public gathering			x			x	Place of public meeting, open-air cultural performance and religious gathering
55	Garden			x			x	Indication Rea, pineapple etc.
56	Disaster prone areas			x			x	Flood, (indicating the flood affected area in 1998) Earthquake and fault line

Table 2. 5: Spot Level Survey Format

Sl. No	Survey Item	Illustrated			
		Map object which may be used if registered with a view to DEM use			
	Special DEM Object	As break line	As terrain points	For delimitation of unsurvey	For Mask Areas
	Spot height	Road Pucca		Coastline	Building
	Special elevation point	Road Katcha		Pond	Pond
	Contour line	Path Pucca			Wetland/bog/marsh land
	Break line	Path Katcha			
	Mask Area	River Edge			
	Unsurveyed Area	Khal Edge			
	DEM Boundary	Pond			
		Drain channel			

Note: Name of settlements, village, roads, khals, markets, etc. must be clearly indicated in the physical features maps.

2.7.2. GIS Mapping (Preparation of Workstation Coverage and Map Lay Out in ArcView)

All survey data were stored and recorded in the TS and DGPS memory with separate ID or code number for each feature i.e. as Line, Point and Polygon. Later on the TS and DGPS data were transferred directly to the GIS database where the features were kept in separate layer wise as per specified code or ID, Names of Settlement, village, rivers, khals, lakes, roads, markets, etc. were also recorded during physical feature survey and incorporated in GIS database as attribute. During survey coding system has been used to ease the survey work. For example, while taking coordinates of a primary school, its coordinates has been coded as PS. GNSS Solution and MSCAD software are used for post-processing of RTK and Total Station based survey data. On the other hand, GIS based Arc/Info, Arc/GIS 10.2 are used to perform the survey data management and presentation and preparation of map layout.

2.8. Field Survey Using RTK GPS Based Advanced Survey Technique

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day. There are no subscription fees or setup charges to use GPS.

- **How it works**

GPS satellites circle the earth twice a day in a very precise orbit and transmit signal information to earth. GPS receivers take this information and use triangulation to calculate the user's exact location. Essentially, the GPS receiver compares the time a signal was transmitted by a satellite with the time it was received. The time difference tells the GPS receiver how far away the satellite is. Now, with distance measurements from a few more satellites, the receiver can determine the user's position and display it on the unit's electronic map.

A GPS receiver must be locked on to the signal of at least three satellites to calculate a 2D position (latitude and longitude) and track movement. With four or more satellites in view, the receiver can determine the user's 3D position (latitude, longitude and altitude). Once the user's position has been determined, the GPS unit can calculate other information, such as speed, bearing, track, trip distance, distance to destination, sunrise and sunset time and more.



Pic 2. 1: TOPCON GTS-230 Series Total Station

- **DGPS Concepts**

Differential GPS is a way of improving the accuracy of GPS. Data from a receiver at a known stationary location (base or reference) is used to correct the data received from a receiver at an unknown location (rover). DGPS lets users with GPS and DGPS receivers know their location within 10 meters of accuracy and is usually within 3 meters or less, depending on the quality of the user's equipment and their distance from the DGPS stationary location. These corrections can be applied in real time or by post processing.

- **How DGPS Works**

Differential GPS basically involves two GPS receivers. One of these receivers is stationary (base or reference station) and the other is roving and making position measurements. As the base station knows its location exactly, it can determine satellite signal errors. This is done by measuring the ranges to each satellite using the received signals which are compared to the actual ranges calculated from its known location. These differential corrections for each tracked satellite are transmitted to the roving GPS receiver and applied to its calculations. Transmissions for real-time use can be over FM radio frequencies, by satellite or by beacon transmitters that are maintained by the U.S. Coast Guard. Calculations can also be recorded for post-processing.

- **Real-Time Kinematic DGPS**

Real-time Kinematic DGPS occurs when the base station calculates and broadcasts corrections for each satellite as it receives the data. The correction is received by the roving receiver via a radio signal if the source is land based or via a satellite signal if it is satellite based and applied to the position it is calculating. As a result, the position displayed and logged to the data file of the roving GPS receiver is a differentially corrected position. The Radio Technical Commission for Maritime Services (RTCM), a nonprofit scientific and educational organization that serves all aspects of maritime radio communications, radio navigation, and related technologies, defined the differential data protocol for relaying GPS correction messages from a base station to a field user. Its Special Committee 104 (RTCM SC-104) format recommendations define the correction message format. Each correction message includes data about the station position and health, satellite constellation health, and the correction to be applied. Using real-time differential corrections allows navigation to within one to two meters of any location depending on the service and the GPS receiver. A RTK-DGPS can provide millimeter level of accuracy.

2.8.1. Use of Differential Global Positioning System (DGPS)

The Global Positioning System (GPS) is a satellite-based navigation and time transfer system developed by the U.S. Department of Defense. It serves marine, airborne, and terrestrial users, both military and civilian. Specifically, GPS includes the Standard Positioning Service (SPS) which provides civilian users with 100 meter accuracy, and it serves military users

with the Precise Positioning Service (PPS) which provides 20-m accuracy. Both of these services are available worldwide with no requirement for a local reference station. In contrast, differential operation of GPS provides 2- to 10-m accuracy to users within 1000 km of a fixed GPS reference receiver. Finally, carrier phase comparisons can be used to provide centimeter accuracy to users within 10 km and potentially within 100 km of a reference receiver. This advanced tutorial will describe the GPS signals, the various measurements made by the GPS receivers, and estimate the achievable accuracies. It will not dwell on those aspects of GPS which are well known to those skilled in the radio communications art, such as spread-spectrum or code division multiple access. Rather, it will focus on topics which are more unique to radio navigation or GPS. These include code-carrier divergence, codeless tracking, carrier aiding, and narrow correlated spacing.

2.8.2. Installation of Ground Control Point (GCP) Survey

Ground control can be classified as targeted and photo-identifiable (picked) control points, and can also be classified as horizontal control, vertical only control, or as 3-D control. Horizontal and vertical controls require different configurations to make them serve their intended purposes. The use of only ground control is now limited to small projects, such as bridge sites, borrow areas and where only one or two models are needed. Photo identifiable control points are rarely needed. The surveyor needs to know what type of control is called for when he or she attempts to pick or photo-identify the point. Accessibility for surveying should also be considered when selecting the locations for control points.

2.8.3. Establishment of Reference Station for DGPS Survey

In order to simplify the process of relative GPS positioning, many organizations are establishing automated reference station facilities. These unstaffed, permanently configured facilities continuously collect and record GPS data. The reference station data are then made available to users. In a very simple scenario, a user could collect data in the field with a single GPS receiver, later retrieve the data collected during the same time span by a nearby reference station, and combine the two datasets to perform single-handed, post-processed relative positioning. Such a procedure is well suited for mapping grade (few meter level accuracy) GPS work designed for applications such as geographic information system (GIS) data collection. Survey grade (few centimeter level accuracy) GPS work can also be supported by a reference station, but it usually involves more than one field receiver operating simultaneously to provide for redundancy and to enhance productivity.

2.8.4. Establishment of Bench Marks (BM)/Control Points (CP) Network

Bench Mark Spacing

The required density of benchmarks will depend on terrain, vegetation and type of construction. *They should be of sufficient density to decrease survey time for subsequent levelling requirements.* The advantage of density must be weighed against the greater initial cost for establishing extra benchmarks. The Bench Mark 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 unique identification number Coordinate X, Y of these pillars along with Z value is to be marked on base map for future reference.

Bench Mark Location

Benchmarks should be placed in locations suitable for the intended purpose and permanence. Utility poles, ornamental trees, or fire hydrants should be avoided.

Permanent benchmarks - Benchmarks that are to remain as reliable elevation references over a period of years, or even for extended construction duration, such as major structures, should generally meet the following criteria:

1. Place in stable, undisturbed original ground.
2. Establish on abutments or wing walls of older existing structures that have become stabilized.
3. Locate near "join" lines of cross streets, intersection of sidewalks and existing facilities outside of the construction area.
4. Select locations with locally level terrain. A benchmark on top of a high slope is not as desirable as one lower on the slope, provided all other criteria can be met. Quite often, the positions of horizontal (traverse) points are not

compatible with project use of benchmarks, but are compatible with other considerations. In such instances, benchmarks in more usable locations should be established from the traverse control.

5. Utilize baseline monuments when practical.
6. Benchmarks destroyed during construction activities must be replaced to ensure a minimum of one benchmark per thousand feet.

Temporary Benchmarks - Less permanent benchmarks may be required for a limited use period for a specific survey operation, i.e., slope staking. Such stakes are called temporary benchmarks and they are not perpetuated after construction. Temporary benchmarks are usually marked with wooden stakes.

2.8.5. Baseline Survey by RTK-GPS

RTK GCP survey was conducted simultaneously with the scanning and digitizing of Mouza Map. At least 4 Ground Control Points (GCP's) will select and identify on Mouza Sheets on the basis of permanent, well-established and suitably located features. Temporary Control Point (TCP) will also be selected on the Mouza Sheets for proper positioning of Map. At least 4 nos. of tentative Ground Control Points (GCP) are selected on each Mouza map/sheet identical with the real field condition such as corners of permanent buildings, traverse points, sharp corner of the Mouza plots, road intersection, etc. Coordinates (Latitude and Longitude) of these GCP are collected from field using RTK-GPS based fast static survey technique and are stored in WGS84 projection system.

After getting GCP readings from field, identify the control points on Mouza sheet and then geo reference each of the sheets. To facilitate this process, we provide a copy of Mouza sheet to our survey engineers to the field. For this, while they are taking a GCP reading, they can mark the point on the respective Mouza sheet for future reference.

2.8.6. Development of Geoid Model for the Project Area

The Survey of Bangladesh (SOB) is the national surveying and mapping organization of Bangladesh under the Ministry of Defense. This department started functioning as 'Bengal Survey' on 1st January 1767 in undivided India and conducted survey and mapping activities until 1947.

After the partition, the organization started its new role as Survey of Pakistan and established a regional office at Comilla, which was subsequently shifted to Dhaka in July 1958. This regional office was transformed into Survey of Bangladesh after independence in 1971.

With the passage of time, SOB has attained remarkable progress in surveying and mapping with photogrammetric system and well equipped geodetic units. With a view to monitor and review Mean Sea Level (MSL) for the country, it has established a tidal gauge station in the river Karnaphuli at Rangadia, Chittagong. SOB has also established National Geodetic Datum (Vertical and Horizontal) at Gulshan, Dhaka and Geodetic Control Network all over the country.

Presently, the SOB is creating Digital Topographic Base Maps of new scale, GIS-database and Digital Elevation Model (DEM). These data would greatly help in analytical science for geospatial modeling, study on socio economic and environmental geo-statistics and planning of all land related development works.

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

The DGPS system consists of a static base station and a movable rover. The rover can be configured in several ways which provide different methodologies for surveying. The simplest configurations involve mounting the roving antenna on a tribrach or pole. These are then positioned over the point to be measured, levelled, and a point is recorded manually (static mode). The time taken to measure points is normally 2-3 minutes when using a tribrach and ~10 seconds when using the pole. In windy conditions points may take longer to measure as the antenna must be held horizontal to minimize errors.

Before points can be recorded the base station must be set up. The base station does not need to have a line of sight to the survey area, and depending on the DGPS system used, it may be up to a maximum distance of 2 – 10 km from the survey area. However, if surveying alone it is preferable to remain within view of the base station, or within easy access of it for security reasons.

The DGPS base must be level to obtain maximum accuracy. This is achieved by positioning the antenna on a tripod. This enables the base station to be set up on most terrain as the length of each leg can be individually altered. While relatively stable, in windy conditions it is best to set the base station up on soil rather than concrete or tarmac for additional stability.

2.8.8. RTK-GPS Fast Static Survey (Establishment of Control Points for TS Survey)

RTK surveys are kinematic surveys with a communications link between the base receiver and rover. RTK can include stop-and-go data collection and continuous data collection. In Real-Time Kinematic surveys, data processing occurs in the field as data is logged, providing immediate centimeter-level results in the form of coordinates in the Trimble controller. The GPS base station is located on a known point. It takes measurements from satellites in view and then broadcasts them along with its known position to the rover receivers. The rover receiver also collects measurements from the satellites in view and processes them with the base station data. The rover then computes its location relative to the base.

Setting up the base station

Locate the base station where there is a clear and unobstructed view of the sky, for example, on top of a hill or building. You should be able to see the sky all around at an elevation angle of 13° above the horizon. The WGS-84 coordinates for the base station should be known. Every 10m error in these coordinates can cause an error of 1 ppm in the length of the RTK baseline.

Total Station Survey Techniques

A **total station** is an electronic/optical instrument used in modern surveying. The total station is an electronic theodolite (transit) integrated with an electronic distance meter (EDM) to read slope distances from the instrument to a particular point. Robotic total stations allow the operator to control the instrument from a distance via remote control. This eliminates the need for an assistant staff member as the operator holds the reflector and controls the total station from the observed point.

- **How it works**

Total stations combine electronic theodolites and EDM into a single unit. They digitally observe and record horizontal directions, vertical directions, and slope distances. These digital data observations can be adjusted and transformed to local X-Y-Z coordinates using an internal or external microprocessor. Various atmospheric corrections, grid and geodetic corrections, and elevation factors can also be input and applied. The total station may internally perform and save the observations or (more commonly) these data may be downloaded to an external data collector. With the addition of a data collector, the total station interfaces directly with onboard microprocessors, external PCs, and software. Electronic theodolites operate in a manner similar to optical theodolites. Angles can be electronically encoded to one arc-second with a precision down to 0.5 arc-second. Digital readouts eliminate the uncertainty associated with reading and interpolating scale and micrometer data. The electronic angle-measurement system minimizes some of the horizontal and vertical angle errors that normally occur in conventional theodolites. These instruments also are equipped with a dual-axis compensator, which automatically corrects both horizontal and vertical angles for any deviation in the plumb line.

Total station surveys are performed similarly to transit-stadia or plane-table-alidade surveys. Total stations are set up over control points similarly to traditional transits, theodolites, or EDM. Most employ a three-screw, forced-centering Wild-type tribrach mounts to fasten and align the total station with the tripod. Heavy wooden or fiberglass tripods are best for supporting total stations. Leveling over a point is performed no differently than traditional instrument methods. The tribrach is roughly centered over the point first using the standard tripod leg adjustment technique. The total station is then mounted in the three-pin tribrach and internally leveled using either level vials or electronic dual-axis methods, depending on the type of instrument. Either optical or laser plummets are used for final centering over a point. Some total stations provide out of level warnings to the operator. All plummets, optical or digital, should periodically be checked, adjusted, and calibrated. A conventional plumb bob provides such a check if used in ideal conditions.

A variety of target poles are used for the remote rod to which topographic observations are made. Both adjustable and fixed height poles are common. Extendable rods (to 20 feet and higher) may be used--especially on beach profiling surveys and in canopy areas. For most applications, a retro-reflector prism is attached to the top of the prism pole such that there is no eccentric offset correction required. If not, then the retro-reflector offset correction must be determined and applied to observed distances. Use of a fixed height pole helps minimize HR blunders. A shoe for the pole point may be needed in soft ground. A standard rod level is used to plumb the prism pole over a point. Many poles have built-in rod levels to facilitate plumbing the prism

- **Coordinate Measurement**

Coordinates of an unknown point relative to a known coordinate can be determined using the total station as long as a direct line of sight can be established between the two points. Angles and distances are measured from the total station to points under survey, and the coordinates (X, Y, and Z or northing, easting and elevation) of surveyed points relative to the total station position are calculated using trigonometry and triangulation.

To determine an absolute location a Total Station requires line of sight observations and must be set up over a known point or with line of sight to 2 or more points with known location.

For this reason, some total stations also have Global Navigation Satellite System interface which do not require a direct line of sight to determine coordinates. However, GNSS measurements may require longer occupation periods and offer relatively poor accuracy in the vertical axis.

- **Angle measurement**

Most modern total station instruments measure angles by means of electro-optical scanning of extremely precise digital bar-codes etched on rotating glass cylinders or discs within the instrument. The best quality total stations are capable of measuring angles to 0.5 arc-second. Inexpensive "construction grade" total stations can generally measure angles to 5 or 10 arc-seconds.

- **Distance Measurement**

Measurement of distance is accomplished with a modulated microwave or infrared carrier signal, generated by a small solid-state emitter within the instrument's optical path, and reflected by a prism reflector or the object under survey. The modulation pattern in the returning signal is read and interpreted by the computer in the total station. The distance is determined by emitting and receiving multiple frequencies, and determining the integer number of wavelengths to the target for each frequency. Most total stations use purpose-built glass Porro prism reflectors for the EDM signal. A typical total station can measure distances with an accuracy of about 1.5 millimetres (0.0049 ft) + 2 parts per million over a distance of up to 1,500 metres (4,900 ft).

- **Data processing**

Some models include internal electronic data storage to record distance, horizontal angle, and vertical angle measured, while other models are equipped to write these measurements to an external data collector, such as a hand-held computer. When data is downloaded from a total station onto a computer, application software can be used to compute results and generate a map of the surveyed area.

2.9. Survey Data Processing (GPS and Total Station Data)

To transfer the survey data to a computer in a usable format. These involve copying the data from the CF cards to a computer's hard-drive. Once on the hard-drive the data can be processed using software provided by the manufacturer. The result is a table which includes information on each point acquired, such as the time recorded, coordinates, elevation, and quality. The table can be copied into a text file or a spreadsheet, ready for further processing.

2.10. Preparation of Map Layout and Legend

Map layout is the presentation format of map which will also present the legend, scale north sign and also the approval authority of the map. The final map layout proposed by the consultant is enclosed herewith in Figure 2.6 and legend of different physical feature is given in the annexure 2.1.

2.11. Physical Feature Surveys

2.11.1. Method

The similar approach will be deployed to conduct Physical Features Survey. RTK-DGPS experts 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 survey by the DGPS groups. DGPS group will 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 GNSS Solution and MSCAD Software and stored into GIS database.

2.11.2. Deliverable

For existing physical infrastructure survey necessary latitudes, longitudes and land surface level of BMs, TBMs, GCP, etc. and necessary attributes of structures, roads, drains, rivers, canals, etc. as per requirements of the ToR and guideline provide by PMO will record in Log Book for the convenience of the survey. The detail manuscript of GIS database preparation is given in annexure 2.2. The information covered and recorded through physical features surveys are presented in the following Table.

Table 2. 6: Features Covered and Recorded in Physical Feature Survey

Physical Feature Survey	<ul style="list-style-type: none"> - Cross section, long section, type, width, length and name of road, road level above datum, flooding lands, slopes, borrow pit. - Identification of any bridge or culvert on the road their length, width and span of the bridge, condition of abutments, condition of the deck, wing walls abutments. - Type, size, depth, inlet and outlet location of drain along with flow direction width and depth of the canal, place of encroachment. - Type of sewer system, size, type and location of sewerage line, location of bins, identification of any other sewerage collection system. - Identification of the water supply system, location of overhead waters tank and its capacity, catchments area of overhead tank. - Identification, location and capacity of electric substation, telephone exchange, Titas gas subs station etc. Treatment plant, waste disposal facilities. - Identification, location and capacity of electricity, telephone, gas waste disposal and treatment system.
--------------------------------	--

2.12. Topographic Survey

2.12.1. Method

GPS based advanced survey technique will be used for conducting topographic survey. A large number of advanced survey equipment including Real Time Kinematic Global Positioning System (RTK-GPS), Total Station, Optical Level, etc. will deploy for the survey. The position of major features, hydraulic structures, bridges, culverts, etc. will survey using Total Station. The optical teams picked up the crest level of the road. Total Station survey technique will use for physical infrastructures survey. Both RTK and Total Station Survey techniques will conduct using the reference BM of SOB and also the BM points establish for RTK-GPS technique. The survey team will sub-divide into separate groups to conduct Total Station survey.

