Government of the People's Republic of Bangladesh

Ministry of Housing & Public Works

Urban Development Directorate (UDD)

"PREPARATION OF DEVELOPMENT PLAN FOR FOURTEEN UPAZILAS" PROJECT

Package 05 – Ramu Upazila and Rangunia Upazila

INCEPTION REPORT

June 2015

Joint Venture of

HOUSE OF CONSULTANTS LIMITED

and

dm.Watch Disaster Management Watch [dm.Watch]

Ref: HCL-dm.Watch/UDD/Inc_Report/15/027 Date: June 14, 2015

To
The Project Director
"Preparation of Development Plan for Fourteen Upazilas"
Room #407, 3rd Floor, Urban Development Directorate
82, Segunbagicha
Dhaka-1000.

Sub: Submission of Final Inception Report

Ref: Consulting Services for Preparation of Development for Package-5, Ramu Upazila (391.71 sq km), District: Cox's Bazar, & Rangunia Upazila (361.54 sq km), District: Chittagong under "Preparation of Development Plan for Fourteen Upazilas" Project.

Dear Sir,

We are pleased to submit herewith 07 (seven) copies of the Final Inception Report along with a soft copy of the above assignment as per Appendix-2 of the contract signed on 23.12.2014 for your kind information and necessary action.

Thanking you and assuring of our best services.

Yours sincerely,

Dr. M. Maksudur Rahman
Team Leader

Encl: As stated.

EXECUTIVE SUMMARY

Inception Report is the second report underPackage-5 of“Preparation of Development Plan for Fourteen Upazilas” projectand it is the initiation of consultancy service.Under this package the development plan will be prepared for two important upazillas of Chittagong Region which are Ramu upazila and Rangunia upazila. The report is being submitted in fulfillment of the agreement signed between the client Urban Development Directorate (UDD) and Join venture of House of Consultants Limited(HCL)& Disaster Management Watch and subsequent Work order issued by the UDD.

The Inception report describes the background, objective, scope and location of the project area, initial activities performed by the consultants as per TOR and the detailed work plan and methodologies to be performed by consultants in fulfilling the preparation of Development Plan for Ramu and Rangunia.The aim of the project is to prepare five tire of development plan such as- sub-regional plan, structure plan, urban area plan, rural area plan and action area plan to facilitate the improvement of infrastructure and services of the upazila.These plans includeseveral sectoral components such as- socio-economic, housing, population, urban and rural economy, hydrology, geology, disaster, environment, agriculture etc.

The current project is a planning effort of central government agency of physical planning that will fulfill the objectives of uplifting the living standard of the people of both the upazila. The main objective of upgrading the living standard of the local people is to income generation through different economic activities and employment opportunities. The implementation of Upazila Development Plan will create congenial environment for new investment through development of basic infrastructure facilities and services through participatory planning. The aim is also to devise a control mechanism for sustainability of the infrastructure and environmental development through integrating Disaster Risk Reduction (DRR) approaches into landuse planning.

Under the preparation of development plan project the consultants have accomplished the initial consultation meetings with differentstakeholders (e.g. local people, administration, public representatives and business groups) through several FDGs tea stall meeting and courtyard meetings in Ramu and Rangunia upazila. Collection of secondary sourcesof data and reconnaissance survey has been done. Collection of Mauza map and stereo images is almost completed. In the meantime the planning team has been mobilized and a number of support staff has been appointed to assist the consulting team.Set up of siteoffices inRamu and Rangunia Upazilais completed. The consultants have gone through the work plan and methodologies as per TOR and Technical Proposal and revised detailed work plan and methodologies have been provided for accomplishing the service successfully.

This is a very important report for the project initiation as all of activities, output and methodologies for carrying out the activities have clearly stated in this report.

INCEPTION REPORT

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List of Abbreviations

AAP	-	Action Area Plan
ADP	-	Annual Development Programme
AIP	-	Area Improvement Plan
BTM	-	Bangladesh Transverse Mercator
BWDB	-	Bangladesh Water Development Board
DAE	-	Department of Agricultural Extension
DGPS	-	Differential Global Positioning System
DLRS	-	Directorate of Land Records and Survey
DTIDP	-	District Towns Infrastructure Development Project
FGD	-	Focus Group Discussions
GCP	-	Ground Control Point
GD	-	Group Discussion
GSB	-	Geological Survey of Bangladesh
GLD	-	Guided Land Development
GDB	-	Geodatabase
ICT	-	Information and Communications Technology
IPRS	-	Interim Poverty Reduction Strategy
KII	-	Key Informant Interview
LRP	-	Land Readjustment Project
MDG	-	Millennium Development Goals
MSIP	-	Multi-Sectoral Investment Program
NDM	-	National Disaster Management
OD	-	Origin and Destination
PRSP	-	Poverty Reduction Strategy Plan
PRA	-	Participatory Rural Appraisal
RAP	-	Rural Area Plan
RL	-	Reduction Level
ROW	-	Right of Way
RRA	-	Rapid Rural Appraisal
SFYP	-	Sixth Five Year Plan
SQL	-	Structured Query Language
TS	-	Total Stations
TCP	-	Temporary Ground Control Points
UAP	-	Urban Area Plan

CHAPTER-1

INTRODUCTION

Chapter - 1
INTRODUCTION

1.1 Project Background

Bangladesh is urbanizing rapidly. From 1961 to 1981 the average urban growth rate was 8% and the present growth rate is about 4.5% (World Bank, 2006). According to the population census of 2001 the share of urban population was about 23.29%. By the end of year 2015 the share of urban population will be about 37% of the national population. The importance of urban development is emphasized in terms of its role in the national economy. More than 60% of the national GDP is derived from the non-agricultural sectors that are based in urban areas (Sixth Five Year Plan). Again, the most foreign exchange earning sectors, like, garment and knitwear enterprises are agglomerated in urban areas. These sectors earn over 70% of the foreign exchange (Banerjee, 2008). Remittance is also a major sector of foreign exchange earnings and a large share of the remittance goes into the purchase of urban land. Surplus remittance is invested in business and manufacturing located in urban areas. These phenomena indicate the increasing role of urban areas being played a greater role in the national economy. The expansion of urban economy leads to the growth of urban population and concomitant haphazard urban spatial growth without planning.

It is very likely, as can be seen from the past trend, urban centers are going to be the focus of employment and economic regeneration in future. The population and economic growth, particularly, in large urban centers is likely to boost in next few decades. Without adequate infrastructure and services provision to support the increasing population and activities the urban centers it would be difficult to turn urban centers as congenial livable places. Planned development of infrastructure and services and development control through land use plan is essential to develop urban centers environmentally congenial places to live and work.

The present infrastructure provisions in Upazilas are in a precarious state. Drains are mostly clogged that cannot drain out water during heavy rains, natural drainage systems have either been filled up or occupied by land grabbers creating water logging during monsoon. Traffic in Upazilas is increasing day by day with the increase in population and demand. But the sub-standard road network can keep pace with the growing demand for movement; as a result congestion becomes a common problem. Road networks are not developed in planned and systematic way leaving room for traffic congestion that increases economic loss to the people due to travel delay. The land use development in the Upazilas is unorganized and unplanned, which is a major source of environment deterioration. Building construction rules are not effectively enforced in Upazilas mainly for want of a well formulated master plan and qualified planning professional.

Ramu and Rangunia Upazila are located in the coastal area of Bangladesh and have very much potential for tourism development activities, It is hoped that the investment and economic importance will increase rapidly in these Upazilas. However, they are developing in an unplanned way without necessary infrastructures and service facilities. The project is proposed to conduct feasibility study to prepare five tiers Development Plan through Sub Regional Plan, Structure Plan, Urban Area Plan, Rural Area Plan and Action Area Plan with the assistance of the Government in order to assess infrastructure and other civic facilities, undertake plan and investment in accordance with the demand of the population, ensure operation and maintenance of the existing infrastructure along with those facilities proposed to be built up under the future investment programme and, above all, to suggest improvement of the management ability of the Upazila area so that their revenue earning capability is enhanced with a view to building up the

authority as self sustaining local government institutions. The project will also suggest construction of roads and bridges/culverts, drainage facilities, markets, bus terminal, solid waste management, sanitation and other such infrastructure facilities. Towards this end a Development Plan package will be formulated for Ramu and Rangunia Upazila, keeping in view the need over a time span of 20 years. In addition, programme will be formulated related to institutional development of the concerned local government institutions and motivation of the population.

In order to facilitate timely preparation of Development Plan for fourteen Upazilas, UDD has engaged some selected professional consulting firms. HCL and dm.watch joint venture is awarded to prepare Development Plan for Fourteen Upazilas" for Package 5.

1.2 Objectives

According to the Terms of Reference the objectives of Ramu and Rangunia Upazila Development Plan are to:

A. National Development Objectives

To find out development issues and potentials of the Upazila and make a 20 years development vision for the Upazila (both urban and rural area) and prepare a Master Plan in line with the vision for the development;

1. Prepare plan for the people of whole upazila to developand update provisions for better transport network, housing, infrastructures for roads, markets, bus terminals, sanitation, water supply, drainage, soild waste management, electricity, education, leisure and such other infrastructure facilities for meeting the social and community needs of the poor and the disadvantaged groups for better quality of life and at the same time ensure the development of rural area within the project area.

2. Prepare a multi-sector short and long term investment plan through participatory process for better living standards by identifying the area based priority-drainage master plan, transportation and traffic management plan, other specific plan need as per requirement in accordance with the principle of sustainability;

3. Provide controls for private sector development, clarity and security with regard to future development;

4. Provide guidelines for development considering the opportunity and constrains of future development of Upazilla town; and rural area.

5. Prepare 20 years Development Plan to be used as a tool to ensure and promote growth of the city in line with the guiding principles of the Master Plan and control any unplanned growth by any private and public organizations.

6. Facilitating the urban growth to protect the valuable farmland and at the same time provide space and facilities for non-agricultural activities.

7. Provision of standards for use by public bodies.

8. Supporting the livelihood of the inhabitants of Ramu and Rangunia Upazila.

9. Protecting the eco-system with the understanding that we are a component of the system rather than the consumer of the system.

10. Discouraging the involuntary displacement of the inhabitants in the name of development.

11. Control of undesired development in all areas for which plans have been prepared.

B. Immediate Objectives

The immediate objectives of the project are:

Objective 1: Determination of Present and Future Function of the Upazila

Preparation of Sub Regional Plan, Structure Plan, Urban Area Plan, Rural Area Plan and Action Area Plan (AAP) are to be based on PRA sessions, land use survey, topographical survey, environmental, disasters/hazards and agricultural studies. The major studies are related to traffic and transportation, drainage and environmental, formal and informal economic studies, slums and squatters, unauthorized encroachment, recreational facilities and stakeholders participation for planning and development control.

Objective 2: Mechanism for Improving and Guiding Development

The mechanisms for improving and guiding development are:

- Preparation of five tier Development Plans namely: Sub Regional Plan, Structure Plan, Urban Area Plan, Rural Area Plan and Action Area Plan.
- Development of mechanisms for stakeholders, especially communities, who control over all development initiatives.
- Preparation of a set of Institutional and Legislative Restructuring Proposals.
- Selection of appropriate standards and guidelines for improving present conditions and guiding future development.

Objective 3: Review of Existing Problems and Propose initiatives

Review of existing problems and proposed initiatives are stated below:

- Detailed analysis of problems presently hampering development, which can be eliminated by action in the short term.
- Development of sectoral programs to alleviate poverty problems.
- Prepare a minimum number of action area plans for early area development or area upgrading of parts of the town that exhibits a representative cross section of development problems.
- Undertake initiative at Upazila level to promote sustainable economic activity by formal private sector and individuals, groups, GOB and NGOs.

Objective 4: Formulation of Bankable Projects

The factors for formulation of bankable projects areas are mentioned below:

- To determine methodology for identifying Multi-sectoral Investment Projects (MSIP) with their major priorities.

- Prepare a multi-sector investment plan through participatory process for better living standards by identifying areas based on the priority such as Drainage Master Plan, Transportation and Traffic Management Plan and other specific plan as per requirement.

- Providing controls for private sector development and clarity and security with regard to future development for inhabitants and investors. The targeted objectives and guidelines of the development projects would be to initiate and implement through participation.

- To identify a range of projects suitable in both sectoral and spatial terms.

- To develop a package for the priority to a level suitable for financial appraisal.

Objective 5: Increasing Capacity/formulation of Local Authorities for Urban and Rural Management and Development

The factors to be considered in regard to increasing the capacity/formulation of local authorities for urban management and development are:

- To prepare a detailed analysis of the past budgets, their expenditure, liabilities and sources of funds of Pourashava, Upazila Prishad and Union Parishad.

- Providing Land use maps and information at Mouza dag level (parcel) as a professional manner for efficient updating, exchange, dissemination and decision support use.

- To prepare practical and detail proposal for increasing the income of the local authorities with reference to any forthcoming donors proposal to assist financial management and paying particular attention to the possibilities of increasing revenue from existing and proposed development activities.

- Providing guidelines for development considering the opportunity and constraints of future development. Moreover for the betterment of the community, actions would be taken through government, public private partnership, private and non-government initiatives as indicated in AAP.

- To prepare proposal for rationalizing the roles and divisions of responsibilities between Upazila and other development agencies.

- To prepare priority list of projects which can be funded from local resources and examine any new forms of funding for such developments.

- To assist Upazila, Pourashava and Union in drawing up schemes within the framework of Strategic Plan and Action Plans for inclusion in Development Programs.

- To strengthen the technical capabilities of local authorities involved in urban management and development.

- Providing Planned Development to ensure Sustainable Environment Action Area Plan (AAP) should be undertaken with the cooperation of other development agencies. So all the agencies should cooperate, coordinate and participate in the process of preparation of Master Plan for proper planning and development. The Plan would be the guiding document for implementation by all concern. GIS based data; map and information would be the resource which could be easily updated when necessary.

1.3 Understanding of the Scope of Services

The scope of Consultancy Services encompasses for Preparation of five tiers Development Plan for Ramu and Rangunia Upazila, which includes Sub Regional Plan, Structure Plan, Urban Area Plan, Rural Area Plan and Action Area Plan. The study will cover surveys of physical features and preparation of Land use Plan, Traffic and Transportation Management Plan, Drainage and Environmental Plan and Ward Action Plans for the project area.

Considering the above scope of services and to prepare an efficient Development Plan for Ramu and Rangunia Upazila, the specific tasks to be performed by the consultants in realization of the scope of services as spelled out in the TOR are given below in brief:

- Determination of study area (755 sq. km) based on suitable physical boundary.
- Explanation of the plan (report) indicating population, density, livelihood and its future plan.
- Collection of socio-economic and demographic information and data both from primary and secondary sources in the study context to forecast future population, requirement of different services, physical and social infrastructure facilities, employment generation.
- Identify the exiting natural and man-made drains in the town and investigating the mechanisms of the drainage and local river system to assess the extent and frequency of flood damage and determine areas where flooding or poor drainage is most severe.
- Preparing a conceptual report on the various alternative solutions to the present storm water problems and selecting the most appropriate and economical alternatives.
- Prepare a Development Plan of the storm water drainage & sewerage system treatment plant for all areas in the town, which will include discharge calculations for the catchment areas, design of main and secondary drains/sewerage including their sizes, types and gradients and retention areas with preliminary cost estimates for the proposed drainage/sewerage system.
- Prepare a conceptual plan to show the phase-wise implementation schedule in an affordable and practical manner considering the technical, environment, institutional, economic and social feasibility of the proposed works.
- Proposal for preparation of hydraulic and structural designs for the priority areas of the study area and preparing a first phase implementation program.
- Study of the existing drainage maintenance procedures and budgets, if any including solid waste collection and design and estimate costs for a planned maintenance system to ensure that the drains are kept free from blockages and physical damage.
- Recommend planning, institutional and legal mechanisms to ensure provision of adequate land for rights of way for storm water drainage, which will also determine illegal encroachments.
- Investigate methods to find the other phases of the storm water drainages and sewerage master plan.

- Assess additional data requirements, critical additional data, not currently available should be collected through reconnaissance and traffic surveys which should estimate present traffic volume and forecast the future traffic growth and identify travel patterns, areas of traffic, conflicts and their underlying causes.

- Study the viability of different solutions and develop a practical short term traffic management scheme of implementation, including one way systems, restricted access for large vehicles, improved signal system traffic islands, roundabout, pedestrian crossings, deceleration lanes for turning traffic, suitable turning radius, parking policies and separation of pedestrians and rickshaws.

- Assess the current land use with regard to transportation, bus and truck terminals, stations, railway stations etc. and recommend actions to optimize this land use.

- Assess existing plot information.

- Prepare a Long Term traffic and Transportation Plan.

- The Development/Master Plan shall assess major investments and activities of the various development agencies/Ministries and indicate the stages of development preferably through 5 year programming approach. Consultants shall be making to liaison with all government and semi-government and other agencies concerned with their development at the Study area. Contract should also be made with the headquarters of such agencies and full details of such plans should be referenced in the plan.

- Survey and evaluate Urban Land Capabilities considering factors such as flood basin, topography, fertility etc.

- The Development/Master Plan Package shall indicate/outline possible frameworks/strategy for management and development control, institutional arrangement ensuring people's participation etc. for effective implementation of the plan.

- Development of Proposal of By-laws for Land Development, Real Estate Development. Urban Plan Development control and Natural Resources/Green belt and places of historical interest.

- In line with the Master Plan, propose a Detailed Area Plan with a list of priority schemes for the development of roads, drains, traffic management and other social infrastructure for implementation during the first five years of plan period.

- Facilitate City Authority, Union Parishad about the publicity of Master Plan, its preparation strategy, function and their role through making, leaflet, newspapers, cable line, FGD etc.

- Allocating zones for as high, middle and low density areas.

- Guidelines for control/promote industries at different locations according to their nature such as heavy industrial, light industrial and service industries including waste disposal / treatment plants.

- Guidelines for controlling/guiding location of commercial use.

- To identify the areas reserved for agriculture, flood flow, public / private open spaces, parks, play grounds, play-lots and other recreational uses like green belts, retention pond, water bodies, water front, natural reservoirs, historical monuments.

- Detailed Area/Action Area Plan will cover all related issues to bring about expected result.

- Allocating the zones where public utilities, institutions and civic services will be established. Moreover zones of urban deferred areas, for future development expanded areas and areas for new development have to be considered.
- To ensure planning principles/standards, gross/net densities, guideline for future development and development control.

- To exercise control over architectural features, elevations, frontage of buildings and structures including zoning regulations to regulate locations, preservation of heritage, and type of buildings within each zone.

- Earthquake hazard, vulnerability, risk and loss assessment for project area.

- Development of scenario based spatial earthquake contingency plan for project area.

- Prepare and submit Development Plan and Report with required standards as specified in the TOR.

1.4 Inception activities as per TOR

The report should include the following (with necessary maps/figures/diagrams/graphs etc.)

1. An introduction narrating the purpose of the study, objectives and scope of services and activities to be performed.
2. A brief of the Sixth Five Year Development Plan and PRSP 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.
3. A Review of the work plan, time schedule, input and management plan.
4. An assessment of the actual provision of inputs in relation to the expected outputs.
5. 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.
6. Review of all relevant reports, documents and other materials, which will from the base for the contract indicating those items already acquired and those requiring official assistance for acquisition.
7. 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.
8. Development of methodology for each component of the development plan package.

1.5 Activities Performed in Inception Period

The following activities are performed in inception period according to the ToR (see details in Chapter-4).

- Completion of Mobilization Report
- Collection of Mouza Maps
- Collection of Satellite Image
- Establishing Site Office at Ramu and Rangunia
- Debrifing of the Project in Project area through Group Discussion (GD), Tea Stall Meeting and Courtyard Meeting

1.6 Description of the Project Area

1.6.1 Ramu Upazila

Ramu Upazila (Cox's Bazar district) with an area 391.71 sq km is located in between 21°17´ and 21°36´ north latitudes and in between 92°00´ and 92°15´ east longitudes. It is bounded by Chakaria and Cox's Bazar Sadar Upazilas on the north, Naikhongchhari and Ukhia Upazilas on the south, Naikhongchhari Upazila on the east, Cox's Bazar Sadar and the bay of bengal on the west. Main river of Ramu is Bakkhali. Ramu Thana was formed in 1908 and it was turned into an Upazila in 1983.

Total population of this Upazila is 202683; with male 104172, female 98511. According to religion population of this Upazila distributed as Muslim 186019, Hindu 8188, Buddhist 86, Christian 8182 and others 208. Religious institutions within the Upazila are Mosque 282, temple 16, Keyang and pagoda 20. Average literacy of this Upazila is very low. It is only 26% with male 29.6%, female 22.3%. Educational institutions: college 1, secondary school 38, primary school 82, kindergarten 6, madrasa 19.It also has Library 2, club 14, cultural organisation 2, playground 13, women organisation 7.

Archaeological heritage and relics are Hindu Temple and Buddhist Keyang at Ramkot, Buddhist Keyang at Lamarpara. Tourist spots are *Ramkot* (Hindu and Buddhist sacred place), Rubber Garden, Thoienga Chowdhury Keyang at Lamarpara.

Main sources of income of this Upazila are agriculture 47.01%, non-agricultural labourer 12.52%, industry 0.82%, commerce 13.06%, transport and communication 2.99%, service 5.10%, construction 1.10%, religious service 0.25%, rent and remittance 0.75% and others 16.40%.

Ownership of agricultural land distributed as landowner 33.41%, landless 66.59%; agricultural landowner: urban 32.67% and rural 37.46%. Main crops are Paddy, potato, pulse, onion, garlic, ginger, betel leaf, rubber, vegetables.

Communication facilities of Ramu developed based on pucca road 66 km, semi-pucca road 114 km, mud road 512 km.

It has Hats and bazars are 32, fairs 2, most noted of which are Ramu Bazar, Kauarkhop Bazar, Panirchhara Bazar, Garjania Bazar, Eidgar Bazar, Joaria Nala Bazar, Fakir Hat Bazar and Ramkot Mela.

1.6.2 Rangunia Upazila

Rangunia Upazila (Chittagong District) with an area 410.73 sq km,is located in between 22°18´ and 22°370´ north latitudes and in between 91°58´ and 92°08´ east longitudes. It is bounded by Kawkhali_Upazila (Rangamati) on the north, Chandanaish Patiya andBoyalkhali Upazilas on the south,Kaptai, Rajashhali and Bandarban Sadar Upazilas on the east, Raozan and Kawkhali

Upazilas on the west. Rangunia Thana was formed on 24 January 1962 and it was turned into an Upazila in 1983. Municipality was formed on 4 July 2000.

Total population of this Upazila is 303998; with male 157596 and female 146402. Average literacy rate is 54.3%; of which male 57.4%, female 50.9%. Total educational institutions: college 9, secondary school 41, primary school 148, madrasa 15. It also has Library 1, club 10, women's organisation 2, playground 30.

Main sources of income of this Upazila agriculture 39.71%, non-agricultural labourer 4.30%, industry 0.58%, commerce 16.24%, transport and communication 3.57%, service 12.31%, construction 1.03%, religious service 0.49%, rent and remittance 10.91% and others 10.86%. Ownership of agricultural land Landowner 41.19%, landless 58.81%; agricultural landowner: urban 38.21% and rural 41.81%.

According to religion the population of this Upazila distributed as Muslim 236474, Hindu 44975, Buddhist 478, Christian 16378 and others 65. Indigenous communities such as Chakma andMarma belong to this Upazila. ain *Water bodies* Main river of this Upazila is Karnafuli .Religious institutions of this Upazila are in numbers Mosque 359, temple 42, tomb 3, pagoda 41, sacred place 1.

Important archeological site of this Upazila are Remnants of the palace Shukbilash (18th century), Ranir Pukur (Raja Hat), Pagla Mama Dargah (19th century), Shahen Shah Dargah (Pomara), Dharma Chakra Vihara (1750), Jagadhatri Mandir, Sree Sree Ramakrishna Mandir (Santiniketan), Shiva Chaturdashi Mandir (Parua), Krishna Mandir (Majumdarkhil), Sagar Dighi (Rajanagar), Mahamuni Buddhist Monastery, Simaghar.

Prominent Tourists spots are Remnants of the Chakma Rajbari (Shukbilash Padua), Mahamuni Buddhist Monastery, Tea garden (Agunia, Kodalia, Thandachhari).

Communication facilities within the Upazila as it has pucca road 53 km, mud road 598 km; waterway 12.96 nautical miles. Noted manufactories of this Upazila are Jute mill, carpet mill, saw mill, chemical industries, welding factory.

Total number of Hats and bazars are 22, fairs 8, most noted of which are Dhamaer Hat, Mughaler Hat, Roazar Hat, Shantir Hat, Mariam Nagar Hat, Chaitra Samkranti Mela (Rajanagar), Muharram Mela (Rangunia), Surya Brota Mela (Majumdarkhil Kadamtali), Rathjatra Mela and Bijoy Mela.

1.7 Organization of the Inception Report

The report is divided into five chapters. The first chapter discusses about objectives, scope of service, description of Ramu and Rangunia Upazila. The second chapter highlights the approach and methodology based on ToR. The third chapter illustrates about work program, training program, reporting schedule for Ramu and Rangunia Upazila. In chapter four progress of work update are discussed in detail. Finally, chapter five concludes the report with discussion the future needs of Ramu and Rangunia Upazila.

CHAPTER-2

APPROACHES AND METHODOLOGY

Chapter-2
APPROACHES AND METHODOLOGY

2.1 Methodology of Field Survey and Plan Preparation

The current chapter explains the approaches and methodologies to be adopted for preparation of the Ramu and Rangunia Upazilla Development Plans.

2.2 Review of National Development Plans and Policies

2.2.1 Introduction

The national development plans studied in this report include, the Perspective Plan, The Sixth Five Year Plan, The Poverty Reduction Strategy (PRS), the Millennium Development Goals (MDGs) and National Disaster Management Plan (NDMP). This section summaries the current plans associated with development plan policies of Bangladesh instead of plans prepared long back.

2.2.2 Rationale of Relating National and Local Plans

National development plans are prepared considering the overall needs and aspirations of the country with respect to different sectors of development. Any development initiative at the local level must relate to the national level plans in order to achieve cohesion and integrity with overall development of the country to attain the national development objectives. It is therefore necessary to study how the Ramu and Rangunia Upazila Development Plan are related to the national development plans of the country.