2.12.2. Deliverable

For the topography survey necessary latitudes, longitudes and land surface level of BMs, TBMs, GCP, etc. and necessary attributes of structures, roads, drains, rivers, canals, etc. as per requirements of the ToR and guideline provided by PMO will record in Log Book for the convenience of the survey. The detail manuscript of GIS database preparation is given in annexure 2.2. The information cover and record through topographic surveys is presented in the following Table.

Table 2. 7: Features Covered and Recorded in Topographic Survey

Topographical Survey	<ul style="list-style-type: none"> • Land levels/spot level for contours at 50m intervals with denser intervals for undulations. • Alignment and crest levels (not exceeding 50m) of road, embankment, dykes and other drainage divides • Alignment of rivers, lake, canal and drainage channels etc. • Outline of bazaars, water body, swamps etc. • Type, width, length and name of road and name of road above flood level. • Contour line would be generated at .3m interval
-----------------------------	--

2.13. Land Use Survey

The methodology undertake the land use survey used a process based upon a ToR defined landuse classification. The following steps will be followed to conduct the survey.

General steps in creating landuse surveys

1. Obtain source data: Mouza map from DLRS
2. Create Geo-referenced and digitized Mouza map
3. RTK-GPS and Total Station survey
4. Record Landuse data in GIS attribute table with necessary Mouza map information
5. Perform various quality control measures such as field checks
6. Create maps, tables, reports etc.

2.13.1. Method

Equipment, Computer, and software will use for conducting physical feature, topographic and landuse survey campaign and data processing activities are listed and described below

Number of advanced survey equipment including Real Time Kinematic Global Positioning system (RTK-GPS) and Differential Global Positioning system (DGPS), Total Station (TS) Level Machine and vehicles were deployed in the field for conducting survey activities. The RTK-GPS will use in this survey provide milimeter level accuracy.

GNSS Solution and MSCAD software are used for post-processing of RTK and Total Station based survey data. On the other hand, GIS based Arc/Info, Arc/GIS 10.2 are used to perform the survey data management and presentation and preparation of map layout. The maps prepared through physical survey have been used as base maps for landuse survey. Landuse features have been identified and classified using the recorded code and separated in different layers during data processing stage, from where the category wise landuse maps were drawn using the identification layers. To derive landuse map it was sometimes necessary to divide plots. This task was carefully done on the basis of extent of structures presented in the plot. If maximum portion of a plot is covered by residential structures then this plot has been identified as residential plot. If only one kind of structures cover a small portion of the plot then that plot has been divided proportionally. And this procedure has been followed for all cases.

2.13.2. Deliverable

Spatial data are characterized by information about the position, connections with other features. These spatial data can be represented as either layers based or object oriented approach. In both approaches the data must be simplified with feature wise separate entities before incorporate in the GIS database. These entities are:

Point Features: Points are used to represent the locations of the features that are too small to be represented as areas. In Landuse map, we used different annotations as point features.

Polygon features: Polygon or Area is used to represent geographical features with closed boundaries, such as building structures, water bodies, landuses, topography etc. In Landuse map, we used Mouza boundary as polygon features.

All of these features contain a numeric user ID representing their feature type in GIS database structure. Every layer is thematic and that reflects either a particular use or a characteristic of the landscape. Spatial data structures are classified into raster or vector data.

Attribute is the non-spatial data associated with spatial data i.e. point, line and polygon/area entities. Attributes give additional information about the character of the entities. Each spatial entity may have more than one attribute. For example, a polygon feature presenting a building structure may have a number of other attributes like, building type, the number of floors and purpose of use. A point feature representing the hotel may have a number of other attributes: the number of rooms; the standard accommodation; name and address of the owner. Attributes give additional information about the character of the entities. The all attribute data are managed using GIS software.

In the following table has shown the categories of land use survey,

Table 2. 8: Categories of Landuse Survey.

SL No	Landuses	Illustrated
1	Residential	-Planned, unplanned, average density (high, middle and low)
2	Commercial	-Established markets and areas earmarked for markets

SL No	Landuses	Illustrated
3	Industrial / Processing and Manufacturing	-Workshops, factories, industries etc including main activity, type of waste effluent
4	Educational & Research	-Primary/ secondary/ other schools
5	Community Services	Association, Auditorium, church and club etc
6	Service Activity	Clinic, Commercial Group Office, Service activity office etc.
7	Recreational Facility	-Parks, play/ sports grounds, indoor facilities, zoological garden
8	Governmental Services	All Types of Governmental Office
9	Non-Governmental Services	International Organization Office and NDOs etc.
10	Urban Green Space	Botanical Garden, Ecological Park, Graveyard etc.
11	Transport & Communication	Airport, Bust-Truck Terminal, Filling Station and Garage etc.
12	Agricultural	-All types of agricultural uses
13	Mixed use	-Mixed areas without a dominant landuse (Residential, commercial, industrial etc.)
14	Circulation Network	Foot path, Katcha Road, Pucca Road and Railway etc.
15	Water Body	Beel, Ditch, Pond, Khal and River etc.
16	Forest	Natural and Man-Made Forest
17	Vacant Land	All unused fallow land
18	Miscellaneous	
19	Restricted	Air force, Ansar, Army, BDR, BNCC, and Cantonment etc.

2.14. Household based Socio-Economic Survey

A development plan of any area cannot be properly formulated without the analysis of the socioeconomic characteristics of that area and the assessment of its demographic profile, population projection, social structure, cultural features, economic circumstances and socioeconomic facilities and services such as housing, roads, health, educational institutions, community centers, recreational facilities, market, cultural heritages, sports, drains, open space, parks, and traffic etc., which are, in fact, associated with geographic, spatial, physical and built environmental characteristics of that area. In the former case, household based socioeconomic survey is one of most widely accepted methods of gathering information, mostly quantitative, for a large population. In the latter case, various surveys, such as, geographical, hydrological, transport, etc. are used for planning exercises.

Based on socioeconomic survey findings, development needs can be identified for long term, short term and medium term, the state of existing resources and potentials for immediate and long term development can be assessed, and public perceptions and opinions regarding sectoral issues, problems and development planning needs can be projected. Socioeconomic surveys will provide socioeconomic facts, assets, potentials, issues and problems reported by the respondents, and local people's perceived needs which are essential for development planning be at any level – sub-regional, structural, urban, rural and action area. Socioeconomic data from secondary sources (including BBS census, local government and other reports) and PRAs will supplement the socioeconomic survey data for planning exercises.

2.14.1. Method

Preparation of Questionnaire

In order to conduct the socio-economic survey, a compact and extensive pre-coded structured questionnaire will be prepared. The questionnaire intends to capture information according to the provided format in the ToR. The Team Leader (TL) along with other consultants will review the questionnaire.

The draft questionnaire containing questions relating to socioeconomic information will be translated into Bangla. This questionnaire will be pretested among few respondents to check the appropriateness of the questions, the issues with words/phrases and then final version will be made.

The survey will include information on: household information, occupation and income, migration, land ownership and use, housing type, sanitation use, drainage, water use, accessibility to physical and social infrastructural facilities (education, healthcare, recreation, market etc.), travel pattern, disaster, local problems, development needs, suggested development schemes and so on. The team leader will integrate socioeconomic survey data and PRA findings with other spatial

topographic, hydrogeological, and environmental, land use, transport and other planning survey data during the comprehensive development planning stage.

Sample Selection

The sample will be selected according to the population census 2011. The sample will be selected according to the guidance of the PMO of UDD. As the unit of analysis for socioeconomic survey is household and since there is no sampling frame of all households of the target population, non-probability sampling strategy will be adopted.

For representation of all socioeconomic groups, quota sampling technique will be used. Among the criteria for quota sampling, housing characteristics (kutcha, tin-shed, or pucca), location of settlements (char/plan land), type of settlements (planned, unplanned or informal settlements), distance to growth center, dominant occupational groups (agriculture or non-agriculture), economic activity (formal or informal), and area of residence (rural or urban) etc. will be maintained to represent the target project area. Before selecting sample households to include proportionally for the socioeconomic survey, the profile and detailed maps of the upazilla, municipality/union, population composition, risk and asset maps, and the number of existing land use/built environment data by location (educational, hospitals, roads, agriculture, rivers, slums and squatters, encroached settlements, etc.) will be made available from official sources (local government/ administration) and other sources (NGOs, etc.).

The sample size will be determined based on 5 percent of total number of households provided by the 2011 Population Census (BBS). The sample size of 5 percent of households comes up to 3448, 2428 and 3781 for Sagata, Sonatola and Sariakandi Upazillas respectivel (See the Table below). The sample seems to be appropriate and will be representative by selecting households based on quota sapling. It should be mentioned here that the MSDP project suggests the sample size of 5 percent of households (MSDP, UDD).

Table 2. 9: Distribution of Sample for Household Based Socioeconomic Surveys by Upazillas

Upazilla	No. of Households	Percent of total Households	Sample Size
Sagata	68,954	5	3448
Sonatola	48,569	5	2428
Sariakandi	75,614	5	3781
Total	193,137	5	9657

The household head will be requested to be interviewed, in case of his/her absence, the next available person of 18 years or older will be interviewed. If any person from a purposively selected household is not found after third visit, the next household will be selected for the survey.

2.14.2. Deliverable

After completing the survey work in field level, a detail database will be prepared following the questionnaire surveyed. The database will be prepared using SPSS software. To make the data input process easier, coding system will be used in the necessary fields. Few data will be stored in Excel software if needed. At the end of all data input, a detail SPSS database will be prepared for analysis.

2.15. Survey of Existing Socio-economic Facilities

2.15.1. Method

Preparation of Questionnaire

In order to conduct the socio-economic survey, a compact and extensive pre-coded structured questionnaire will be prepared. The questionnaire intends to capture information according to the provided format in the ToR. The Team Leader (TL) along with other consultants will review the questionnaire.

The draft questionnaire containing questions relating to socioeconomic information will be translated into Bangla. This questionnaire will be pretested among few respondents to check the appropriateness of the questions, the issues with words/phrases and then final version will be made.

The survey will include information on: household information, occupation and income, migration, land ownership and use, housing type, sanitation use, drainage, water use, accessibility to physical and social infrastructural facilities (education, healthcare, recreation, market etc.), travel pattern, disaster, local problems, development needs, suggested development schemes and so on. The team leader will integrate socioeconomic survey data and PRA findings with other spatial topographic, hydrogeological, and environmental, land use, transport and other planning survey data during the comprehensive development planning stage.

Sample Selection

The sample will be selected according to the population census 2011. The sample will be selected according to the guidance of the PMO of UDD. As the unit of analysis for socioeconomic survey is household and since there is no sampling frame of all households of the target population, non-probability sampling strategy will be adopted.

For representation of all socioeconomic groups, quota sampling technique will be used. Among the criteria for quota sampling, housing characteristics (kutcha, tin-shed, or pucca), location of settlements (char/plan land), type of settlements (planned, unplanned or informal settlements), distance to growth center, dominant occupational groups (agriculture or non-agriculture), economic activity (formal or informal), and area of residence (rural or urban) etc. will be maintained to represent the target project area. Before selecting sample households to include proportionally for the socioeconomic survey, the profile and detailed maps of the upazilla, municipality/union, population composition, risk and asset maps, and the number of existing land use/built environment data by location (educational, hospitals, roads, agriculture, rivers, slums and squatters, encroached settlements, etc.) will be made available from official sources (local government/ administration) and other sources (NGOs, etc.).

The sample size will be determined based on 5 percent of total number of households provided by the 2011 Population Census (BBS). The sample size of 5 percent) of households comes up to 3448, 2428 and 3781 for Sagata, Sonatola and Sariakandi Upazillas respectivel (See the Table below). The sample seems to be appropriate and will be representative by selecting households based on quota sapling. It should be mentioned here that the MSDP project suggests the sample size of 5 percent of households (MSDP, UDD).

Table 2. 10: Distribution of Sample for Household Based Socioeconomic Surveys by Upazillas

Upazilla	No. of Households	Percent of total Households	Sample Size
Sagata	68,954	5	3448
Sonatola	48,569	5	2428
Sariakandi	75,614	5	3781
Total	193,137	5	9657

The household head will be requested to be interviewed, in case of his/her absence, the next available person of 18 years or older will be interviewed. If any person from a purposively selected household is not found after third visit, the next household will be selected for the survey.

2.15.2. Deliverable

After completing the survey work in field level, a detail database will be prepared following the questionnaire surveyed. The database will be prepared using SPSS software. To make the data input process easier, coding system will be used in the necessary fields. Few data will stored in Excel software. At the end of all data input, a detail database will be prepared for analysis. All collected data will be transferred into GIS database.

2.16. Housing, Slums and Squatters Settlement Study

2.16.1. Method

Preparation of Questionnaire

In order to conduct the socio-economic survey, a compact and extensive pre-coded structured questionnaire will be prepared. The questionnaire intends to capture information according to the provided format in the ToR. The Team Leader (TL) along with other consultants will review the questionnaire.

The draft questionnaire containing questions relating to socioeconomic information will be translated into Bangla. This questionnaire will be pretested among few respondents to check the appropriateness of the questions, the issues with words/phrases and then final version will be made.

The survey will include information on: household information, occupation and income, migration, land ownership and use, housing type, sanitation use, drainage, water use, accessibility to physical and social infrastructural facilities (education, healthcare, recreation, market etc.), travel pattern, disaster, local problems, development needs, suggested development schemes and so on. The team leader will integrate socioeconomic survey data and PRA findings with other spatial topographic, hydrogeological, and environmental, land use, transport and other planning survey data during the comprehensive development planning stage.

Sample Selection

The sample will be selected according to the population census 2011. The sample will be selected according to the guidance of the PMO of UDD. As the unit of analysis for socioeconomic survey is household and since there is no sampling frame of all households of the target population, non-probability sampling strategy will be adopted.

For representation of all socioeconomic groups, quota sampling technique will be used. Among the criteria for quota sampling, housing characteristics (kutcha, tin-shed, or pucca), location of settlements (char/plan land), type of settlements (planned, unplanned or informal settlements), distance to growth center, dominant occupational groups (agriculture or non-agriculture), economic activity (formal or informal), and area of residence (rural or urban) etc. will be maintained to represent the target project area. Before selecting sample households to include proportionally for the socioeconomic survey, the profile and detailed maps of the upazilla, municipality/union, population composition, risk and asset maps, and the number of existing land use/built environment data by location (educational, hospitals, roads, agriculture, rivers, slums and squatters, encroached settlements, etc.) will be made available from official sources (local government/ administration) and other sources (NGOs, etc.).

The sample size will be determined based on 5 percent of total number of households provided by the 2011 Population Census (BBS). The sample size of 5 percent of households comes up to 3448, 2428 and 3781 for Sagata, Sonatola and Sariakandi Upazillas respectivel (See the Table below). The sample seems to be appropriate and will be representative by selecting households based on quota sapling. It should be mentioned here that the MSDP project suggests the sample size of 5 percent of households (MSDP, UDD).

Table 2. 11: Distribution of Sample for Household Based Socioeconomic Surveys by Upazillas

Upazilla	No. of Households	Percent of total Households	Sample Size
Sagata	68,954	5	3448
Sonatola	48,569	5	2428
Sariakandi	75,614	5	3781
Total	193,137	5	9657

The household head will be requested to be interviewed, in case of his/her absence, the next available person of 18 years or older will be interviewed. If any person from a purposively selected household is not found after third visit, the next household will be selected for the survey.

2.16.2. Deliverable

After completing the survey work in field level, a detail database will be prepared following the questionnaire surveyed. The database will be prepared using SPSS software. To make the data input process easier, coding system will be used in the necessary fields. Few data will stored in Excel software. At the end of all data input, a detail database will be prepared for analysis.

2.17. Investment and Employment Study

As per the ToR requirement, the questionnaire for studying the urban and rural economic covering the trade, commerce, shopping and related activities will be prepared. Due to collect data of the area, the economic activities of this area will be divided in two sectors. One is formal sector which will be identified from the physical feature survey in this study. Other is

informal sector playing a very significant role in urban economics as such major portion of employment. The growth, nature and characteristics of this sector are significantly different from those of the formal sector. While most of the required information on the formal sector can be obtained from the secondary sources, information activities has to be collected from the primary source through sample surveys of the major centers of employment.

2.17.1. Method

Preparation of Questionnaire

In order to conduct the socio-economic survey, a compact and extensive pre-coded structured questionnaire will be prepared. The questionnaire intends to capture information according to the provided format in the ToR. The Team Leader (TL) along with other consultants will review the questionnaire.

The draft questionnaire containing questions relating to socioeconomic information will be translated into Bangla. This questionnaire will be pretested among few respondents to check the appropriateness of the questions, the issues with words/phrases and then final version will be made.

The survey will include information on: formal and informal sector economy both in urban and rural areas covering trade, commerce, shopping and other related activities in SPSS and other compatible format, editing, piloting, finalization and printing of questionnaire and other planning survey data during the comprehensive development planning stage. The attribute data of surveyed commercial and industrial enterprises shall be linked with spatial data collected from physical feature and land use survey.

Sample Selection

The sample will be selected according to the population census 2011. The sample will be selected according to the guidance of the PMO of UDD. As the unit of analysis for socioeconomic survey is household and since there is no sampling frame of all households of the target population, non-probability sampling strategy will be adopted.

For representation of all socioeconomic groups, quota sampling technique will be used. Among the criteria for quota sampling, housing characteristics (kutcha, tin-shed, or pucca), location of settlements (char/plan land), type of settlements (planned, unplanned or informal settlements), distance to growth center, dominant occupational groups (agriculture or non-agriculture), economic activity (formal or informal), and area of residence (rural or urban) etc. will be maintained to represent the target project area. Before selecting sample households to include proportionally for the socioeconomic survey, the profile and detailed maps of the upazilla, municipality/union, population composition, risk and asset maps, and the number of existing land use/built environment data by location (educational, hospitals, roads, agriculture, rivers, slums and squatters, encroached settlements, etc.) will be made available from official sources (local government/ administration) and other sources (NGOs, etc.).

The sample size will be determined based on 5 percent of total number of households provided by the 2011 Population Census (BBS). The sample size of 5 percent) of households comes up to 3448, 2428 and 3781 for Sagata, Sonatola and Sariakandi Upazillas respectivel (See the Table below). The sample seems to be appropriate and will be representative by selecting households based on quota sapling.