2.2.3 Perspective Plan

In recognition of the substantial development challenges, recently the Government has embarked on a Perspective Plan covering 2010 to 2021 aimed at implementing Vision 2021. The development perspective envisages to achieving, in the coming days, a prosperous progressive nation in which food and energy security shall prevail with drastic reduction of poverty and a low level of unemployment. The perspective also includes great strides in human development including health and nutrition, effective population control, progress in all levels of education, primary, secondary and tertiary in addition to commendable improvement in science and technology, along with great achievement in ICT. Infrastructure development will improve integrated multi-modal transport encompassing, railways, roads and inland water transport having connectivity with our neighboring countries. In other words, the development perspective implies the simultaneous fulfillment of economic and social rights of the people alongside civil and political rights. For this to happen strong links between economic growth on the one hand, and expansion of employment opportunities, reduction of poverty, expansion of democracy and empowerment, consolidation of cultural identity and protection of environment with its freshness for the next generation on the other will be established. The broad development goals underlying the Perspective Plan include:

- building a secular tolerant liberal progressive democratic state
- promoting good governance and curbing corruption
- promoting sustainable human development
- reducing the growth of population
- instituting a prudent macroeconomic policy mix
- promoting a favorable industrialization and trade policy regime
- addressing globalization and regional cooperation challenges
- ensuring adequate supply of electricity and fuel
- achieving food security
- making available adequate infrastructure
- pursuing environmental friendly development and
- building a digital Bangladesh

The Perspective Plan sets the strategic directions and provides a broad outline for the course of actions for making the Vision 2021 a reality. This broad framework leaves considerable latitude for the Sixth Five Year Plan (FY11-FY15) and the Seventh Five Year Plan (FY16-FY20) to work out operational details of how the country should move forward. Nevertheless, the objectives and targets of the two plans to be implemented [i.e. the Sixth Five Year Plan (FY11-FY15) and the Seventh Five Year Plan (FY16-FY20)] within the purview of the Perspective Plan period must be consistent with the visions, objectives, and targets contained in the Perspective Plan. A number of core targets have been identified to monitor the progress of the Sixth Plan. These targets have been set according to the vision and objectives of the perspective plan as well as the goals of the Millennium Development Goals. The achievement of these targets by the end of the Sixth Plan should likely put Bangladesh on course to realize most of the objectives of the Vision 2021 and MDG goals. These monitor able targets fall in seven broad categories: (i) Income and Poverty; (ii) Human Resource Development (iii) Water and Sanitation; (iv) Energy and Infrastructure, (v) Gender Equality and Empowerment; (vi) Environment Sustainability; and (vii) Information and Communications Technology (ICT).

2.2.4 Sixth Five Year Plan

The Sixth Five Year Plan (SFYP) is framed for the period 2011-2015. The Sixth Plan's strategy for capacity development consists of four pillars: strengthening the civil service; promoting devolution to local governments; strengthening public-private partnerships; and reforming planning and budgetary processes. Regarding the civil service, the strategy is to develop a long term program for re-building the civil service that is grounded in the socio-political realities in Bangladesh. The basic features of the reform strategy for civil service includes merit-based recruitment and promotion; strong training; ensuring a proper incentive and work environment; establishing and enforcing clear rules of business and codes of conduct; and seeking feedback on performance through a citizen's charter. The plan had set an environment to flourish the dynamic private sector.

Major Objectives of the SFYP

The objectives of the Sixth Five Year Plan can be summarized as follows

a)To reduce and ultimately eradicate poverty by accelerating economic growth
b) To achieve sustained growth with equity and social justice
c) To create productive job in the manufacturing and organized service sectors of the economy
d) To reduce income inequality
e) To reduce regional disparities by ensuring distributive justice
f) To digitize the country with a view to exploiting the benefits of ICT
g) To enhance the incremental capital output ratio (ICOR) through human development
h) To revitalize the rural economy by higher farm productivity and stimulating SMEs
i) To encourage diversification and commercialization of agriculture sector
j) To ensure food security
k) To achieve replacement level of fertility
l) To ensure cent percent Net Enrolment at Primary Level

2.2.5 Poverty Reduction Strategy (PRS)

In persuasion of achieving the MDGs in 2003 Poverty Reduction Strategy (PRS) was prepared. PRS has taken over the place of 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 to targets of at least 20 sectors on special priority basis.

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

2.2.6 Millennium Development Goal (MDG)

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

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

2.2.7 National Disaster Management Plan

The National Plan for Disaster Management is prepared by the Disaster Management and Relief Division. The Plan is to be used to:

i. Articulate the long-term strategic focus of disaster management in Bangladesh.
ii. 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.
iii. 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.
iv. Detail a road map for the development of disaster management plans by various entities.
v. Guide the DM & RD in the development and delivery of guidelines and programmes.
vi. 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.
vii. Provide a framework within which to report performance and success in achieving goals and strategies.

2.2.8 Integrated Coastal Zone Management (ICZM) and Policy

Ramu and Rangunia Upazila located in the coastal zone of Bangladesh which facing 710 km long coast to the Bay of Bengal. This coastal zone contains several ecosystems that have important conservations values. As a zone of vulnerabilities as well as opportunities this coast prone to

natural disaster like cyclone, storm surge and flood. This poses severe challenges to the life and livelihood of the people live in coastal areas. The coastal zone of Bangladesh is an area of 47,201 sqkm that consists of 19 Districts covering 32% of the total landmass. Around 35 million people representing 29% of the total population of the country live in the coastal zone. Integrated Coastal Zone Management policy has eight objectives to address the vulnerabilities and opportunities of the coastal areas, where environmental friendly activities and other sustainable use of natural resources have been used very carefully and lawfully. The ICZM process consists of three main components:

- A coastal zone policy;
- A coastal zone strategy; and
- A priority investment program.

The coastal zone policy of 2005 was adopted with the overall goal to create conditions in which the reduction of poverty, development of sustainable livelihoods and the integration of the coastal zone into national processes can take place. Therefore the development project of Ramu and Rangunia has been attempted to consider the Integrated Coastal Zone Management (ICZM) and Policy of Bangladesh for the formulation of its local to sub-regional planning.

2.2.9 Other Sectoral Policies and Acts related to Land use Planning

The major Sectoral Policies and Acts related to Land use Planning are described below:

Sector Policies:

- National Urban Policy (Draft)
- National Housing Policy, 1993
- Population Policy, 2004
- Agriculture Policy, 2004
- Industrial Policy, 2005
- --Bangladesh Urban Management Policy Statement, 1999

Major Acts and Rules

- The Local Government (Pourashava) Act, 2009
- The Local Government (City Corporation) Act, 2009
- Building Construction Act, 1952
- Town Improvement Act, 1953
- Building Construction Rules, 1996
- Dhaka City Building Construction Act, 2008
- National Reservoir Protection Act, 2000
- Brick Burning (Control) Ordinance, 1989
- Conservation of Environment Act, 1995
- Land Development for Private Housing Project Act, 2004

2.2.10 Linkage of National Plans and policies with Development plan of 14 Upazila Project

Following the goals, objectives, aims, policies and strategies of upper level plan which are described above the plan for Ramu and Rangunia Upazilla Development Plan will prepare. The perspective Plan, The Sixth Five Year Plan, The Poverty Reduction Strategy (PRS), Millennium Development Goal and National Disaster Management Plan and other policies are the major

guiding factors of 14 Upazila Development Plan Project. The sectoral policies will also be reflected in the final plan preparation.

2.3 Collection of Relevant Documents

The Consultant Team Leader arranged a meeting with the concerned Project Director of UDD for discussion elaborately on the documents availability in the Project Management Office and the documents yet to be collected. Following relevant project documents are collected from the UDD office and the concerned offices.

- Relevant documents on Urban Strategies, Policies, Plans, Decisions, Programs commitments made by the Government/Semi-Government/Public Sectors/ Corporation/Departments/Institutions, NGOs and Donors Agencies;
- The Land use Master Plan of Town by UDD;
- National Flood Action Plan Reports,
- The best available map of the project area;
- Information on current Land use planning & programs, if any;
- Any other relevant information;
- Geophysical maps and report
- Topographical Maps and report

2.4 Collection of Maps, Basic Statistics and Information

According to the Terms of Reference the Consultant have to prepare Development Plan/Urban and Rural Area Plan on CS mouza maps. So collection of mouza maps is a prerequisite for this project. These mouza maps are preserved, updated and supplied by the only organization the Directorate of Land Records and Survey (DLRS). The Geological Survey of Bangladesh (GSB), Bangladesh Water Development Board (BWDB), etc produce maps relevant to their responsibilities. The following sources will be exploited for collection of maps.
Following relevant documents and maps will be collected from the concerned offices.

- Mouza Maps: Directorate of Land Records and Survey
- Maps on Geological Information: Geological Survey of Bangladesh
- Hydrological Data and Information: Bangladesh Water Development Board
- Administration Boundary Map: District Administration Office
- Union and Thana Maps: Thana Land Offices
- Upazila Jurisdiction Map: Bangladesh Police
- Soil Map: Bangladesh Soil Research Center
- Other maps: Different Sources
- Previous documents of studies on Ramu and Rangunia , if any available;
- National Flood Action Plan Reports
- Information on current land use planning & programs, if any;
- Topographical maps and report.
- Disaster related maps and reports will be collected from DDM and CDMP.

2.5 Preparation of Base Map using GIS and Mouza Map

Preparation of base map is an important requirement for planning and designing of the assigned project. The base map will be used to create working maps for field surveying, to depict the survey findings and to prepare planning maps. The base map preparation will be carried out digitally using GIS technology and the basic GIS software specified in the TOR. Preparation of base map comprises the following item of works presented in steps:

- Collection and scanning of Mouza Maps

- Digitization of Mouza Maps
- Edit Plot Check of Digitized Shapefiles
- Selection of Ground Control Point (GCP)
- GCP Survey of Mouza Maps Geo-referencing of Mouza maps
- Preparation of Map Layout of Mouza Maps

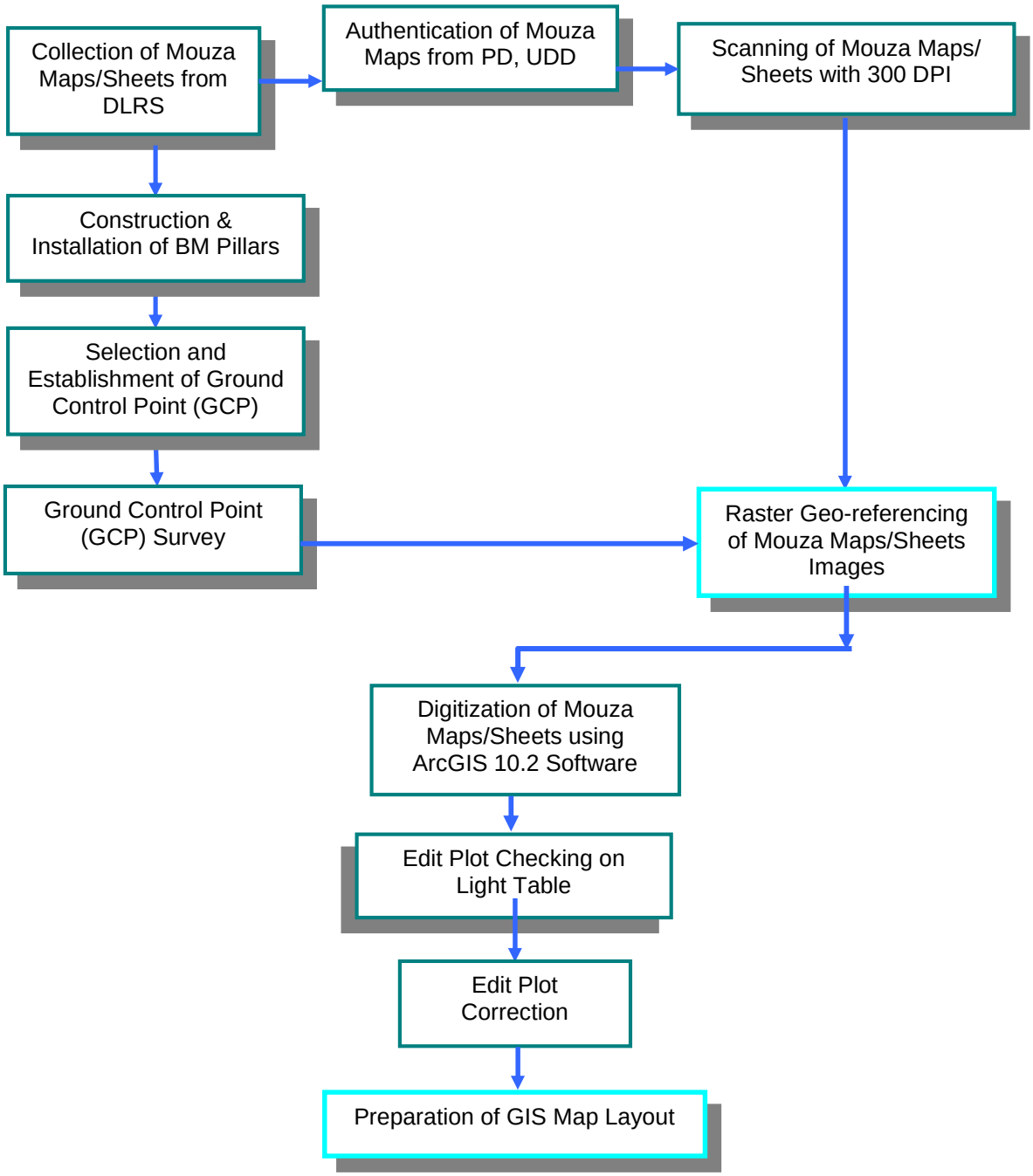


Figure-2.1: Flow Diagram of Base Map Preparation using Mouza Map

2.5.1 Collection of Mouza Maps

The basic input of base map preparation will be mouza maps. According to TOR, RS mouza maps have to be collected from DLRS office covering the entire project area. In Ramu Upazila out of 170 sheets 165 have been collected from local Upazila offices. In Rangunia Upazila out of 189 sheets 170 have been collected. Collection of remaining mouza sheets are under process. UDD has given a letter to DLRS to provide a letter covering the list of mouza map. The DLRS were pursued and letter has been collected. The collected maps have been cross checked with the list and similarity was found. The mouza sheets having distortion due to rapping or pasting cloths/tape was avoided during collection of mouza maps. Before scanning of mouza maps, all collected maps have been submitted to PM for review and quality check. The list of Mouza maps is provided in the Appendix-1.

2.5.2 Scanning of Mouza Maps

Scanning of all the mouza map sheets will be carried out immediately after their checking by PM. According to the TOR, scanning of mouza maps sheets will be carried out using drum scanner with 300 DPI and saved as JPG format to be used later on for screen digitization. Extra care will be taken during the scanning process for maintaining the proper rotation and alignment to minimize the distortion and deviation.

Table 2.1: Specifications for Scanned Images

Image Type	Grayscale
Image Format	JPG
Image Resolution	300 dpi
Image Scale	100%(1:1)

Later on all raster mouza files will be submitted in soft format to Project Management Office for preservation.

Table 2.2: Specifications of the Scanner used for Scanning of Mouza Maps

Brand & Model	HP Design jet 815 mfp
Scan Resolution, enhanced	2400×2400 dpi, with variable resolution setting from 50 dpi in increments of 1 dpi
Scan Resolution, hardware	800×800 dpi
Bit Depth	24-bit color
Levels of grayscale	256
Maximum scan size	42×unlimited in

2.5.3 Digitization of Mouza Maps

On screen digitization method will be used for digitization of Raster mouza maps. ArcGIS software will be used for this purpose. Plot boundary, Mouza boundary, Plot numbers, Building, Katcha House, Mosque, Temple, Traverse Station, Iron Pillar, etc, will be stored in three different vector feature layers (Line, Point, Polygon).

2.5.3.1Specifications for Digitization of Mouza Maps

For creating and storing geospatial data, a document on technical specifications of GIS database has been prepared for all the spatial layers including mouza maps. This document is given in Appendix-2. The specifications will be finalized in consultation with Project Management Office.

2.5.4 Edit Plot Checking of Digitized Shapefiles

After digitization of mouza maps, initial edit plot checking will be carried out on-screen by overlaying the digitized vector layers on scanned image of respective mouza map. Every plot will be checked one by one on-screen and updating will be done if any error found. After this initial checking, the digitized mouza maps will be printed at original scale of the mouza map. This printed map will be checked and verified by superimposing on the original mouza map using the light table. The checking of digital mouza maps will be done by the joint team of UDD and consultant. All possible errors (missing or dislocation of plot number and arcs, extra arcs or plot number, tic locations, etc.) will be corrected with edit plot check and final digital mouza maps will be prepared. After digitization and necessary edit plot check, both soft and hard copy of all the digital mouza maps will be supplied to UDD for preservation.

2.5.5 Selection of Ground Control Point (GCP) for Geo-referencing of Mouza Map

Ground Control Points (GCP) are required for geo-referencing of mouza maps. A possible GCP may be on the sharp corner of a plot, a traverse point, corner of a permanent building, monument, hydraulic structures or any permanent structure which exists both in mouza map and real world. At least 4 number of GCP will be selected in ground for each of mouza sheet for conducting GCP survey. The joint team of UDD and consulting firms will select the GCPs.

2.5.6 GCP Survey for Mouza Maps

The consultant will carry out the GCP survey to acquire GCP coordinates (Latitude, Longitude) for geo-referencing of mouza maps. The GCP survey technique is discussed in the section 2.8.1.3. Later on GCP data will be projected using the Bangladesh Transverse Mercator (BTM) projection system as the ToR does not mention any specific Projection/Coordinate System.

The parameters of BTM coordinate system are as below

Projection: Transverse Mercator
False Easting: 500000.0
False Northing: -2000000.0
Central Meridian: 90.0
Scale Factor: 0.9996
Latitude of Origin: 0.0
Linear Unit: Meter
Datum: Everest Bangladesh (Everest 1830 adjusted in 1937)
Spheroid: Everest Bangladesh (Everest 1830 adjusted in 1937)
Semi-major Axis: 6377276.345
Semi-minor Axis: 6356075.413
Inverse Flattening: 300.801

All GCP survey data will be stored both in geographic (Latitude, Longitude) and projected coordinate (Easting, Northing) systems and will be submitted to PMO as soft and hard copy immediately after completion of GCP survey.

2.5.7 Geo-referencing of Mouza Map

Geo-references the process of establishing the geographical coordinates of certain points with great accuracy and their location on a digital map, while the remaining points are calculated automatically, based on transformation formulas.

Scanned Mouza map sheets will be geo-referenced with reference to the projected GCP values (Easting and Northing values). Rectified satellite image will be used to examine the accuracy of

geo-referencing. If it is found that mouza map is not matching properly with the satellite image, some extra Tics/GCPs will be picked up from the satellite image and the geo-referencing process will be repeated. After getting the best matching, the raster mouza will be rectified using a suitable method for minimizing the errors of Mouza Map Sheets which generally occurs from shrinkage of papers or distortion due to photocopy. The resulting RMS error during geo-referencing will be kept as less as possible.

Digitized features or vector layers of mouza map will be spatially adjusted or transformed from digitizing coordinates to projected coordinates using the GCPs and geo-referenced raster mouza map. ArcGIS software will be used in this purpose.

2.5.8 Edge Matching of Mouza Maps

Edge matching of mouza maps is one of the most challenging tasks. In practice, adjacent mouza boundaries do not exactly match with each other. Therefore, the edge matching of these maps cannot be done accurately. However, ArcGIS software will be used in edge-matching of vector mouza map layers. In this respect, edge of mouza maps may be overlapped or may have gap which will be rectified in consultation with the client.

2.5.9 Demarcating the Project Area/Boundary

After edge-matching of all the mouza map sheets of the Upazila, the mouza maps will be merged together layer by layer. The outer mouza boundaries of this merged map will form the Upazila Boundary or the Project Area Boundary. After this process the Consultant's survey team will identify the boundary of the project area in real world. The town planner will supervise and guide the survey team to demarcate the actual boundary of the project. With necessary co-operation and co-ordination from the Project Management Office and the Upazila Parishad, the consultant will ascertain the boundary line of the project area. The Consultant will maintain close liaison with the officials for drawing the boundary line on the map.

2.5.10 Preparation of Project Area Map

Final map coverage and lay out of study area map (merge mouza of project area) will be done as per specification suggested by Project Director's Office using GIS based Workstation and ArcGIS 10.2 software. All the features of mouza maps including plot, mouza and boundary of the project area will be identified and shown in the base maps in separate layer. Later on this study area map will be incorporated in the physical and topographic survey maps. Both soft and hard copy of base/study area map will be supplied to Project Management Office at the scale of 1: 3960, one copy will be provided in A1 size. The Base maps will be prepared on the enlarged survey maps (mouza map). The following features in **Table-2.3** will be provided in the base map:

Table-2.3: Features to be included in Base Map

Features	Illustrated
a. BM	BM ID, Reduced Level (RL), Easting (X-coordinate), Northing (Y-coordinate), location description of the BM
b. Administrative Boundaries	Internal boundary, District boundary, Thana boundary, Union boundary, City corporation boundary, Ward boundary, Mouza boundary, Sheet boundary
c. Khas land	Plot number, Area, existing use
d. Spot heights	Reduction level (RL), Existing (X-coordinate), Northing (Y-

Features	Illustrated
	coordinate)
e. Contour lines	Contain the value (RL), type (Index, intermediates)
f. Land use	Land use type (Administrative, Agriculture, Commercial, Educational, Graveyard, Health, Industrial, Miscellaneous, Mixed use, Open space, Play ground, Place of worship, Recreational, Residential, Restricted, Transportation, Water bodies, Forest, Hill), data base will contain detail category as per survey format, Jurisdiction area
g. Structure	Structure type (Pucca, Semi-pucca, Katcha), Structure use (as per survey) data base will contain detail category as per survey format, structure name, year of construction, under construction, owner name of the structure, Holding number, adjacent road name, locality name, ward/union name
h. Road	Road name, Road number, type of the road (Pucca, Semi-pucca, Katcha), category of the road (Primary, Secondary, Access), Road width, Right of Way (ROW)
i. Footpath	Road name, width
j. Rail lines	Line, number of railway track, ROW
k. Drainage/Sewerage	Type, width, category, depth, Reduced Level
l. Water pipe network	Type, Dia (secondary source)
m. Overhead water tanks	Capacity, catchments area
n. Electric lines	Capacity, type
o. Gas line	Dia, pressure (secondary source)
p. Utility features	Type (Electric pole, Electric Tower, Hifh Volt, , Electric box, Power station, Power sub-station, Transformer, Gas transmission center, Light post, Telephone pole, Telephone box, Fire service station, Traffic signal pole)
q. Important area	Type (Graveyard, Crematorium, Cemetery, Eidgah, Restricted Area, Airport, Brick Field, Rickshaw Garage, Automobile Garage, Monument, Open Space, Parks, Playground, Stadium, Botanical Garden, Zoological Park, Power Plant/Station, Bus Terminal, Truck Terminal, Water Treatment Plant, Waste Disposal Plant, Railway Station, Bazar Boundary, Forest Land, Swimming Pool, Slum, Embankment, Homestead), Name location
r. Others feature	Type (Deep tube well, Hand tube well, Dustbin, Sluice gate, School, College, Madrasa, University, Filling Station, Oil reservoir/Depot, Historic site, Museum, Monument, Mosque, Mazar/Dargah, Temple, Church, Pagoda, Graveyard, Cemetery, Crematorium, Theater Hall, Cinema Hall, Hospital/Clinic, Police Station, Police Box, Post Office, Brickfield, River Port, Bus Terminal, Truck Terminal, Airport, Over Bridge, Under Pass, Bridge, Culvert), name, location
s. Water bodies	Type (River, Khal, Irrigation Canal, Lake, Swamp, Pond, Ditch, Borrow Pits), use (Private, Public)
t. Bridge/Culvert/Box Culvert/Over Bridge/Railway	Length, Width, Abutment, Span, Location

2.6 Preparation of Base Map using Satellite Image and Photogrammetric Method

The consultant will procure high resolution (0.5 m) satellite stereo images (3D) as specified in section 4.3 of Chapter 4, under the supervision of PD. These stereo images possess the ability to extract appropriate coordinates and altitude (x,y and z) of natural and manmade features like hills, forests, rivers, roads, buildings, etc. After image analysis and preparation, features identifiable on the image will be collected by digital photogrammetric methods. Survey base map will be prepared based on the features collected from satellite image. Later on survey activities will be carried out using the features extracted by photogrammetric method and the output of the survey data will be overlaid on the mouza maps to prepare Base Map for planning and other works. The step by step procedures has been shown in the flow chart below.