Table 2. 12: Distribution of Sample for Household Based Socioeconomic Surveys by Upazillas

Upazilla	No. of Households	Percent of total Households	Sample Size
Sagata	68,954	5	3448
Sonatola	48,569	5	2428
Sariakandi	75,614	5	3781
Total	193,137	5	9657

The household head will be requested to be interviewed, in case of his/her absence, the next available person of 18 years or older will be interviewed. If any person from a purposively selected household is not found after third visit, the next household will be selected for the survey.

2.17.2. Deliverable

After completing the survey work in field level, a detail database will be prepared following the questionnaire surveyed. The database will be prepared using SPSS software. To make the data input process easier, coding system will be used in the necessary fields. Few data will stored in Excel software. At the end of all data input, a detail database will be prepared for analysis.

Trade encompassing banking and other financial institutions, shopping centres and shop, and commercial establishments differentiated into wholesale and retail shopping should be recorded. Growth or decline in economy during the last 10 years should be collected and presented in a report with explanatory notes on the causes for growth or decline covering a possible quality of existing and future trade, commerce and shopping facilities for the project area with tentative pedestrian linkage (missing link) considering manmade and natural disasters for the Project area. All the collected attribute and spatial economic data shall be linked with other spatial database.

2.18. Hydrological Study

Considering the flood effect, rain water and other disaster during rainy season and other period, for smooth & sustainable Master Plan design up to next 20 years , following issues are the major objectives for Hydrological study, these are-

- To study the geomorphology and meteorological conditions.
- To delineate BM in these three Upazila.
- To draw present flood level (max. and minimum level) during rainy season.
- Draw flood affected area by using digital elevation model (DEM)
- Draw river water level (maximum & minimum level)
- Study on existing all water body (river-lake-pond-canal)
- Find out the real causes of flood (manmade and natural)
- Metrological data analysis(rain water-temperature-humidity etc)
- Find out the flooding causes and source.
- Find out flood risk zone, flood free zone, moderate flood zone.
- Find out three types (low, moderate, severe) of river erosion zone.

2.18.1. Method

Hydrogeological study deals with surface water (River water, lake, pond, canal, flood water, stream etc). The project area (Sariakandi-Sonatola-Saghata Upazila) is situated in Bogra and Gaibandha district, these areas are under flood plain deposited area (Jumuna belt). Himalayan is on the north side. The project areas are under Barind tract, Flood plain deposited area, and Piedmont deposited area. In rainy season, many areas are submersed by flood water and rain water. For next, 20 years Urban Plan design, we will measure different technical points and issues. Under this study, we will draw real hydrological situation, develop sustainable design, on what basis Planners /engineers will develop road net work, office-school College, and other infrastructure and also develop engineering building code and rules. General people will flow during their self building /infrastructure /construction period. On the hydrological data and comments, planners/Engineers will set up safe Elevation points like flood effected elevation, safe elevation for different types of construction (road-bridge-culvert-office-school-public building-industry etc).This research work is carried out following the steps mentioned below-

Hydrological Study Plans for Sariakandi-Sonatola-Saghata Upazila:

Study plans are divided into three step, these are-

1. As per TOR and Master plan preparation for next 20 years, necessary data collection on Hydrology.
 2. Existing all hydrological map collection and analysis.
 3. Study on all previous flooding, natural disaster and other related causes.
 4. Study and review of BWDB and LGED program (previous and present) on flood, embankment, erosion etc
 5. Technical report preparation and discussion with Team member for Master plan preparation.
1. **Hydrological data Collection:**

- a) Project site frequently visit, discuss with local people on flood and other natural disaster, stagnant water, flood affected areas and shear with local people comments & views.
- b) Hydrological data (river water level maxi-min, flood extended areas, rain water, affected areas etc) previous last ten years and also collection maximum flood level (previous) .
- c) Data collection of all major existing water points (lake-beel-khal-canal-ditch etc)
- d) Data collection of all major embankments, sluice gate.
- e) River erosion, river bank erosion, implementing agency and their future planning.
- f) Metrological data (rain water, temperature-humidity etc).

2. Existing all hydrological map collection and analysis:

For Master Plan design, all hydrological maps are very important, in these maps, all flood affecting parameters are found, like water level, elevation, free area, affected area, river flow direction, embankment, sluice gate, river erosion points/areas. We will collect from BWDB and from LGED (if possible). We will draw new maps from Master Plan.

3. Study on all previous flooding, natural disaster and other related causes

Sariakandi and Saghata Upazila is vulnerable area due to flood, every years, areas affected by Jumuna flood water, and erosion. So we will detail study on of all previous flood and effected area,(flood affected area, damage of bridge-culvert-building-road-building etc. These three upazilas are in Jumuna basin , every years flood and natural disaster are occurred, local peoples are affected in every years. For their safety and sustainable master plan preparation, we will study all previous flood, natural disaster, affected areas, local people 's perception, their demand and also study on major issues which are very important for sustainable Master Plan preparation.

4. Study and review of BWDB and LGED program (previous and present) on flood, embankment, erosion etc

Sariakandi and Saghata Upazila is vulnerable area due to flood, every years, areas affected by Jumuna flood water, and erosion. So we will discuss with BWDB and LGED for their program on flood and erosion. During Master Plan design period, we will consider all previous flood , erosion and future sustainability.

5. Technical report preparation and discussion with Team member for Master plan preparation.

Modern Engineering Planners & Consultants Ltd (MEPC) is working on Master Plan preparation on Sariakandi-Sonatola-Saghata Upazila for next 20years. Area is highly affected by flood-erosion-earthquake. So will try to address all points in Master Plan and thread bread discussion with all other technical members.

2.18.2. Deliverable

The deliverables from hydrological survey and study are, the hydrological analysis and study will serve to quantify the peak storm water flows associated with the different return frequency storm events. The area will be catagorise into different zone according to flood risk and river erosion. This hydrology will take into account the existing and future land use conditions and will be used for the Flood Hazard Area Delineation, the Alternatives Evaluation, and the final Conceptual Preliminary Design Report with GIS Database & Map.

2.19. Agricultural Study

The agricultural land demarcation survey will be based on Single crop land, Double crop land, Triple crop land, Barren land, Mango garden/ Lichi/ Jackfruit/ Banana/ Lemon/ others, fruits garden etc, different types of flower garden, tree cultivation, Hatchery/Gher, Livestock / Poultry Farm / Diary Farm, Agricultural Research Area, height of land, cropping pattern, cropping type, land utilization, and flood level. To prepare the development plan of the rural area there need to assess and conduct the whole agricultural study of that area. It is vital for preparing this plan for rural areas because most of the rural areas of this country is directly depend on agricultural activities.

2.19.1. Method

In order to conduct the Agriculture survey, a compact and extensive pre-coded structured questionnaire will be prepared. The questionnaire intends to capture information of Single crop land, Double crop land, Triple crop land, Barren land, Mango garden/ Lichi/ Jackfruit/ Banana/ Lemon/ others, fruits garden etc, different types of flower garden, tree cultivation, Hatchery/Gher, Livestock / Poultry Farm / Diary Farm, Agricultural Research Area, height of land, cropping pattern, cropping type, land utilization and flood level. These data collect from the field through physical feature, topographic survey and questionnaire survey of these areas. The data can be collected by mobile clouding software tools.

2.19.2. Deliverable

After completing the survey work in field level, a detail database will be prepared following the questionnaire surveyed. The database will be prepared using SPSS software. To make the data input process easier, coding system will be used in the necessary fields. Few data will stored in Excel software. At the end of all data input, a detail database will be prepared for analysis. From physical feature, topographic survey we will prepare GIS map of Single crop land, Double crop land, Triple crop land, Barren land, Mango garden/ Lichi/ Jackfruit/ Banana/ Lemon/ others, fruits garden etc, different types of flower garden, tree cultivation, Hatchery/Gher, Livestock / Poultry Farm / Dairy Farm, Agricultural Research Area, height of land, cropping pattern, cropping type, land utilization and flood level of these areas. Growth or decline of agricultural land during the last 10 years should be collected and presented in a report with explanatory notes on the causes for growth or decline covering a possible quality of existing and future agricultural land for the project area. All the collected attribute and spatial transportation data shall be linked with other spatial database.

2.20. Transport Sector Study

Transportation is a very important aspect of planning which has greater impact on the other facets like land use or environment and thus it is very crucial for any plan preparation. Efficient and effective transportation is also a fundamental prerequisite for city dwellers as well planned transportation system provides efficient movement of people and goods from one place to another. Thus, the assessment of the detailed features and characteristics of the transport infrastructure and transport users of these upazila will provide much needed information for suggesting useful tools and techniques as well as infrastructure for meeting the existing transport demand and the future challenges.

2.20.1. Transportation Infrastructure and Facilities

This component of information is essentially the preparation of an inventory of existing facilities available, in the study area for the transportation of passengers and goods by all the modes of road, rail and river.

The infrastructure data gathering program will fall into these three modal groups. The required information will be collected from the relevant authorities as well as field surveys to be conducted by the consultants. In addition to this data gathering exercise from primary and secondary sources, an overview/appraisal will be developed of the interaction of modal groups, particularly in relation to the spatial development pattern, and future development.

The consultant will review existing information in future urban form and where necessary carry out survey to obtain further information on available facilities for the 3 modes in the area and prepare transport plan with the prediction model of 20 year period for the project area. Major information to be collected by mode is mentioned below.

Road

- Road network by hierarchy for both rural and urban areas
- Physical condition of roads (row, x-sectional elements, pavement type and condition etc.)
- Geometries of major road intersections
- Truck routes and their loading unloading areas
- Bus route and terminals
- Traffic control, management and signaling
- Parking
- Modes accessibility
- Regional connectivity
- Rural-urban linkages

2.20.2. Transportation Fleets and Services

In addition to the physical infrastructure and facilities, information will be obtained on the transportation services and fleets operating within the study area. Most of this information will be collected from various registration authorities of different types of vehicles and from their owners' and operators' associations. However some field surveys and verifications will be required especially related to no-motorized vehicle (NMV). The major information to be collected by mode includes the followings.

Road

Number of motorized vehicles by their types, condition and ownership

- Number of buses by route.
- Extent and forms of public transportation services, their services conditions, fare levels etc.
- Number of tracks, condition, and ownership
- Number of taxicab, fare level, extent of services
- Number of rickshaws and auto-rickshaws and fare levels
- Number of all other types of NMVs
- Types of goods carried
- Information of cost by different modes

Rail

Number, types, conditions and capacity of rails operating in study area.

- Service operated and their frequency
- Types of goods arried
- Cost
- Unserved areas

River

Number, types, conditions and capacity of river way operating in study area. There also initiate study about,

- River
- Ghats
- Toll system
- Goods movement
- Routs
- Seasonality

The summarized information collected on completion of this activity will also form apart of the report on the proposed traffic and transportation study to be carried out under the project.

2.20.3. Volume and Movement Patterns

To analyze the existing traffic situation, key locations will identify where the volume count survey conduct for 18 hour basis (6am to 12pm) considering both office day and hat day of peak hour and off peak hours. The survey was carried out by locally recruited surveyors after proper training for survey. The data was collected according to different modes like Truck, Bus, Car, Auto-Rickshaw, Motor-cycle and Non-motorized Vehicles (Cycle Rickshaw, Bicycle, Push cart) using Manual counting method and data will record in standard formats to determine the direction of flow of traffic and its impact on people attitude of project area.

2.20.4. Analysis of Volume and Movement Patterns

After completion of the traffic volume survey, the collected information will be collated and analyzed with the help of a wide variety of computer programs. The final selection of the package for the data collation, statistics and spatial analysis, matrix building etc. will be assessed during actual designing of the surveys and the data collection stage. Critical traffic junctions will be separately studied and conditions will be illustrated graphically.

The selection of the programs will be made from the list given below. However, selection may not remain limited to three programs only.

Database and spreadsheet programs

- MS-Excel

Data collection and analysis

- SPSS

2.20.5. Origin Destination Survey

In order to determine the transportation needs and appropriate solutions for an area, it is important to have an understanding of the underlying characteristics of travel. The origin and destinations of traffic are among the most important of these characteristics.

By knowing where traffic was coming from and going to, better estimates could be made about where traffic would reroute itself if a particular street were closed. The information is especially important in trying to gauge the amount of possible spillover. Another purpose of the survey is to determine how much of the traffic are generated from within the neighborhood and how much of it is 'through' traffic which does not have an origin or a destination in the neighborhood.

O-D survey provides valuable information including the needs of traffic intervention whether the surveyed area needs any by-pass or not, the mode specific performances, freight characteristics and in general usual vehicles routes. The origins and destinations of traffic are among the most important of these characteristics.

The Techniques of O-D Survey are

1. Home interviews
2. On-board transit surveys

Origin-Destination Data

1. household characteristics
 - no. of persons who live there
 - number of cars
 - occupation of the head
 - Income etc.
2. Location of the origin and destination of the trip (where trips begin & end)
3. Time at trip started & ended (when trips begin & end)
4. Mode & route of travel
5. Purpose of trip

2.20.6. Use of Four Step Model

The Four Step Model set for forecasting travel demand is based on procedures and data that have been evolved over many years. The model set is used to simulate existing travel conditions and to forecast future year travel on the entire transportation system spanning most of the region, for the transit, auto, and walk/bike modes.

The model set simulates the modes and routes of trips from every zone to every other zone. Population, employment, number of households, vehicle ownership, highway and transit levels of service, parking costs, vehicle operating costs and transit fares are some of the most important inputs that are used in applying the model to a real world situation. These inputs are constantly updated so that the model set simulates current travel patterns with as much accuracy as possible.

2.20.7. Major Features of the Model

Some important features of the model set are listed below.

- The model set will be estimated using data from a Household Travel Survey, Traffic Volume data, O-D Survey Data, employment database from BBS and primary data collection.
- The transportation system will be broken down into three primary modes.
- This mode contain the rail, bus and other motorized vehicle.
- Walking trips will also be examined and presented in the non-motorized mode.
- The model is set up to examine travel on an average weekday. The base year is 2011 and the forecast year is 2031.

2.20.8. Four Step Model

The model set is based on the traditional four-step urban transportation planning trip generation, Trip distribution, mode choice, and trip assignment. This process is used to estimate the daily transit rider ship and highway traffic way traffic

volumes, based on changes to the transportation system. The model set takes into consideration data on service frequency (i.e. how often trains and buses arrive at any given transit stop), travel time and fares for all transit services. The highway network includes all the regional highways and local roadways. Results from the computer model provide us with detailed information relating to transit rider ship demand. Estimates of passenger boarding on all the existing and proposed transit lines can be obtained from the model output.

Trip Generation: in the first step, the total number of trips produced by the residents in the model area is calculated using demographic and socio-economic data. Similarly, the numbers of trip attracted by different types of land use, such as employment centers, schools, hospitals, shopping centers etc., are estimated using land use data and trip generation rates obtained from travel surveys. All of these calculations are performed at the TAZ level.

Trip Distribution: in the second step, the model determines how the trips produced and Attracted would be matched throughout the region. Trips are distributed based on transit and Highway travel time between TAZ and the relative attractiveness of each TAZ. The attractiveness of a TAZ is influenced by the number and type of jobs available, the size of schools, hospitals, shopping centers etc.

Mode Choice: Once the total number of trips between all combinations of TAZ's is determined, the mode step of the model splits the total trips among the available modes of travel. The modes of the travel are walk, non-motorized and transit. To determine what proportions of trips each Mode receives, the model takes into account the travel times, number of transfers required and Costs associated with these options. Some of the other variables used in the mode choice are Vehicle ownership rates, household size, and income.

Assignment: After estimating the number of trips by mode for all possible TAZ combinations, the model assigns them to their respective transportation networks.

2.20.9. Model Application

Once the Calibration is completed, the model will be run for the forecast year, 2031, using future Year inputs such as projected population and employment by TAZ, in addition to transportation system characteristics.

Ridership Forecasts are first developed for a no-build forecast year that assumes no improvements in the corridor. Then the transportation network is updated to reflect the project improvements and the model is re-run for the various build options. The outputs of these model runs can then be compared to the no-build to see what changes in travel patterns occur to the transportation system.

2.20.10. Model Outputs

The travel model produce several important statistics related to the region's transportation system. Some of these are listed below.

- Average daily transit ridership by transit sub modes
- Average weekday station boarding by mode of access
- Average mode split by geographic region
- Average trip length for transit and auto trips
- User benefits (travel time savings) associated with different market segments
- Total vehicle miles and vehicle hours of travel, made by all vehicles on a typical weekday in the model area and by sub-region.
- Average speed of traffic in the region
- Daily traffic volumes on major freeways, expressways and arterials
- Volume to capacity ratios on major freeways, expressways and arterials

Rail and Waterway Surveys

During road survey, details 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. A road inventory will be developed for Project Upazila.

Finally, all the collected attribute and spatial transportation data will be linked with other spatial database buy the consulting firm. Projected bankable project/schemes will also be identified. Planning Implications of the above mentioned method are as following

1. Identification of new routes
2. Road capacity and level of service (LOS)
3. New mode introduction(Specially Public Transport)
4. Identification of existing road improvement (Specially road widening)
5. Connectivity and accessibility improvement
6. Identification of future transport Infrastructure

2.21. Study on Drainage and Environmental Issues

Improvement of the drainage and environmental system has been identified as one of the highest priority needs of the Pourashava authority as well as the resident. This is an essential part for the future development of the area. The main objectives of the drainage and environmental study are to assess the existing environmental condition and prevailing drainage form and pattern in the Upazila and to identify the future requirements of the drainage system improvement to ensure flooding and water logging free environment as well as required control over environmentally critical and vulnerable areas and living things. The development objectives of the drainage improvement works are to provide new drain (Primary, Secondary and Tertiary), cleaning and re-excavation of the existing natural canal/khals and drains for increasing their discharge capacity and to repair and rehabilitate the existing drains up to their full capacity.

2.21.1. Drainage Issues

2.21.1.1. Method

The main objectives of the drainage study are to assess the existing condition and prevailing drainage form and pattern in the area and to identify the future requirements of the drainage system improvement to ensure flooding and water logging free environment as well as required control over environmentally critical and vulnerable areas and living things. The development objectives of the drainage improvement works are to provide new drain (Primary, Secondary and Tertiary), cleaning and re-excavation of the existing natural canal/khals and drains for increasing their discharge capacity and to repair and rehabilitate the existing drains up to their full capacity.

The information regarding drainage survey will collect both by using physical feature survey and checklist comprised of drainage types and nature (brick, RCC, earthen), dimensions (length, width, and depth), outfall point and condition of the drains. To identify the spatial position of these drains and other features, GPS based advanced survey technique will use. Preparing the Contour map and identifying the slope from topographic survey by using Real Time Kinematic Global Positioning System (RTK-GPS), Total Station etc. The position of other drainage features e.g. bridges; culverts, etc. will also surveyed using Total Station.

2.21.1.2. Deliverable

The objective of the drainage survey is to prepare a comprehensive (storm water) Drainage Master Plan for a plan period of 20 years considering all relevant issues including discharge calculation, catchment areas and design of main and secondary drains along with their sizes, types and gradients and retention areas for the proposed drainage system. The Survey formats prepared for collecting information and data are based on the following aspects for assessing the present drainage situation of the Upazila:

- a) Inventory of existing drainage
- b) Inventory of existing bridges /Culverts
- c) Inventory of water logged areas.