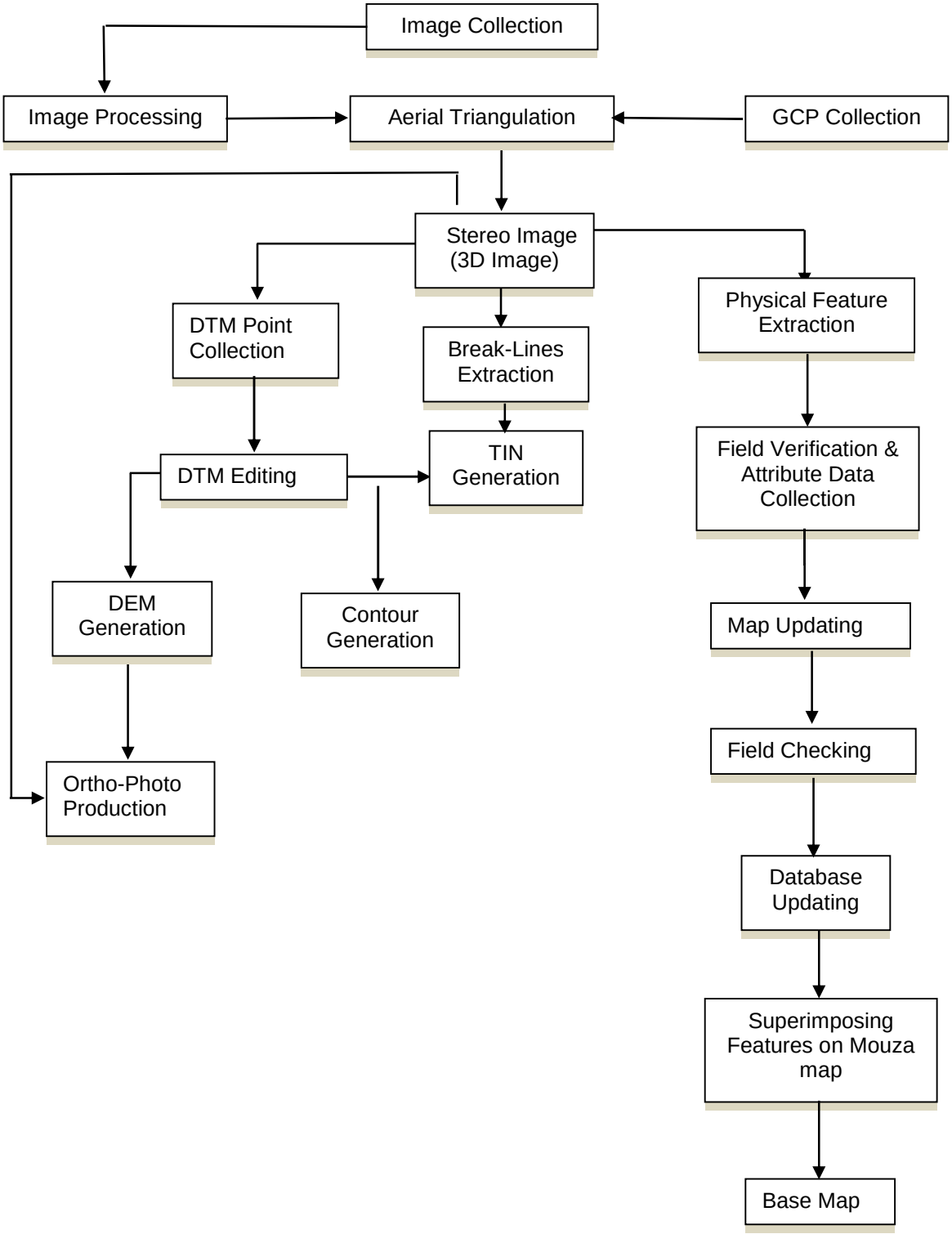


Figure-2.2: Flow Diagram of Base Map Preparation using Satellite Image

2.6.1 Collection of Satellite Image

In order to achieve greater perfection in physical features survey, satellite imagery of the study area will be used extensively. Satellite Image with the resolution of 0.5m has been purchased for the urban and rural areas where greater accuracy is needed for the formulation of Development Plan (see Appendix-4). 1.0-m multi-spectral satellite image collection for rural areas is under process.

2.6.2 Image Processing

Image processing will be done after collecting raw digital images. The tasks involved in image processing are

- Epi-polar Correction
- Color Balance
- Contrast Adjustment
- Sharpening
- Pyramid
- Bit Rate Setting

2.6.3 GCP Collection for Satellite Image

Ground control points (GCP) are required in aerial triangulation of satellite images. The GCP will be selected by photo identification of existing ground features. Considerable number of GCP will be selected as required for the whole study area. All GCPs will be collected by conducting field survey using RTK GPS/DGPS method. The survey method for GCP collection is discussed in the section 2.8.1.2. After collecting GPS data of the GCP, post processing will be done day to day in the sites. Accuracy level will be maintained within 10 cm. All post-processed GCP data will be submitted to PMO as soft and hard copy immediately after completion of GCP survey.

2.6.4 Aerial Triangulation

Aerial triangulation is a mathematical process used to determine the position and orientation of each photograph at the moment of exposure. The input and output data of aerial triangulation process is shown in following **Table 2.4**.

Table-2.4: Input and Output Data of Aerial Triangulation Process

Input for AT	**Output of AT**
(1) IMU data (2) GPS (on board) (3) GCP (collected from field) (4) Image (5) RPC file	Geo-referenced Stereo Model

2.6.5 Digital Mapping from Stereo Model

After the orientation of stereo models, digital mapping will be carried out. ArcGIS Geo database model for storing geospatial data is proposed. The proposed Geo database and its Feature Classes will be designed based on the followings:

1. Projection Parameters of the Coordinate System
2. Name and type of layer (feature classes)
3. Structure of Attribute Tables of the Feature classes

The specifications of Feature Classes and its Attribute Table are given in the Appendix-2.

Digital Photogrammetric Workstation (DPW) will be used as the platform for acquiring features from digital stereo images (model).

Feature registration will be done considering and measuring the position of the object under its accuracy level. The Summit Evolution & Stereo Plotter of DAT/EM will be used for identifying and registration of the objects. ArcGIS 10.2 of ESRI will be used for vector data storing and editing.

2.6.6 DTM/DEM/TIN/Contour Generation

DTM Point: DTM points are the 'spot heights' or 'spot elevations' extracted by photogrammetric method from stereo images. Extraction of DTM points from the stereo model will be done by semi-automatic process. DTM points will be generated at an interval of 10 meter in urban area and 20 meter in rural area. At first, DTM points will be generated automatically from Stereo Pair images by the software, and then editing of the software generated DTM points will be done by the Photogrammetrist comparing them with stereo model.

Break-lines: Break-lines are the unique, linear, topographic features that depict an abrupt change in the mapping surface. The cliffs, edges of roads, embankment, rivers, canals, etc. will be digitized as break-lines from the stereo model. These break-lines will be used later in creating TIN.
TIN: The TIN will be created for realistic representation of the terrain. Using DTM Points and Break-lines, the Triangulated Irregular Network (TIN) will be generated and delivered in 1 km x 1 km or 5 km x 5 km blocks for the project area.
Contour: Contours are one of the most effective representations of 3-dimensional topography on a 2-dimensional map. After creating DTM Points, Break lines and TIN the Contour lines will be produced at 0.3 meter vertical interval. The contour lines will be delivered in 1 km x 1 km or 5 km x 5 km blocks or one single file for the project area.
DEM: Using the TIN the DEM will be generated at a resolution of 10 meters in 1 km x 1 km or 5 km x 5 km blocks or one single file for the project area.
OrthoPhoto: An Orthophoto is a photographic image constructed from aerial photograph or satellite image. The processes used to generate orthophotos remove the effects of terrain relief displacement and tilt of the aircraft or spacecraft. When properly generated, these digital images have a predictable constant positional accuracy throughout the entire image. Orthophotos are widely used as sources for editing and revising vector topographic data in a GIS.

2.6.7 Mosaicking of Ortho-photo

Individual rectified photograph will be assembled to form seamless mosaic. Mosaicing of Orthophoto includes the following tasks

- Seam line Drawing: Drawing the boundary of the image delineating which part of the image will go which image.
- Balancing of Color and Contrast within different images
- Feathering

2.7 Creating Final Base Maps of the Project Area

The final base map will be created by superimposing Project Area Maps derived from Mouza map and Satellite Image Processed Map. This superimposition is very important to form a unique map and database with the information collected from satellite imagery (e.g. infrastructure type, use, name, location) and information of mouza map (e.g. mouza name, JL no., sheet no., ownership information).These base maps will be used for planning of the project area.

2.8 Field Survey Using GPS Based Advanced Survey Techniques

A series of field survey will be conducted to collect Ground Control Points (GCP) coordinates and detail data of natural and man-made features of the study area. These are:

- GCP Survey
- Physical Feature Survey
- Topographic Survey
- Land use survey

2.8.1 Ground Control Point (GCP) Survey

Two sets of GCPs will be established covering the Project Area in real world coordinate system of latitude and longitude through GPS survey to serve the purposes of mouza map geo-referencing works and conducting subsequent surveys. These are

- GCP Survey for Establishment of permanent Ground Control Point (PGCP)
- GCP Survey for Establishment of Temporary Ground Control Point (TGCP)

2.8.1.1 Selection of Reference BM

Before starting GCP survey the Reference BM will be selected from the existing BMs. The BM Pillars established by Survey of Bangladesh (SOB) in or around the project area will be used as reference BM for the GCP surveys. The locations and the coordinate values (x,y,z) of the SOB/JICA GPS BMs will be collected from SOB.

2.8.1.2 GCP Survey for Establishment of Permanent Ground Control Point (PGCP)

A set of Permanent Ground Control Points with both horizontal (x,y) and vertical controls (z) will be established uniformly covering the entire project area. These GCPs will serve as the Primary Survey Controls or Bench Marks (BM) for all survey and mapping works including topographical, physical feature and temporary GCP surveys. On the newly constructed BM Pillars, GCP survey will be conducted through DGPS method which is described in the section 2.8.2.3. These primary GCPs of the permanent BM Pillars will be assigned with systematic identification number (IDs) unique within the Project Area.

2.8.1.3 GCP Survey for Establishment of Temporary Ground Control Point (TGCP)

Temporary Ground Control Points will be established mainly for georeferencing of Mouza maps. At least 4 GCP will be collected per Mouza Map Sheet. Suitable reference points on both mouza maps and ground will be identified and located. The temporary GCP will be established on and around the boundary line of each mouza sheet, which are clearly identified and marked on mouza map and ground such as sharp corners or intersection of plot boundaries, Traverse Stations, Iron Pillars, Buildingor any other permanent structure. Some temporary GCP will also be established to aid Total Station survey so that the equipment can use them as Temporary Bench Mark (TBM) during physical feature and topographic survey. The temporary GCPs will be established with a combination of GPS and TS surveys where suitable. The output of this survey i.e. the final geodetic coordinates will be provided to the GIS team for geo-referencing of mouza map sheets and preparation of Base maps.

2.8.2 Methodology for Establishment of Permanent GCP / BM Pillars

For establishment of Permanent Ground Control Points or BM Pillars in the project area, a GPS based geodetic control survey includes the following distinct phases:

- Site Selection
- Construction and Installation of BM pillars.
- Field observations
- Data Processing and Establishment of Coordinate of BM Pillars

A brief description of some important aspects of the above methodology has been given in the following subsections.

2.8.2.1 Site Selection

The location of BM pillars will be selected by a comprehensive reconnaissance survey of the project area, as per suggestion of Upazila and respective Union Parishad, and their suitability for GPS Survey. As per TOR, the pillars will cover the entire project area including approximately 5 km. grid in rural area. A good GPS site should be free from obstructions and interference. Through field reconnaissance, obstructions or interference will be identified and avoided by alternate site selection. Obstructions are obstacles, which block the line of sight between a satellite and a receiver, thereby preventing signal reception. To avoid satellite blockage, a site will be selected as obstruction-free in all directions above 15° elevation.

2.8.2.2 Construction and Installation of BM Pillars

The BM pillars will be constructed and installed before starting the survey work. At least 47 BM Pillars (estimated) will be established in the two project area with respect to PWD/SOB datum. As per TOR, is the pillar will be constructed with the specification of: Pillar 10"X10", Base 3'X 3', height 5'. RCC pillars will 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. One pillar will be constructed within 5 sq.km. in urban areas and one for 20 sq.km in rural areas. Local concerned authority will be consulted to set the location of the pillars.

2.8.2.3 Field observations

The primary control should have higher horizontal accuracy and therefore two nearest controls of National Geodetic Control Network (Established by SOB) will be used as reference of the proposed GCPs network. Higher accuracies are generally achieved by observation for a longer duration and with more baselines measured. It is proposed that the time length of control observations would be more than 1 hour on each baseline control network. The base line (distance between reference station and rover station) would not exceed 20 Km. Tasks of survey persons for GPS observations is as follows:

Table-2.5: Tasks of survey persons for GPS observations

Survey Expert	• Schedule observations as per plan • Check for satellite problems, geomagnetic storms
GPS Observers (Surveyors)	• Verify correct station is being occupied • Level and orient GPS antenna over marker measure antenna height • Initialize receiver • Monitor receiver operation and data recording • Complete station log sheet • Submit data and log sheets to processor at end of day

Field observations for Permanent Ground Control Point (GCP) will be conducted using Differential Global Positioning System (DGPS) based survey technique. As per TOR, accuracy level of permanent GCP will be maintained within 10 cm.

2.8.2.3.1 Use of Differential Global Positioning System (DGPS)

As per the Terms of Reference the consultant will conduct the Global Positioning Systems (GPS) survey. For the Permanent GCP survey the Consultant proposes to use a technique called Differential GPS survey. Here a control GPS receiver is placed at a geodetic control (Reference

BM) whose position is known. The receiver collects positioning information and calculates a position fix, which is then compared to the known coordinates, while another receiver is placed on target point (constructed BM Pillar) whose coordinates are unknown. This receiver collects positioning information from the same satellites as the control receiver. Then the signal files from both the receivers are down loaded to a personal computer for post-process the signals using post processing software. From post-processing of the received signals, coordinates for the unknown points are established. These coordinates will then be used to geo-ruler the survey sheets.

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

2.8.2.3.2 Baseline Survey by RTK-GPS

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

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

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

2.8.2.4 Data Processing and Establishment of Coordinate of BM Pillars

A Geoid is a representation of the earth surface over which the earth's gravity is constant. If the value of earth gravity on the geoid is the value of the gravity on the average sea level, then the geoid represent the mean sea level of the corresponding area.

With the output co-ordinates of the BMs in latitude, longitude and ellipsoidal height from the network adjustment result, a network of geoid points will be established for the project area.

However, to be a precise geoid model the ellipsoidal heights need to be converted to the corresponding geoidal heights. Furthermore, in order to develop the Geoid Model of the project area in terms of a functional datum i.e. mPWD, it is required to determine the heights or levels of the BMs in mPWD datum.
Scientists measured the earth's gravity in a grid of several kilometers all over the world and then made a mathematical model, which is known as "World Geoid Model".

To establish a relationship between the ellipsoidal height (h) & geoidal height (N) of an area, the relationship between the world geoid model and local land topographic (undulation) characteristics of that area is required. The following procedure will be applied for that purpose:

Using the network adjustment data of baseline survey as input the "World Geoid Model" the geoid separation or geoidal height (N) for each of the surveyed points i.e. BM will be obtained. Then the orthometric height (H) will be calculated by using the above equation. The combination of "World Geoid Model" and the surveyed data will make a new model known as "Local Geoid model".

Secondly it is needed to make a relationship between the orthometric height (H) and the local datum (PWD). To do so, few numbers of BMs those covers the boundary conditions of Local Geoid Model are needed to be surveyed with respect to PWD datum from one or more reference BM available in the project area. Then an input data file for the "local geoid model" which consists of Latitude, Longitude, Ellipsoidal height, and m PWD height will be prepared. Incorporating this input file to the Local Geoid Model a relationship data file will be established between the orthometric height (H) and local datum (PWD). This data file is known as "local model input data file".

Finally, if the Latitude, Longitude, and Ellipsoidal height of a particular point (whose local datum i.e. PWD datum is unknown) is used as input to this "Local Geoid Model" in association with the local model input data file, then the mPWD height of that unknown point will be calculated by the model.

2.8.3 Methodology for Establishing Temporary GCP

The temporary GCPs will be established with a combination of GPS and Total Station surveys where suitable. DGPS receivers in RTK mode will be used for quick observation. However, in many cases, Total station will be used for establishing TGCPs by referencing (connecting) to the already established primary GCPs with geodetic coordinates.
The results and final outputs of the above survey will be a list of horizontal geodetic coordinates (x,y) in GWS84 and their projected values in BTM with Everest Bangladesh spheroid. All the TGCPs will be assigned with unique IDs and the same to be clearly identified and marked on the working mouza map sheets.

2.8.4 Physical Feature Survey

The physical feature survey will be carried out covering the entire Project Area.Before deployment of the survey team base map for conducting field level surveys shall be prepared using both features extracted by photogrammetric method and Mouza maps of the project area. Base map shall be compiled with majorroad network of the project area, important infrastructures, permanent prominent physical features etc. superimposed on Mouza maps having all Mouza features. The physical features which are hidden by tree canopy or dense vegetation will be surveyed Total Stations (TS) survey technique. Location of all existing structures and installations along with types in respect of use, construction and storied will be surveyed. Names of structures, type of construction, uses and storey etc. will also be recorded during physical feature survey.

Survey will also cover location of all existing exposed light/electric, telephone posts and towers, water, sewerage line roads etc. Data will be recorded with separate ID or code number for each feature (a Line, Point and Polygon). Later on the survey data will be transferred directly to the GIS database where the feature will be kept in separate layer wise with specified code or ID. Physical feature survey information will be presented on the Mouza maps.

2.8.5 Topographic Survey

Stereoscopic Satellite Image (3D Image) will be used to extract the topographic features. The Land levels or Spot levels have been derived as DTM points with an interval of 10m grid from the stereo model. To carry out the survey for alignment and crest levels (not exceeding 50m) of roads, embankments, dykes and other drainage divides, alignment of rivers, lake, canal drainage channels, irrigation canals etc. with flow direction and water body demarcated in the study area, a combined methodology will be followed using Satellite Image (with Stereoscopic Data), DGPS and Total Station. Photogrammetric technique will be applied in the less vegetated and cloud-free area in the satellite images. On the other hand, the areas that are under covered with thick vegetation are not possible to survey using photogrammetric method. Those areas will be surveyed using DGPS/RTK-GPS and Total Stations. The BMs established by the RTK-GPS will be used in the Total Station Survey as reference (Station and Back Point). The TS survey will cover the survey of the point, line and closed boundary features as well as general spot levels on the land. Spot/Land level survey has included spot value as Northing, Easting and Elevation. These points will be incorporated into DTM points.

2.8.6 Land use survey

The Land use survey will be carried out by recording the current use of the land in the study area. The current use of land will be classified according to provision given in the TOR. Land use survey basically records the use of land by its functional activity such as residential, industrial or commercial in built up areas. The maps prepared through physical survey will be used as base map for land use survey. Land use features will be identified and classified using the recorded code and separated in different layers during data processing stage, from where the category wise land use map will be drawn using the identification of each land uses features. The methodology and technique will be followed bellows:

- Checking every plot of land and building and its current use.
- Checking infrastructure provisions
  - Social infrastructure e.g. school, hospital, etc. with location
  - Physical infrastructure e.g. housing, offices, energy, work, sanitation etc.
  - Transportation with width of roads with and without drainage links with other areas etc.
- Recording of natural physical conditions of the land like: rivers, drainage, canals etc.
- Review of topography of the area from the Topographic Maps

Perfection in land use determination and area demarcation will be attained through intensive field verification.

2.8.7 Field Verification of Physical Survey and Updating of Maps

After preparation of physical survey maps, one set of colored maps (topographic and physical infrastructure, physical feature and landuse) will be plotted in appropriate scales for field level verification. The field level checking has been supervised and monitored by the joint team of UDD and the consultants. Based on field verification, the necessary updating of physical survey maps will be done and final map layout will be produced for submission to UDD.

2.9 Data Base Preparation

The consultant will prepare digital databases for using the data collected through field survey and other secondary sources. These data can be used by the project staffs and counterpart staff of PMO for use in planning, development as well as research purposes.

Two types of database will be developed these are GIS Database and Textual Database. The GIS database will contain spatial layers such as structures, roads, waterbodies, etc. with their attributes and the textual database will contain textual data such as socio-economic survey data, traffic survey data, etc.

2.9.1 Development GIS Database

The Consultant will develop a GIS database for systematically organizing, storing and easy retrieving the information and data of the project area.GIS Database is the key component of a GIS and has two general types: Spatial and Attribute data.

Spatial Data

Spatial data is optimized to store and query data that represents objects defined in a geometric space. Most spatial databases allow representing simple geometric objects such as points, lines and polygons.

Points 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 is i.e Latitude and Longitude, or a co-ordinate reference with details 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. They can also be used to represent linear features that do not exist in reality, such as administrative boundaries or international borders. 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. Polygon/Areas are represented by a closed set of lines.

The spatial dimension of data can be regarded as the values, character strings or symbols that convey 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 is depends on:

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

Sources of spatial data for development of GIS database of Preparation of Development Plan for Ramu and Rangunia Upazila may be outlined below:

Mouza maps from DLRS
Stereo Satellite image based features
GPS and Total Station based field survey.
Maps and Data collected from different secondary sources.

In this project all spatial data will be structured and stored in GIS database using layer based approach, the most common method of structuring spatial data in GIS. Every layer will be thematic and that will reflect either a particular use or a characteristic of the landscape.
There are some most common spatial layers to be used in the project are given below:

Building structures
Road networks
River
Utility services
Institutes
Land Use category
Physical infrastructures etc.

Digital Data/ Information

Attribute Data

Attribute is the non-spatial data associated with spatial data i.e. point, line and polygon/area entities. Each spatial entity may have 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. Attributes give additional information about the character of the entities. Some GIS are 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 is:

dBase
Microsoft Access
Microsoft Excel
Oracle
Structured Query Language (SQL)
Fox-pro

The followings measures will be taken as part of GIS Database development:

- All different layers of spatial data would be referenced to the GCPs under the geodetic coordinate system projected into BTM.
- Spatial data will be stored in different layers systematically as per GIS database specifications developed by the consultant. Name and type of the layer and structure of the Attribute Table of the Shapefile or Feature classes are clearly defined in those specifications.
- All attribute and textual data which have spatial relationship will be assigned with a common ID be stored either in mdb/dbf or ArcGIS Table formats.

2.9.2 Development of Textual Database in SPSS

The textual database will be developed in SPSS to store and analyze the following data:

- Socio-economic survey data of both urban and rural areas
- Survey data of both urban and rural economy
- Social infrastructure data of both urban and rural areas
- Traffic survey data

- Formal and Informal Industrial Survey data of both urban and rural areas
- Recreational Open Space survey data
- Health Facilities survey data
- Educational Facilities survey
- Agricultural Land Demarcation Survey data
- Archaeological survey data
- Pollution survey data

2.9.3 Preparation of Map Layout and Legend

A standard map layout will be developed by consultation with concern project officials. ArcGIS 10.2 will be used to develop the standard layout for mapping. Legend will be created after symbolizing features of each layer from the available symbols in ArcGIS. Necessary approval on draft map layout will be taken from PMO on the Title, Legend and Size of different maps.
Proposed shape description and layers are enclosed in Table- 2.6. If required, later on this layer will be updated and finalized as per suggestion from Project Management Office.

Table-2.6: Proposed Shape Files Description and Legend

Proposed Coverage Name	Feature Type	Type
Land Use	Polygon	Shape
Boundaries	Line/Polygon	Shape
Roads/Railways	Line/Polygon	Shape
Road Island/Divider	Line/Polygon	Shape
Embankments and Drainage Divides	Line/Polygon	Shape
River, Khal and Natural Drainage Channels	Line/Polygon	Shape
Artificial Drainage System	Line/Polygon	Shape
Pond, Water Bodies, Swamp Areas	Line/Polygon	Shape
Hydraulic Structures	Point	Shape
Towers	Point	Shape
Utilities Services	Point/Line	Shape
Structures	Polygon	Shape
Natural Features	Polygon/Line	Shape
Other Features	Line	Shape

2.10 Survey Data Processing (GPS and Total Station Data)

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

2.11 Preparation of Map Layout and Legend

A standard map layout will be developed by consultation with concern project officials. Leading GIS software for map production ArcGIS 10.2 will be used to develop the standard layout for mapping. Layer files for map features will be selected from the available symbols in ArcGIS 10.2 and all the soft data will be supplied as Shape files. Proposed shape description and layers (compatible to use in ArcGIS) are enclosed in Table- 2.7. If required, later on this layer will be updated and finalized as per suggestion from Project Management Office.

Table-2.7: Proposed Shape Files Description and Legend (Compatible to use in ArcGIS desktop info version).

Proposed Coverage Name	Feature Type	Type
Land Use	Polygon	Shape
Boundaries	Line/Polygon	Shape
Roads/Railways	Line/Polygon	Shape
Road Island/Divider	Line/Polygon	Shape
Embankments and Drainage Divides	Line/Polygon	Shape
River, Khal and Natural Drainage Channels	Line/Polygon	Shape
Artificial Drainage System	Line/Polygon	Shape
Pond, Water Bodies, Swamp Areas	Line/Polygon	Shape
Hydraulic Structures	Point	Shape
Towers	Point	Shape
Utilities Services	Point/Line	Shape
Structures	Polygon	Shape
Natural Features	Polygon/Line	Shape
Other Features	Line	Shape

More detail of technical specification of GIS data is attached in Appendix-2.

2.12 Physical Feature Survey

2.12.1 Method

The methodology for physical feature survey has been prepared on the basis of the targeted objectives in the TOR.

a. Mobilization of Survey Team

A reconnaissance survey of the project area will be carried out immediately after the signing of the contract agreement. A data collection team will be then engaged to collect the map, data and other related information of the project. A survey work plan will be submitted to the client and the Upazila in due course.

b. Field Reconnaissance

The consultant will conduct a reconnaissance visit to the Ramu and Rangunia project area to get first hand information on the site data, on site location, access, communication, land condition, requirement of personnel, and equipment etc. will be collected for detailed site analysis. The field reconnaissance will be done with an overall visit to the entire project area, discussions with PMO/ Upazial Parishad for collecting of existing data. The detailed tasks may be further specified in the following:

- Interaction with the Project officials of PMO, UDD.
- Collection of existing data and project maps.
- Collection of existing Bench Mark (BM) information in and around the project area.
- Planning the proposed BM/Control points network and selection of tentative Locations for those BM/Control Points.
- Detail planning of the survey activities.
- Arrangement of field office.
- Arrangement for communication and field transport.
- Calibration of equipments.

c. Selection of Temporary Ground Control Points (TCP)

Temporary ground control points are established to locate the total station equipment that need to be shifted for the purpose of picking up physical features. They are not permanent BMs but require to be identified during total station survey. However, these can be converted into permanent bench marks if found advantageous.

Physical infrastructure survey will include:

- All existing structures position and dimension (3-D-X, Y, Z value).
- Cross section, long section, type, width, length and name of road, road level above datum, flooding, land slopes, borrow pit.
- Identification of any bridge or culvert on the road and their length, width and span of the bridge, condition of abutments, condition of the dyke, wing walls abutment.
- 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 deep tubes well, overhead water tank and its capacity, catchment area of overhead tank.
- Identification, location and capacity of electric substation, telephone exchange, Titas gas subs station etc. Treatment plant and waste disposal facilities.
- Identification, location and capacity of electricity, telephone, gas, and waste disposal and treatment system.