Table 2. 13: Drainage survey format

S.L No	Name	Location	Type	Length	Width	Start	End	Outfall

2.21.2. Environmental Issues

2.21.2.1. Method

The methods of the Environmental survey includes the assessment of existing situation of environmentally sensitive areas, and it's potential threat, environmental hazard and risk assessment those necessary for proposed Master Plan. For this, a detail analysis of the characteristics of environmental forces and elements and environmental impacts of solid waste, water pollution etc. has been done following a well-planned methodology.

The focus of this survey is to identify the environmental status of the area under study and for this, a well-structured checklist will use. The Checklist covers but not limited to the following broad issues in the study area:

- General description of the environment
- Identification of the pollutants and pollutions
- Identification of vulnerable areas, areas under potential threat and risks
- Waste disposal System, Natural Hazards , Water and Sanitation and Diseases
- Locate the dumping site.
- Solid waste, waste generation rate projection.
- Air, water, sound pollution study
- Identify all those study into GIS map.

2.21.2.2. Deliverables

After the necessary survey and collection of data, we prepare report and survey map of the specific Upazila.

2.22. Studies on Disaster Management

2.22.1. Regional Morphotectonic and Neotectonic Mapping

Objective of identifying the morphotectonic set-up and neotectonic activities to figure-out the contribution of potential seismic sources for the distribution of seismic hazards in regional to local context. Morphotectonic map will represent the imprints of surface expression indicating recent tectonism (neotectonic). Adequate satellite images, aerial photo/corona image interpretations with ground trotting will be well-represented in the document of morpho-tectonic / neo-tectonic reporting.

2.22.2. Engineering Geological Mapping

Objective of the preparation of engineering geological map is to develop the geotechnical and geophysical characteristics of the shallow relatively soft sub-surface sedimentary rock which caused damages to the infrastructures. The purpose of engineering geology map is to generate AVS30 map for the investigated areas.

The consultants will collaborate with GSB and collect all necessary information available to GSB. Compiling all results on soil, geology/geomorphology and geophysical investigations, and some relation for Vs-N value etc. N values are recheck by Vs or borehole resistivity values. AVS30 distribution for each grid of all investigated area will be developed as the Engineering Geological Map.

During field work we will use PS logging, MASW, Micro tremor (if needed) but we will prepare report on the basis of secondary data from GSB and from other agencies.

Study works are:

- Desk Study - Document review, research and aerial photographic interpretation
- Field Work - Rock core drilling, Geotechnical and Geological Mapping, sample collection for laboratory testing
- Analysis - GIS platform used as tool for analysis, manipulation of data and display of maps

Following issues will be considered in preparing the Map

- Aerial Photographic Interpretation to identify landslide features
- Geological boundaries in the field

2.22.3. Seismic Hazard Assessment

The seismic hazard analysis is concerned with the evaluation of the levels of various natural effects of earthquakes, which may be of consequence for the safety of an existing or a proposed man-made structure at a site. Some important parameters used for characterization of seismic hazard can be listed as the peak ground acceleration, Fourier and response spectrum amplitudes, strong motion duration, peak strains, surface faulting, soil liquefaction and landslides out of which the response spectrum is the most widely used and extensively studied strong-motion functional. The concept of response spectrum method was introduced in early 1930s; and since 1970, it has become the principal tool in the design of earthquake-resistant structures, because of the simplicity and directness with which it relates the strong motion with the response of a structure. Existing methodologies for seismic hazard assessment are improved and new methods are developed, which are applied to a range of different test areas. In this work, all geoscientific information must be integrated appropriately. This includes, in addition to the results of seismological analyses, also paleo seismological, geodetic and geological data. New seismic hazard assessments are based on a consistent probabilistic treatment of all input data through the use of "logic trees". This gives the possibility of calculating not only the explicit hazard levels (peak ground acceleration, macroseismic intensity) as mean or median values, but also the associated fractiles of their standard deviation.

Seismic hazard map will be prepared using the concept of microzoning. By soil microzoning mapping, the spatial variability of the soil will be figured-out for the purpose of estimating localized damage potential and developing landuse regulations. The seismic hazard maps of the towns will be prepared following probabilistic and deterministic approaches. Seismic motion estimation is the main of seismic hazard assessment and other collateral hazards of liquefaction and slope failure are used to consider for risk assessment.

2.22.4. Vulnerability Assessment

The objective of vulnerability assessment is to address the seismic vulnerability characteristics of the existing building stock, essential facilities, and lifeline facilities. In order to achieve this objective, the base map, building stock database, lifeline and essential database considering the vulnerability factors associated with them etc. will be developed.

Based on the building and lifeline inventory, vulnerability maps which will show the characteristics of the buildings, essential facilities, and lifelines that make them susceptible to the damaging effects of earthquake will be developed.

Method for vulnerability assessment

- PGA and PGD at facility
- Classification (i.e. with or without anchored equipment and backup power)
- For urban stations, the fragility curves are defined in terms of Spectral values and PGD.
- For fuel facilities, the fragility curves are defined in terms of PGA and PGD.
- For maintenance facilities, the fragility curves are defined in terms of Spectral values and PGD.
- For dispatch facilities, the fragility curves are defined in terms of PGA and PGD.

2.22.5. Damage and Risk Assessing

Damage and risk assessment will be estimated using HAZUS system. HAZUS risk assessment methodology will include interdependent modules of (1) potential earth science hazard assessment, (2) inventory of buildings, essential facilities and lifelines, (3) direct physical damage calculation, (4) induced physical damage calculation (5) direct economic/social losses and (6) indirect economic losses.

HAZUS is the Federal Emergency Management Agency's (FEMA) nationally applicable software program that estimates potential building and infrastructure losses from earthquakes, riverine and coastal floods, and hurricane winds. HAZUS-MH loss estimates reflect state-of-the-art scientific and engineering knowledge and can be used to inform decision-making at all levels of government by providing a reasonable basis for developing mitigation, emergency preparedness, and response and recovery plans and policies.

HAZUS-MH uses geographic information system software (ArcGIS) to map and display hazard data, the results of damage and economic loss analyses, and potential effects on area populations. HAZUS-MH analyses also can be run in real time to support response and recovery actions following a disaster event.

2.22.6. Detailed Building Inventory Database Preparation

While topographic survey and database preparation in the project to be conducted, the building inventory database will be carried-out by delineating the building footprints using high resolution (0.5meter) satellite images and collecting secondary data under TOR-01. Then, random surveys will be carried-out in each ward of the area differentiating each ward into number of clusters.

Consulting firm will plan to make a more detail building inventory survey not only for earthquake vulnerability assessment, but also to make the building inventory for other purposes: like for tax collection by Pourashava, instant physical vulnerability assessment by concerned authority etc. In this context, there will be made one-to-one building survey to develop a details database of the buildings for the purpose of multi-uses of the buildings and other infrastructures of the project area.

2.22.7. Deliverables

Necessary reports, maps etc.

2.23. Study on Unauthorized Encroachment

A study of unauthorized encroachment of different place as like on the bank of the river, on govt. khas land, beside the railway and major highway road and any other place of this upazila will be identified through physical feature and socio economic survey. These encroachment of this area will locate in GIS maps.

2.24. Review of Relevant Previous Studies and Plans

Sectoral projects planned or under implementation in the Project area by different organizations which will have impact in the form and character of growth will be identified. Projects will be mapped to help identify complementary and incompatible outputs of different projects and other spatial economic or social impacts. Information will be obtained as "necessary from public agencies as well as from private formal and informal sources."

2.24.1. Implementation through Multi-Sectorial Investment Program

Major infrastructure development works such as primary roads, water supply, drainage etc., would continue to be largely controlled by Government. However, within the framework set by the Planning Component development, implementation of these and other public works is to be efficiently coordinated through the Multi-Sectorial Investment Programme. (MSIP)

2.24.2. Principle of MSIP

The underlying principle of a Multi-Sectorial Investment Programme (MSIP) is to match a list of urban development projects with the funding stream necessary to implement them. There are two basic activities that determine the contents of an MSIP for a planning area.

1. The first activity is to prioritize and schedule the investment projects of all public agencies so that they will collectively help achieve the development goals and objectives of the Plans.
2. The second activity (which can be done in parallel) is to analyze the source and availability of funding for the prioritized list of development projects.

2.24.3. Project Prioritization and Scheduling

The project prioritization and scheduling procedure occurs in two stages:

1. The evaluation and ranking of development projects within each sector e.g. transport, water supply, power supply, drainage works etc. by the respective sector agencies;
2. The evaluation and ranking of Sectoral priority projects against each other and across all development sectors.

All projects are ranked using three broad sets of criteria:

- Preferred investment projects prioritized through an evaluation of how well they achieve the plan's development goals and objectives;
- Those investment projects that are pre-requisites. This means those projects which for technical or other reasons must be completed before others;

Those investment projects which complement and reinforce each other or which logically fit well together.

2.24.4. Funding Analyses

This involves a financial analysis of the current and future funding capabilities of the various development agencies to determine what funding may be available to pay for the prioritized list of projects. If development funds are expected to be insufficient (as is usually the case), then the analysis should also recommend ways in which funding might be enhanced. These might include more efficient tax collection methods, direct cost recovery mechanisms, improved accounting and financial management systems, etc. Since development usually requires substantial capital outlays which are beyond the short-term financial resources of local authorities, long-term debt financing and the capability to service such debt is a vital aspect of the analysis. The final result of matching expected development revenues with the schedule of prioritized development projects becomes governments Multi-Sectoral Investment Program (MSIP) for Project area. The investment program would then be integrated into the next Poverty Reduction Strategy Plan with implementation through the Annual Development Plan.

2.24.5. Community Level Participation

Public participation is an essential element in plan preparation. People's participation will be ensured in the current plan making process through holding a number of formal and informal consultation meetings in the project area. It helps in gathering information regarding public demand of various facilities, identify local problems and peoples view, opinion and attitudes towards future development activities. Besides, such meetings also help in obtaining local knowledge in solving different problems on the project. Physical condition improvement project should have stipulation for public consultation in different stages of the project. Mainly the project for preparation of a planning package like- Structure Plan, Master Plan and Detail Area Plan has provision for public consultation at various stages.

2.25. Approaches to Planning

Planning of these two upazilas was prepared in Isolation as an individual upazila. In this respect the following approach and methods will be followed to prepare the plan.

Typology of the Plan

The proposed Plan for the project area will comprise of an integrated 'package' of plans. Each of the components has a set of specialized functions designed to address particular planning requirements. The contents of all components require to be combined to form the integrated Plan. The integrated set of plans will comprise in two stages. The stages are hierarchically interrelated to constitute a Comprehensive plan. Following components of the plan are:

1. Structure Plan
2. Action Area Plan

Sub-regional plan

Sub-Regional Structure Plan for respective Upazila will be prepared for 20 years according to the guidelines from: National policies, Formulated and Integrated different sectorial strategies at sub regional level, spatially interpreted sectorial strategies at sub regional level, formulated Conservation Plan at sub regional level and formulated Development Plan. Conservation Plan will cover ecology and environment, land forms: forest, wetland, rivers and agricultural land, major infrastructures, area of archaeological/ anthropological interest. It is also necessary to figure it out the economic disparity by using "shift-share analysis" or "input-output analysis" technique among the Upazilas within districts under study for drawing the future socio-economic development scenario.

Structure Plan

Plan is a Visionary plan for the Project area for a period of 20 years or may be more than that. There are general policy outlines in this plan within the content and meaning of the National perspective plan of Bangladesh.

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 administration, planning administration. It will also describe the duration of the plan, and the procedure of its revision and amendments.

The term Structure Plan is derived from British planning practice, but has been internationally adopted. The Principal components of such a plan are:

- An inventory of existing physical, demographic, economic, and social and infrastructure features.

- An analysis of the major existing problems.
- An estimation of trends and changes likely in future (for the next 20 years).
- The identification of the major constraints and opportunities for development.
- Consideration of the major development options and policies.
- An indication of the most suitable areas for such development.
- The identification of the priorities in each sector and the major activities needed to implement the development strategy.

Urban area plan

Urban Area Plan (UAP) provides an interim mid-term strategy for 10 years and covers for the development of urban areas within the project area. Generally, UAP contains an explanatory report, resource maps, interim management report, planning rules, urban area plan and a multi-sectoral investment program.

a) Demographic Analysis and Population Forecasting

All population projections are subject to some degree of uncertainty, because it is impossible to exactly predict future trends, particularly the future level of migration. Here is no exact of predicting the future population in a particular area, nor is there any way of determining the direction that the future development may follow.

There are various methods of projecting population (mathematical, economic and component methods). Some are very sophisticated and rigorous while others are simple and less sophisticated. Normally, population in future is governed by the following equation:

$$P_n = P_o + \text{Number of Births (B)} - \text{Number of Deaths (D)} + \text{Net Migration (N}_m)$$

For the projection of population, base year population (P_o) in 2001, the number of births and deaths between 2001 and 2011 and net migration is required. Keeping in view that though population in the base year (2001) is available but, in details of information like number of births, deaths and migration is not available for Upazila level population projection. In-migration and out-migration, net migration may be either positive or negative to be projected which is not possible.

Therefore, the module discusses simple and easy-to-handle methods of population projections given the purpose. A slightly improved method is the compound rate of growth method, which can be computed with the help of the following formula.

$$R = [(P_n / P_o)^{1/n} - 1] \times 100 \text{ ----- (i)}$$

By the formula population in any requisite year can be projected using the following equation which is also known as Geometric Progression Method

$$P_n = P_o (1+R/100)^n \text{ ----- (ii)}$$

b) Determination of Planning Principles

Determine the planning principles of the current planning practices, following two situations will be address:

Existing Services and Facilities

Based on the existing survey, a base map will be prepared to find out the existing growth of the project area. Once the base map with its four overlays (geo-physical situation, topography, higher level plans, outcome of first consultations) is ready and the basic development strategies have been formulated for existing project areas as well as unplanned (small scale incremental development) new areas, the functional design work just comes down to applying the planning that result from the survey and study.

Planning Standard

For planned development of new area and enhancing public facilities within the existing settlement planning principles and design will be developed.

In general, the approach for new areas starts with the do-sign of the major infrastructure networks (drainage, roads, public transportation), followed by other types of infrastructure, such as drinking water, sewerage, electricity etc.

Emphasis will be given on conservation of flood flow, agriculture and water protection areas. Rapid urbanization in the form of unplanned development will take place in the project area, unless a definite plan of development process is not followed. Therefore, the Consultant will analyze the area, which is partially developed, and will absorb with the existing urban areas. For the existing urban area, density control guidelines, planning principles and appropriate land management techniques will be adopted.

Demand and Need Assessment

Based on existing services and land use, the consultant will assess future requirement for the next 20 years. Based on planning principals, individual demand/need assessment will be calculated for each of the services.

Rural area plan

Rural Area Plan (RAP) provides a long-term strategy for 20 years and covers for the development of rural areas within the project area. Generally, RAP contains an explanatory report, resource maps, conservation and management report, planning rules, rural area plan and a multi-sectorial investment program.

Action Area Plan

Action Area Plan is a separate document covering the first five-year period of the structure plan. Action area plan should be prepared for all urban promotion area (UPA) and to be presented on mouza map with detailed plot boundary. Detailed planning standard will be formulated for the planning area. It examines, in the context of the structure plan, those items that might be implemented in this period and thus contains more details on a more limited range of subjects within the framework of structure plan. It tries to provide the Upazila with guidance in deciding between priorities.

Action plan consists of three parts, a summary of resources available, project selection and project evaluation. The analysis of available resources looks at the past availability of funds, in so far as this is possible for such a recent institution as an Upazila and attempts to assess funds likely to be available for the upazila itself for development in the action plan period. Project selection summarizes existing guidelines as they affect five-year plans and lists the criteria used selection before identifying priorities in each sector and proposing projects to address these priorities.

2.25.1. Land Management Technique at Neighborhood Level

Appropriate land management technique at neighborhood level will be adopted as mentioned below:

- a) Land banking
- b) Land readjustment
- c) Guided land development
- d) Site and service
- e) Community based development
- f) Land acquisition
- g) Land purchase

2.25.2. Participatory Action Area Development Plan

Participatory Action Area Development Plan is an approach to community planning that intends to build local consensus to help people manage and improve their livelihood options.

The approach is Participatory Action Area Development Plan - a structured and repeatable set of activities that helps local people identify key problems and constraints together with realistic opportunities to address them.

Participatory Action Area Development Plan is a consensus building tool that seeks to identify and then solve environmental or livelihoods problems with community support and input. Participatory Action Area Development Plan draws from several participatory techniques and principles. Its key features are: 1) recognising the wide range of stakeholders and their diverse interests in natural resource management and; 2) engaging these stakeholders fully. Over the last nine years the approach has been used in Bangladesh, India, Cambodia and Vietnam to help local people plan in floodplains, forests, coastal areas and cities.

Planning and discussion within Participatory Action Area Development Plan is intended to increase the level of understanding of all stakeholders and to help reach consensus on proposed new activities. These agreed activities can sometimes be modest but they will be well thought through, with broad support, and will benefit most local people. In turn, this planning can provide the foundations to address more complex issues such as long-term disputes or conflict.

2.26. Analysis of Current Situation and Identification of Critical Issues

Analysis of the Constraints and opportunities in development of the project area will be carried out using "sieve maps" and incorporated the key spatial impacts of projects identified from the review process. Sieve analysis will take particular account of existing flood prone low land and other hazardous areas to become flood-free as a result of current projects, which can be developed with urban services connected to conveniently locate off-site infrastructures etc. This task will be assisted, where possible by the use of information regularly collected by government agencies, inspection, and verification with the local residents. Key outputs of this task will include identification of critical areas where, for example, infrastructure costs per capita rise steeply because of natural factors, distance from main services, dependence on major new transport linkage etc.

2.27. Formulation of Planning Standards

The main basis of future requirement will be the population size of the Upazila and area will be covered by each utility service. The existing services have to be considered in the forecasts.

The supply and Demand management of utility services fully depends on the consumption level of the residence, existing population and the projected population. Demands of various utility services in the Upazila will be estimated considering population projection for the Upazila. Land requirements for different types of utility services will be analysed by this following the standard.