2.12.2 Deliverables

Physical feature survey will be done on the enlarged mouza map at a scale of RF 1: 3960. Physical features map will be updated based on the data/information collected during physical verification in the proposed project area. Updating will be done on the computer through digitization. This updated physical feature map will be used for further activities of the project.

2.13 Topographic Survey

2.13.1 Method

Topographic survey refers to measuring the surface of the earth, in particular the study area, with standard known coordinates (0-0 origin for x and y coordinates) for Northing and Easting, and vertical (Z) coordinate, where Mean Sea Level in m PWD is considered as 0 m PWD. In order to perform topographic survey the study area was divided into specified grids as per ToR and grid intersection points were established for x, y and z coordinates. The Topographic database are obtained from geo-referenced 3-D (four band) image and further cross-checked and ground truthing by using RTK-GPS and Total Station to obtain and verify 3-D data (X,Y,Z value) on location and alignment of all data obtained from physical feature survey including roads, flood embankments and other drainage divides. Topographic survey covers the following features:

- Topographic survey by using RTK-GPS and Total Station to obtain 3-D data (X,Y, Z value)-location and alignment of all roads, flood embankments and other drainage networks. Location and alignment of all drainage and irrigation channels/canals showing depth and direction of flow. Closed boundary/outline of homestead, water bodies, swamps, forests etc. junctions, spot heights or land levels at roughly 10 m intervals for urban area and 20 m intervals for rural areas.
- All collected raw data submitted to PD before processing.
- Generating contours at 0.5 meter intervals with denser intervals for undulations.

- Alignment and crest levels (not exceeding 50meter) of roads, embankments, dykes and other drainage networks.
- Alignment of rivers, lake, canal and drainage channels etc.
- Outline of bazaars, water body, swamps etc.

2.13.2 Deliverables

The delivered topographic map will include roads, flood embankments and other drainage networks and location and alignment of all drainage and irrigation channels/canals showing depth and direction of flow. Closed boundary/outline of homestead, water bodies, swamps, forests etc. junctions, spot heights or land levels at roughly 10 m intervals for the whole project area and close interval as and when required such as dyke, embankment, roads, rail-roads, river bank, rail line etc.

2.14 Existing Physical Infrastructure Survey

2.14.1 Method

A physical infrastructure survey will be conducted to ascertain the existing physical features of the study area. According to the guideline in the TOR the consultant will conduct the surveys on the following features described in **Table-2.8** and features will be transferred to the enlarged CS/RS base maps.

Table 2.8: Physical Infrastructure Survey

Type	Name
Water Bodies	River Edge, Khal Edge, Drainage Channels, River/khal centerline, Flow direction, ponds/Tanks/Dishes, Coastline
Buildings/Structures	House, Industry, Commercial, Mixed, Boundary Wall
Roads	Road (Pucca, HBB, Katcha), Path (Pucca, Katcha), Traffic Island/ Divider, Road/Path Centreline
Railways	Railway Row Line, Centerline, Junction Points
Other Structures and Flood works	Bridge / Culverts, Embankments, Pump Station for Flood, Sluice Gates, Bus/Trucks Terminals, Harbor/ Bathing/boat Jetty
Natural Features	Forest, Group of trees, Group of Trees Point, Wetlands / Bog/ Marshland/ Flood prone area, Sand/Sand Dunes, Significant Single Tree
Utility Services	High voltage Electric Line, Telephone Line, Gas Line, Utility Substation, Overhead Water Tank, Waste disposal and treatment points, Water work, Deep Tube well Stations
Area Polygons	Residential Area, Commercial Area, Institutional, Educational, Health Govt office, Industrial (as classified by acts and rules), Agricultural Area, Recreation / sports, Religious / cemetery, Graveyard. Cemetery, Historic Place, Borrow Pits, Vacant Land, Public gathering, Garden, Disaster prone areas.

The survey team equipped with GPS, Total Stations and other necessary tools will be at field with draft plots of the mouza maps. Corrections will be done on the draft plot during field verifications and will involve adding missing lines and points for attributes of the existing features. During the field verification the information will be checked as per the format given in Table-2.9 and Table-2.10.

Table 2.9: 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 centre line		x			x		Name, width
5	5. Flow direction	x					x	
6	6. 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 Centre line		x			x		Name, width
D. Railways								
20	1. Railway Row Line		x			x		
21	2. Railway centre line		x			x		

Sl. No	Physical Feature Name	Data Type			Z Value (Z measurement level)			Description
		Point	Line	Polygon	On Top	On Ground/level	Not Required	
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
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

Sl. No	Physical Feature Name	Data Type			Z Value (Z measurement level)			Description
		Point	Line	Polygon	On Top	On Ground/level	Not Required	
								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 EPHE 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

Sl. No	Physical Feature Name	Data Type			Z Value (Z measurement level)			Description
		Point	Line	Polygon	On Top	On Ground/Level	Not Required	
								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

Sl. No	Physical Feature Name	Data Type			Z Value (Z measurement level)			Description
		Point	Line	Polygon	On Top	On Ground/level	Not Required	
								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 2.10: Spot Level Survey Format

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

During the field verification the Consultant team will check the following information and include on the base map:

- Existence and flow direction of river, khals and drainage channels
- Ponds, tanks, ditches and flooding area
- Pucca and semi-pucca structures

- Road and railway lines, if there is any
- Bus and truck terminal
- Embankment, sluice gates and pump stations
- Bridges, culverts, electric line, gas line, telephone line, deep tubewell etc.
- Boundary of union, ward and thana
- Commercial areas, shops, markets, etc.

2.14.2 Deliverables

All the collected data will be presented with maps, graphs and charts.

2.15 Land Use Survey

2.15.1 Method

The Land use survey will be carried out by recording the current use of the land in the project area. The current use of land will be classified according to provision given in the TOR. The land use survey (both attribute and spatial) will indicate the use of each plot of land and each building in the rural area and rural-urban fringe area. The surveyors will visit each and every site to record existing usage with specified notation and colors as per direction of the PD. The output of this survey will be one or more maps (scale: RF 1:3960) showing existing Gross Rural agricultural land use, residential, commercial, administrative and cultural zones, nature of rural area or rural urban fringe area (high, lower), water courses and water bodies, roads demarcating the main zones and plantation/vegetations .The methodology and technique to be followed:

Work details

1. Checking every plot of land and building and its current use.
2. Checking infrastructure provisions
3. Social infrastructure e.g. school, hospital, etc. with location
4. Physical infrastructure e.g. housing, offices, energy, work, sanitation etc.
5. Transportation with width of roads with and without drainage links with other areas etc.
6. Recording of natural physical conditions of the land like: rivers, drainage, canals etc.
7. Review of topography of the area from the Topographic Maps.
8. Density of population averaging from the no. of existing household, slum/squatters and mouza-wise areas under the study area. Field sheets would be joined together and every item of land use would be hatched or colored for different indexes categorically on the land use map as described in the TOR or as per the suggestions of the supervisory officials of City Corporation/PD office.

Land use survey data analysis

This will pertain to the study area only and include:

- Existing Land use and analysis
- Mouza-wise distribution of urban and semi-urban functions
- Characteristics of land use changes with existing economic potentials
- Adequacy of land use economically and socially
- Identification of areas of income generating activities

The preparation of list of occupants in the project area will start with reference to the mouza map. The field data collectors will prepare a list of occupants on the basis of field study. Legal/illegal status of occupation will be verified from records.

Land Use Survey Updating

Land use information have to be extracted from physical feature survey as per specification of TOR after completion of data processing and draft mapping, land use survey have to be updated through field verification.

Land Ownership Pattern Survey

During land use survey the investigators will also collect data on the land ownership pattern. They will identify the owners of the land in the project area and assess the area of the land owned by them based on the mouza maps and the available documents. With a view to collect data on land ownership systematically, Consultant will design a format and will finalize it in consultation with the concerned officials of Project Management Office.

2.15.2 Deliverables

Utilizing the physical feature base map, the land use survey maps will be prepared showing the twelve categories of land use according to the occupancy type indicated in TOR (Appendix-3). The characteristics of each land use area will fully be described in the survey report. The Land Use Maps will be prepared on BS maps at specified scale based on the data collected through land use survey and the information of the base map. Perfection in land use determination will be attained through intensive field verification. The land use data will be made compatible to Workstation/ArcGIS 10.2 package. As per specification in the TOR land use information has to be extracted from physical features survey. After completion of data processing and draft mapping, land use surveys have to be updated through field verification.

2.16 Household Based Socio-economic Survey

2.16.1 Method

Household sample survey will be done using the approved questionnaire based on specified format indicated in TOR. Sample size will be minimum 5% of total household (sample size shall be determined in consultation with PD). Preparation of socio-economic questionnaire, editing, piloting, finalization and printing of questionnaire will be done by the consulting firm. Collected data will be processed through SPSS software. Then, a questionnaire survey will be conducted both in urban and rural areas in consultation with PD, and will check the quality of the field level surveyed data and enter the surveyed data into computer. The attribute data of surveyed households will be linked with spatial data collected from physical feature and land use survey where applicable. An indoor training will be provided to the investigators/surveyors before starting the field survey for maintaining the data quality. The enumerators will also ensure the quality of database (data editing, data cleaning) and would perform data analysis, tabulation, present it in graphs and figures, and preparation of report.

2.16.2 Deliverables

It is expected that from the survey, the following type of data/information (but not limited to this) will be available for using in the plan preparation and it will be represented by using graphs, figures.

- Holding information like area of holding, number and types of housing structure;
- Housing size, age, sex composition, educational, occupational status, income, expenditure, etc;
- Holding information like house structure, service provision such as electricity, gas supply, water supply connection, etc;
- Holdings tenure ship, nature of land, sanitation information, type of latrine, sewerage, drainage system, etc.;

- Information regarding urban facilities such as road, telephone, hospital, clinic, community center, etc.
- Information about household's attitude towards development works and initiatives.
- Location, size and attached facilities for Parks, playgrounds, river bank, historical space, and other open spaces;
- Information regarding dispensaries, health centers and hospitals showing their location and capacity;
- Information on different categories of schools, colleges, university and other education related institutions with the location, sizes and capacity.

2.17 Housing, Slums and Squatter Settlements Study

2.17.1 Method

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

Data from both the primary and secondary sources will be utilized for this study. General conditions regarding housing structure, sanitation and provision of services are available from census publication. For the slum and squatter settlement survey, first the locations and settlement sizes will be collected from a reconnaissance survey in the study area, supplemented by information collected from secondary sources. However, most of the information has to be collected from the primary source through a specially designed household questionnaire survey. The questionnaire will be designed to capture all the required information in a coded form suitable for fast processing by computer. A stratified weighted random sampling method will be used to conduct the household level sample survey. The study area will be divided into 4 primary areas. After discussion with Project Management Office, a suitable housing typology will be developed for each of these 4 broad types of area. The purpose of these sub-classifications is to ensure that the samples are drawn across the broad classification, and no important type is left out, and also duly represented in the sample size according to their number.

The questionnaire will capture a wide variety of information related to housing namely, access facility, building use, construction material, size and condition, service and utility facilities, ownership, cost/rent affordability etc.

2.17.2 Deliverables

After analysis, all relevant collected data will be presented in suitable tabular form. Any change in housing condition from that of 2011 census record will be analyzed.

Similar type of analysis as that of housing study will be carried out for the slum and squatter settlements. Most of the results will be presented in tabular form. Also maps of slums and squatter settlements will be provided.

2.18 Investment and Employment Study

2.18.1 Method

An employment and investment study of the project area is required to be carried out through collection of secondary data and sample survey of major centers of employment by broad employment types like formal and informal sectors. Questionnaire development related tasks will be done by consultant. Then, a questionnaire survey shall be conducted both in urban and rural areas in consultation with PD, and shall check the quality of the field level surveyed data and enter the surveyed data into computer. The attribute data of surveyed commercial and industrial

enterprises shall be linked with spatial data collected from physical feature and land use survey. The enumerator would also ensure the quality of database (data editing, data cleaning) and would perform data analysis, tabulation, present it in graphs and figures, and preparation of report.

Formal Sector

Information on formal sector will be collected mostly from the secondary sources. Direct inquiries of large employers, chamber of commerce, trade organizations, owners' associations and labour unions will be conducted. Besides, relevant government agencies (Bureau of Statistics, Ministry of Industry) publish regular reports that contain information on employment, investment, production etc. will be analyzed. Furthermore, official records of Chittagong City Corporation (CCC) will also be a valuable source of such information.

Informal Sector

At first it would be necessary to identify the nature of informal sector activities in the study area. It is expected that most of these activities will be in the service sector and small manufacturing units. A reconnaissance survey is proposed to identify the nature of activities.

Sample surveys will be conducted at the household level and at the business unit level with the help of two separate sets of questionnaires. While the household surveys will be designed to collect information on employees, type and nature of employment, income level etc. The business unit level survey will be conducted to collect information on investment, production, if locally consumed, or "exported", type of trading, number of employees etc.

The objective of this study is to analyze the present economic base of the study area and to assess how the significance of its economic base is changing compared to the national economy. This would determine the future growth potential of the area. The consultant will apply standard analytical tools for this purpose such as location quotient and shift and share analysis. The findings of these analyses will depict a clear picture about future employment and investment prospects in the study area.

At this stage, it is difficult to suggest anything about the sampling frame. This should be determined after the proposed reconnaissance survey and consultation with project officials and other concerned agencies. A sample detailed questionnaire/survey format to carry out formal and informal economic sector study will be as follows:

Table-2.11: Items to be Included in Formal and Informal Economic Survey

Items	Illustrated
Formal Economic Activities	Economic group, professional (NGOs/Bank/Insurance company etc.), economic activities, potentialities, type of business center (Katcha bazar, Hat, Retail market, Wholesale market, Shopping center and other etc.), industry, critical issues, turnover, registered, GDP, GNP, trade, and consumer.
Informal Economic Activities	Means of livelihood, unregistered economy, informal trade, category, fixed place retailers, mobile hawkers, turnover, consumer, and credit.

2.18.2 Deliverables

The attribute data of surveyed commercial and industrial enterprises shall be linked with spatial data collected from physical feature and land use survey. It would also ensure the quality of database (data editing, data cleaning) and would perform data analysis, tabulation, present it in graphs and figures and preparation of report.

2.19 Urban and Rural Economy Study

2.19.1 Method

Questionnaire will be prepared for studying urban and rural economy covering trade, commerce, shopping and other related activities. Editing, piloting, finalization and printing of questionnaire will be done. Then, a questionnaire survey shall be conducted both in urban and rural areas in consultation with PD, the quality of the field level surveyed data will be verified. The surveyed data will be entered into computer and will be analyzed using SPSS software. The attribute data of surveyed commercial and industrial enterprises will be linked with spatial data collected from physical feature and land use survey where applicable. The quality of database (data editing, data cleaning) will be ensured. Data analysis, tabulation and presentation will be performed in the report.

Trade encompassing banking and other financial institutions, shopping centres and shop, and commercial establishments differentiated into wholesale and retail shopping will be recorded. Growth or decline in economy during the last 10 years will be collected 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. This information will also be connected with the spatial data where applicable.

2.19.2 Deliverables

It is expected that from the survey, the following type of data/information (but not limited to this) will be available for using in the plan preparation and it will be represented by using graphs, figures.

- Information on overall economy related to trade and commerce of the study area including bank and other financial information, shopping centers and shops, various commercial establishments;
- Information of wholesale and retail shopping.
- Report on growth or decline in economy during the last 10 years with explanatory notes on the causes for growth or decline
- Information on 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.

2.20 Agricultural Study

2.20.1 Method

On the basis of the TOR, a questionnaire will be prepared and pretested. The team of the field level surveyors from the consulting firm will be assigned to carry out the field survey activities. The team will conduct a meeting with the field professional personnel of Department of Agricultural Extension (DAE) and collect secondary data. The agricultural land demarcation survey would be based on height of land, cropping pattern, cropping type, land utilization and flood level. Growth or decline of agricultural land during the last 10 years will be collected with explanatory notes on the causes for growth or decline covering a possible quality of existing and future agricultural land for the project area. The field survey work will be carried out through the process of Rapid Rural Appraisal (RRA) approach into the classified blocks in consultation with the DAE officials. The consultant will supervise the field survey work. Survey form will be recorded using code. They will survey land for earmark the agricultural activities and for conservation of agricultural practices. Moreover, areas of land levels with their cropping intensity (single, double and triple cropping) will be delineated. The agricultural land demarcation survey would be based on height of land, cropping pattern, cropping type, land utilization and flood level. All the collected

attribute and spatial data will be linked with other spatial database where appropriate. Later on, the output of the field activities will be processed, analyzed and classified according to the TOR. Work details are provided below:

- Questionnaire development, field pretesting and survey.
- Communicating with the respective Government and local level offices.
- Identification and classification of block.
- Data analysis, storage and presentation
- Report writing.

2.20.2 Deliverables

Using the field survey data, the land use survey and land type map will be prepared with the help of GIS. Reports will be based on using the information of major crops, cropping pattern, production potential of agricultural markets, industrial location identification, technology for development, growth or decline of agricultural land during the last 10 years etc.

2.21 Transport Sector Study

2.21.1 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 information on regional connectivity, accessibility, will be collected from the relevant authorities as well as from field surveys 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 model groups, particularly in relation to the spatial development pattern, and future development. Regarding traffic problems three types of surveys will have to be conducted;

a) Statistical analysis of the past trends in growth on the basis of types and numbers of different Vehicles.
b) The traffic flow and O-D survey in major roads, river ghats, and railway stations both day and night time for peak and off-peak period 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 at different locations in consultation with PD.
e) Regional connectivity
f) Accessibility
g) Public transport
h) Rural-urban linkage
i) Road network to growth center
j) Type of goods carried by different transport modes
k) Intervention of transport policies in that area

Transportation plan will be prepared on the basis of output of the surveyed data with a prediction model of 20-year period for Project area considering the future urban form. The consultant will review existing information and where necessary carry out surveys to obtain further information on available facilities for the available modes in the area. Major information to be collected by mode is mentioned below.

Road

- Road network by hierarchy
- Physical condition of roads (alignment, 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
- Mode

Rail

- Location of existing stations
- Physical condition and facilities
- Rail route
- Inter-modal transfer facilities

River

- Location of existing *'ghats'* and terminals
- Routes for different river transport
- Goods movement
- Modes of river transport

2.21.2 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 for different types of vehicles and from their owners' and operators' associations. However some field surveys and verifications will be required especially related to non-motorized vehicles. 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
- Number of taxicab, extent of service
- Number of auto-rickshaws, extent of service
- Number of rickshaws
- Number of all other types of NMVs
- Types of goods movements
- Information on cost by different modes

Rail

- Number, types, condition, and capacity of rails operating in the study area
- Services operated and their frequency
- Types of goods carried
- Cost

River

- Number and types of river transport operating in the study area
- Services operated and their frequency
- Types of goods carried
- Information on cost by different modes

2.21.3 Volume and Movement Patterns

To determine traffic volume in important roads within the project area and at entry and exit points, the consultant will carry out a traffic survey. For this purpose appropriate forms will be designed and detailed work plan will be prepared. Origin and Destination (OD) survey will be carried out in the project and its surrounding area to determine the direction of flow of traffic and its impact on particular areas.

In addition to collecting information on volume and pattern of traffic movement by traffic surveys, the consultants would try to accommodate certain important questions regarding people's attitude**.**

2.21.4 Analysis of Volume and Movement Patterns

After completion of the traffic and transportation surveys as discussed above, sufficient information will have collected and collated to proceed for analyzing the data. The collected information will be collated and analyzed with the help of SPSS and RIAS or other suitable software packages. The final selection of the package for data collation, statistical and spatial analysis, matrix building etc. will be assessed during actual designing of the surveys and at the data collection stage. Critical traffic junctions will be separately studied and conditions will be illustrated graphically.

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

Database and Spreadsheet Programs
- FoxPro, MS-Access
- MS-Excel

Data Collection and Analysis
- SPSS
- RIAS

Capacity Assessment
- HCM

2.21.5 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 origins 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. This information was especially important in trying to gauge the amount of possible spillover. Another purpose of the survey was to determine how much of the traffic was generated from within the neighborhood and how much of it was 'through" traffic which did not have an origin or a destination in the neighborhood.

There are two type of Origin-Destination Survey (O-D Survey). They are
1. Transit Terminal Survey
2. Home Interview Survey

The Techniques of O-D Survey are
1. Home interviews
2. Telephone interviews
3. On-board transit surveys
4. Mailed questionnaires
5. Pick-up postal cards

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

2.21.6 Deliverables

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
- Identification of routes connecting growth centers
- Regional connectivity, accessibility
- 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

2.22 Study on Drainage and Environmental Issue

2.22.1 Drainage Issue

2.22.1.1 Method

Extensive drainage study will be conducted to prepare a drainage plan for the study area by preparing contour map not only to cater the existing problems but also to address the future need. The following studies will be conducted.

- Preparation of detailed drainage inventory;
- Categorization of drainage system;
- Existing natural drainage situation with identification of areas of encroachment;
- Capacity and deficiency of drainage system;
- Drainage catchment zone demarcation

2.22.1.2 Deliverables

- Contour map
- Drainage network map
- Drainage plan

2.22.2 Environmental Issues

2.22.2.1 Method

An environmental management plan will be formulated for mitigation and protection of adverse effect of the project on the environment.

For assessment of environmental impact the following steps will be followed:

- Study of baseline environmental condition;
- Study of physical environmental condition;
- Study of biological environmental condition;
- Study of human environmental condition;
- Sloping, bounding and selection of important environmental components;
- Prediction, evaluation and mitigation of potential impacts;
- Suggestion of possible environmental management plan.
- Study on solid waste management
- Study on water pollution.

2.22.2.2 Deliverables

The following outputs are expected to be revealed from the survey and associated collected data.

- Pollution Map;
- Identification of environmental hot-spots;
- Solid waste management plan;
- Water pollution management plan.

2.23 Hydro-geological Survey

2.23.1 Hydrological Survey

2.23.1.1 Objectives and Methods

The objective of this study is to plan urbanization in such a manner that the impact of any development work can be absorbed by the watershed with minimum disruption and hence the adverse impacts on the ecosystem may be minimized. It is also an imperative to predict the response of the watershed due to a planned future urbanization and its impact, if any, over the surrounding suburbs. Any major disturbance that may befall upon will be foreseen and solution for that will be found out. A sewer system that leaves the sources of fresh water and agricultural lands in the outskirts unharmed and at the same time efficient and easy to maintain and solves water logging problems will be prescribed. Preparation of detailed drainage inventory and categorization of drainage system will be necessary for that. Encroachment of the natural water bodies will be identified too. Referring to water logging problem alone, it is necessary to calculate the capacity and deficiency of the existing drainage system and demarcation of Drainage Catchment Zone will have to be done. Keeping the interests of the coming generations in mind it is preferable to formulate a water resource management plan that relies more on surface water and lesser on the ground water. Expansion should not undermine ground water recharge.

During reconnaissance survey of the project area, major water bodies like ponds, haors, rivers, marshes, channels that are perennial and manmade canals will be identified. Significant depressions, wetlands and non perennial channels will be identified. Source of drinking and household water at present and probable sources will also be recognized. Suitable area(s) where household and sewer may be disposed will be demarcated. Another important task will be to identify hydraulic structures like water retention structures, regulators, sluices, closures, header tanks, irrigation canals (buried/surface), embankments, dams, levy, drainage canals (buried/surface), siphons, aqueducts, culverts etc and understanding the purpose of those. The present condition of these interventions has to be noted. Directions of the flowing water bodies

have to be identified and the effects of lunar tides have to be observed. Drainage plan will also be prepared using the drainage map extracted from the contour map/DEM as well as considering Highest Flood Level (HFL), annual rainfall data, flood return period etc.

Detail level hydrological survey will involve the bathymetric survey of existing rivers and channels. Survey has to cover the bottom profiles of haors, marshes, ponds, ditches etc. Profiles of depressions and non perennial water bodies also have to be surveyed if imageries for photogrammetric survey are not taken during dry period. Route survey of existing drainage system has to be done and their sizes will have to be measured.

Data for aquifers are to be obtained from authorized secondary sources. Highest flood level, flood return period, water level, annual rainfall data, discharge and sediment data will be collected from BWDB hydrology department. The extent of data collection from secondary sources is subject to the availability of relevant data.

The reconnaissance and detailed survey, collected maps and analyzed data will lead the consultants to identify the flood flow zones, flood free zones and help them to delineate the drainage zones. It will also help determining any increase in peak discharge and to arrest the increased peak flow if necessary.
Report will be prepared on the basis of output of the obtained data showing a prediction model of long, medium and short term (100, 50, 20 and 5-year period) for Project area. All the collected attribute and spatial hydrological data will be linked with other spatial database.
To conclude, the study will help the consultants devise policies for a sustainable plan from the hydrological point of view.

2.23.1.2 Deliverables:
A report containing the table, graphs and charts representing the following data:

- Collected and analyzed data.
- Calculation and projection of storage and runoff.
- Drawings representing survey works like cross sections and long sections of major rivers and channels.
- Maps showing the outlines and contours of haors, depressions, marshes, wetlands etc. and encroachments of water bodies.
- Consultant's assessments on the short term and long term response of the watershed.
- Devised policies on the basis of analysis and assessments done.
- Proposals for sewer systems.
- Location and alignment of all drainage and irrigation channels/canals showing depth and directions of flow. Closed boundary/outline of homestead, water bodies, swamps, forest etc. junctions, spot heights or land levels at roughly 10 m intervals for urban area and 20 m intervals for rural areas.
- Generating contours at 0.5 meter intervals with denser intervals for undulations.
- Alignment and crest levels of road, embankment, dykes and other drainage divides.
- Report on prediction models of long,medium and short term for project area.

2.23.2 Engineering Geological Mapping

2. 23.2.1 Sub-surface 3D model of different layers up to depth 30m

Method:

- Preparation of geomorphological map using digital elevation model (DEM) and satellite and different image such as Spot images, Satellite images etc. The prepared geomorphological map will be verified by field auger test and collecting of relevant existing data.
- Based on the area of the geomorphic units, borehole locations will be selected and drilling for identifying the geological characteristic of sub-surface soft sedimentary rocks up to depth 30m and description of different sub-surface layer of the soil its sedimentary characteristics, structure, lithology etc. Number of boreholes for urban and rural areas will be decided as per TOR.
- Description of engineering properties of different sub-surface soil layer: SPT value, soil strength and foundation layer etc.
- Collection of soils from different sub-surface units from the bore hole and analyses the samples in sedimentary and engineering laboratory.

Computing all the results of soil properties, geomorphological and geotechnical properties preparation of 3D model for sub surface information of different layers of the area will be done by using GIS and other software.

2.23.2.2 Methods to be used for Subsurface Investigation in the field

Geotechnical investigations will be executed to acquire information regarding the physical characteristics of soil and rocks. The purpose of geotechnical investigations is to design foundations for structures.

The list of geotechnical works that will be done in the study area are given below in **Table-2.12**:

Table-2.12: List of geotechnical works, reason for testing and number of testing

Test Category	SL No	Name of Test	Reason for Testing
In-situ	1	Standard Penetration Test(SPT)	To determine the geotechnical engineering properties of subsurface soils
Laboratory	1	Grain Size Analysis	To determine the percentage of different grain sizes contained within a soil
	2	Direct Shear Test	to determine the consolidated-drained shear strength of a sandy to silty soil
	3	Unconfined Compression Strength	To determine the unconfined compressive strength.

The methods and materials which will be used to carry out the above-mentioned activities described below:

In-situ/ Field work

One of the oldest and most common in-situ tests is the Standard Penetration Test (SPT). It was developed in the late 1920s and has been used extremely in North and South America, the United Kingdom, Japan, and elsewhere. Because of this long record of experience, the SPT is well-established in engineering practice. It is performed inside exploratory boring using inexpensive and readily available equipment, and thus adds little cost to a site characterization program.

Although the SPT also is plagued by many problems that affect its accuracy and reproducibility, it probably will continue to be used for the foreseeable future, primarily because of its low cost.

However, it is partially being replaced by other test methods, especially on larger and more critical projects.

The geotechnical boreholes will be done using wash boring method. The boring methods those will be followed are-

- Wash Boring
- Soil Sampling
  - Thin-walled sampler will be used to collect undisturbed samples from boreholes.
  - Split-spoon sampler will be used to collect disturbed samples from boreholes.

Laboratory test

The methods of the laboratory tests are described in the following sections. ASTM Standard will be followed to carry out the tests.

- Grain Size Analysis
  - Sieve Analysis
  - Hydrometer analysis
- Direct Shear Test
- Unconfined Compression Strength (UCS) Test

The technique of geotechnical investigations are summarized in the following figure

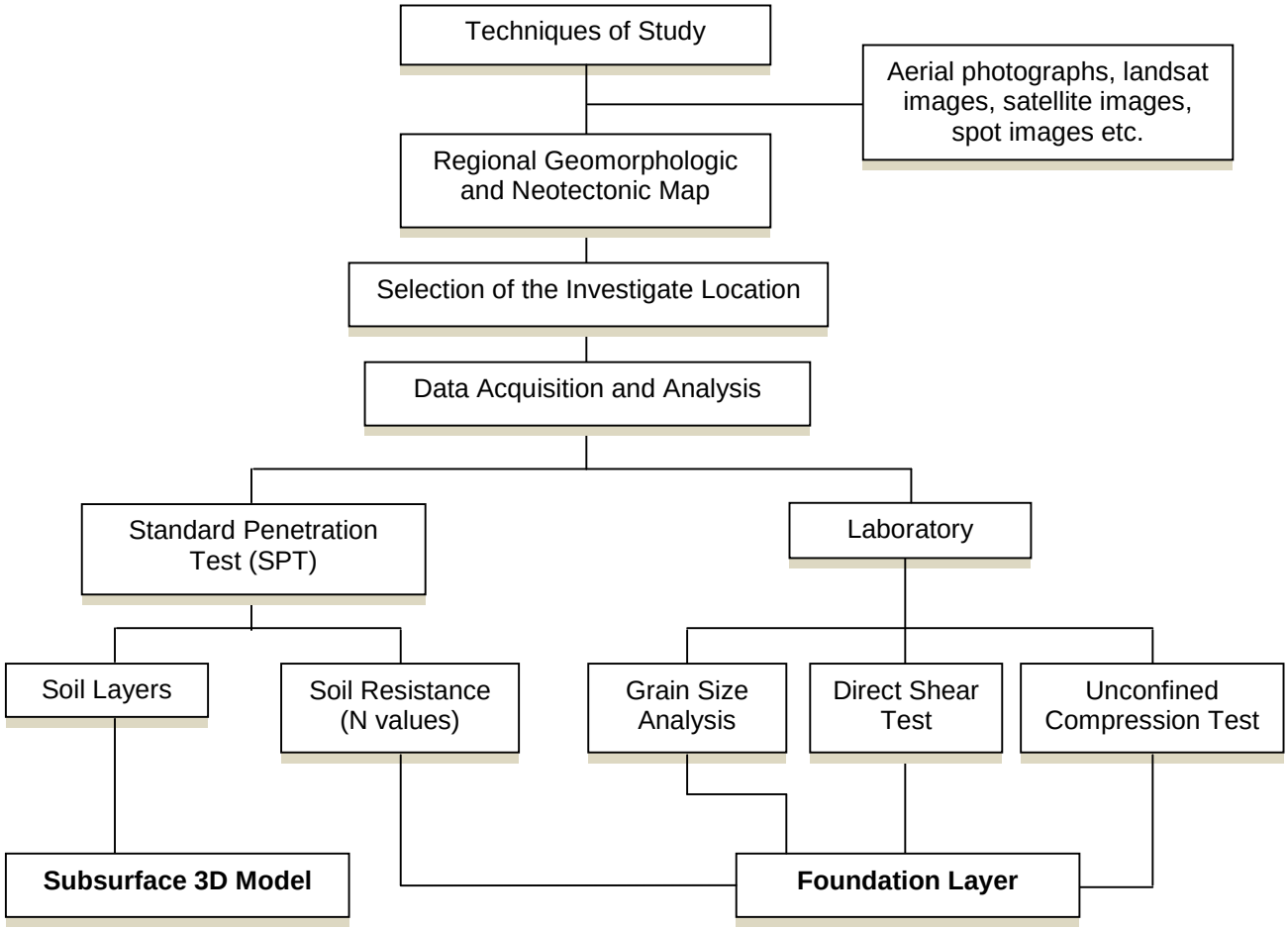


Figure-2.3: Flow Diagram of Geotechnical Investigation Method

2.23.2.3 Deliverables

The following maps and data will be Delivered-

1. Geomorphological map of the study area
2. 3D sub-surface lithological model up to the depth of 30m from existing ground level.
3. Regional morphotectonic and neotectonic map
4. Foundation Layer Map

2.24 Studies on Disaster Management

In the Fourteen Upazila project, risk reduction is a potential thematic area that comprise of reduction of urban and rural populations through structural and non-structural interventions, improve awareness of natural hazard events that targeted the specifically extreme poor. This area covers the assessment and management of earthquake, landslide and hydrological hazards in predominately urban context.

This component mainly address the following areas,

a. Earthquake hazard, vulnerability, risk and loss assessment for project area.
b. Building inventory of the Urban area
c. Development of scenario-based spatial earthquake contingency plan for project's urban area.
d. Preparation of ward based spatial contingency plan of the project area.

2.24.1 Regional Morpho-tectonic and Neo-tectonic Mapping

2.24.1.1 Method:

1. Preparation of regional morphological map
   - Using the topographic contour map, different band based satellite images and aerial photographs
2. Regional tectonic map
   - Using the published reports and data from different sources, compilation of all the collecting data and maps in library and laboratory work.
3. Regional Neo-tectonic map
   -Using the aerial photographs, satellite images, spot images etc. in laboratory work. Study the lineament, land forms, structures and drainage pattern from signatures and other features of aerial photos and different images. Required field visit for ground truth studying in the area will be performed.
4. All maps will be prepared in computer by Digital Method.

2.24.1.2 Preparation of Map and Report

Compiling all available data of Bangladesh and surrounding areas, morphotectonic and neotectonic map and report will be prepared.

2.24.2 Seismic Hazard Assessment

2.24.2.1 Method

Morphological map including slope of the land formation, soil characteristic, engineering properties of different subsurface layer will be collected.

- Collection of seismic zoning regional map.
- Collection of earthquake effect data of the area including geomorphological changes of land, subsidence or displacement of land, crack of land surface or any infrastructure damage in the area for multi-hazard map.

- Collection of earthquake data of the region from US Geological Survey, Dhaka University, GSB and other organizations, and compilation of these data.
- Collection of seismic sub surface data from GSB, BAPEX or any other organization.

2.24.2.2 Deliverables:
Collecting all the available data from different sources seismic hazard assessment report and maps will be prepared.

2.24.3 Vulnerability Assessment
2.24.3.1 Method
Vulnerability estimation is a complex process, which has to take into account not only the design of building but also the deterioration of the material and damage caused to the building, if any. Based on the building and lifeline inventory, vulnerability maps which show the characteristics of the buildings, essential facilities, and lifelines that make them susceptible to the damaging effects of earthquake were developed. Table 2.13 below illustrates the outlines of database.

Table2 .13: Outline of database for Vulnerability Assessment

List of Features	Updated Information Required
Building Information	Number of stories, Occupancy class, Structural type Number of occupants during the day and the night, Age of the building, Presence of soft story, Presence of heavy overhangs, Shape of the building in plan view, Shape of the building in elevation view, Pounding possibility etc.
Road	Type, Width, with or without footpath
Lifeline facilities	Location of electric pole, cable orientation, location of water pump & sluice valve, water supply and gas network detail with joint points. Underground facilities should be updated based on the information from respective service provider agency

2.24.3.2 Deliverables
(I) Report of different level of building survey, lifelines and essential facilities system (II) Seismic vulnerability assessment of the buildings, lifelines and essential facilities system

2.24.4 Damage and Risk Assessment
2.24.4.1 Method
A strong earthquake will affect the urban centers may result in widespread damage, high numbers of fatalities, destroying buildings and other physical infrastructure and facilities and may have disastrous consequences for the entire nation. In the aftermath of a catastrophic earthquake and subsequent aftershocks there will a massive requirements of response efforts. The conventional response efforts and capabilities will be quickly overwhelmed. For an effective response to a severely damaged area, immediate life-saving and life-sustaining measures entailing unique solutions will be required.

2.24.4.2 Deliverables
Damage and Risk assessment of the potential earthquake scenario, risk map etc.

2.24.5 Detailed Building Inventory Database Preparation
2.24.5.1 Method
The vulnerability assessment will carried out to find out the buildings vulnerability to earthquake and other disaster. A rapid visual screening survey will find out the buildings vulnerability types including heavy overhang, soft storey, short column, and pounding possibilities. From the visual

inspection, it is also found out the physical conditions of the buildings. After survey a detailed database on building vulnerability will prepare.

2.24.5.2 Deliverables

I) Multi-hazard Map, (II) Sub-soil profile for earthquake vulnerability (III) Multi-sectoral Risk Map

2.25 Studies on Unauthorized Encroachment

Encroachment of rivers, khals, low lands, wetlands, ponds and retention areas are a common practice in Bangladesh. Most of the natural drainages of study area disappeared or are in way to lose their existence due to unauthorized occupation through encroachment. These encroachments are taking place mostly through the unplanned development, unauthorized land filling to develop new residential areas, industrial and commercial activities, and encroachment on khals and rivers with unauthorized construction, etc. This part of the case study looks into the unauthorized encroachment with a focus on particular sites.

Usually unauthorized encroachment takes place on public water body or watercourse. Public water body / watercourse refer to khas or other state owned water body/water course. So such studies can take place on the banks of the river/khal, public pond, beel, etc. within the study area.

The terms of reference of the project has specified several items to be covered by the unauthorized encroachment study. The items to be covered under this study are presented in **Table-2.14.**

Table- 2.14: Format of Unauthorized Encroachment Study

Unauthorized Encroachment	Water body, road, rail way land, retention area, enforcement, law & regulation etc.

2.26 Review of Relevant Previous Studies and Plans

2.26.1 Implementation through Multi-Sectoral 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 Master Plan, implementation of these and other public works are to be efficiently coordinated through the Multi-Sectoral Investment Program, or MSIP. The consultant will make inventory of project and select projects based on following MSIP proceeding and other guidelines.

2.26.2 Principle of MSIP

The underlying principle of a Multi-Sectoral Investment Program (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 metropolitan area. One activity is to prioritize and schedule the investment projects of all public agencies so that they could collectively help to achieve the development goals and objectives of the Master Plan. 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.

2.26.3 Project Prioritization and Scheduling

The project prioritization and scheduling procedure occurs in two stages:

(a) 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:

(b) 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.

2.26.4 Funding Analysis

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 urban authorities, long-term debt financing and the capability to service such debt is a vital aspect of the analysis.

2.26.5 Implementation through Action Plans and Projects

Action Plans and Projects are implementation plans generally used to solve problems at the local level; for example, clearly environmental issues. Action plans take a direct approach toward plan implementation with a minimum of research, reports or elaborate planning methods. The objective is to identify those problems which are commonly recognized and which are believed to be solvable in the foreseeable future with presently available resources. They are a type of planning intended to identify solution to immediate and known problems requiring a minimum of resources.

2.26.6 Implementation by Facilitating Private Investment

The Upazila Master Plan, as proposed, will assist government to effectively guide the development activities of the public and private sector. Government's land taxation policies, coordinated investments in infrastructure, acquisition of land and other actions can be a part of this and can strongly influence, guide and encourage development activities of the private sector in a preferred manner. These will help to achieve the overall goals and objectives of the integrated Upazila Master Plan 'package'.

2.26.7 Community Level Participation

One of the main components of planning is "Problem Identification" the question then arises, what are the problems? Why and for whom do these problems exist?

These are vital questions to be answered. The answers must come from the community, because the community can play the major role in identifying problems, and the strategies and actions to be taken to solve these problems. It is observed that there are big differences between professionals and community members the way they look at the problems of the community. Professionals are mainly concerned with spatial infrastructural problems on the other hand the community members are mainly concerned with non-spatial socio-economic problems (such as unemployment, illiteracy, etc.).

Analysis of Constraints and Opportunities

Analysis of urban area development constraints and opportunities will be carried out using "sieve maps" and incorporate the key spatial impacts of projects identified from the review process. Sieve analysis will take particular account of existing flood prone lowland 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, field 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.

Forecasts

The Consultant shall make fresh population projection for the study area on the basis of National Population Census, 2011. Data in desegregated form will be collected on magnetic medium from the Bureau to enable a greater depth of analysis. Equal importance will be given the data from earlier censuses of 2001 1991, 1981 and 1974. Density will also be taken into account as an important factor for the study area. All forecasts would be for 5 years periods and wherever possible by 5-year or other broad age groups so that age wise specific facility requirements, such as number of schools could be determined.

Resource Assessment

Assessment of expected resources to be available with Pourashava, Upazila Parishad, Union Parishad and other development agencies operating in the sub areas will be made in order to formulate the viable action plans for the project area. Projection of anticipated revenues and expenditure will also be made.

This will help to address the following questions.

- availability of funds in the short term, including municipal revenue, untapped ability to pay, under payment, national government and external agency support etc.;
- human resources availability;
- availability of technical and physical resources like base map, construction equipment, other physical resources including land; and
- Commitment of development agencies to respond to the identified problems and short term development objects.

2.27 Approaches to Planning

The Consultant will follow an innovative, realistic and people oriented planning approach considering the present problems and development constraints and anticipated aspirations of the people. This approach will have better prospects of implementation under the present circumstances. The consultant believes that the plan should not only be a land use plan to regulate the land uses like residential, commercial, industrial or other developments in the traditional sense of development control but a realizable and pragmatic planning document. The plan will elastically aim at achieving objectives of planned and guided development. The plan will not only create an optimal land use development but will probably bring out a development, which will form the environment, accessibility, shelter and services point of view and would be much more rational than the present uncontrolled and uncoordinated development.

Planning output

The final output of the planning process will be a series of hierarchical and integrated plans comprising the Sub-regional Plan, Structure Plan, Urban Area Plan, Rural Area Plan and Action Area Plans, which will be based on thorough analysis and understanding of the present

characteristics, development constraints and future developmental opportunities. Moreover, action would be taken through government, private and non-government initiatives as indicated in the preparation of Detailed Area Plan for the betterment of the community. Attention will also be given to the following qualitative aspects of the plans:

a. Functional quality to accommodate space for different functions that establish relation between functions and ensure efficiency of infrastructure.

b. Aesthetic quality

Aesthetic quality is very much important for any city/town design. Except the aesthetic view there is no city that can be decorated. So, the specific area design should consider the aesthetic quality e.g. zoning regulations, density and height restrictions etc. Building types should be similar and well organized. Following guidelines may be followed to maintain the aesthetic quality:

- Profile alignment and 'greening' of major infrastructure elements.
- A clear distinction between formal development (frontage) along major infrastructure and more informal development inside infrastructure "cells".
- Composition of high-rise and low-rise construction zones, as related to infrastructure and landscape.
- Typical landscape elements as rivers khals, lakes and ponds, forest, tree lanes etc. (to be preserved and enhanced when existing, to be created when it is required), the plan should seize the opportunity to use these elements to emphasize the identity of the area and come to a more location specific design.
- Beautification of special elements and special zones (urban centers, important institution, major roads/public transportation intersections, etc. by using sight lines, vistas, landscaping, open space, composition of building masses and other architectural means.

c. Flexibility

Flexibility is another important element for urban planning. Planning should not be rigid but always flexible. Plan should be changed with the consultation of Town Planner / Consultant. A vast discussion may be held on any type of planning issue for better city/town planning.

e. Allowable Deviations

Allowable deviations are generally determined in different survey works and mapping (GPS survey, map digitization, maps distortion, field checking, etc.). These deviations are corrected through consultation with clients and consultants according to design principles. After discussion about allowable deviations then planners possibly reach their decision how many percentages are accepted and discarded the above mentioned method.

2.28 Determination of Planning Principles

To determine the planning principles of the current planning practices, following two situations will be addressed:

Delineation Existing Urban Area

Based on the existing survey, a base map will be prepared to find out the existing urban growth. 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 urban areas as well as unplanned (small scale incremental development) new areas, the functional design work just comes down to applying the planning principles that

result from the survey and study. For these purpose land management technique for sub-areas: land readjustment, guided land development and site-and-services schemes have to be identified, and these have to be combined with road widening/missing link proposals and locations for neighborhood centers.

Delineation of New Urban Area

For the development of new urban area, especially large scale planned development; there is more freedom to adopt formal design principles.

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

The networks have to be combined as much as possible to prevent waste of space. Once the combined infrastructure network has been established, the design process has to be dealt with landuse in each of the 'cells' of the network. Here plot size and principles for clustering and accessibility are the most important issues.

Non-Urban Area

Non-urban area includes flood flow, agriculture and water protection areas. Emphasize should be given on conservation of those non-urban lands. In some special cases, those lands may be used (for communication network planning, rainwater harvesting and expansion of any major economic activity where employment generation is possible).

Rapid urbanization in the form of unplanned development is taking place in the project area. Therefore, the Consultant will analyze the area, which is partially developed, and will be absorbed with the existing urban areas. For the existing urban area, density control guideline, planning principles and appropriate land management technique will be adopted.

2.28.1 Land Management Technique at Neighborhood Level

Land management technique can be taken at neighborhood level in the following method, these are - Participatory Detailed Area Development Plan and Compulsory Land Acquisition Based Detailed Area Development Plan.

2.28.2 Participatory Action Area Development Plan

This kind of plans can be prepared for a potential residential area going to be developed or has already developed as sprawl area when there is still scope for improvement or upgrading through provision of infrastructure. The plan will be prepared taking the local land owners as development partners supported by other stakeholders including local service agencies. There are several important types of plans under this category such as:

Urban renewal

Most cities and towns contain areas that are substandard, decadent or blighted open space (a predominately open area which is detrimental to the safety, health, morals or sound growth of a community and which is predominately open because it is unduly costly to develop it soundly through the ordinary operations of private enterprise). Urban Renewal is the process of redeveloping that deteriorated section of a city, often through demolition and new construction. Although urban renewal may be privately funded, it is most often associated with government renewal programs. The typical program attempts to demolish concentrations of dilapidated housing and attract developers of middle-income or mixed housing. Often, however, urban

renewal areas become sites for new public buildings, such as civic auditoriums, sports arenas, and universities.

While envisioned as a way to redevelop residential slums and blighted commercial areas in cities, large and small, it often resulted in vast areas being demolished and replaced by freeways and expressways, housing projects, and vacant lots. Extra caution must be attached to this technique to avoid heritage structures or sites in the name of development. Historical heritage site of Project area deserves such caution.

Land Readjustment Project (LRP)
In this type of plan development authority can play a vital role in planning and development in cooperation with land owners and other service giving agencies. The features of LRP are as follows:

- Prepared for undeveloped urban fringe areas where structures are yet to be cropped up;
- Land owners need to surrender their land development rights temporarily to the developer;
- Developer shall take over the entire tract comprising suitable sizes of plots;
- The area is developed and provided with road and other services and infrastructure;
- After development the plots are allotted to the original land owners as per agreement and the surplus land remained after allotment is sold out to recover the project cost.

Guided Land Development (GLD)
Guided Land Development Plan is a participatory plan usually prepared for an area where there are a large number of small land parcels belonging to many different owners. The main features of GLDP are:

- Usually prepared for urban fringe areas;
- Land remains under the existing ownership;
- Development agencies construct road and other infrastructure facilities;
- NGO can play active role in negotiation, planning and development;
- Land owners provide land free of cost for road and other infrastructure development.

Area Improvement Plan (AIP)
Area Improvement Plan (AIP) is prepared for existing spontaneous areas that are threatened by degradation of physical environment due to sprawl and unplanned development. The objective of such plans will be to promote civic facilities and improvement of livable environment. The main features of AIPs are as follows:

- Widening of existing narrow roads to appropriate level to allow smooth movement of traffic;
- New link roads are created to open up congested areas;
- Contribution of the local community may be sought to share development cost in the form of land or money; development authority will bear the initial cost of development;
- Development cost may be realized from the beneficiaries through development of appropriate mechanism.

2.29 Analysis of Current Situation and Identification of Critical Issues

The Consultant will analyze the study area from various perspectives based on the visual observation, consultation with stakeholders and survey data collected from the field. The objectives of all the surveys will be to assess the existing conditions, problems and opportunities of the study area from different dimensions. The study area will be assessed with respect to physical and social infrastructure, utility services, and availability of space for development, drainage, land use development, social classes, and housing conditions based on the income group and environmental conditions. These assessments will help the Consultant to identify the critical issues of the project area. These will in turn, assist in priority-planning proposals, keeping in view the critical issues and extent of problems of the area concerned.

2.30 Formulation of Planning Standards

A set of planning standards and development provisions will be formulated before embarking into the planning process to determine the level and kind of services and facilities to be provided in the planning area. District Towns Infrastructure development Project (DTIDP), Upazila Towns Infrastructure development Project (UTIDP) of LGED, Upazila Master Plan Prepared by UDD, Dhaka Metropolitan Development Plan (Structure Plan and Urban Area Plan) Report, Structure Plan, Master Plan and Detailed Area Plan of Khulna City, Structure Plan, Master Plan and Detailed Area Plan of Rajshahi City and recently completed Master plan for Sylhet & Barisal Divisional Towns, other national and international standards of different development agencies for providing the services and facilities will be reviewed for formulation of planning standard. The nature and types of existing services/facilities and future demand will be analyzed for formulating planning standards based on poulation projection.

2.31 Reference to Relevant Previous Plans

After completion of review and analysis of the existing situation of the project area the planning process will be started immediately. The study team of Consultant will make a comprehensive review of different plans of other cities like plan prepare at different pourashava, Upazila head quarter master plan, Rural Development Plan, Risk Sensitive Land Use Plan, Dhaka Master Plan 1959, Dhaka Metropolitan Area Integrated Urban Development Plan 1981, Structure Plan, Master Plan and Detailed Area Plan of Rajshahi City in order to examine the method, approach, standards followed in those plans and how far they can be adopted in the new plan. For the preparation of Detailed Area Plan, policies and guideline of the Structure Plan and Urban Area Plan will be followed. Besides, a review will also be carried out to assess the success, failure and causes of failure of the implementation of earlier plan provisions.

2.32 Demographic Analysis and Population Forecasting

A primary criterion in the planning process is to analyze the pattern of demographic changes and peripheral issues like population and housing density of the project area and to forecast future population for which, the development plan will be prepared. These forecasts will be necessary to provide adequate services and facilities including physical and social infrastructure.

The methodology applied in forecasting residential land use involves forecasting of intensification of the existing land use in terms of likely increase in persons per hectare density as well as forecasting land use extension in terms of increases in the residential area. The location of the projected new residential development can be specific at this time. The technique was based on:

a) The use of approximate density standards derived from the analysis of the present land use pattern.
b) The analysis of physical capacities of the areas to absorb additional development

c) The analysis of the physical growth pattern of the settlement during the last 20-30 years.

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

PRA is an approach used to incorporate the knowledge and opinions of people in the planning and management of development projects and programmes. The main outcome of the participatory approach is increase knowledge about the social, economic, environment, physical settings that are available both with the researchers and actors in the situation.

The broad objective of PRA is to involve local people in the planning process. The specific objectives are as follows-

- To attain first hand participatory information on social life of community members such as resources, mobility, social and environmental problems, risks and coping mechanism of the project area
- To gain in depth knowledge of the project area
- To make target people active rather than passive in planning process
- To develop 'we' feeling to the local stakeholders regarding the project

Table-2.15: Overview of PRA Techniques

Group and Team Dynamic Methods	Visualization and Diagramming Methods
Team contacts	Social mapping
Team reviews and discussions	Resource & risk mapping
Interview guides and checklists	Venn diagrams
Rapid report writing	Listing mobility maps
Energizers	Seasonal calendars
Work sharing (taking part in local activities)	Trend analyses
Villager and shared Presentations	Matrix scoring
Process notes and personal diaries	Participatory modeling

2.33.1 Method

There are 11 Unions in Ramu Upazila of Cox's Bazar district; 15 Unions in Rangunia Upazila and 9 wards in the Rangunia Pourashava under Rangunia Upazila of the Chittagong district. A total of 35 PRA sessions will be conducted under this project before preparing development plan as per direction of the project of UDD.