Table 2. 14: Planning standard Considered for Utility Services

Types of Land Uses	Recommended Standard Provision
	(unit)
General residential	100 – 150 persons/1 acre
Real Estate – Public/Private	200 population/ 1 acre
Roads	
Upazila primary roads	150 – 100 feet
Upazila secondary roads	100 – 60 feet
Upazila local roads	40 - 20 feet
Education	
Nursery	0.5 acre/10,000 population
Primary School/ kindergarten	2.00 acres/5000 population
Secondary/High School	5.00 acres /20,000 population
College	10.00 acres/20,000 population
Vocational Training Centre	5 - 10 acres / Upazilla
Other	5.00 acres / 20,000 population
Open Space	
Play field/ground	3.00 acres/20,000 population
Park	1.00 acre /1000 population
Neighborhood park	1.00 acre /1000 population
Stadium/sports complex	5 – 10 acres/Upazila HQ
Cinema/ Theatre	1.0 acre /20,000 population
Health	
Upazila health complex/ hospital	10 -20 acres/Upazila HQ
health centre/Maternity clinic	1.00 acre/ 5,000 population
Community Facilities	
Mosque/Church/Temple	0.5 acre /20,000 population
Eidgah/	1.0 acre/20,000 population
Graveyard	1.00 acre /20,000 population
Community centre	1.00 acre /20,000 population
Police Station	3 – 5 acres/Upazila HQ
Police Box/outpost	0.5 acre/ per box
Fire Station	1.00 acre/ 20,000 population
Post office	0.5 acre /20,000 population

Types of Land Uses	Recommended Standard Provision
	(unit)
Commerce and Shopping	
Wholesale market	1.0 acres/ 10000 population
Retail sale market	1.0 acres/ 1000 population
Corner shops	0.25 acre/per corner shop
neighborhood market	1.00 acre/per neighborhood market
Super Market	1.50 – 2.50 acres/per super market
Utilities	
Drainage	1.00 acre /20,000 population
Water supply	1.00 acre /20,000 population
Gas	1.00 acre /20,000 population
Solid waste disposal site	4 – 10 acres/Upazila HQ
Waste transfer station	0.25 acres/per waste transfer station
Electric sub-station	1.00 acre/20,000 population
Telephone exchange	0.5 acre/20,000 population
Fuel Station	0.5 acre/20,000 population
Industry	
small scale	1.50 acres /1000 population
cottage/agro-based	1.00 acres /1000 population
Transportation	
Bus terminal	1.0 acre /20,000 population
Truck terminal	0.50 acre /20,000 population
Launch/steamer terminal	1.00 acre /20,000 population
Railway station	4.00 acre / per Station
Baby taxi/tempo stand	0.25 acre /one baby taxi/tempo stand
Rickshaw/van stand	0.25 acre /one baby taxi/tempo stand
Passenger Shed	0.25 acre /one baby taxi/tempo stand
Administration	
Upazila complex	15.00 acres
Upazila office	3 – 5 acres
Jail/Sub-Jail	10 acres/Upazila HQ
Agri-extension Farm	10 acres/Upazila HQ
Urban Deferred	10 percent of the total build up area
Reserve	-

Source: (Urban Development Directorate, November 2013)

2.28. Reference to Relevant Previous Plans

There is a master plan for upazila pourashava of Sonatola and Sariakandi under the project of Upazila town infrastructure development project (UTIDP) by LGED. There is no previous master plan of saghata upazila of Gaibandha district.

2.29. Analysis of existing situation, local demand/aspiration through PRA Sessions

The approach aims to incorporate the knowledge and opinions of rural people in the planning and management of development projects and programmes. Participatory rural appraisal (PRA) is an approach to the analysis of local problems and the formulation of tentative solutions with local stakeholders. It makes use of a wide range of visualization methods for group-based analysis to deal with spatial and temporal aspects of social and environmental problems. It mainly deals with a community-level scale of analysis but is increasingly being used to help deal with higher level, systemic problems.

2.29.1. Method

PRA's are aimed to involve local people's participation in giving indepth knowledge and views in their own ways and words. Participatory and flexible techniques are used to involve local people, own the project and share their real life experiences.

There various tools and techniques, but the use of the techniques depends on the purpose of the study and the goal of the project.

For this project, 41 PRAs will be conducted covering each municipal ward and each union parisad (UP) of three Upazilla (See Table). Thus for Sagata, there will be 10 PRA sessions in 10 UPs, for Sonatotal Upazilla, there will be 16 PRAs (9 PRAs in 9 UPs and 7 PRAs in 7 municipal wards), and for Sariakandi Upazilla, there will be 15 PRAs (3 PRAs in 3 wards of Sariakandi Municipality, and 12 PRA sessions in 12 UPs).

Table 2. 15: Distribution of PRAs by Upazilla, Ups and Municipality

Upazilla	No. of Union Parisads (Ups)	No. of Municipal Wards	PRA
Sagata	10	-	10
Sonatola	7	9	16
Sariakandi	12	3	15
Total			41

Ward level and union level PRAs having knowledgeable participants from each UP and municipal wards will offer issues, problems and potentials with locational aspects, that have immense implications for development planning. The team leader will integrate PRA findings and socioeconomic survey data with other spatial topographic, hydrogeological, environmental, land sue, transport data during the comprehensive development planning stage.

Given the development planning, for PRAs, three techniques will be used. Popular PRA techniques - Social mapping and Venn Diagram, and the Institute of Cultural Affairs (ICA) introduced globally recognized and used participatory technique - Technology of Participation (ToP) will be used for getting people’s in-depth knowledge and views about their assets, problems, potentials, development needs and planning aspirations. In all cases spatial dimension of local people’s information will be checked for development planning purpose.

Social Mapping

Social mapping tool will be used to engage people to map their area with physical features, waterbodies, land use, transportation lines, and socioeconomic facilities.

Venn diagram

Venn diagram tool will be used for portraying the problems and potentials of the local areas. This will also correspond to identifying risks and opportunities. The shape of the circles will reflect volume of the problem or potential of that area.

Technology of Participation (ToP)

ToP is a set of approaches based on three core participatory tools – focused conversation, workshop and action planning. It has been used by individuals, communities and organizations for planning and human development in more than 100 nations (www.ica-international.org). Through ToP, participants will identify key prioritized development needs by major sectors for sub-regional, structural, urban, rural action plans based on the identified locations, issues, problems and potentials to be gathered from social mapping and Venn diagram.

As mentioned earlier, for special data needs, PRAs will invite participants who are knowledgeable about their areas, assets, problems and potentials as well as their aspirations, vision, and solutions. The following table presents the mixed group of participants for PRAs.

The PRA sessions using social mapping, Venn diagram and ToP will be conducted in an unique way due to the information and data needs for this project as mentioned earleir. Typically PRAs are conducted in yards or village open space settings. As the project requires mapping by the participants and also need sectoral issues, problems, needs and plans, PRAs require drawing tables, spaces, flip charts etc., hence PRAs will be carried out in venues having such settings. At UP level, UP conference room can be used. If UP office is not convenient, any school or college meeting room can be used. At municipal ward level, school, community center or NGO meeting room can be used.

PRA Process and Design

Each PRA will begin at 10 am with registration sheet sign up. The concerned UP chairman or Municipal ward councillor will open the session. The presence of Upazilla chairman or Mayor would be appreciated. In the opening session, participants will be introduced and oriented to the goals and objectives as well different methods of PRAs reminding the debriefing meetings conducted prior to PRA meeting. Major development and planning sectors will be introduced to the participants. Participants will be requested to provide accurate data and views to the best possible.

Table 2. 16: Characteristics of Participants for PRAs by UPs and Municipal Wards

Participants	UP	Municipal Ward	Remarks
Ward Members	1 male from each ward, 1 female for 3 wards reserved	1 male and 1 female from each ward	
Teachers	3 (1 female)	3 (1 female)	
Businessmen, dealers, brokers	3 (1 female)	3 (1 female)	
NGOs, CSOs, Clubs	1	1	
Imams, religious priests or leaders	1	1	
Farmers, laborer	3 (1 female)	3 (1 female)	
Journalist	1	1	
Professional (physician, engineers)	3 (1 female)	3 (1 female)	
Local elite, politician	3 (1 female)	3 (1 female)	
Total	20-30	20-30	Depending on number of wards

Social Mapping and Venn diagram

At 11am, one group will work on social mapping exercises, and two groups will work on Venn diagram. During one and half hour time, social mapping group will map their boundaries and locate land use, physical features, socioeconomic facilities, housing, traffic etc. One of the Venn diagram group will work on problem identification and assessment of causes and effects with ranking with end result of problem tree analysis. The other Venn diagram group will work on potentials identification and assessment and end in objective tree analysis.

Table 2. 17: Sequence of Activities and Duration of PRA Sessions

Sessions	Duration	Time	Remarks
Registration	30 minutes	10-10:30am	
Opening, introductions, expectations and group formation	30 minutes	10:30-11am	Whole group
Social mapping and Venn diagram		11am-12:45pm	Separate groups
Lunch break	30 minutes	12:45 - 1:30 pm	
Technology of Participation (ToP) Consensus Workshop and Focused Conversation		1:30 – 3:45 pm	Whole group
Reflection and closing	30 minutes	3:45 – 4:00pm	Whole group

ToP Consensus Workshop and Focused Conversation

Then after lunch, ToP session starts at 1:30pm. Before the ToP session, participants will be reminded of group norms and 3 core facilitation principles (everybody has wisdom, no right or wrong answers, raise hands to speak). Facilitators will give Meta card instructions (1 idea per card, 5-6 words per idea, and Write BIG). For dots, color markers will be used. A warm up or ice breaking exercise at the beginning may be made in the beginning of ToP.

At the start, the whole group will be informed of what they got from previous sessions (assets, potentials, problems, risks etc.) showing the flip charts and maps on room wall or sticky wall or flip chart stand. Then the participants will be requested to brainstorm on the focus question - what is the hope for our long term future (20 years) and share their ideas. The facilitator will ask them to write/keep ready 3-5 key ideas. The ideas written on cards will be posted on the wall.

Later the ideas will be clustered and named, and major sectors for planning will be identified by the participants. Once the ideas by columns are named, the facilitator will have a few people look at ideas in each column and name the (key measure of success). Once each column is complete the facilitator will ask them to decide which are near term and which midterm or do they need to add more measures now that they are adding timing to their thinking.

Afterwards a focused conversation on priorities will be made. The conversation will capture answers to questions like below:

Read the names of the clusters out loud.

Which of these are you most passionate about?

Looking over the data which sectors are noticed?

Which of these would be easiest to make happen? Hardest?

What areas are most exciting or energizing for the future?

As we look at our sector what are the most critical areas for long term change?

Which would make the most difference for us in the community? (Each person puts a blue dot on the title card they choose)

Which needs to happen first so other things can happen? (Put a red dot)

Which would take the longest to accomplish and can be done later? (Put a yellow dot)

If we were to define the 3-5 key needs over the next 20 years what would they be?

In each of those need areas how we would describe the 20 year measure or measures of success

Now that you can see what others have said, let's put these under the headings of immediate, medium, and long- term needs.

Closing Reflection

At the end of PRA with ToP, at 3.45pm, a reflection on what the Group did and if the expectations are met will be conducted. Also participants will be asked to make a comment or to express one thing they will do after this event. The Guest of honour or the designated person will do a closing speech and the team will thank the participants for their cooperation and working together for development for all.

2.29.2. Deliverables

The deliveries of the PRA output will be given in report. The opinion and demand of the local people has been considered throughout the plan program of this project. In this report will include problem tree, objective of the PRA session, identifying the scheme. Identifying the specific problems in GIS maps.

2.30. Matching PRA Analysis with Technical Analysis

After completion of PRA session and analysis of findings from PRA, the output will then be incorporated to the Technical Analysis. The findings of PRA will be included in Su-Regional Plan and Structure Plan in a broad basis, but its true application will be included in Urban Area Plan, Rural Area Plan and Action Area Plan. The summary of matching PRA analysis with different planning packages are as following:

Matching PRA Analysis with Sub-Regional Plan: In times of conducting PRA session at both rural area and urban area, the regional level development agenda will be focused to get public opinion for regional development. This aspect will cover A broad concept and won't make any detailing. Regional geographic context and socio-economic pattern will be focused in this part. And finally, the findings will be integrated to the recommendations regarding Sub-Regional Plan.

Matching PRA Analysis with Structure Plan: The consultants will conduct PRA session in each ward of the urban area to get the public view living in the urban area. The consultants also will conduct PRA session at each Union of the whole

Upazila. In times of conducting PRA session at both urban and rural area, the local level development agenda will be focused to get public opinion for longer period. This aspect will cover a broad concept and won't make any detailing. Future local development patterns and possible initiatives will be forecasted on the basis of planning perspective and public view regarding this will be integrated into this plan. The view of local people will be analyzed on planning view before including these into structure plan. And finally, the findings will be integrated to the recommendations regarding Structure Plan.

Matching PRA Analysis with Urban Area Plan: The consultants will conduct PRA session in each ward of the urban area to get the public view living in the urban area. In times of conducting PRA session at urban area, the urban level development agenda will be focused to get public opinion for medium period. This aspect will cover more detail concept than Structure Plan. Future urban expansion and possible initiatives will be forecasted on the basis of planning perspective and public view regarding this will be integrated into this plan. The view of urban people will be analyzed on planning view before including these into Urban Area Plan. And finally, the findings will be integrated to the recommendations regarding Urban Area Plan.

Matching PRA Analysis with Rural Area Plan: The consultants will conduct PRA session at each Union of the whole Upazila. In times of conducting PRA session at rural area, the rural level development agenda will be focused to get public opinion for both short and long period. This aspect will cover a broad concept and will make details as necessary. Future rural development patterns and possible initiatives will be forecasted on the basis of planning perspective and public view regarding this will be integrated into this plan. The view of rural people will be analyzed on planning view before including these into Rural Area Plan. And finally, the findings will be integrated to the recommendations regarding Rural Area Plan.

Matching PRA Analysis with Action Area Plan: The consultants will conduct PRA session in each ward of the urban area to get the public view living in the urban area. The consultants also will conduct PRA session at each Union of the whole Upazila to get the public view living in the rural area. In times of conducting PRA session at both urban and rural area, the local level development agenda will be focused to get public opinion for immediate actions. This aspect will cover more detail concept than any other plan. Immediate local development patterns and possible initiatives will be forecasted on the basis of planning perspective and public view regarding this will be integrated into this plan. The view of local people will be analyzed on planning view before including these into Action Area Plan. And finally, the findings will be integrated to the recommendations regarding Action Area Plan.

Table 2. 18: PRA and integrated planning framework

Planning activity	Appraisal Activity	PRA Applications
Integrated rural development planning	Area needs analysis	Exploratory PRA s- general analysis of area needs and potential inclusion of social expert on RRA team
	Target group analysis	Exploratory PRA s- identification of target groups
	Resource assessment	Exploratory PRA s- analysis of area resources and resource use ranking of local people's resource-use priorities
Integrated Char area management	Char area resource assessment	Exploratory PRAs- analysis of Char resources and resource-use appraisal of current conditions of Char resources identification of key issues in Char management analysis of potential role inclusion of social expert on RRA team
	User group assessment	Topical PRAs- identification of users of Char resources identification of potential target groups for Char development
Land-use planning	Zoning	Topical PRAs- ranking of suitability of land areas

		ranking of local people's land-use priorities PRA- participatory planning of land use community consultations on land-use proposals
	Resource-use interactions	Topical PRAs- analysis of conflicts over resource use analysis of environmental interactions between different resource uses PRA- participatory planning for conflict resolution

2.31. Planning Methodology & Deliverables

2.31.1. Preparation of Sub Regional Plan

Sub-Regional Structure Plan for respective Upazila will be prepared for 20 years according to the guidelines from: National policies, Formulated and Integrated different sectorial strategies at sub regional level, spatially interpreted sectorial strategies at sub regional level, formulated Conservation Plan at sub regional level and formulated Development Plan. Conservation Plan will cover ecology and environment, land forms: forest, wetland, rivers and agricultural land, major infrastructures, area of archaeological/ anthropological interest. It is also necessary to figure it out the economic disparity by using "shift-share analysis" or "input-output analysis" technique among the Upazilas within districts under study for drawing the future socio-economic development scenario.

The plan will also study on the following component at sub regional level;

- **Lands Study**

In the lands study, reviewing the existing land use and development plans, change in land category and land use after FCD, Assessment of change in land use after construction of major infrastructure, Settlement Pattern, Hinterland, Location and level of major facilities at sub regional level, Hierarchy of settlements within the sub region, Identification of major criteria of the settlements.

- **Hydrology**

In hydrological study, there study about local river's Hydrodynamic, Morphological, Geomorphologic development, Impact of FCD and FCDI at sub regional level (Flood Control, Drainage and Irrigation)

- **Environmental studies**

Related Environmental Policies, Acts and Laws, Environmental Procedures and Guidelines (in sub regional planning study), Economic, Social, Biological and Physical Environment at sub regional level will be considered in sub regional planning procedure.

- **Hazard management**

To prepare the sub regional plan there should study of the hazard management. To conduct this study there should consider guidelines on Hazard management at sub regional level, Hazard mapping considering natural hazards: Flood, water logging, drainage congestion, salinity intrusion according to guidelines on Hazard and Risk management at sub regional level

- **Water Resource Management**

Agriculture water management and Domestic water management at sub regional level will be considered in sub regional plan period.

- **Transport Studies (Rail, road, and water)**

Preparing the sub-regional plan of these area, there should consider inter and intra-regional transport facilities. To considering this facilities there need to study the Existing Transport Situation, General Situation of Road Infrastructure, Situation of Road Transport (Passengers), Road Transport (Goods), Water Transport, Major Traffic Generating Centers and Areas of Congestion, Traffic Flow Characteristics, Road Transport Services, River Traffic Situation, Travel Pattern, Road Network Development, Situation of Rural Transport, Location of key point installation at sub regional level, Strategic Issues

to be addressed in planning the Future Transport System.

- **Population Study**

Population is the vital factor to prepare a plan for a region. We need to assess their need, because all kind of plan should develop for the human development. So, to prepare the sub regional plan there need to analyze the growth trend of the population of these regions and spatial distribution of population and its changes since 1991.

- **Study on Basic services (major urban area)**

Basic urban services is necessary for the plan development of an area. To prepare the sub regional planning there need to study of Housing, Sanitation, Communication, Energy, Education, Health problem, prospect and existing situation of each particular area.

- **Economic Activities**

Economic activities is more important for the well-being of the people and also for the regional development. Economic sustainability and prosperity is one of the important aim of this development plan of this area. So following economic activities should study to prepare a better sub-regional plan, those are Agriculture, Industry, Fisheries, Forestry, Disparity analysis.

- **Anthropological and Ethnographical Study**

Livelihood Study of local people, Ethnographical Study will be conduct to prepare sub-regional plan of these upazilas.

- **Heritage, Archaeology and Tourism management**

Potentials of Tourism in the in the sub region, Planning Tourism in the for the sub region, Linkage of Tourism to Recreation and Sports, Potential Sites of Heritage, Archaeological sites will survey and give the proposal of this conservation, development and tourism management for these upazilas.

Regional Structure Zoning Category: In order to promote and protect public safety welfare by (i) minimising adverse effect resulting from the inappropriate location or use of sites and structures, (ii) conserving limited land resources and encouraging their efficient use. To carry out the purposes and provisions of the project as they apply within the context of the Regional Structure Plan, the following land zoning category would be followed:

- Main flood flow zone
- Sub flood flow zone
- Wetland
- Forest
- Agricultural land
- Urban area
- Rural settlements
- Forest settlements
- Industrial moderate hazards
- Industrial low hazards
- Water supply protection zone
- Restricted flood protection reserve
- Restricted military / public safety
- Restricted road / rail/ utility reserve
- Restricted special

Conservation Plan: Major Land use pressure is heavily depending on the ecosystems and resources of the existing nature. Land-use conflicts and clearly unsustainable uses may be found in planning areas. There is a clear need for broad-based, multi-sectorial and long term development management, including community-based initiatives in sanitation, biomass preservation and collective management of natural resources, including more detailed priorities such as ecosystem preservation of fisheries habitat, maintenance of biological diversity and productivity, forestry management, containment of saltwater intrusion and population risk management. Also needed are institutional and regulatory actions.