Participants of PRA

It is accepted that 25-30 participants are good enough to manage for getting quality information. The elected representatives of local government, civil society organizations, community leaders and representatives from social strata will request to involve in the PRA sessions.

Place of PRA

Calm and quiet environment is prerequisite to conduct a PRA. We are proposing the place of PRA at the office of Union Parishad (UP), it is know that this place is know and familiar of a UP dwellers.

Selection and Invitation of Participants

A brief discussion of the project will present for inviting the participants. The objectives of the PRA session, the procedure of conducting the session will describe to participant by the PRA team. A formal letter will be sent to UP/Pourasahva Chairman to assist for conducting the PRA.

Session of PRA

A three (3) hours PRA session will be organized. "A basket of Tools" will be used in a PRA session, different four spell and practice will conduct with participant. The following tools will be used in this project according to its objectives, needs and justification of the data and information:

Step/practice-1: Rapport building

Objectives: Rapport building with participants and ice breaking among participant

Procedure of rapport building

Well come speech will be delivered by facilitator and a self introduction session will be organized where introduces every participant in a brief. After completing the introduction session facilitator will present the objective and procedure of the PRA.

Step/practice-2: Social Mapping

Objectives: Social mapping will be prepared according to resource base of the area

Procedure of Social Mapping: (a) The facilitator will explain the procedure of the preparation of social mapping to the participants in an easy and simple manner. A PPT will be presented

(b) The facilitator will elect a person for drawing the social map on the basis of discussion make with the participants' and request the other participants' to the person involve in social mapping.

(c) The poster or paper will be placed on the table, floor or board.

(d) The boundary of the area will draw cautiously, and then the map will drawn collectively with the help of marker of sign pen.

(e) Different types of resources such as road, pond, agricultural land, river, homesteads, school etc. will be located on the map by using marker or sign pen.

(f) Surrounding unions and important areas or establishments around the boundary will also plotted on the map.

(g) North direction will show in the map

(h) Signature of the participants' will take on the map drawn by them.

(i) Necessary correction will be made by displaying the map just drawn.

Step/practice-3: Venn Diagram

Objectives: To identify the problems/risks (social and environmental) of the area/UP/ward of pourashava.

Procedure of Venn Diagram: (a) The facilitator will select a person among the participants' for assistance, who would cut the paper into circular form of different size for venn diagram and stick them on poster paper.

(b) The facilitator will identify the problems of the basis of their severity e.g., 1,2,3… with the help of participants'.

(c) Color poster paper is cut into circular form according the severity of the problems and would stick them on the white color poster paper.

(d) The biggest circular sized paper will indicate the most severe problem i.e., no. 01 problem and the size of the circle will reduce according to descending order.

(e) The main area will be stickled at the centre of the poster paper.

(f) The problems would be arranged according their importance for aesthetics.

(g) Signature of all the participants' will be taken on the venn diagram.

(h) Necessary correction will be made in the venn diagram by participants.

Step/practice-4: Technology of Participation (ToP)
Objectives: To identify probable solution to the problems of the area

Procedure of Technology of Participation (ToP):
(a) The facilitator shall select a person among the participants' for assistance having good hand writing.
(b) The facilitator will explain the procedure clearly and may use the 'Gate Keeper' if necessary.
(c) To find out the probable solution to the problems by arranging them according to priority, which have been identified from this procedure.
(d) Determination of timeframe for solution to the problems (e.g., 5-year, 10-year, 20-year).
(e) Obtaining signature of all the participants'.
(f) Necessary correction by displaying the listing.

Step/practice-5: Closing PRA session
After completing above mentioned steps facilitator will take feedback from participants on PRA session and declare completion of session with thanks.

Documentation and compilation of PRA
Consultant will prepare a content of documentation of PRA. After completing a PRA session, team will write and compile all notes and practice of participants in a prepared content of PRA documentation.

2.33.2 Deliverables

- Every PRA session will cover by each PRA documentation report covering objectives, methods, team description and outputs like; Social map, description and analysis of the community and its context, identification of problems and potential solutions, and project design and programming of activities for project implementation.
- A Working paper will be prepared covering brief output from all PRA sessions and compilation of all individual PRA documentations.

2.34 Matching PRA Analysis with Technical Analysis

Data obtained from different PRA sessions will lead the consultants to indentify and classify different development issues and problems prevailing in the two Upazilas (Ramu and Rangunia) through PRA analysis. These data will be triangulated with the other available data sources and survey data. PRA analysis will be matched with other technical analysis such as Spatial Analysis and GIS mapping. Areas subject to the special concern will be identified by GIS mapping. Optimal location of different important services (e.g. location of school, vulnerable position of settlements or any important feature) will be determined by spatial analysis. Need based prioritized services will be identified from PRA analysis and thus matched with technical analysis.
PRA analysis especially to be conducted in the second phase or planning stage need to fulfill collection of local demand, aspirations, strength, weakness, opportunity, threat and indigenous knowledge that must need to synchronize with technical view of the Urban Planners and finally produce sustainable and viable development plan ensure local participation.

2.35 Planning Methodology & Deliverables

The following methodology will be carried out to accomplish the overall planning tasks under the current project. The project planning area will cover the whole of Ramu and Rangunia Upazilas which might have potential for development within the next 20 years up to 2035 A.D. The project is planned to be completed in five types of plans i.e. Sub-regional Plan, Structure Plan, Urban Area Plan, Rural Area Plan and Action Plan.

2.35.1 Preparation of Sub Regional Plan

The sub-regional plan will include regional strategic plan, regional structure plan and conservation plan. The methods are described in the following section.

2.35.1.1 Method

Strategic Plan for Ramu and Rangunia Upazila at Sub-Regional Level

Sub-Regional Plan will be prepared for 20 years in readable scale according to the guidelines from: National policies, Formulated and Integrated different sectoral strategies at sub regional level, spatially interpreted sectoral strategies at sub regional level, formulated Conservation Plan at sub regional level and formulated Development Plan. There are general policy outlines in this plan within the content and meaning of the Sub Regional and National Perspective Plan of Bangladesh. To illustrate future socio-economic development scenario and figure out the economic disparity "shift-share analysis" and "input-output analysis" technique will be used. The Plan will also study on the following component at sub regional level:

- Lands Study:
  - Review existing Land use and Development Plans, Upazila Plan Books.
  - 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:
  - Local rivers: Hydrodynamic, Morphological, Geomorphologic development
  - Impact of FCD and FCDI at sub regional level
- Environmental studies:
  - Related Environmental Policies, Acts and Laws (in regional planning study)
  - Environmental Procedures and Guidelines (in sub regional planning study)
  - Economic, Social, Biological and Physical Environment at sub regional level
- Hazard management:
  - Review on 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 at sub regional level
  - Domestic water management at sub regional level
- Transport Studies (Rail, road, and water)
  - Overview of the Existing Transport Situation
  - General Situation of Road Infrastructure
  - Situation of Road Transport (Passengers)
  - Road Transport (Goods)
  - Water Transport
  - Major Traffic Generating Centres 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
  - Spatial distribution of population and its changes since 1991
- Study on Basic services (major urban area):
  - Housing,
  - Sanitation
  - Communication
  - Energy
  - Education
  - Health
- Economic Activities:
  - Agriculture
  - Industry
  - Fisheries
  - Forestry
  - Disparity analysis
- Anthropological and Ethnographical Study
  - Livelihood Study of local people
  - Ethnographical Study
- 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

Regional Structure Zoning Category

In order to promote and protect public safety welfare by (i) minimizing adverse effect resulting from the inappropriate location or use of sites and structures, (ii) conserving limited land resources and encouraging their efficient use regional structure zoning category will be carried out. 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 will 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 Landuse pressure is heavily depending on the ecosystems and resources of the existing nature. Landuse conflicts and clearly unsustainable uses may be found in planning areas. There is a clear need for broad-based, multi-sectoral 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 will cover ecology and environment, land forms, forest, wetland, rivers and agricultural land, major infrastructures, area of archaeological/ anthropological interest etc.

2.35.1.2 Deliverable

- Sub-regional strategic plan for 20 year period.
- Information on socio-economic development scenario and economic disparity of the study area at sub-regional level.
- Formulation of sub-regional plan on the basis of regional (i) Lands Study, (ii) hydrology (iii) Environmental Studies (iv) Hazard Management (v) Water Resource Management (vi) Transport Studies (vii) Population, (viii) Basic Services (ix) Economic Activities (x) Anthropological and Ethnographical Study (xi) Heritage Archaeology and Tourism Management and so on.
- Determination of Regional Structure Zoning Category as per stated in the TOR. Conservation Plan under sub-regional plan depending on the ecosystems and resources of the existing nature and landuse conflicts.

2.35.2 Preparation of Structure Plan

2.35.2.1 Method

Structure Plan, in fact, to a certain level is open-ended, providing a broad policy framework for action plans and development programs. It is a broad framework for major development and a guide for preparation of subsequent lower level plans viz. Urban Area Plan, Rural Area Plan and Action Area Plans. The plan will guide the growth and changes for distribution and redistribution of population, activities and their relationship and the pattern or land use that the activities will give rise together with a network of communication, circulation and utility services. The structure plan concentrates on the broad structure of the Upazila and is not concerned with the details of physical layout or individual development details which cannot be implemented until the later stages of the planning period.

Structure plan will be prepared based on the outputs of sub-regional plan and other surveys and studies to develop the indicative plans for the upazilas. The structure plan will establish inter and intra-regional connectivity, economic base the upazlia, set policies and develop strategies to achieve the policies. The plan will identify the urban areas and different rural centres of the upazila; and will also determine the planning requirements for the urban area, rural centers and rural area. The plan will also come up with a basis for preparing urban area plan, rural area plan

and detailed plan for the upazila.

Components of Structure Plan

The Structure Plan 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.

Style and Format of Structure Plan

The Structure Plan will be presented in the form of text in report and the policy issues translated into maps with R.F= 1:10000 for visual understanding. The map will only show the broad future possible built up area, restricted areas for development, areas for development potentials, major existing and proposed communication network and other existing major features and land marks.

The most important element of structure planning is developing alternative strategies to accommodate foreseeable growth of an entire area. However, before defining long-term strategies for the study area, it will be necessary to agree on the objectives for longer term development. Based on our evaluation of alternative strategies a draft structure plan will be prepared and submitted to Project Management Office for its approval. This approval is necessary because all subsequent plans to be prepared under the TOR will basically be more detailed interpretations of already established guidelines and policies in the structure plan for a more local area and over a shorter time span. Any change in structure plan final submission would require changes in every other planning proposal. After plan is provisionally approved by Project Management Office, future works on it will be carried out before its resubmission in the draft final from at the end of the stipulated time period.

Two other types of activities that are being carried out concerning the structure plan are implementation mechanism and monitoring and review. The implementation issues are closely interlinked with unresolved institutional issues regarding overall coordination of activities by various public and private organizations. The consultants are also required to prepare sustainable proposal for consideration by the development partners in the study area. As these issues will have to be dealt with separately at this stage we can at best say that our implementation proposals will much depend on the suggested coordination mechanism among the various development agencies.

The last important aspect about structure planning is monitoring and review. A plan is prepared based on certain forecasts, which are in tern based on certain assumptions. The validity of these assumptions is required to be tested as time passes on. Furthermore, there may be more fundamental changes in priority, social objectives etc. All of these may justify revision of the plan. For timely revision a monitoring activity should be instituted to monitor the progress and departures of the planning provisions.

Following are, in short, the steps to be followed in preparation of the Structure Plan:
Step-1: Physical, topographic, land use and socio-economic and other data collection.
Step-2: Appraisal of study area and identification of critical issues.
Step-3: Identification of the strategic regional importance of the Upazila.
Step-4: Identification of economic potentiality of the city.
Step-5: Setting forth of the broad sectoral policy framework for future development of the town.
Step-6: Structure Plan in text and graphical format.

The structure plan concentrates on the broad structure of the Upazila and is not concerned with the details of physical layout or individual development details which cannot be implemented until the later stages of the planning period. In those areas and sectors where action is anticipated or proposed within a relatively short time however, more detail may be needed than is provided in the structure plan.

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 and health
- Agriculture and fisheries
- Transport system (road and water)
- Ecology and environment

These sectoral 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.

There is a need for a legal instrument in order to regulate land use in a manner that will encourage orderly urban and rural settlements in accordance with the strategic policies of the Structure Plan. This is 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 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 and water
  - 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

2.35.2.2 Deliverables

The composite Structure Plan will reflect the complexity of the area. This broad plan will be presented in both map and report format. The deliverables under this plan will be as follows:

- Conservation plan (primary, secondary and tertiary flood)
- Delineation of the structure of different infrastructures
- 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

2.35.3 Preparation of Urban Area Plan

2.35.3.1 Method

Urban Area plan will be prepared for the urban areas of the upazila identified in the structure planning stage based on the planning requirements. The plan will also come up with a basis for preparing detailed plan for the urban areas.

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 this 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 statistics will be collected from all possible sources, such as:
  (a) Census. (b) Municipal Record,
  Analysis of existing population will 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 problems three types of surveys will be conducted;
  a. Statistical analysis of the past trends in growth.
  b. Types and numbers of different vehicles.
  c. The traffic flow in major arterial roads will be surveyed and presented with sufficient maps and charts showing origin and destination.
  d. Critical traffic junctions will be separately studied and conditions illustrated graphically.
  e. 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 will be studied and presented with appropriate explanatory notes.

- ***Industrial Surveys:***
  a. Details of location, size and capacity of the existing industries will 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 will be collected and presented.
  c. Labour statistics from directorate of labour and labour unions will be collected and presented.

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

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

- ***Water Supply Data:***
  a. Source and extend of existing supplies will be recorded on maps and its future programme of expansion will be shown side by side in different colours.
  b. The capacity and system of water supply and future programme of expansion will be investigated 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 will be presented in appropriate maps.
  b. Existing supply lines and the future probable lines will be presented on the same map side by side preferably in different colors.

- ***Telephone Service:***
  a. Types of Telephones Exchange and future programme.
  b. 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 will be collected and presented with detail information.

- ***Health Facilities***: Dispensaries, health centres and hospitals showing their location and capacity will be collected and presented with explanatory notes.

- ***Educational Facilities***: Information on different categories of schools and colleges with the location, sizes and capacity will 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 will 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.

- ***Municipal Budget:*** Municipal Budget for last five years will 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. will be collected and presented.

- ***Disposal Services***: The methods of collection and disposal of garbage will be surveyed and presented with comments. The graveyards, cremation ground, etc. will be surveyed and presented. The methods of sewage disposal will 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 be conducted wherever needed.

Concept and Aim of Urban Area Plan

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

Components of Urban Area Plan

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

(1) Land-use Plan
(2) Transportation and Traffic Management Plan
(3) Drainage and Environmental Management Plan
(4) Disaster Management Plan
(5) Site plan, Land Acquisition Plan
(6) Industrial Issues

(7) Recreational and Open Space
(8) Health and Educational Facilities

Style and Format of Urban Area Plan

The Urban Area Plan will be the composite functional plan with spatial translation in 1:3960 scale map supported by report. It shows the broad land use zones on a more detailed scale of maps as derived from Structure Plan. As the desired scale of the map is the same as that of cadastral map, and the plan provides detailed land use zoning and building controls, the development control function becomes easier to implement with Urban Area Plan. It also shows land reservations required for essential uses and major infrastructure development.

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

2.35.3.2 Deliverables

The following contents are expected to be delivered after the completion of Urban Area Plan:

- Survey map at scale, RF 1: 3960 which includes the result of all survey listed under urban area plan in the TOR. The design of the map will be appropriate in size so that it is not difficult for handling. If the maps are too large it will be cut into standard sizes, which can be fitted during any kind of discussion and presented without any inconvenience. The colors and indications will be used as obtained from Urban Development Directorate.
- Survey report
- Urban Area Plan

2.35.4 Rural Area Plan

2.35.4.1 Method

Rural Area Plan (RAP) will be prepared for the rural areas of the upazila identified at the structure planning stage based on the planning requirements. The RAP will provide a long term strategy for 20 years and covers for the development of rural areas within the project area on map with R.F= 1:3960. This will contain an explanatory report, resource maps, conservation and management report, planning rules, rural area plan, multi-sectoral investment program. In the present project, Content of Rural 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 homestead in the rural area and its immediate neighborhood. The surveyors will visit each and every site to record existing usage with specified notation and colors 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 rural 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 will 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 will be collected and presented in the map of RF 1: 3960.

- ***Population Survey:*** The population statistics will be collected from all possible sources mainly from census data.

Analysis of existing population will bring out the following characteristics—
(i) Male/Female ratio, (ii) Age-sex pyramid, (iii) Reasons for population growth/decline (birth rates, death rates, immigration, and migration)/extension of Municipal boundary, etc and (iv) General economic conditions of the people.

- ***Traffic Survey:*** Regarding Traffic problem three types of surveys will be conducted;
  a. Statistical analysis of the past trends in growth.
  b. Types and numbers of different vehicles.
  c. The Traffic flow in rural roads will be surveyed and presented with sufficient maps and charts showing origin and destination.
  d. Critical traffic junctions (if any) will be separately studied and conditions illustrated graphically.
  e. Trip generation survey.
  f. Traffic and commodity flow at river port, kheya ghat/gudara ghat.

- ***Road Surveys:*** In this survey details of existing roads like type and condition of road, existing width and possibility for bridging missing links will be studied and presented with appropriate explanatory notes.

- ***Industrial Surveys:***
  a. Details of location, size and capacity of the existing industries (if any) will be surveyed in any appropriate proforma suitable for this purpose and as per direction of the Survey in-charge.
  b. Details of labor statistics with the housing conditions will be collected and presented.
  c. Labor statistics from directorate of labor and labor unions will be collected and presented.
  d. All these information will be presented with proper explanatory notes, graphs and charts showing the future trend.

- ***Agricultural:*** Agricultural land will be surveyed for earmark the agricultural land and for conservation. Moreover, high land, low land, delineation of land according to single, double and triple cropping and productivity will also be surveyed.

- ***Sources of Potable Water:*** Sources of potable water including distance from homestead, number of users, quality of water etc. will be collected.

- ***Power Supply:***
  a. Capacity of the existing power supply sources and probable future expansion will be presented in appropriate maps.
  b. Existing supply lines and the future probable lines will be presented on the same map side by side preferably in different colors.

- ***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.

- ***Health Facilities:*** Dispensaries, health centers and hospitals showing their location and capacity will be collected and presented with explanatory notes.

- ***Educational Facilities:*** Information on different categories of educational institutes both formal and informal with the location, sizes and capacity will be collected and presented with appropriate explanatory notes graphs and charts. Information on dropouts at primary and secondary levels may be collected.

- ***Hats/Bazars/Shopping:*** Hats/Bazars/Shops and commercial establishments differentiated into wholesale and retail shopping will 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.

- ***Sanitation Facilities:*** Existing sanitation facilities will be surveyed and presented with comments.

- ***Graveyard/Cremation Facilities:*** The graveyards, cremation ground, etc. will be surveyed and presented.

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

2.35.4.2 Deliverables

The following contents are expected to be delivered after the completion of Rural Area Plan:

- Survey map at scale, RF 1: 3960 which includes the result of all survey listed under rural area plan in the TOR. The design of the map will be appropriate in size so that it is not difficult for handling. If the maps are too large it will be cut into standard sizes, which can be fitted during any kind of discussion and presented without any inconvenience. The colors and indications will be used as obtained from Urban Development Directorate.
- Survey report
- Rural Area Plan

2.35.5 Action Area Plan

2.35.5.1 Method

The Action Plan is a separate document covering the first five-year period of the structure plan. It examines, in the context of the structure plan, those items that might be implemented in this period and thus contains more detail on a more limited range of subjects than the structure plan. It tries to provide the upazila with guidance in deciding between priorities. The preparation of Action Area Plan (AAP) will be formulated through participatory approach involving the local people. It will contain problem analysis using participatory approach, stakeholder analysis, potential analysis (basic and derived potentials), identification of possible projects, priority ranking of projects, and strategy formulation for prioritized projects. AAP will provide prioritized projects consisting location of project, goal & objectives, activities, tasks, actors, resources, cost and assumptions/constraints.

The action plan will be consisted of three parts i.e. 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 in selection before identifying priorities in each sector and proposing projects to address these priorities. Project evaluation looks at projects, which might be locally funded over the five-year period, given budgetary and other constraints, looks at projects which cannot be locally funded but which might be considered by national agencies operating locally and makes preliminary assessments of larger scale projects, which would need larger investment.

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 aim of the action plan is to evaluate those projects, which will 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 will be presented in four parts:

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. 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 will 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 will 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

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 upazila followed by other public agencies. This analysis will look at the past availability of funds (in so far 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 apportioned between various towns, as other priorities in other areas are not known. Proposals can however be made on their own merit and the appropriate agency and action identified.

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.

An AAP will be prepared considering the following aspects both in the urban and rural area of the project area,

- Prepare the proposed bankable projects for the upazilas.
- Existing Condition: Review of the existing situation of the ward or union with respect to land use, community facilities, public services, utilities, infrastructure etc.
- Problems and Opportunities: Discussion of problems needing immediate attention and scope of development
- Current Investment Programme: Discussion of current investment programmes of upazila itself.

2.35.5.2 Deliverables

- List of important projects needed to be implemented within the upazilla.
- Evaluation of listed projects
- Analysis of available resources to implement the project
- Priority list of the project

2.36 Output and Format

2.36.1 Data Management Structure

The Consultant proposes to use Geodatabase as the foundation of Data Management Structure. The geodatabase (GDB) is the native data storage and management framework within ArcGIS. It is a container for spatial and attributes data. The geodatabase promotes the idea of having all GIS data stored uniformly in a central location for easy access and management. The Consultant prefer the File Geodatabase because it offers structural, performance, and data management advantages over collection of shapefiles in folders.

The Spatial data of the study area will be managed by developing a File Geodatabase by using ArcGIS software. This geodatabase will have different Datasets such as

Physical Features
Topographic Features
Administrative Boundaries
Landuse
Annotation, etc.

The different spatial layers of the study area will be created as Feature Classes in the datasets. For example, Structures, Existing Roads, etc. will be created and managed within the dataset of Physical Features. Similarly Contours, DEM, etc will be created and managed under the dataset of Topographic Features, and so on.

Other textual data will be managed by developing a Relational Database Management System (RDBMS) using Microsoft Access. This relational database will be used to create various types of Reports, Charts, and Maps.

2.36.2 Inventory

The Consultant will develop a Relational Database which will contain inventory of all structures and other physical and infrastructure features as well as demographic, economic and social features of the study area. The Relational Database will be developed in Microsoft Access format and later be used for thematic mapping by linking with attributes of spatial features, where applicable.

2.36.3 Projection Parameter

As the ToR does not provide any specific Projection/Coordinate System for the GIS database, the consultant proposes Bangladesh Transverse Mercator (BTM) to comply with other GIS database of UDD and most of the government/non-government organizations in Bangladesh. The parameters are as follows:

Projection: Transverse Mercator
False Easting: 500000.0
False Northing: -2000000.0
Central Meridian: 90.0
Scale Factor: 0.9996
Latitude of Origin: 0.0
Linear Unit: Meter
Datum: Everest Bangladesh
Spheroid: Everest Bangladesh (Everest 1830 adjusted in 1937)
Semi-major Axis: 6377276.345
Semi-minor Axis: 6356075.413
Inverse Flattening: 300.801

2.36.4 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

2.36.5 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.

2.36.6 Data Precision of Survey Equipment

The data precision of Survey Equipment (RTK-GPS, Total Station, etc) will be within 50 cm.

2.36.7 Data Precision of Digitization of Mouza Maps

The precision of individual Mouza Map digitization will be within one meter. But in the mouza database for whole Upazila it will be higher due to the accumulated errors in process of mouza geo-referencing and edge matching.

2.36.8 Map Layout

Standard map layouts will be developed by consultation with concern project officials of UDD. There will be three types of map layouts, these are

Physical Feature Survey Map in 30 inch x 40 inch
Topographic Survey Map in 30 inch x 40 inch
Plan Map in 30 inch x 40 inch

Data Driven Page layouts will be developed by using ArcGIS software to automate the process of generating series of maps.

2.36.9 Map Legend

The Map Legend will be created by ArcGIS software by consultation with concern project officials of UDD.

2.37 Checklist for Survey

The following survey activities will be carried out to prepare the survey report:

- Topographic Survey
- Physical Feature Survey
- Land Use Survey
- Socio-Economic Survey
- Traffic Survey
- Hydro-geological Survey
- Survey of Urban and Rural Economy
- Environment Studies
- Disaster Studies
- Social Space Studies

2.38 Monitoring and Supervision of Project Activities

The data and information collected during survey activities will be monitored by the respective experts. Table-2.16 shows the data to be monitored under specific responsible experts.

Table-2.16 Experts of the Project Team and Monitored Data

Expert	Data to be Monitored
Survey Expert	Physical feature, topographical and landuse survey and ensure quality and accuracy of survey data
Photogrammetric Expert	Digital database (Spatial and Attribute)
GIS Expert	Digital database (Spatial and Attribute)
Agricultural Scientist	Agriculture related data collection process and ensure quality of collected data
Economist	Urban and rural economy related data collection process and ensure quality of collected data
Transport Planning Expert	Traffic and transport related data collection process and ensure quality of collected data
Urban Planner	Land use, Socio-economic, Physical feature, topographic and other related surveys and studies
Socio-economic Expert	Socio-economic and other related questionnaire surveys including PRA Data entry, editing and presentation of data in tabular form

2.39 Public Hearing on Draft Development Plan

A formal Public Hearing on the Development Plan will be carried out through:

- Display of Development Plan Maps (Hard Copy)
  - UDD, PD Office
  - Ramu and Rangunia Upazila Office
- Media Coverage
  - Print
  - Electronic
- Press Conference
- Web based Publication

2.40 Gazette Notification of Upazila Development Plan

Complaints from public hearing will be collected in prescribed format, in the form of letter to Chairman/PD, UDD. The Upzaila Development Plan package comprised of reports and maps will be approved by the government through gazette notification after the necessary alteration in the plan based on the complaints collected from public hearing.