Contrary to some current impressions, conservation and economic development are not conflicting ideas. In fact, well-planned conservation-oriented development will add to the general economic and social prosperity of a coastal community, while bad development will sooner or later have a negative effect. With innovative management based upon sustainable use, communities may be able to achieve a desirable balance without serious sacrifice to either short-term development progress or longer-term conservation needs. In broad sense Conservation Plan would cover ecology and environment, land forms: forest, wetland, rivers and agricultural land, Major infrastructures, area of archaeological/ anthropological interest.

2.31.2. Preparation of Structure Plan

Structure Plan is a kind of overall long term strategic plan for the area. It consists of a comprehensive package of policies which deal, in principle only, with all aspects of urban development over a long period of time. The most important policies are, usually, employment, land, agriculture, infrastructure, transport, housing and social services.

The process includes studies on future growth potentials of the areas/regions. It then identifies basic strategic options available to accommodate the anticipated growth. After evaluation the preferred strategic option is accepted. This preferred strategy then identifies spatial and other structural issues relating to the overall development of a city. It also provides area-wise strategies for expansion of different urban activities in space. The Structure Plan also outlines major sectoral policies to guide the development in desired manner over a longer period of time.

The Structure Plan will include studies on:

- Hydrological study on the of the *Upazila* and connecting rivers (Hydrodynamic characteristics, Morphological characteristics, Geomorphologic development, Dominant Hydrodynamic and Morphologic process)
- Disaster management: Flood, water logging, drainage congestion,
- Water Resource Management
- Lands Study: Change in Land Use
- Livelihood Study
- Settlement Pattern
- Population Study
- Housing, Water supply and sanitation
- Communication, energy, education
- n and health
- Agriculture and fisheries
- Transport system (road and water)
- Ecology and Environment

These sectorial studies will provide planning guidelines for land use and physical infrastructure. Land use, physical feature and spot level survey will be carried over the whole project area

To carry out the purposes and provisions of the project within the context of the Structure Plan, the following land zoning category will be followed:

- Main flood flow zone
- Sub flood flow zone
- Water supply protection zone
- Mixed use planned zone
- Mixed use spontaneous zone
- Rural settlements
- Industrial low hazards
- Restricted flood protection reserve
- Restricted military / public safety
- Restricted road / rail/ utility reserve
- Restricted special

Components

- Translation of outputs of upper stages of planning in more specific terms:
 - Settlement: Rural and urban

- Transportation infrastructure: Road, rail, water, air
- Infrastructure: All sectors of both physical and social depending on local condition

Requirements

- Final Delineation of
 - Agriculture
 - Non-agriculture: urban, rural and special (both natural and man-made)
- Sensitivity to flood and drought

Output

- Conservation plan (primary, secondary and tertiary flood)
- Delineation of the structure of different infrastructures: Point, Linear and Area
- Interpretation of proposal of upper level policies
- To guide long term growth and development
- To provide basis from coordinating decision, development action within the urban area
- Provide guidance for development control
- Framework for local plan
- Focus planning issues of the urban area to the govt. and public

Composite Structure Plan reflects the complexity of the area.

Scale: R.F. 1: 10000, **Period:** 20 Years

2.31.3. Preparation of Urban Area Plan

Urban Area Plan (UAP) provides an interim mid-term strategy for 10 years and covers for the development of urban areas within the project area. Generally, UAP contains an explanatory report, resource maps, interim management report, planning rules, urban area plan and a multi-sectoral investment program. In the present project, Content of Urban Area Plan is decided to be as follows:

Existing Land Use Survey: The land use survey will indicate the use of each plot of land and each building in the urban area and its immediate neighborhood. The Surveyors will visit each and every site to record existing usage with specified notation and colours as per direction of the Survey-in-charge. The output of this Survey will be one or more maps showing existing Residential, Commercial, Administrative and Cultural zones, nature of Town/City land (high, lower), water courses and water bodies, principal streets lanes and bye lanes demarcating the main zones and plantation or agricultural uses.

Scale of Survey: The survey should be conducted on maps of RF 1: 3960.

Notation or color—Survey information shall be recorded and presented in any colors as specified by Urban Development Directorate.

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: 3960.

Population Survey: 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.

Traffic Survey: Regarding Traffic problem three types of surveys will have to be conducted;

- a) Statistical analysis of the past trends in growth. Types and Numbers of different Vehicles.
- b) The Traffic flow in major arterial roads should be surveyed and presented with sufficient maps and charts showing origin and destination.
- c) Critical traffic Junctions should be separately studied and conditions illustrated graphically.
- d) Trip generation survey.

Road Surveys: In this survey details 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.

Industrial Surveys

- (a) Details of location, size and capacity of the existing industries should be surveyed in any appropriate proforma suitable for this purpose and as per direction of the Survey in-charge.
- (b) Details of labour statistics with the housing conditions should be collected and presented.
- (c) Labour statistics from directorate of labour and labour Unions should be collected and presented.

All these information shall have to be presented with proper explanatory notes, graphs and charts showing the future trend.

Recreational and Open Space: Parks, playgrounds should be surveyed to find out its details like location, size and attached facilities. This should be presented in proper maps with proper explanatory notes like population, open space, relationships, etc.

Water Supply Data

- (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.

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.

Telephone Service

- (b) Types of Telephones Exchange and future programme.
- (c) Existing Communication lines and future probable expansion shall be shown side by side.

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.

Health Facilities: Dispensaries, health centres and Hospitals showing their location and capacity should be collected and presented with explanatory notes.

Educational Facilities: Information on different categories of schools and colleges with the location, sizes and capacity shall be collected and presented with appropriate explanatory notes graphs and charts. Information on dropouts at primary and secondary levels may be collected.

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.

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.

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

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.

Physical Feature Surveys: Engineering surveys like physical feature and spot level survey will have to be conducted wherever needed.

Output

- (a) Survey result will be presented in two forms: first on the map of RF 1: 3960; secondly in report form.
- (b) Final survey results shall be analyzed, interpreted and presented in Report form.

2.31.4. Rural Area Plan

Rural Area Plan (RAP) provides a long-term strategy for 20 years and covers for the development of rural areas within the project area. Generally, RAP contains an explanatory report, resource maps, conservation and management report, planning rules, rural area plan and a multi-sectoral investment program. In the present project, Content of Rural Area Plan is decided to be as follows:

1. Existing Land Use Survey

Scale of Survey: The survey should be conducted on maps of RF 1: 3960.

Notation or color: Survey information shall be recorded and presented in any colours as specified by Urban Development Directorate.

2. **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: 3960.
3. **Population Survey:** The population statistic shall have to be collected from all possible sources mainly from Census data.
4. **Traffic Survey:** Regarding Traffic problem three types of surveys will have to be conducted;
5. **Road Surveys:** In this survey details of existing roads like type and condition of road, existing width and possibility for bridging missing links should be studied and presented with appropriate explanatory notes.
6. **Industrial Surveys**
 - (a) Details of location, size and capacity of the existing industries (if any) should be surveyed in any appropriate preform suitable for this purpose and as per direction of the Survey in-charge.
 - (b) Details of labour statistics with the housing conditions should be collected and presented.
 - (c) Labour statistics from directorate of labour and labour Unions should be collected and presented.

All these information shall be presented with proper explanatory notes, graphs and charts showing the future trend.

7. **Agricultural:** agricultural land should be surveyed for earmark the agricultural and for conservation. Moreover, high land, low land, delineation of land according to single, double and triple cropping and productivity as well.

8. Sources of Potable Water

Sources of potable water including distance from homestead, no of users, quality of water etc. to be collected.

9. Power Supply

- Capacity of the existing power supply sources and probable future expansion shall have to be presented in appropriate maps.
- Existing supply lines and the future probable lines should be presented on the same map side by side preferably in different colours.

10. **Growth of the village:** Historical background with graphic materials on the existing village along with proposal for future development will be collected and presented with detail information.

11. **Health Facilities:** Dispensaries, health centres and Hospitals showing their location and capacity should be collected and presented with explanatory notes.
12. **Educational Facilities:** Information on different categories of educational institutes both formal and informal with the location, sizes and capacity shall be collected and presented with appropriate explanatory notes graphs and charts. Information on dropouts at primary and secondary levels will be collected.
13. **Hats/Bazars/Shopping:** Hats/Bazars/Shops and Commercial establishments differentiated into wholesale and retail shopping should be recorded. Growth or decline of shopping during the last 10 years will be collected and presented with explanatory notes on the causes for growth or decline.
14. **Sanitation Facilities:** Existing sanitation facilities will be surveyed and presented with comments.
15. **Graveyard/Cremation Facilities:** The graveyards, Cremation ground, etc. should, be surveyed and presented.
16. **Physical Feature Surveys:** Engineering surveys like physical feature and spot level survey will have to be conducted wherever needed.

Presentation

- (a) Survey result will be presented in two forms:
 - ✓ First on the map of RF 1: 3960;
 - ✓ Secondly in report form

2.31.5. Action Area Plan

Action Area Plan provides guidance for development where action is expected in the short term for a period of 5 years and covers individual parts of a city within a variable time frame. It comprises high priority projects and programmes that can be implemented in a relatively short time period, in an intensive manner. The planning provisions are localized and do not rely on legal, political or institutional actions to change the legal or institutional framework for their success.

The Action Area Plan (AAP) guides land use and infrastructure within the area potential for immediate intervention based on public demand and necessity. It is prepared on 5 years interval. The preparation of Action Area Plan (AAP) will be formulated through participatory approach involving the local people. It will contains problem analysis using participatory approach, stakeholder analysis, Potential analysis (Basic and derived potentials), Identification of possible projects, Priority ranking of projects, Strategy formulation for prioritized projects. Action Area Plan will provide prioritized projects consisting location of project, goal & objectives, activities, tasks, actors, resources, cost and assumptions/constraints.

The purpose of a plan is to lessen uncertainty about what presently exists and what is likely to happen in future and to provide a basis for different agencies, public and private, to proceed on the basis of a common goal by providing a framework for overall development.

The structure plan examined the existing situation, drew attention to key problems, assessed likely changes and their implications and proposed how some major problems will be tackled. Very briefly, the structure plan notes an anticipated population increase of some 30% in the *Upazila* by the end of the plan period and assesses the implications of this growth. Amongst its major proposals are the needs for more modern inputs to sustain agricultural productivity, the need for new non-agricultural jobs, improved infrastructure. It concentrates on the framework and not the details of layout or individual development. Where action is anticipated or proposed within a relatively short time however, more detail will be needed than is provided in the structure plan. The structure plan identified the major actions needed to bring about development in accordance with its recommendations. Its final chapter consists of a development programme, listing, for five-year phases, the projects needed in each sector to bring about development along the lines proposed. This programme for the first five-year period forms the starting point for the action plan.

The objective of the action plan is to evaluate those projects, which should be implemented during the first five years life of the structure plan. It thus contains more detail on a more limited range of subjects. It consists of four parts:

Analysis of Resources: Though most of the development that takes place will be carried out by private individuals, the single most important developer is likely to be the Paurashava /*Upazila* followed by other public agencies. This analysis looks at the past availability of funds (insofar as this is possible) and assesses the sum likely to be available for development

during the action plan period. This can only be done for the local agencies funds, as it is not possible to estimate how a ministry or central agency's fund is allocated between various towns, as other priorities in other areas are not known. Proposals will be given according to the availability of the resources.

Establishing Priorities: It is worth repeating that all the actions/projects selected and evaluated are required to bring about development along the lines advocated in the structure plan. Nevertheless, constraints make it difficult to carry out all these activities in even such a small programme. Where possible, therefore, priorities are recommended. It is the funding authority concerned, which should decide upon priorities, but the evaluations can assist in this decision.

Project Selection: This consists, basically, of the actions listed for the first five-year period in the implementation chapter of the structure plan. While the importance of maintenance has been stressed throughout the structure plan, maintenance activities by themselves, except where they form a part of a development project, are not included in the action plan.

All the projects listed are needed in the first 5-year phase. Their selection is based on a variety of criteria. These include the maintenance of existing provision levels, the need to develop new areas and to address the worst problems. In other instances, they are the first increment in meeting standards selected for the year 2026. There are however financial restraints, which mean that priorities have to be established even for such a small list. After the projects have been evaluated therefore, availability of resources is considered and some priorities drawn.

Project Evaluation: Project evaluation is done for the projects, which might be locally funded, and for those unlikely to be locally funded but which are the responsibility of a Ministry or another central agency. Ideally, funds would be made available for implementing priority projects following evaluation. This unfortunately is not the case but the evaluations will assist the local agencies in deciding upon priorities for using local development funds and in pressing for action by national agencies.

The evaluations vary according to information available but overall are more qualitative than quantitative. They cover the following aspects:

- Nature of project
- Location
- Justification (why project needed)
- Approximate cost including maintenance element
- Beneficiaries, direct and indirect
- Agency responsible
- Risk/difficulties/problems anticipated

There are limits also to recommending priorities. They can only be made within sectors e.g. construction of road A favored over road B and not between sectors e.g. between clinic A and school B. It may however be pointed out that the absence of one precludes the other e.g. a road to develop a new area is needed before a school should be provided in that area. Even within a sector, while the relative importance of projects can be assessed, priorities cannot be recommended if the source of funding is different.

2.32. Output and Format

The consultants will create a digital database of physical features using the data collected through 3D survey and other secondary sources. These data will be used by the project staffs and counterpart staff of UDD personnel for use in planning, development and as well as for research purpose,

For GIS application purpose, the collected data were stored externally in digital form in GIS software database package. Attribute data were frequently stored externally with the geographic data and were stored within the GIS software.

Database Management System (DBMS) is a computer program for creating, maintaining and Accessing digital databases. The DBMS provides the essential link between the GIS software and External data sources. DBMS work with different data types, such as character, numerals or Dates. They have languages for describing or manipulating the data or for querying the database for particular pieces of information; they also provide programming tools and have particular structures.

2.32.1. Data Management Structure

To prepare the spatial data, GIS software will be used. The following are the principal features that will be used for implementing the GIS.

The Whole Database was prepared in the following three features:

- Point
- Lines and
- Polygon or Area.

The Database Management System will comply the following:

- To create databases, which are in a carefully structured and consistently logical format
- To create new data bases.
- To extract data from the database in a variety of ways.
- To persistently and constantly execute any commands.
- To display data as required.
- To edit data in requisite way.
- To allow for the transfer of data between various software packages.
- To be independent of particular hardware needs.

Point will be used to represent the locations of the features that are too small to be represented as areas. For example, telephone pole, electricity pole, post box, Radio/TV/Telecommunication towers etc. A point data is geographic location of that point and details of that point feature i.e. latitude and Longitude, or a co-ordinate reference with details of entity of that point.

Line will be used to represent features that are linear in nature, such as roads, railway lines, embankments, different utility services line etc. A line is simply an ordered set of points. It is a string of (x, y) -co-ordinates joined together in order and usually connected with straight lines.

Polygon or Area will be used to represent geographical closed zones, such as building structures, vacant land, water body, administrative areas etc. Polygons/Areas are represented by a closed set of lines.

The spatial dimension of data will be regarded as the values, character strings or symbols that conveys to the user information about the location of the feature being observed. As GIS have no 'local knowledge' about spatial data used in GIS, therefore GIS needs a mathematical spatial reference. It means spatial data depends on:

- purpose of use
- scale
- spatial entities
- generalization
- projection system
- spatial referencing system
- topology

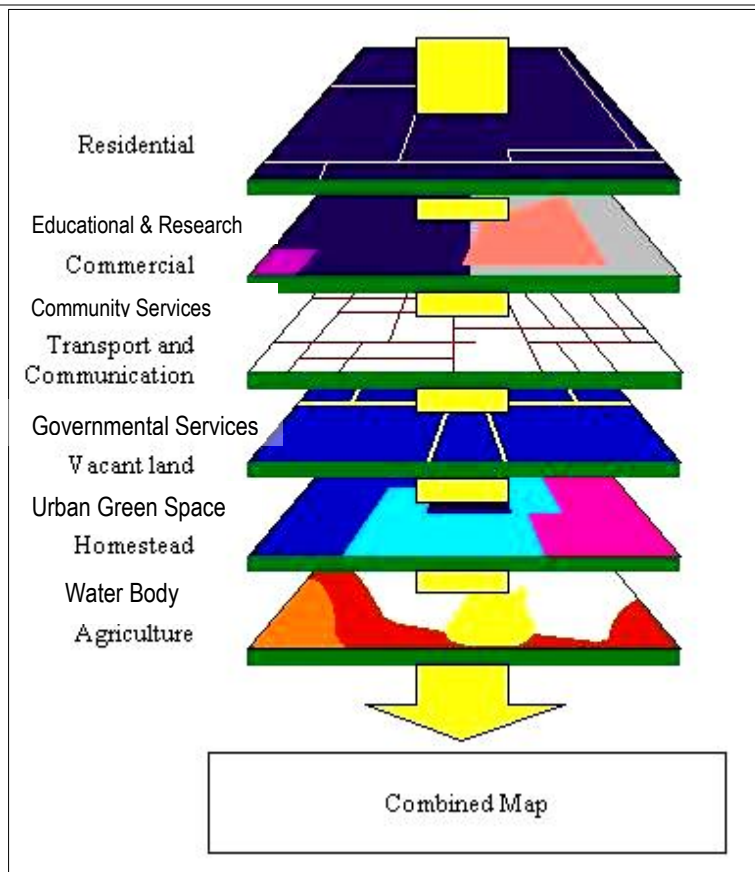


Figure 2. 1: The Layer Based Approach of Spatial Data Structure

2.32.2. Inventory

For planning and management of urban infrastructure, maintenance of infrastructure data Inventory is very important. Format of each infrastructure has been previously explained e.g. road inventory, drain inventory etc. Each inventory will have numbers of attribute field. Attribute is the non-spatial data associated with spatial data i.e. point, line and polygon/area entities. Each spatial entity has more than one attribute. For example, a pointer presenting the hotel may have a number of other attributes: the number of rooms; the standard accommodation; the name and address of the owner, etc. Attributes provide additional information about the character of the entities. Some GIS software is good at handling attribute data; and others have very limited database capabilities but all the GIS software offers the linkage facilities from different platform of database management. The most commonly used software for attribute data management are:

- dBase
- Microsoft Access
- MS Excel
- Structured Query Language (SQL)
- SPSS

Linking Spatial and Attribute Data

The relationship between GIS and databases varies. Most GIS data structure and attribute data are stored in a relational DBMS. This approach allows integration of existing databases with graphics by the allocation of a unique identifier to each feature in the GIS.

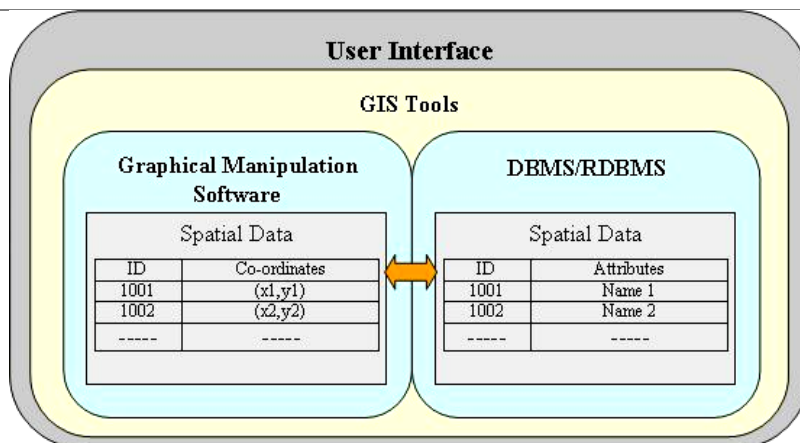


Figure 2. 2: Linking spatial and attribute data in GIS

All spatial information or data from different surveys, such as line and point features, structures dimensions etc. has processed and stored under a comprehensive GIS database component. Geographic information System (GIS) software, such as Arcview 3.2a and Workstation 9.0 were used for data processing and preparing maps. Later on digitized and geo-referenced mouza maps were incorporated in the surveyed map.

2.32.3. Projection Parameter

A spatial reference system (SRS) or coordinate reference system (CRS) is a coordinate based local, regional or global system used to locate geographical features on the earth surface. A spatial reference system defines a specific map projection system as well as transformations between different spatial reference systems.

Bangladesh Universal Transverse Mercator (BUTM 2010) projection system is used in all the survey and mapping tasks for the project. BUTM 2010 projection System is developed by Survey of Bangladesh (SoB). The following are the projections parameters for BUTM 2010.

Projection Parameters

- Projection : Bangladesh Universal Transverse Mercator (BUTM 2010)
- Spheroid : WGS 84
- Central Meridian : 90 Degree East Greenwich
- Latitude of Origin : 0 Degree (The Equator)
- False Northing : 0 Meters
- False Easting : 500,000 Meters
- Scale Factor at the Central Meridian : 0.9996
- Coordinate System** : Geographic Coordinate
- System : WGS 84
- Angular Unit : Degree (0.017453292519943299)
- Prime Meridian : Greenwich (0.000000000000000000)
- Datum : WGS 84
- Spheroid : **WGS 84**
- Semi Major Axis : 6378137.000000000000000000
- Semi Minor Axis : 6356752.314245179300000000
- Inverse Flattening : 298.257223563000030000

All the mapping tasks of geo-referencing of Satellite Imageries, extracted different type of physical features, land uses and cartographic map composition will be performed using BUTM Coordinate System.

2.32.4. Conversion Factors

The Conversion Factors are used to convert coordinates referenced to one datum to coordinates referenced to another datum. The GIS data with BTM coordinate system will be based on the datum Everest Bangladesh. But Stereo Satellite imagery will be based on WGS 1984 datum. So we need conversion of the coordinates from WGS84 to Everest Bangladesh and vice versa. The following factors for geocentric translation will be used which is established by SOB/JICA study:

From Everest_Bangladesh to WGS84

X Axis Translation (meter) = 283.729

Y Axis Translation (meter) = 735.942

Z Axis Translation (meter) = 261.143

From WGS84 to Everest_Bangladesh

X Axis Translation (meter) = -283.729

Y Axis Translation (meter) = -735.942

Z Axis Translation (meter) = -261.143

2.32.5. Data Precision

The data precision will be 50cm in both horizontal and vertical distance measurement in the urban area and 1.0 meter in the rural area.

2.32.6. Data Precision of Survey Equipment

Number of advanced survey equipment including Real Time Kinematic Global Positioning system (RTK-GPS) and Differential Global Positioning system (DGPS), Total Station (TS) Level Machine and vehicles will deploy in the field for conducting survey activities. The RTK-GPS use in this survey provide millimeter level accuracy. Detail list of survey precision is presented in the following table.

Table 2. 19: Data Precision of Survey Equipment

SL No	Name of Equipment	Mode of Use	Accuracy
1	MAGELLAN RTK-GPS Receiver	RTK (horizontal accuracies)	Fixed: 1cm (0.032ft) +1ppm
			Float: 20cm (0.656ft) +1ppm (CEP), convergence: 3 min
			Horizontal: <1m (3ft)
		SBAS (WAAS/EGNOS) (rms)	Horizontal: <1m (3ft)
			DGPS (Beacon or RTCM) (rms)
		Static Survey (rms)	Horizontal: 0.005 m + 1 ppm (0.016 ft + 1 ppm)
			Vertical: 0.01 m + 2 ppm (0.032 ft + 2 ppm)
			Azimuth: < 1 arc second
Observation Time: Ranges from 4 to 40 min depending on distance between the receivers			
Kinematic Survey	Horizontal: 0.012 m + 2.5 ppm (0.039 ft + 2.5 ppm)		
	Vertical: 0.015 m + 2.5 ppm (0.049 ft + 2.5 ppm)		
	Recommended Initializer Bar Occupation: 5 min		
2	Total Station-TOPCON: GTS-230	Measurement accuracy	$\pm(2\text{mm} + 2\text{ppm} \times D)$ m.s.e.
		Least Count in Measurement	Fine measurement mode : 1mm (0.005ft.) / 0.2mm (0.001ft.)
			Coarse measurement mode : 10mm (0.02ft.) / 1mm (0.005ft.)
			Tracking measurement mode : 10mm (0.02ft.)
		Measurement Time	Fine measurement mode : 1mm : 1.2sec. (Initial 4 sec.)
			0.2mm : 2.8sec. (Initial 5 sec.)
Coarse measurement mode : 0.7sec. (Initial 3 sec.)			
Tracking measurement mode : 0.4sec. (Initial 3 sec.)			
3	Automatic Level Machine (SOKKIA)	Accuracy in 1 km double run (back Check)	Without optical micrometer : ± 1.5 mm With optical micrometer : ± 1 mm
4	Automatic Level Machine (WILLD)	Average m.s.e. (standard deviation) in ft. per mile - double run	± 0.0016
5	Theodolite/Level	South	
6	Tri-pod	TOPCON	
7	Prism	TOPCON	
8	Ranging Rod	-	
9	Data Transfer Cable	Magellan/TOPCON	

2.32.7. Data Precision of Digitization of Mouza Maps

Extra care will be taken during the scanning process for maintaining the proper rotation and alignment, therefore to minimize the distortion and deviation. To confirm the accuracy of the scanning, sample images will print with plotter and verify with the original one using light table. The scanned images will store in CD under consultant's own custody. We will check the scanned Mouza sheets with original Mouza sheets with light table. The accuracy of the scanned Mouza sheets we find very high.

2.32.8. Map Layout

Map layout is the presentation format of map which will also present the legend, scale north sign and also the approval authority of the map. The final map layout proposed by the consultant is enclosed herewith in Figure 2.4.


Map No.	Title of the Map		
Client	Name of the Project	Consultant	
Index Map	Scale (Meter and feet)	Data Source Reference Bench Mark (BM) Projection	
	Legend	Signature	

Figure 2. 3: Map Layout

2.32.9. Map Legend

Map legend will incorporate all categories of features (point, line, and polygon) in map layout to give a clear view. The legend item may increase or decrease as per requirement based on Physical survey with prior approval from UDD. The palette name/number (both pen and marker) And size need to be finalized with respect to scale of the map at the inception of the project. Sample map legends is enclosed in the appendix-2.1.

2.32.10. Checklist for Survey and Studies

The consultant will develop a checklist format for its necessary surveys and studies. The format will be submitted to PMO, UDD. The format will be helpful for checking survey status as well as progress of the consultant's work.

This checklist highlights a number of questions and considerations that need to be addressed throughout the Survey process.

- Define the purpose of the survey as precisely as possible.
- Review previous surveys/data to determine whether a new survey is needed.
- What is the survey population?
- Create a draft of questions/subjects to be included in the survey.
- Revise the draft questionnaire according to the feedback from the pretest.
- Define the field period and adopt a tracking plan

2.32.11. Monitoring and Supervision of Project Activities

The experts assigned for this project by MEPC Ltd. are being worked maintaining close collaboration with the counterpart staff Urban Development Directorate (UDD) and the stakeholders at field level. The team also incorporating the innovative ideas and suggestions of the UDD officials to achieve maximum output. The consultants think that active and functional coordination among the parties will be technically proficient and comfortable in performing the duties to produce effective output under this project. The consultants will give high importance to work with executing agency and the Upazila authority as well as with other concerned development authority to ensure that the activities to be carried out are properly informed to facilitate their contribution in respect to survey, data collection, and analysis and plan preparation.

2.32.12. Public hearing

After completing the Draft Plan and Report, the consultants will arrange Public Hearing over the Plan to obtain the opinion from the beneficiary of the project. The Draft Plan will be hanged in public place so that people can see the plan and set their comments on it. As a participatory approach of planning, the consultants will focus on the idea of local people and after checking its viability, future plan will be prepared giving priority on public needs. One month long public hearing will be arranged in each Upazila. The program will be continued simultaneously in three Upazila as per guidelines of UDD. The key personnel of the project team will be present during public hearing as per requirement to ensure the expertise services and take the comments of local people. The comments of the public hearing will be further analyzed to incorporate into the Final Plan.

2.32.13. Gazette notification

The most vital part of this project is the gazette notification of all planning packages. The five tier of plan to be prepared under this project for each Upazila will be then made as a legal document of the government authority through gazette notification. Urban Development Directorate (UDD) will ensure the task of gazette notification through their respective ministry and other government procedures. Once the plan is made as legal document through gazette notification, the concerned authorities to implement the plan will be bound to go through the plan and thus the general people will be benefitted from the activities of planned area development.

2.32.14. Institutional capacity building for plan implementation

To Implement the five tier of the Development Plan, Institutional Capacity Building will be included into the plan. Institutional Capacity Building will be done in three stage as following:

Step 1: Validate development plan with stakeholders

All relevant stakeholders will be involved in the articulation and validation of the development plan at the design stage of development plan. The discussions will consider stakeholder views, thorough reviews of the project document. Clarifying the development plan from the stakeholders' perspectives will help to reorient thinking about the project, to focus more on results to be achieved for the local people.

Step 2: Identify institutional capacity constraints

It will include:

- Identify and prioritize institutional constraints to implement development plan

- Identify which institutional constraints in Upazila Administration, Pourashava and Union Parishad level.
- Describe how institutional changes should look when constraints are addressed properly

Step 3: Design a capacity development component for institutional change

It will include:

- Identify agents who are critical in making institutional changes
- Describe the process of institutional change and how learning can influence such change
- Explore which capacity development activities enable agents of change to implement the plan.

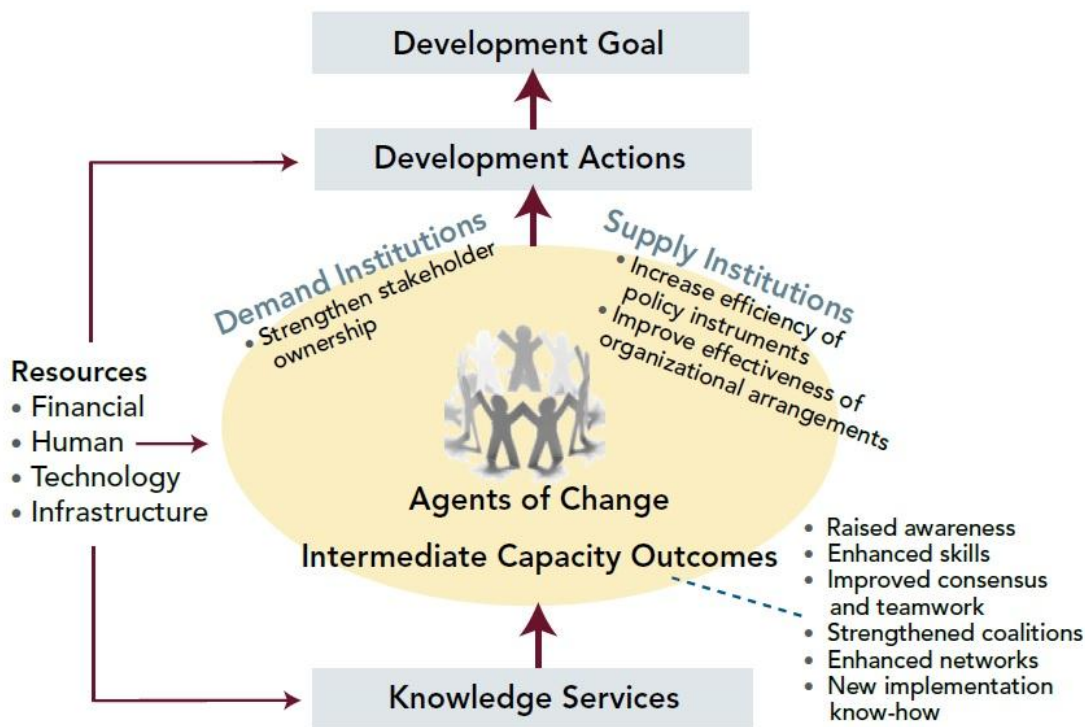


Figure 2. 4: Flow Chart of Institutional Capacity Development Process

Uses of Institutional Capacity Building

Institutional Capacity Building will be used to guide:

- Stakeholder engagement for strategic planning
- Institutional capacity diagnostics or needs assessments
- Design of capacity development programs and projects
- Adaptive management of capacity development to learn what works and does not work
- Documentation and communication of capacity development results
- Evaluation of capacity development efforts

Capacity development efforts should be aimed at a specific development goal that is marked by strong consensus among stakeholders and owned by local leaders. The development goal should be well defined and its economic and social value articulated. A local champion should set the goal and assume responsibility for its attainment. The development goal should derive from a broader, long-term development strategy—sector, country or regional—that establishes the priority and compatibility of the goal with other development priorities.

Section III: Work Plan

3.1. General

Since the contract has been signed on the 24th December 2014, the consultants have commenced the services immediately. The consultant started preliminary activities from that day which include arrangement of office space, mobilization of consultant's team, conduction of reconnaissance survey and submission of Mobilization Report. The consultants also prepared work plan for survey activities, preparation of survey work and plan preparation as per the requirement of Terms of Reference.

3.2. Revised Work Plan

This section provides details of the Work Plan and Activity Schedule, which is proposed by the Consultants, to be performed during execution of this specialized consultancy services within the stipulated time frame of the present assignment. This Work Plan and Activity Schedule have been prepared by the experienced professionals of MEPC based on the understanding of the well-defined ToR furnished by the Client. Systematic planning of the Activity Schedule always ensures the quality of Standards during the implementation of the project. It is the tradition of MEPC to collect relevant detail information as far as practicable before submission of the mobilization proposal.

From the ToR it is evident that the project will have four phases be namely inception phase, survey reporting, draft final reporting and final reporting. The Work Plan is tentative one considering the fact that it may require some modifications in the course of project period, especially after completing reconnaissance survey and preliminary review of available information. The detailed work program can be prepared in the Inception Phase and will be provided accordingly. A self-explanatory Activity Schedule associated with time frame in the form of MS Project has been developed for this project. Based on the ToR the consultants proposed the work plan (given in appendix-3.1).

3.3. In- house Training Program

There are few in-house training program will be conducted throughout the project. In inception period the training of 3-D image processing photogrammetric technology, topographic survey, RTK GPS survey and physical feature survey, hydro geological survey (urban area), socio economic survey, transport survey, disaster related survey, environmental studies, archeological studies, pollution study, bathymetric studies, survey of urban and rural economy, seismic hazard vulnerability and risk assessment has been conducted by specific expert. In draft survey period in house training of knowledge sharing of draft survey report will conduct. In final survey period training program of sub-regional plan will conduct, in sub regional plan period the training of sub-regional plan and structure plan will conduct. In structure plan period training and knowledge sharing of draft structure plan and draft urban area plan will be conducted. In urban area plan period in house training and knowledge sharing of urban area plan and draft rural area plan will conduct. In rural area plan period training and knowledge sharing of rural area plan and draft action area plan will conduct. In action area plan period training and knowledge sharing of action area plan will be conduct.

3.4. Reporting Schedule

Total six report need to be submitted to finish this work, including draft final plan and final plan of the project. Here below show the period of submission to deliver the report,

Table 3. 1: Time schedule to deliver the output

Report	Period of Submission
Mobilization Report	Within 15 days of Signing contract
Inception Report	End of 1 st month
Draft Survey Report	End of 8 th month
Final Survey Report	End of 9 th Month
Draft Final Plan with Report	End of 20 th Month
Final Plan with Report	End of 21 th Month

Section IV: Progress of Work Update

4.1. Completion of Mobilization Report

The Mobilization Report is the 1st footprint to achieve goal and objectives of the project. The Mobilization Report describes the mobilization of project activities, deployment of key personnel, background, objective, scope of the project and findings of the reconnaissance survey activities of the project area as per ToR by consultants in fulfilling the for Package- 04 of the 'Preparation of Development Plan under Preparation of Development Plan for Fourteen Upazilas' Project.

The consultants have completed the preparation of Mobilization Report and submitted it to Urban Development Directorate (UDD) on 20th January 2015. The meeting of technical management committee (TMC) was called on 21st January and the consultants presented mobilization report before the TMC members. With some modification, the mobilization report was accepted by the TMC and the consultants resubmitted the final report with required modification suggested by the TMC members.

4.2. Collection of Mouza Maps

The Gazette Notification of these Upazilas consists of 340 Mouzas. The original RS/CS Mouza sheets will be collected from the Directorate of Land Records and Surveys (DLRS) office. These sheets will be initially checked for the quality. Only the good quality sheets will be then submitted to the office of the PD for further verification and authentication. Detailed list of Mouza maps to be collected covering the entire Upazila area is presented in annexure 4.1.

4.3. Collection of Satellite Image

The Satellite image in 0.5-meter resolution for Urban Area and 1.0-meter resolution in Rural Area with multi spectral four-band images in stereo pairs will be procured for three Upazila. We have contacted with many image provider agencies including Satellite Imaging Corporation of USA, SECON Private Limited of India, MapMart of USA & some other national and international image providers. Eventually, we are in final stage to collect image from Satellite Imaging Corporation of USA. As per our work plan, we will collect Satellite Image after submitting our Inception Report. Although we are lacking behind from our time schedule due to some unwanted causes, we are hopeful to collect Satellite Image shortly and proceed related activities concurrently. The order copy of satellite image is given in annexure 4.2.

4.4. Establishing Field Office

To ease the implementation process of the project and as per the requirement of Terms of Reference (ToR), three (03) site offices have been accommodated in the respective Upazilas. The site offices will ease the field activities and assist experts for both survey and planning period. The address and pictures of three site offices are as following:

Saghata Site Office

Office Address: Saghata Road, Bonarpara, Gaibandha (2nd floor of Krishi Unnayan Bank Office).

Owner of the House: Mohammad Ali (Address: Shimultair Middle, Bonarpara-5750, Saghata, Gaibandha).

Contact No.: 01714-422889



Pic 4. 1: Saghata Site Office

Inception Report

Preparation of Development Plan
under "Preparation of Development Plan for Fourteen Upazilas" Project- Package-04

Sonatola Site Office

Office Address: Holding No. 149, Ward No. 03, Atimkhana Road, Garfatepur, Sonatola Pourashava, Bogra.