2.41 Institutional Capacity Building for Plan Implementation

A detailed study on existing institutions liable for plan implementation within the Upazilas will be carried out. The study will find out the existing strength, weakness and opportunities of the institutions. The study will explore the implementation mechanisms of the development plans and detailed capacity building options including administrative reform and capacity building training.

2.42 Final Deliverables

(1) Base Map at a scale of 1: 3960 – Colored copy in A0 size paper.
(2) Landuse Map at a scale of 1: 3960 – Colored copy in A0 size paper.
(3) Proposed Plan at a scale of 1: 3960 – Colored copy in A0 size Paper.

Rest of the maps will be printed in A3 size paper at a suitable scale. In all cases digital map will be provided in DVD.

CHAPTER-3

WORK PLAN

Chapter-3
WORK PLAN

3.1 Introduction

Chapter 3 of the Inception Report describes the progress of work achieved during the first three months of project initiation.

3.2 Revised Work Program

The Detailed Work Programme prepared using MS Project is enclosed at the end of this chapter.

3.3 In-house Training Programme

The Consulting firm will provide in-house training to the UDD Project team on GIS, RS, Photogrammetric mapping, Hazard analysis, Topographic survey, Physical feature survey, Landuse survey, Traffic and transportation survey, Socio-economic survey and others based on collected data, information and working paper. Training/workshop will be arranged as per approved work plan in UDD office with the help of respective experts in consultation with PD.

3.4 Reporting Schedule

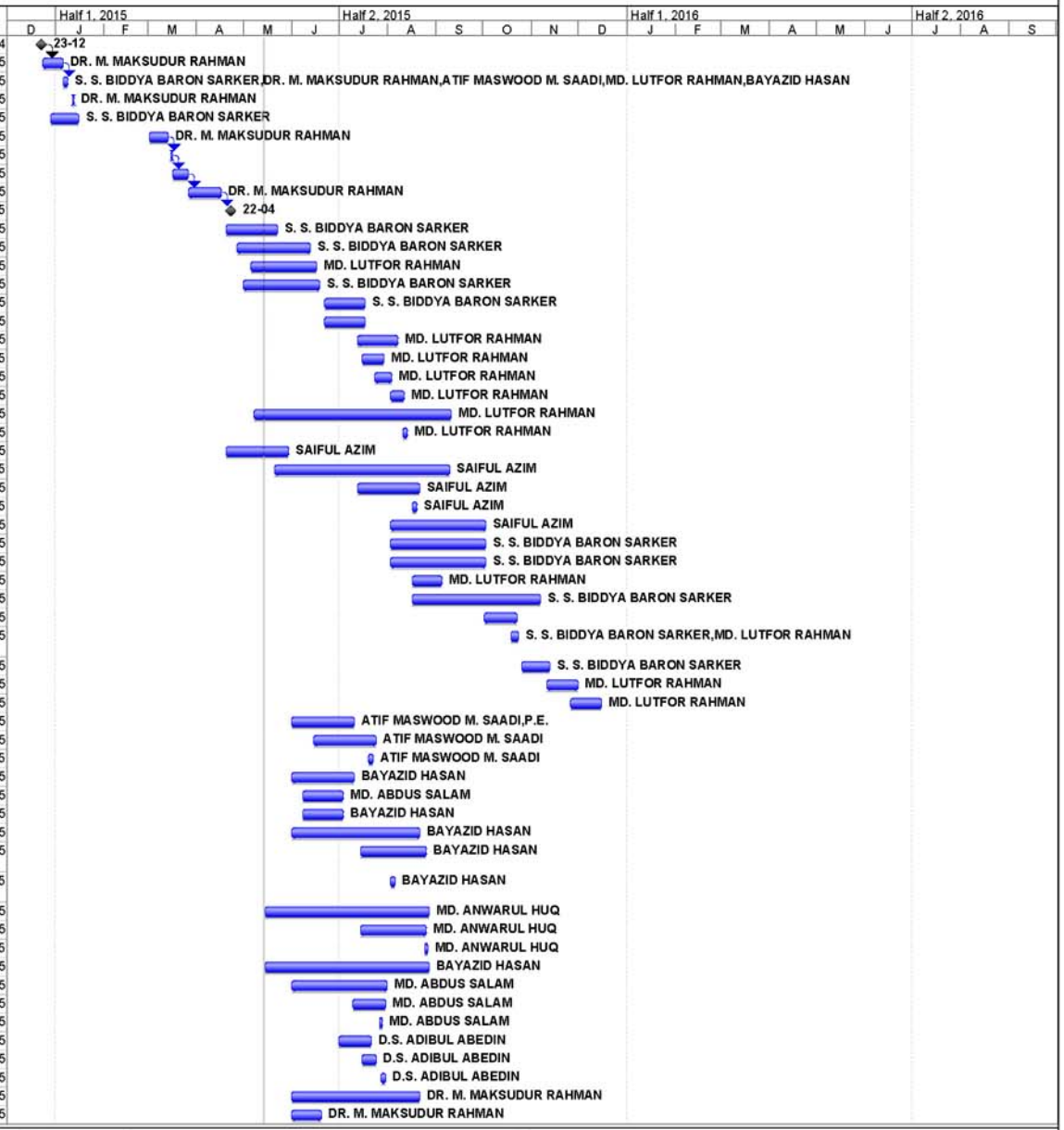
As per TOR following is reporting schedule of the current project:

Report	Language	Copy	Period of Submission	Binding Status
Mobilization Report	English	20	Within 20 days of Signing contract	Spiral Binding
Inception Report	English	20	End of 4th Month	Spiral Binding
Draft Survey Report	English	20	End of 9th Month	Spiral Binding
Final Survey Report	English	20	End of 10th Month	Spiral Binding
Draft Final Plan with Report	English	20	End of 20th Month	Spiral Binding
Final Plan with Report	English	20	End of 22nd Month	Hard Binding

Period of submission/reporting schedule may be changed on discussion with the Project Director.

Work Schedule: Development Plan Project of Ramu and Rangunia Upazila

ID	Task Name	Duration	Start	Finish
1	Start of the Project	0 days	Tue 23-12-14	Tue 23-12-14
2	Mobilization	9 days	Wed 24-12-14	Mon 05-01-15
3	Reconnaissance Survey	3 days	Tue 06-01-15	Thu 08-01-15
4	Submission of Mobilization Report	1 day	Mon 12-01-15	Mon 12-01-15
5	Collection of Maps,Drawing Data from Secondary Sources	14 days	Mon 29-12-14	Thu 15-01-15
6	Preparation of Draft Inception Report	10 days	Mon 02-03-15	Fri 13-03-15
7	Submission of Draft Inception Report	1 day?	Mon 16-03-15	Mon 16-03-15
8	Comments on Draft Inception Report from the Client	8 days	Tue 17-03-15	Thu 26-03-15
9	Preparation of Final Inception Report	15 days	Fri 27-03-15	Thu 16-04-15
10	Submission of Final Inception Report	1 day	Wed 22-04-15	Wed 22-04-15
11	Collection of Mouza Maps	25 days	Mon 20-04-15	Fri 22-05-15
12	Scanning and Digitization of Mouza Maps	35 days	Mon 27-04-15	Fri 12-06-15
13	Edit Plot Checking of Digitized Coverage	30 days	Wed 06-05-15	Tue 16-06-15
14	Construction/Installation of BM Pillars	35 days	Fri 01-05-15	Thu 18-06-15
15	Establishment of BM Control Point Using RTK GPS	20 days	Mon 22-06-15	Fri 17-07-15
16	Collection of Ground Control Points	20 days	Mon 22-06-15	Fri 17-07-15
17	Preparation of Draft Georeferenced Mouza Maps	20 days	Mon 13-07-15	Fri 07-08-15
18	Joining of Mouza Maps and demarcating Study Area	10 days	Thu 16-07-15	Wed 29-07-15
19	Preparation of GIS Map Layout (base map for survey) & Printing of Study Area Maps	7 days	Fri 24-07-15	Mon 03-08-15
20	Submission of Study Area Map with Report-I	7 days	Mon 03-08-15	Tue 11-08-15
21	Working Paper on GIS Mapping/Study Area Mapping	90 days	Fri 08-05-15	Thu 10-09-15
22	Training of UDD Officers and Staff on GIS Based Study Area Mapping	3 days	Tue 11-08-15	Thu 13-08-15
23	Procurement of Satallite Image	30 days	Mon 20-04-15	Fri 29-05-15
24	3D Digitaization, Image Processing and DEM Prepration	80 days	Thu 21-05-15	Wed 09-09-15
25	Working Paper on Photogrammetic Study	30 days	Mon 13-07-15	Fri 21-08-15
26	Training of UDD Officers and Staff on Photogrammetric Image Processing and DEM Prepration	3 days	Mon 17-08-15	Wed 19-08-15
27	Topographical Survey and Data processing	45 days	Mon 03-08-15	Fri 02-10-15
28	Physical Feature Survey and Data processing	45 days	Mon 03-08-15	Fri 02-10-15
29	Landuse Survey and Data Processing	45 days	Mon 03-08-15	Fri 02-10-15
30	Preparation of Map Layouts (Physical Feature, Topo and Land Use)	15 days	Mon 17-08-15	Fri 04-09-15
31	Working Paper On Topographic, Physical Feature and Landuse Survey	60 days	Mon 17-08-15	Fri 06-11-15
32	Printing of Draft Physical Survey Maps	15 days	Fri 02-10-15	Thu 22-10-15
33	Training of UDD Officers and Staff on Topographic, Physical Feature and Landuse Survey and data processing	5 days	Mon 19-10-15	Fri 23-10-15
34	Field Verification of Draft Physical Survey Maps	14 days	Mon 26-10-15	Thu 12-11-15
35	Updating of Physical Survey Maps Based on Field Verification	14 days	Wed 11-11-15	Mon 30-11-15
36	Printing of Physical Survey Maps (Final)	14 days	Thu 26-11-15	Tue 15-12-15
37	Traffic and Transportation Survey and Data Analysis	30 days	Mon 01-06-15	Fri 10-07-15
38	Working Paper on Transport Planning and Management	30 days	Mon 15-06-15	Fri 24-07-15
39	Training of UDD Officers and Staff on Traffic and Transportation Survey and Data Analysis	3 days	Mon 20-07-15	Wed 22-07-15
40	Housing, Slums and Squatters Settlement Survey and Data Analysis	30 days	Mon 01-06-15	Fri 10-07-15
41	Investment and Employment Survey and Data Analysis	20 days	Mon 08-06-15	Fri 03-07-15
42	Population and Migration Study and Data Analysis	20 days	Mon 08-06-15	Fri 03-07-15
43	Socio-Economic Survey and Data Analysis	60 days	Mon 01-06-15	Fri 21-08-15
44	Working Paper on Socio-economic, Housing, Slums & Squatters Settlement, Investment & Employment, Population & Migration Survey and Data Analysis	30 days	Wed 15-07-15	Tue 25-08-15
45	Training of UDD Officers and Staff on Socio-economic, Housing, Slums & Squatters Settlement, Investment & Employment, Population & Migration Survey	3 days	Mon 03-08-15	Wed 05-08-15
46	Gelogical Survey and Data Analysis	75 days	Fri 15-05-15	Thu 27-08-15
47	Working Paper on Geological Survey and Data Analysis	30 days	Wed 15-07-15	Tue 25-08-15
48	Training of UDD Officers and Staff on Geological Survey and Data Analysis	2 days	Tue 25-08-15	Wed 26-08-15
49	PRA Session With local Peoples	75 days	Fri 15-05-15	Thu 27-08-15
50	Survey of Urban and Rural Economy, Formal and Informal Industrial Survey and Data Analysis	45 days	Mon 01-06-15	Fri 31-07-15
51	Working Paper on Urban Economy and Formal Informal Studies and data Analysis	15 days	Fri 10-07-15	Thu 30-07-15
52	Training of UDD Officers and Staff on Urban-Rural Economy	2 days	Mon 27-07-15	Tue 28-07-15
53	Hydrological Studies and Data Analysis	15 days	Wed 01-07-15	Tue 21-07-15
54	Working Paper on Hydrological Study and Data Analysis	7 days	Thu 16-07-15	Fri 24-07-15
55	Training of UDD Officers and Staff on Hydrological Study and Data Analysis	3 days	Tue 28-07-15	Thu 30-07-15
56	Disaster Related Survey and Studies and Data Analysis	60 days	Mon 01-06-15	Fri 21-08-15
57	Environmantal and Pollution Study and Data Analysis	15 days	Mon 01-06-15	Fri 19-06-15

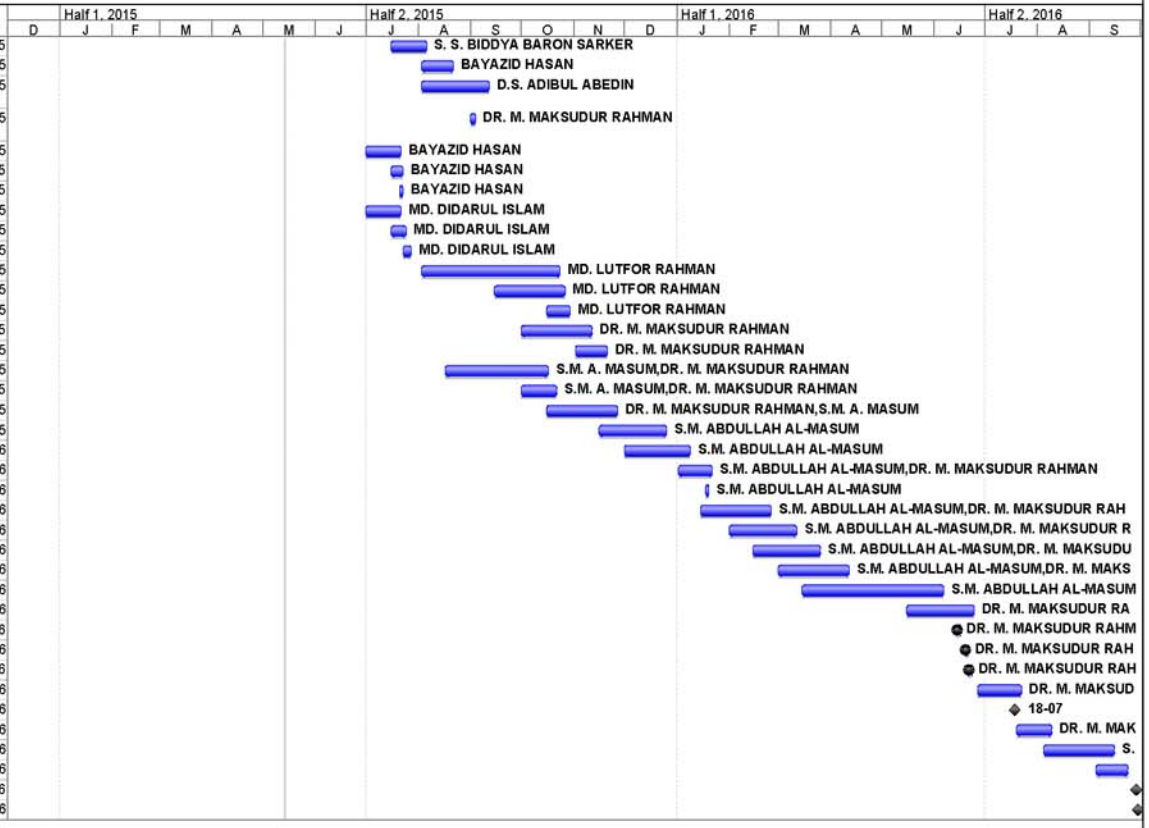


Project: Work Schedule
Date: Thu 14-05-15

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Work Schedule: Development Plan Project of Ramu and Rangunia Upazila

ID	Task Name	Duration	Start	Finish
58	Initial Environmental Examination & Pollution Studies and Data Analysis	15 days	Thu 16-07-15	Wed 05-08-15
59	Social space studies, Growth of the human settlement and Data Analysis	15 days	Mon 03-08-15	Fri 21-08-15
60	Working Paper on Disaster Studies, Environment and Plooution Social space studies, Growth of the human settlement Study and Data Analysis	30 days	Mon 03-08-15	Fri 11-09-15
61	Training of UDD Officers and Staff on Disaster Studies, Environment and Plooution Study and Data Analysis	3 days	Tue 01-09-15	Thu 03-09-15
62	Archologigal Study and Data Analysis	15 days	Wed 01-07-15	Tue 21-07-15
63	Working Paper on Archology and Human Settlement	5 days	Thu 16-07-15	Wed 22-07-15
64	Training of UDD Officers and Staff on Archeological Study and Data Analysis	2 days	Tue 21-07-15	Wed 22-07-15
65	Agricultural Survey and Data Analysis	15 days	Wed 01-07-15	Tue 21-07-15
66	Working Paper on Agricultural Survey and Data Analysis	7 days	Thu 16-07-15	Fri 24-07-15
67	Training of UDD Officers and Staff on Agricultural Survey and Data Analysis	3 days	Thu 23-07-15	Mon 27-07-15
68	Preparation of GIS Database	60 days	Mon 03-08-15	Fri 23-10-15
69	Data Input in GIS (Spatial & Attribute Data)	30 days	Tue 15-09-15	Mon 26-10-15
70	Linking of Spatial and Attribute Data	10 days	Fri 16-10-15	Thu 29-10-15
71	Submission of Draft Survey Map with Report	30 days	Thu 01-10-15	Wed 11-11-15
72	Submission of Final Survey Map with Report	15 days	Mon 02-11-15	Fri 20-11-15
73	Review of Previous Plans and Assesment	45 days	Mon 17-08-15	Fri 16-10-15
74	PRA Session With local Peoples	15 days	Thu 01-10-15	Wed 21-10-15
75	Formulation of Planning Standards & Principles	30 days	Fri 16-10-15	Thu 26-11-15
76	Working Paper on Urban Planning and Management	30 days	Mon 16-11-15	Fri 25-12-15
77	Data Analysis and Forecasting	30 days	Tue 01-12-15	Fri 08-01-16
78	Planning Process	15 days	Sat 02-01-16	Thu 21-01-16
79	Training of UDD Officers and Staff on Forecasting & Planning Porcess	2 days	Mon 18-01-16	Tue 19-01-16
80	Draft Sub-Regional Plan Prepration	30 days	Fri 15-01-16	Thu 25-02-16
81	Draft Structure Plan Preparation	30 days	Mon 01-02-16	Fri 11-03-16
82	Draft Urban Area Plan Prepration	30 days	Mon 15-02-16	Fri 25-03-16
83	Draft Rural Area Plan Prepration	30 days	Tue 01-03-16	Mon 11-04-16
84	Draft Action Area Plan Prepration	60 days	Tue 15-03-16	Mon 06-06-16
85	Draft Development Plan Preparation	30 days	Mon 16-05-16	Fri 24-06-16
86	Consultation of Draft Plan With the PMO Team	1 day	Wed 15-06-16	Wed 15-06-16
87	Workshop on Draft Development Plan at Ramu	1 day	Mon 20-06-16	Mon 20-06-16
88	Workshop on Draft Development Plan at Rangunia	1 day	Wed 22-06-16	Wed 22-06-16
89	Modification of Development Plan	20 days	Mon 27-06-16	Fri 22-07-16
90	Submission of Draft Development Plan with Report	1 day	Mon 18-07-16	Mon 18-07-16
91	Review and Evaluation of Draft Development Plan	15 days	Wed 20-07-16	Tue 09-08-16
92	Public Hearing on the Draft Development Plan	30 days	Fri 05-08-16	Thu 15-09-16
93	Modification of Draft Development Plan incorporating of Comments of Public Hearing	15 days	Mon 05-09-16	Fri 23-09-16
94	Submission of Fianl Development Plan Map	1 day	Wed 28-09-16	Wed 28-09-16
95	Submission of Final Development Plan with Report(English)	1 day	Thu 29-09-16	Thu 29-09-16



Project: Work Schedule
Date: Thu 14-05-15

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

CHAPTER-4

PROGRESS OF WORK

Chapter - 4
PROGRESS OF WORK

4.1 Completion of Mobilization Report

Chapter 4 of the Inception Report describes the progress of work achieved during the first three months of project initiation. After signing of agreement with UDD, the consultant took preparation for mobilization of project personnel including appointment of additional staff for the project.

Table-4.1: Key Personnel/Sub-Consultants

Sl No	Name of Consultant	Position	Man-Month	Date of Joining	Comments
1.	Dr. M. Maksudur Rahman	Team Leader	13	01 January, 2015	*Serial 4 are mobilized for full time **Serial 1 to 3 and 4 to 12 are mobilized as staggered deployment *** All team members are agreed to join this project and they started to work as per working schedule. Replacement letter of Md. Sadequl Islam (serial-7) has already submitted.
2.	S.M. Abdullah Al-Masum	Urban Planner	08		
3.	Md. Lutfor Rahman	GIS Expert	21		
4.	Atif Maswood M. Saadi, P.E.	Transport Planning Expert	04		
5.	Saiful Azim	Photogrammetric Expert	04		
6.	D.S. Adibul Abedin	Civil Engineer cum Hydrologist	04		
7.	Md. Bayazid Hasan	Social Expert	06		
8.	Md. Abdus Salam	Urban Economist	04		
9.	Md. Didarul Islam	Agriculture Scientist	02		
10.	Md. Anwarul Huq	Geologist	04		
11.	Md. Shakhawat Hossain	Associate Geologist	04		
12.	Md. Abdur Razzak	Geological Survey Technician	02		
13.	S. S. Biddya Baron Sarker	Survey Expert	03		

The **Table-4.1** shows the status of mobilization of the consulting team working under the project. To help accomplish the tasks of Ramu and Rangunia Upazila Development Plan project under the package-5, the consultant appointed 3 planners as support staff. These personnel will be engaged in data collection at the Pourashava level, supervise survey work and conduct sample household survey of the Pourashava. They will keep continuous liaison with Pourashava and support the team members by supplying necessary information from the Pourashava and other government and on-government sources.

4.2 Collection of Mouza Maps

Though Mouza map collection is a difficult and time consuming process, most of the mouza maps of both the project areas have already been collected (Please see Chapter-2, Section 2.5.1). Detail information reagrding the mouza maps (e.g. mouza names, sheet no., JL. no.) has also been collected from DLRS office. Before scanning of mouza maps, all collected maps will be submitted to Project Management Office for reviewing and quality checking. A detailed list of mouza maps of Ramu and Rangunia Upazila has been provided in the **Appendix-1**.

4.3 Collection of Satellite Image

Persuasion of satellite image for survey has already been completed. In order to achieve greater perfection in physical features survey, satellite imagery of the study area will be used extensively. Satellite Image with the resolution of 0.5m has been purchased for the urban areas where greater accuracy is needed for the formulation of Development Plan (copies of purchase order, price quotation and money receipt of satellite image are provided in **Appendix-4).** 1.0-m multi-spectral satellite image collection for rural areas is under process.

4.4 Establishing Site offices

The consultant has finalized the site office both in Ramu and Rangunia Upazila. The project site of Ramu will be retaken in suitable place of Ramu, if not Cox's Bazar (For legal contract agreement of hiring site offices, please see **Appendix-5**).

4.5 Debriefing of the Project in Project Area

4.5.1 Group Discussion

Focus Group Discussions (FGDs) was used to gather information from participants of public consultation meetings were local elected representatives, women groups, representatives of professional groups such as farmers, journalists, lawyers, businessmen, teachers, transport workers etc.

Social consultant of the study team conducted the public consultation meetings together, which enabled them to collect/record opinions and views from their own perspectives. The social expert also served as the facilitators, conducted and recorded the opinions of the stakeholders. In describing the proposed project activities to the participants, maps of the proposed project were shown and other related issues were discussed. The facilitators explained all relevant points and issues in order to enable the participants to comprehend the proposed project properly and to respond accordingly. The consultants paid utmost care in recording opinions and views of the participants relevant to the report, although occasionally, the participants raised other developmental or social issues which are outside the scope of the project.

The main objectives of the Focus Group Discussion (FGD) are to lay out a plan for the organization of Preparation of Development Plan for 14 Upazilas (package-5).The specific objectives of FGD are to:

- Inform the public and stakeholders about the Preparation of Development Plan for 14 Upazilas (package-5) Project
- Create awareness of stakeholders (local people and union parishad officials and provide them general information of the project as a part of the project awareness campaign
- Facilitate the local community (people) to participate in the project planning
- Learn from the community (people) and share with them their perception of the project
- To know people's suggestions from the local community (people) for solution of problems/ constraints of the project. (Photos and attendance list please see **Appendix-6**).

4.5.2 Tea Stall Meeting

In conducting the tea stall meetings, a checklist was used by the consultants to enable the participants to comprehend the issues easily, so that they could participate in the discussions more effectively and expressed their opinions and views objectively. This participatory approach was well accepted by all participants. During consultations, social, environmental as well as cross-cutting issues were discussed in detail, including potential impacts of the project activities on environmental and social parameters, identification of sensitive issues, risks, potential threats, public concerns and expectations from the project. The list of participants with their occupation was prepared with their authentic signature. (Photos and attendance list please see **Appendix-6**).

4.5.3 Courtyard Meeting

A courtyard meeting is an effective strategy with which to inform communities about the development planning issues. By consideration for the convenience of local people, and especially women, was given priority when arranging meetings. In this meeting they understood the messages given on development plan. (for photos and attendance list please see **Appendix-6**).