Owner of the House: Md. Robiul Islam Tulun
(Address: Garfatepur, Sonatola Pourashava, Bogra).

Contact No.: 01734-214577



Pic 4. 2: Sonatola Site Office

Sariakandi Site Office

Office Address: House No. 53, Stall No. 03, Upazila Gate, Sariakandi Pourashava, Bogra.

Owner of the House: Md. Mehedi Hasan Hafizar
(Address: Dhap, Sariakandi-5830, Sariakandi Pourashava, Bogra).

Contact No.: 01834-050306



Pic 4. 3: Sariakandi Site Office

4.5. Debriefing of the Project in Project Area

Following the reconnaissance survey, several project debriefing meetings with the stakeholders in three upazilas of the Package 4 were held during 18-24 April 2015. As per the requirement of Terms of Reference (ToR), the consultants conducted Focus Group Discussion (FGD), Courtyard Meeting (CYM) & Tea Stall Meeting (TSM) in three Upazilas.

The prime objective to conduct this FGD, Courtyard Meeting and Tea Stall Meeting were to inform local people about the project i.e. to inform people about the activities to be done under this project, the benefit of local people from the project, the role of local people into the project, the need for planning practice into the area and so on.

Besides, establishing the ground work for conducting PRA session and surveys with the help of local people was also a vital objective of this field work. Additionally, learning about the potentials and gross problems of the Project area was also an important objective of this field visit.

During this field visit, meeting and discussion have been conducted with mostly representatives of all groups of local people including Upazila Chairman, Upazila Vice-Chairman, UNO, different Government Officials, local Journalists, Traders, Chairman & Members of different Union Parishads, Local Leaders, Mass People, NGOs Representatives etc. During the second visit to the field, team members collected available local maps, focal contacts and list of executives from upazilla, municipality and union councils, and local NGOs working in those areas for networking and building ground for next steps – PRAs and surveys.

Process and Methods

Three participatory methods - FGD, Courtyard meeting, and Tea stall meeting were used for project debriefing with the stakeholders at different levels – upazilla, ourashava, union parisad and bazar levels. The client officials including the Project Director and the concerned Project Manager were in the project debriefing sessions along with the consultants including the urban planner and social expert. Before holding these events, the team had facilitation meeting to design sessions and meeting content as well as to identify and select participants and locations/levels as mentioned above.

The main objectives achieved through these sessions were:

- the project purpose, timeline, consulting firm and the team who will be working with local administration, local government institutions and local people were introduced;
- the local site office of the project where the project details and implementation updates will be made available was informed;
- the planning levels (sub-regional, structural, urban, rural and action), to have a preliminary general understanding of the local development potentials, problems and issues for long-term, medium-term and short-term planning needs were shared; and
- the stakeholders familiar with the processes and methods, such as, reconnaissance survey, debriefing meetings (FGD, courtyard meeting and tea stall meeting), PRA, Surveys, Workshop, public hearing etc., that are being followed, and the role of stakeholders in form participation in those meetings, PRAs and surveys and providing inputs and encouraging others to assist the project activities at grassroots level were familiarized.

4.5.1. Group Discussion

FGDs were conducted with some groups that are very vital stakeholders for the local development and planning as well. FGDs were designed for two hours with the presence of head of local government or local administration and other officials as mentioned below. The Project Director, Project Manager, social expert and planner led the FGDs starting with introductions of team members, through project description, asking the participants for questions and feedback, and ending with asking for local problems, potentials, planning issues and development needs.

For debriefing with FGDs, the focus groups that were consulted are ---

- Local administration representatives (Upazilla Parisad executives including chairman and members, Mayors, Councilors, Upazilla Nirbahi Officer, Upazilla Engineer, and other upazilla/municipal level officials, who are undoubtedly more knowledgeable and concerned about local problems, issues and potentials and development projects as well).
- Local college teachers (preferred private college teachers as most of the staff are from within their local upazilas, who are usually very knowledgeable and thoughtful about local development needs, obstacles, constraints and future projections)
- Local journalists (preferably working in locally published newspapers who are more likely to be residents of the concerned upazilas and are more active and concerned about local problems and solutions).
- Traders, women groups, NGO workers, farmer groups

In Sagata Upazilla, the first FGD was held with upazilla nirbahi officer (UNO) and upazilla officials, the second with a women leaders group (women local government members), the third with journalists, and the fourth with local private college teachers (Borhanpur University Degree College). In Sonatola Upazila, one FGD was held with upazilla local government and upazilla administration representatives, one was with NGOs and farmers, and another with local journalists. In Sariakandi Upazila, the first FGD was held with Upazilla Chairman, Upazilla vice chairman, UNO, Upazilla Engineer, upazilla women affairs officer, women social welfare officer, and local business, the second with union chairmen of all UPs and the third with Sariakandi Municipality Panel Mayor, councillors, officials, businessmen, and urban residents.

Project information brochure and discussion materials of group meeting is prepared and given in annexure 4.2.

4.5.2. Tea Stall Meeting

Tea stall meetings were organized at local bazars. Not all or major bazar were covered, but few bazars were selected for tea stall meetings given the bazar size, location of the bazar and the area characteristics. These meetings helped the consultants to grasp views of the local people who are found inside restaurants and who later joined seeing the team about the project, benefits and their role. They were also invited to share their potentials and problems of their very local areas. Tea stalls located in a central position of the bazar was selected for TSMs.

Tea stall meetings under Sagata Upazilla included Padumshah Bazar, Guridoh, and Muktinagar Bazar. In Sonatola, TSMs were organized in Araithat Bazar, Jorgasa Bazar, Baluapara bazar and Digder bazar. TSMs were held at Chandfaissa bazar, Verabari bazar and Kutubpur bazar of Sariakandi Upazills.

4.5.3. Courtyard Meeting

Courtyard meetings were organized at Union Parisad (UP) office premises with UP chairman and ward members both elected men and women as well as reserved women members. Local traders, farmers, journalists, NGO workers and general men and women were also invited in each CYM. These meetings were conducted mainly to make leaders and people at Union level to be aware of the project and their role in the planning process. The duration was shorter than FGD, but follows more or less the same steps taken in FGDs.

For courtyard meetings, not all UPs were possible to cover, but some UPs were selected based on geographic locations, socioeconomic characteristics and availability of local government leaders. Courtyard meetings were held at Jumerbari UP, Sagata UP, and Bharatkali under Sagata Upazilla.

In Sonatola Upazila, courtyard meeting were held at Pakulla UP, Thekchapainagar UP and Balua UP. For Sariakandi Upazilla, courtyard meeting were held at Goail UP and Sariakandi Pourasava.

4.5.4. Preliminary Observations and Discussion

Saghata Upazila

Among the UPs, Haldia, Sagata and Jumarbari are the disaster-hit UPs of Sagata Upazilla. These areas also munga-prone areas. Jumarbari was a very old port established by the East India Company, but the port is not alive now. The participants of the FGDs, CYMs and TSMs consider Jumarbari port to revive for easing the transport of local produce. Most of the people live by agriculture. Among the produce of the upazilas – rice, ground nut, onion, maize, sugarcane, lentils, wheat, spices are very potentials for agro processing industries. The upazilas needs river training as four out of 10 UPs are being lost by the Zamuna River. It has no municipality yet, but Bonarpara has potentials to be established for expanding municipal services as desired by the local people. Given the serious river bank erosion, a river training project is in place, but for budget allocation, the area is at risk of erosion. However, sedimentation makes its land fertile for huge agricultural productivity at both char areas and plain land.

The rural part and the fringe area are not well connected by the pucca road. Existing paved roads are narrow for crossing two trucks at the same time. Most of the inhabitants of the upazila is not under the cover of electricity. Some inhabitant has solar power but that is not enough and price is high enough for the poor people. The core area is little bit urbanised. People of the area are highly suffer from the pure drinking water and electricity etc.

Though Bonarpara UP has high potential to become industrialized but lack of proper planning and guidance its development is hampered. Citizen of this Upazila were not satisfied about the services given by the Pourashava. A regional highway cross through the Saghata Upazila. The Jamuna is flowing at the boundary of this town. Boarpara has a railway station. In fact, the whole upazilla has rail, land and water transport routes, which make it a potential hub for agriculture and agriculture base industries. Due to the Zamuna's devastating flood, all sectors are affected.

All the inhabitants and also the officials also claimed that they are politically deprived from any kind of projects and government grant for any kind of development works. We also discussed about this matter, they said that they lived on agriculture they have no fixed monthly income only daily base income by selling their products in the local market/haat-bazar.

FGD, CYM and TSM findings also showed that Sagata Upazilla regularly suffers from natural floods as well as climate change effects in form of excessive rain, drought and sedimentation. At subregional level, Sagata Upazila along with neighbour Sonatola and Sariakandi will benefit tremendously from the connecting road from Gaibandha to Zamuna Bridge, Kurigram, reviving the river port and the old rail connectivity with Sirajganj. Among other development needs, river training, agrobased cottage industrialization, food storage and processing centers, drainage for solving waterlogging problem are highlighted by the participants. For Bonarpara Pourasava, municipal water supply, drainage, road widening, flood control, skill training and produce purchase centers, and zoning for housing development needs to be prioritized.



Pic 4. 4: Court yard meeting in Bharatkhalhi (Shagata) and FGD in UNO Office



Pic 4. 5: tea stall meeting in Guridah (Shagata) and Court yard meeting in saghata

Sonatala

Sonatala have some commonalities with Saghata, particularly in regards to river bank erosion, disaster (cyclone and flood), waterlogging, struggling char areas (half of the upazilla), unemployed labor force, and narrower roads. Among other local issues, the lack of access to electricity, poor bus service with Bogra, lack of government facilities for storing produce, bad road condition. Among the local potentials, the similarities are the combination of three transport systems (rail, road and water), availability of pucca roads connecting to Bogra, and agricultural produce including bamboo, dairy and livestock. However, many people, especially in municipal areas are engaged in non-agricultural activities. Among other potentials, higher literacy rate, 5-10 percent (as perceived by local people) of households have overseas migrant workers, many houses are brick-built or strong structures, fisheries, jute, tat-polli (cottage industrial areas), the flowing of two rivers (the Jamuna and the Bangla) are very significant ones for local development.



Pic 4. 6: River erosion and road network in Sonatala

Sonatala Pourashava is apparently a semi-urban area. The drainage condition of this town is pathetic. The main bazar area is polluted by wastes. The waste disposal system of this Upazilla is so poor. This Upazilla has high potential to grow as an urban hub in the future through the regional connectivity through water and road network.

Based on the FGDs, CYMs and TSMs, the local people aspire to have river training, connectivity through rail, road and water route at regional and national level, jute purchase centers, industries based on jute, dairy and livestock, cold storage and food processing industries, cottage industries (cloth based on tat) fish hatcheries, etc. over the long, medium and short term planning periods.

Inception Report

Preparation of Development Plan
under "Preparation of Development Plan for Fourteen Upazilas" Project- Package-04



Pic 4. 7: Court yard meeting in balua & pakulla in Sonatola



Pic 4. 8: Group discussion with local NGO & UNO office

Sariakandi

Sariakandi is similar to Sagata and Sonatola, mainly in regards to various aspects – the huge development of char areas, the dominating agricultural activities, river bank erosion, waterlogging, and disaster. Among these 3 upazillas, Sariakandi has 7 UPs seriously affected by the Jamuna and hence huge development of informal settlements linearly along the river Jamuna happened. Due to disaster vulnerabilities, the Upazilla has also caught attention of the Bangladesh and international such as the World Bank and NGOs in various development projects. The Upazilla has got a huge investment in building a grown embankment in different UPs located along the Jamuna River.

Because of displacement, environmental refugees, water-logging, and disasters, the area has a big number of low-income people, unemployed people and marginalized people looking for development projects that will change their quality of life. The upazilla does not have places for hat bazar for selling the local produce. Drinking water is contaminated with excessive iron. Most of the people do not have tube-well facilities and they use pond, canal, and river's water which is not safe for health. The people of this Upazila are suffering from traffic, security, graveyard, tree plantation facilities. It has high potential to develop agro based industry in this town. Most of the people of this town are poor farmer.



Pic 4. 9: Court yard and Group Discussion in Sariakandi



Pic 4. 10: Group Discussion in pourashava office and UNO office

Sariakandi has a municipality, but even it has not office or land for premise. In one small rented room, the pourashava is moving one. Its settlement pattern is linear. Only license for trade taxes are the main source of revenue. They cannot have other sources as they cannot offer minimum urban services. The municipality has no water supply system, no drainage system, have jurisdictional issues over land use between Zilla Parisad and the Pourashava, no community or recreation facilities. The people of this town highly suffer from the pure drinking water because layer of water of this town is so deep. But the municipality is still in rural characteristics

Sariakandi has various development potentials. Most of the land uses are for agricultural purpose. Most of the people live by agriculture and few agro based industries have been developed around. The area is popular for apilepsi grass. The upazilas also are tied to two rivers – Jamuna and Bangla.

Peoples are conscious about development and they are eager to participate and work together for their own development. While they are hard-working and struggling with disasters every year, they are often confused of real development projects are being implemented as they often have experienced many development actors came to their area did some projects giving more hopes, but finally they did not see them. Local leaders also share the similar views that many of the plans are made, but remained in the book-self.

Concluding Remarks

River bank erosion, flooding and waterlogging are the key problems faced by all three upazilas under the Package 4. The Zamuna affects their development seriously. For Sonatola and Sariakandi, the river Bangla also is very associated with their life with agriculture and disaster. All three Upazillas have mostly common realities and similar development potentials such as agricultural produce (potato, rice, wheat, maize, chillies, jute, fisheries, milk and livestock). Char areas of these upazilas are mostly the producers of these cashcrops and are often reputed for hot chillies. All three upazillas are connected and have advantage of future connectivity with water and roads, but Sagata and Sonatola have potentials for three systems – rail, road and water. Poverty, unemployment and low quality of life are common to the majority people of these Upazillas, though the situation is worse for Sagata and Sariakandi that Sonatola. As the government has initiated upazilla wise development planning and these three Upazillas are in the process, given the needs and aspirations of the local people along with existing assets, resources and potentials, these Upazillas can utilize the formulated plan for its sustainable development in the next 20 years and more. The subregional and structural plan can incorporate river training along the Jamuna river for all three Upazillas, road connectivity for Sagata and Sonatola, reviving previous rail connectivity in Sagata and Bonapara, reviving port in Sagata and also river ports in two other upazilas needs to be considered with priority. For urban and rural development plans, housing and zoning, agro-based industries, agricultural produce purchasing centers, food processing and cold storage, drainage system, water supply system, electricity, road network, recreational center and skill training centers for youth, women and semi or unskilled poor people should be undertaken. The assessment of these potentials, needs and problems will need detailed and accurate data which will be generated by PRAs and surveys including socioeconomic, topographic, hydrological etc.

Section V: Conclusion

5.1. Conclusion

The inception report has been prepared keeping in mind the Terms of reference of the project. This will guide project activities including conducting workshops in each Upazilas, field survey, data collection and analysis and preparation of maps and reports. The project area profile based on Reconnaissance Survey and data collection has been useful in understanding the characteristics of the project Upazilas, its general condition in physical and socio-economic development. Subsequent stages of project work will largely be dependent on the inception output.

The Inception Report describes the inception of project activities in full extend. The report contains purpose of the study, objectives and scope of services and activities to be performed, review of the Sixth Five Year Development Plan, review of Perspective Plan, MDG, review of Urban Management Policy, review of Land Use Policy and so on, review of the work plan, time schedule, input and management plan, analysis and findings from reconnaissance survey, review of all relevant reports, documents and other materials, assessment of all additional data collected and survey works to be carried out for completion of the database, development of methodology for each component of the structure plan as per ToR by consultants in fulfilling the for Package- 04 of the 'Preparation of Development Plan under Preparation of Development Plan for Fourteen Upazilas' Project.

It is understood that the deficiency in infrastructure of the project Upazilas is currently holding back the faster progress in development. This can be improved substantially, if planned development of the areas is ensured through Sub-Regional Plan, Structure Plan, Urban Area Plan, Rural Area Plan and Action Area Plan as visualized through the current project. Thus the commencement of the project under the Urban Development Directorate (UDD) is very relevant and timely in line with national policies and regional development strategies.

5.2. Way forward

With the approval of inception report the consultant's team is oriented to prepare the draft survey report for the project. The consultants will conduct all forms of survey activities (Topographic Survey, Physical Feature Survey, Socio-Economic Survey, Traffic Survey, Bathymetric Report Studies, Hydro-geological Survey, Survey of Urban and Rural Economy, Environment Studies, Disaster Studies, Social Space Studies etc.) and collect relevant data from published sources. The consultants will also conduct three (03) workshops (one in each Upazila) in the project area. The Draft Survey report will include the following (with necessary maps/figures/diagrams/graphs etc.):

- ❖ Purpose of the study, objectives and scope of services and activities to be performed.
- ❖ A review of the work plans and time schedule for the remaining period of the contract
- ❖ Topography, physical feature and undulation of the area
- ❖ Land Use including spatial quality, and trends and patterns of growth
- ❖ Housing and socio-economic condition
- ❖ Social and Urban Infrastructure
- ❖ Agriculture
- ❖ Utilities and Services including water supply, sanitation, sewerage disposal,
- ❖ Transportation and traffic
- ❖ Hydrology and bathymetric studies (if any)
- ❖ Geology including both engineering and hydro-geology
- ❖ Urban and Rural Economy including informal economic and industrial sector
- ❖ Environment, Disaster Risk Assessment, Waste Management and Pollution
- ❖ People's participation and Social space
- ❖ Historical Importance, archaeology and Tourism

References

Bangladesh Bureau of Statistics (BBS). (2011). *Community Report: Bogra, Population & Housing Census 2011*.

Bangladesh Bureau of Statistics (BBS). (2011). *Community Report: Gaibandha, Population and Housing Census 2011*. GoB.

Bangladesh Bureau of Statistics (BBS). (2011). *Report of District Statistics 2011; Bogra*. GoB.

Bangladesh Bureau of Statistics (BBS). (2011). *Report of District Statistics 2011; Gaibandha*. GoB.

Urban Development Directorate. (November 2013). *A research on 'Formulation of planning Standard for Small Town of Bangladesh'*. Bangladesh: GoB.

<http://www.bangladesh.gov.bd/www.bangladesh.gov.bd/index16f0.html?q=bn>

Sariakandi Upazila at a glance, Upazila Office, Sariakandi Upazila, 2015.

Sonatola Upazila at a glance, Upazila Office, Sonatola Upazila, 2015.

Saghata Upazila at a glance, Upazila Office, Saghata Upazila, 2015.

<http://saghata.gaibandha.gov.bd/>

<http://shariakandi.bogra.gov.bd/>

<http://sonatala.bogra.gov.bd/>

<http://www.bbs.gov.bd/>

<http://link.springer.com/article/10.1007/BF02106512>

<http://www.state.nj.us/transportation/eng/documents/survey/Chapter7.shtm>

<http://www.state.nj.us/transportation/eng/documents/survey/Chapter6.shtm>

<http://www.theguardianbd.com/survey-of-bangladesh-ushers-in-an-era-of-geospatial-datamanagement-and-digital-mapping-in-bangladesh-2/>

Annextures