The checklist used for consultation includes the following issues:

- Awareness of the participants about the project
- Benefits of the project
- Concerns about the project
- Expectations of the public from the project
- Willingness to participate and co-operate in the project activity
- Suggestions about the project

The number of participants in each discussion meetings varied from 10 to 30. A total number of 8 discussion meetings were conducted in the influence area of project activity site is located

CHAPTER-5

CONCLUSION

Chapter-5
CONCLUSION

5.1 CONCLUSION

The urban centers of Ramu and Rangunia Upzila have tremendous potentials for growth. They both are located in the coastal area of Bangladesh. The main impetus of growth in Ramu comes from agricultures and tourism activities and Rangunia comes from the natural resources (e.g. forests) and tourism activities. The both towns have good industrial and business potentiality. Congenial investment climate will have to be created for this purpose providing necessary urban basic services. It has good communication with Chittagong and other surrounding urban centers (e.g. Cox's Bazar). As an urban center with economic potentiality and good transport linkage has prospects of developing as an important trading center. Preliminary investigations reveal that the both Upazila suffers from a number of urban related problems similar to other urban centers of the country. Despite its advantages and opportunities in many respects these problems undermine investment prospects. Care has to be taken during plan preparation to address these problems of the town on priority basis. Like all other towns, drainage is an important problem for the town and likely to take precarious shape in future, if it is not intervened and planned immediately. There is need for open space recreation, which must also have to be addressed in the plan. The stakeholder consultation on master plan has opened up a new horizon in participatory development planning and this will make development efforts more sustainable and people oriented. This will surely strengthen Upazila's accountability to the people and promote good governance. The process of participation must continue in future.

5.2 Way Forward

The project planning area will cover the whole Upazilas which might have potential for development within the next 20 years up to 2033 A.D. The consultants have already completed the inception tasks. From the experiences of the Reconnaissance Survey, it was felt to re-organize the agreed working-schedule and planning method. After that Sub Regional Plan and *Structure Plan* will be prepared for the both Upazilas covering whole areas. Then the Urban and Rural Area Plan will be prepared by addressing the local problems or opportunities, which need immediate intervention. Due to heterogeneous topography containing undulating lands and water bodies, the study must be based on Geographic Information System (GIS) and satellite images incorporating ground level data. The third stage will be preparation of *Action Area Plan* in the form of sectoral projects and programs for immediate intervention based on local need.

Appendices

APPENDIX-1

Detailed list of Mouza Maps of Ramu and Rangunia Upazilas

Appendix- 1

List of Mouza Maps (Ramu Upazila)						
District	**Upozila**	**Name of Mouza**	**J.L. No**	**Total No. Sheet**	**Collected Sheets**	**Remarks**
Coxsbazar	Ramu	জঙ্গল ঈদগড়	১	১	১	
Coxsbazar	Ramu	ঈদগড়	২	১৬	১৬	
Coxsbazar	Ramu	গর্জনিয়া	৩	১৩	১৩	
Coxsbazar	Ramu	কচ্ছপিয়	৪	১	১	
Coxsbazar	Ramu	দক্ষিণ কচ্ছপিয়	৫	১০	১০	
Coxsbazar	Ramu	মনির ঝিল	৬	৩	৩	
Coxsbazar	Ramu	মৈসকুম	৭	১	১	
Coxsbazar	Ramu	কাউয়ার খো	৮	২	২	
Coxsbazar	Ramu	উখিয়ার ঘোনা	৯	৩	৩	
Coxsbazar	Ramu	জঙ্গল গর্জনিয়া	১০	১	১	
Coxsbazar	Ramu	পশ্চিম গর্জনিয়া	১১	২	২	
Coxsbazar	Ramu	জোয়ারিয়া নালা	১২	৭	৭	
Coxsbazar	Ramu	জঙ্গল ধলীছড়া	১৩	৬	১ থেকে ৫	৬ No. Under Collction process
Coxsbazar	Ramu	ধলীছড়া	১৪	৫	৫	
Coxsbazar	Ramu	নন্দাখালী	১৫	২	২	
Coxsbazar	Ramu	উল্টাখালী	১৬	১	১	
Coxsbazar	Ramu	নোনাছড়ী	১৭	৪	৪	
Coxsbazar	Ramu	চাকমার কুল	১৮	৫	৫	
Coxsbazar	Ramu	উত্তর মিঠাছড়ী	১৯	২	২	
Coxsbazar	Ramu	হাইটুপী	২০	১	১	
Coxsbazar	Ramu	মেরংলোয়া	২১	২	২	
Coxsbazar	Ramu	ফতেখারকুল	২২	৫	৫	
Coxsbazar	Ramu	শ্রীকুল	২৩	১	১	
Coxsbazar	Ramu	সোনাইছড়ী	২৪	৬	১ থেকে ৫	৬ No. Under Collction process
Coxsbazar	Ramu	রাজারকুল	২৫	৯	৯	
Coxsbazar	Ramu	উমখালী	২৬	৬	৬	
Coxsbazar	Ramu	দক্ষিণ মিঠাছড়ী	২৭	১১	১১	
Coxsbazar	Ramu	চাইন্দ	২৮	৭	১ থেকে 6	17 No. Under Collction process
Coxsbazar	Ramu	জঙ্গল খুনিয়া পালং	২৯	১	১	
Coxsbazar	Ramu	জঙ্গল ধোয়া পালং	৩০	১	১	
Coxsbazar	Ramu	পেঁচার দ্বীপ	৩১	৩	৩	

List of Mouza Maps (Ramu Upazila)

District	Upozila	Name of Mouza	J.L. No	Total No. Sheet	Collected Sheets	Remarks
Coxsbazar	Ramu	জঙ্গল গোয়ালিয়া পালং	৩২	১	১	
Coxsbazar	Ramu	গোয়ালিয়া পালং	৩৩	৩	৩	
Coxsbazar	Ramu	ধোয়া পালং	৩৪	২	২	
Coxsbazar	Ramu	খুনিয়া পালং	৩৫	৬	২ থেকে ৫	১ ও ৬ No. Under Collction process
Coxsbazar	Ramu	ধেচুয়াপালং	৩৬	৩	৩	
Coxsbazar	Ramu	দারিয়ারদীঘি	৩৭	৭	৭	
Coxsbazar	Ramu	জঙ্গল দারিয়ারদীঘি	৩৮	১	১	
Coxsbazar	Ramu	লট উখিয়ার ঘোনা	৩৯	৭	১থেকে ৭ Available	
				Total	**Collected** ১৭০	**Under Collection** ৫

List of of Mouzas (Rangunia Upazila)

District	Upozila	Name of Mouza	J.L. No	Total Sheets	Collected Sheets	Remarks
Chittagong	Rangunia	জঙ্গল বগাবিলি	১	৩	১	২ ও ৩ Sheets Under collection process
Chittagong	Rangunia	বগাবিলি	২	৩	৩	
Chittagong	Rangunia	লট ৫৬ বগাবিলি	৩			Mouza Under collection process
Chittagong	Rangunia	মেঘাছড়ী	৪	১	১	
Chittagong	Rangunia	ভরণছড়ী	৫	১	১	
Chittagong	Rangunia	লট ৫৭ ঠাণ্ডাছড়ী	৬	১		Mouza Under collection process
Chittagong	Rangunia	ঠাণ্ডাছড়ী	৭	২	২	
Chittagong	Rangunia	শিয়ালবুক্কা	৮	৪	৪	
Chittagong	Rangunia	জঙ্গল পারুয়া	৯	৫	২,৪,৫	১ ও ৩ Sheets Under collection process
Chittagong	Rangunia	পারুয়া	১০	৩	৩	
Chittagong	Rangunia	দক্ষিণ ঘাগরা	১১	৫	৫	
Chittagong	Rangunia	মধ্য ঘাগরা	১২	৫	1,3,5	১ ও ৪ Sheets Under collection process
Chittagong	Rangunia	উত্তর ঘাগরা	১৩	৪	১,২	৩ ও ৪ Sheets Under collection process
Chittagong	Rangunia	পশ্চিম নিশ্চিন্তপুর	১৪	৮	৮	
Chittagong	Rangunia	পূর্ব নিশ্চিন্তপুর	১৫	৭	৭	
Chittagong	Rangunia	লট ৫৮ নিশ্চিন্তপুর	১৬	১	১	
Chittagong	Rangunia	গজালিয়া	১৭	৩	৩	
Chittagong	Rangunia	লালানগর	১৮	২	২	
Chittagong	Rangunia	হোচলাবাদ	১৯	২	২	
Chittagong	Rangunia	খারগোলা	২০	১	১	
Chittagong	Rangunia	জঙ্গল দক্ষিণ নিশ্চিন্তপুর	২১	৫	৫	
Chittagong	Rangunia	দক্ষিণ নিশ্চিন্তপুর	২২	৪	৪	
Chittagong	Rangunia	বাইনালা	২৩	১	১	
Chittagong	Rangunia	গুমাইঝিল	২৪	২	২	
Chittagong	Rangunia	গুমাই	২৫	৪	৪	
Chittagong	Rangunia	চন্দ্রঘোনা	২৬	৩	৩	
Chittagong	Rangunia	সোনাইছড়ী	২৭	১	১	
Chittagong	Rangunia	কদমতলী	২৮	১	১	
Chittagong	Rangunia	কাটাখালী	২৯	১	১	
Chittagong	Rangunia	দেবীপুর কদমতলী	৩০	২	২	
Chittagong	Rangunia	দক্ষিণ পারুয়া	৩১	১	১	
Chittagong	Rangunia	দক্ষিণ ইছামতি	৩২	১	১	
Chittagong	Rangunia	সৈয়দবাড়ী	৩৩	২	২	
Chittagong	Rangunia	রাঙ্গুনিয়া	৩৪	৪	৪	
Chittagong	Rangunia	ইছামতি	৩৫	২		Mouza Under collection process
Chittagong	Rangunia	কোকানিয়া	৩৬	১	১	
Chittagong	Rangunia	ঘাট চেক	৩৭	২	২	

List of of Mouzas (Rangunia Upazila)

District	Upozila	Name of Mouza	J.L. No	Total Sheets	Collected Sheets	Remarks
Chittagong	Rangunia	জঙ্গল ঘাট চেক	৩৮	২	২	
Chittagong	Rangunia	জঙ্গল সুরতসিংহের ঢালা	৩৯	২	১	২ No. Sheet Under collection process
Chittagong	Rangunia	সুরতসিংহের ঢালা	৪০	৪	৪	
Chittagong	Rangunia	লট ৯৯ হাজারী	৪১	১		Mouza Under collection process
Chittagong	Rangunia	নোয়াগাঁও	৪২	২	২	
Chittagong	Rangunia	গোমরা	৪৩	৮	৮	
Chittagong	Rangunia	জঙ্গল গোমরা	৪৪	২	২	
Chittagong	Rangunia	পুকিয়ালোলা	৪৫	১	১	
Chittagong	Rangunia	বানিয়াখোলা	৪৬	১	১	
Chittagong	Rangunia	বেভাগী	৪৭	৬	৬	
Chittagong	Rangunia	চেমিরছড়া	৪৮	১	১	
Chittagong	Rangunia	আন্দরঘোন	৪৯	১	১	
Chittagong	Rangunia	ডিঙ্গললঞা	৫০	২	২	
Chittagong	Rangunia	তিনচাদিয়া	৫১	১	১	
Chittagong	Rangunia	চেঙ্গখালী	৫২	২	২	
Chittagong	Rangunia	কাউখালী	৫৩	১	১	
Chittagong	Rangunia	গুনগুনিয়াবেভাগী	৫৪	১	১	
Chittagong	Rangunia	সরপভাটা	৫৫	৫	৫	
Chittagong	Rangunia	জঙ্গল সরপভাটা	৫৬	৭	১ থেকে ৬	৭ No. Sheet Under collection process
Chittagong	Rangunia	শিলক	৫৭	৬	৬	
Chittagong	Rangunia	তৈলাভাঙ্গা	৫৮	২	২	
Chittagong	Rangunia	ধোপাঘাটা	৫৯	১		Mouza Under collection process
Chittagong	Rangunia	কোদালা	৬০	৩	৩	
Chittagong	Rangunia	লট ৫ জঙ্গল কোদালা	৬১	২	২	১৩৩ No. Sheets Under collection process
Chittagong	Rangunia	লট ২ কোদালা	৬২	৬	৬	
Chittagong	Rangunia	নারিসচা	৬৩	৩	৩	
Chittagong	Rangunia	ত্রিপুরাসুন্দরী	৬৪	৩	২, ৩	১ No. Sheet Under collection process
Chittagong	Rangunia	পদুয়া	৬৫	৫	৫	
Chittagong	Rangunia	দারিকোপ	৬৬	১	১	
Chittagong	Rangunia	সুকবিলাস	৬৭	৫	৫	
Chittagong	Rangunia	ফলাহারিয়া	৬৮	৩	৩	
Chittagong	Rangunia	পশ্চিম খুরুসিয়া	৬৯	৬	৬	
Chittagong	Rangunia	পূর্ব খুরুসিয়া	৭০	৫	৫	
Chittagong	Rangunia	নাপিতপুকুরিয়া	৭১	২	২	
Chittagong	Rangunia	দুধপুকুরিয়া	৭২	১	১	
				Total	**Collected** ১৮৯	**Under Collection** ১৯

APPENDIX-2

Technical Specifications of GIS data

Appendix-2
Technical Specifications of GIS Data

This document contains the technical specifications forthe development of GIS database. It has two sections: Section-A and Section-B. In Section-A, specifications for mauzamap scanning and digitizationhas been provided. Section-B contains the specifications of GIS layersof Survey and Plan Maps

Appendix- 2 A: Specifications for Mauza Map Scanning &Digitization

This section contains the scanning specifications and digitization of mauza maps.

Scanning Specifications of Mouza Maps

The scanning specifications ofmauza mapsspecifies Image Type, Image Format, Image Resolution and Image scale as follows:

Image Type	Grayscale
Image Format	JPG
Image Resolution	300 dpi
Image Scale	100%(1:1)

Nomenclature of Scanned Mouza Maps

A systematic nomenclature will be followed for naming the scanned image files of the mauza maps.

File Name	**XXX_XXX_XXX_XX**							
	XXX							First 3-digit of the District name
		_						An underscore as a separator
			XXX					First 3-digit of theUpazilaname
				_				An underscore as a separator
					XXX			JL No. of the Mouza (3 digits)
						_		An underscore to separate JL No. and Sheet No.
							XX	Number of Sheet No of the mauza map. (2 digits)
Example:**COX_RAM_018_02.jpg** represents the image file in JPG format of Sheet no. 2of ChakmarkulMouza having JL no. 18 of RamuUpazila of Cox's Bazar District.								

Digitizationof Scanned Mouza Maps

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

1) Shape file name: **N_XXX_XXX_XXX_XX.shp**
Type: **Point**

This shape file will contain dag number (plot number) of theMouza 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
Plot_No	Long Integer	-	-	To contain *dag* number (plot number)
Plot_Type	String	20	-	To contain following plot types - "Plot" - "Katcha Road" - "Pucca Road" - "Halot" - "Pond" - "Canal" - "River"
Mouza	String	100	-	To contain name of the Mouza
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 Mouzaname+singlespace+JLno(3-digits)+single space+sheet no(2-digits)
Scale	String	20		To contain scale of the mouza sheet.
Surv_No	String	100		To contain survey number of the mouza map
Survey_Period	String	20		To contain survey period of the mouza map. E.g 1973-85
Upazila	String	25	-	To contain name of the current Upazila to which the mauza belongs.
District	String	25	-	To contain name of the current District to which the mauza belongs o.
Remarks	String	100	-	To contain remarks, if any.

2) Shape file name: **L_XXX_XXX_XXX_XX.shp**
Type: **Polyline**

This shape file 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
Code	String	3	-	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.
Type	String	30	-	To contain the type of plot boundaries and other line features such as - "Mouzaboundary" - "Sheet boundary" - "Plot boundary" - "Katcha Road" - "Pucca Road" - "Halot" - "Khal"

				- “Thoka line” - “North line” - “Unknown line”
Mouza	String	100	-	To contain name of the Mouza
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 Mouzaname+singlespace+JLno(3-digits)+single space+sheet no(2-digits)

3)Shapefile:**P_xxx_xxx_xx.shp**

Feature Type: ***Point***

This shape file 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**
ID	String	3	To contain the user ID of different point features. For example: 45 is the ID of Traverse Station (New)
Item	String	50	To contain type 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.
Mouza	String	50	To contain name of the Mouza
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		To contain the name of Mouza, JL number and Sheet number as concatenated string from three fields (Mouza, JL_No and Sheet_No) to all the featurers. For example, Kandirpar_96_3.

4) Shapefile: **S_xxx_xxx_xx.shp**

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**
ID	String	3	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.
Type	String	50	To contain type of features such as - “Permanent Structure [Dalan]” - “Tinshed Structure” - “Other Structure” - “Pond/Waterbody” - “Pan Baraz” - “Graveyard”

Field Name	Field Type	Field Width	Purpose of the field
Mouza	String	50	To contain name of the Mouza
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		To contain the name of Mouza, JL number and Sheet number as concatenated string from three fields (Mouza, JL_No and Sheet_No) to all the featurers. For example, Kandirpar_96_3.

Feature Codes

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

Feature Type/Item	Shape File Name	Feature Code (ID)
International Boundary	L_xxx_xxx_xx	10
Mouza Boundary		11
Sheet Boundary		12
Thoka Line		13
Plot Boundary		14
Embankment		16
Hill		17
Road		21
Halot		22
Khal (Canal)		23
River		24
Rail Line		25
Slope		26
North Line		27
PuccaSadak		28
KatchaSadak		29
Unknown Line		99
Permanent Structure [Dalan]	S_xxx_xxx_xx	31
Tin Shed Structure		32
Other Structure		33
Pan Baraz		34
Pond/Water Body		35
Graveyard		36
Missing or not readable plot number	N_xxx_xxx_xx	99999
Boundary Pillar	P_xxx_xxx_xx	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

Feature Type/Item	Shape File Name	Feature Code (ID)
Temple		54
Adjacent Mouza/Sheet		61
0tier 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

Appendix- 2 B: Specifications for Layers of Survey and Plan Maps

It specifies name of the spatial layers and the structure of their attribute tables.

1) Shape file name: **Admin_boundary.shp**
Type: **Polyline**

This shape file will contain administrative boundaries of project area. 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
Type	String	100	-	To contain the followingadministrative boundaries "International Boundary" "District Boundary" "Upazila Boundary" "Union boundary" "Ward Boundary" "Mauza boundary" "Sheet boundery"

2) Shape file name: **BS_Mouza_Plot_Poly.shp**
Type: **Polygon**

This shape file will contain plots of merged BS Mouza maps of project area as polygon 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
Plot_no	Long Integer	-	-	To contain *dag* number (plot number)
Plot_Type	String	20	-	To contain following plot types - "Plot" - "KatchaRoad" - "Pucca Road" - "Halot" - "Pond" - "Canal" - "River
Khas Exist	String	3	-	Whether the Khas land exist in the plot. - "Yes" - "No"
Khas_area	Double	-	-	To contain area of khas land in the plot, in decimals of acres (if exist)
Mouza	String	100	-	To contain name of the Mouza
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 Mouzaname+singlespace+JLno(3-digits)+single space+sheet no(2-digits)

Mouza_JL	String	100	-	To contain Mouzaname+singlespace+JLno(3-digits)
Scale	String	20		To contain scale of the mouza sheet.
Surv_No	String	100		To contain survey number of the mouza map
Survey_Period	String	20		To contain survey period of the mouza map. E.g 1973-85
Ward	String	10	-	To contain name of the Ward, e.g.**Ward-09**
Un_Pau	String	50	-	To contain the name of Union/Paurashava
Upazila	String	25	-	To contain name of the current Upazila to which the mauza belongs.
District	String	25	-	To contain name of the current District to which the mauza belongs o.
U_W_Geocode	String	6	-	To contain Six-digited BBS Geocode of Union or Ward as District+Thana+Union/Ward
M_Geocode	String	9	-	To contain Nine-digited BBS Geocode of Mouza as District+Thana+Union/Ward+Mauza
Remarks	String	100	-	To contain remarks, if any.

3) Shape file name: **BS_Mouza_Plot_line.shp**
Type: **Polyline**

This shape file will contain line features of merged BS Mouzas of project area as polyline 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
Type	String	20	-	"Plot Boundary" "Sheet Boundary" "Mauza Boundary" "Katcha Road" "Pucca Road" "Halot" "Pond" "Canal" "River"
Remarks	String	100	-	To contain remarks, if any.

4) Shape file name: **BS_Mouza_Plot_No.shp**
Type: **Point**

This shape file will contain Plot numbers of merged BS Mouzas of project area 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
Plot_no	Long Integer	-	-	To contain *dag* number (plot number)
Plot_Type	String	20	-	To contain following plot types - "Plot"

				- "Katcha Road" - "Pucca Road" - "Halot" - "Pond" - "Canal" - "River
Khas Exist	String	3	-	Whether the Khas land exist in the plot. - "Yes" - "No"
Khas_area	Double	-	-	To contain area of khas land in the plot, in decimals of acres (if exist)
Mouza	String	100	-	To contain name of the Mouza
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 Mouzaname+singlespace+JLno(3-digits)+single space+sheet no(2-digits)
Mouza_JL	String	100	-	To contain Mouzaname+singlespace+JLno(3-digits)
Scale	String	20		To contain scale of the mouza sheet.
Surv_No	String	100		To contain survey number of the mouza map
Survey_Period	String	20		To contain survey period of the mouza map. E.g 1973-85
Ward	String	10	-	To contain name of the Ward, e.g. **Ward-09**
Un_Pau	String	50	-	To contain the name of Union/Paurashava
Upazila	String	25	-	To contain name of the current Upazila to which the mauza belongs.
District	String	25	-	To contain name of the current District to which the mauza belongs o.
U_W_Geocode	String	6	-	To contain Six-digited BBS Geocode of Union or Ward as District+Thana+Union/Ward
M_Geocode	String	9	-	To contain Nine-digited BBS Geocode of Mouza as District+Thana+Union/Ward+Mauza
Remarks	String	100	-	To contain remarks, if any.

5) Shape file name: **Structures.shp**
Type: **Polygon**

This shape file will contain the information of each structure in the area under project. It must contain thirteen fields as described in the following table:

Field **Name**	Field **Type**	**Width** of the field	No. of **Decimal** Places	**Purpose** of the field
Str_Type	String	20	-	To contain the type of the structure as follows - "Pucca" - "Semi-pucca" - "Katcha"
Storied	Short Integer	-	-	To contain the number of floors of the structure.
Str_Use1t	String	100	-	1. To contain the use (1^{st}) of the structure.

				2. The attributes should be according to the given “Existing_Landuse” categories.
Str_Use2t	String	100	-	To contain the use (2nd) of the structure.
Str_Use3t	String	100	-	To contain the use (3rd) of the structure.
Str_name	String	100	-	To contain the name of the structure.
Cons_Year	Short Integer	-	-	To contain the year of construction.
Undercon	String	3	-	To contain the information if it was being under construction during the feature survey. - Yes/No ; True/False ; 1/0
Struc_Owner	String	50	-	To contain the owner name of the structure.
Holding_no	String	50	-	To contain Holding number of the structure.
Road_no	String	50	-	To contain adjacent road number, if any
Road_name	String	100	-	To contain the name of the nearby road
Locality (Mauza/ Ward)	String	50	-	To contain the name of the Mauza_JL_Sheet.

6) Shape file name: **Ex_Road_polygon.shp**
Type: **Polygon**

This shape file will contain the existing roads as polygon features in the area under project.It must contain three fields as described in the following table:

Field **Name**	Field **Type**	**Width** of the field	No. of **Decimal** Places	**Purpose** of the field
Road_name	string	100		To contain the name of the road, if any
Road_no	string	20	-	To contain road number, if any
Road_ID	string	20	-	To contain the ID of Road
Road_type	string	20	-	To contain the physical type of the road as follows - “Pucca” - “HBB” - “Katcha”
Road_Class	string	100		To contain the Class of the road - “Primary” - “Secondary” - “Tertiary”

7) Shape file name: **Ex_Road_Edge.shp**
Type: **Polyline**

This shape file will contain the existing roads as polyline features in the area under project.It must contain three fields as described in the following table:

Field **Name**	Field **Type**	**Width** of the field	No. of **Decimal** Places	**Purpose** of the field
Road_name	string	100		To contain the name of the road, if any
Road_no	string	20	-	To contain road number, if any

Road_ID	string	20	-	To contain the ID of Road
Road_type	string	20	-	To contain the physical type of the road as follows - “Pucca” - “HBB” - “Katcha”
Road_Class	string	100		To contain the Class of the road - “Primary” - “Secondary” - “Tertiary”

8) Shape file name: **Ex_Road_CLshp**
Type: **Polygon**

This shape file will contain the centerlines of existing roads as polyline features in the area under project.It must contain the following fields compatible to network analysis:

Field **Name**	Field **Type**	**Width** of the field	No. of **Decimal** Places	**Purpose** of the field
Road_name	string	100		To contain the name of the road, if any
Road_no	string	20	-	To contain road number, if any
Road_ID	string	20	-	To contain the ID of Road
Road_type	string	20	-	To contain the physical type of the road as follows - “Pucca” - “HBB” - “Katcha”
Road_Class	string	100		To contain the Class of the road - “Primary” - “Secondary” - “Tertiary”
Road_width	numeric		-	To contain average width of the road segment in meter
Road_length	numeric		-	To contain calculated length of the road segment in meter
Num_Lanes	numeric		-	To contain number of lanes on the road segment such as 1, 2, etc.
Road_own	string	100		To contain the name of the department or organizationto which the road segment belongs.
METERS	Double	-	-	To contain length of the road in meters
FT_MINUTES	Float	-	-	To contain the time duration needed to travel the arc from the start node unto theend node, measured in minutes.
TF_MINUTES	Float	-	-	To conatointhe time duration needed to ravel the arc from the end node unto thestart node of the arc, measured in minutes,
Oneway	string	2		To contain the value to represent the possible directions to travel an arc
Hierarchy	Long			To contain order or rank assigned to road network elements.

9) Shape file name: **Footpath_poly.shp**
Type: **Polygon**
Surface
This shape file will contain footpath of project area. 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
Road_name	string	50	-	To contain road name
Road_No	string	20	-	To contain road number if any
Road_ID	string	20	-	To contain the adjacent Road ID
Width	numeric		-	To contain width of Footpath
Footpath				-Yes; true; 1

10) Shape file name: **Road_Island_poly.shp**
Type: **Polygon**

This shape file will contain road islands of the project area. 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
Road_name	string	50	-	To contain road name
Road_No	string	20	-	To contain road number if any
Road_ID	string	20	-	To contain the adjacent Road ID

11) Shape file name: **Waterbody_poly.shp**
Type: **Polygon**

This shape file will contain water bodies of project area. 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
WB_Type	string	50	-	To contain following type of water bodies - “River” - “Khal” - “IrrigationCanal” - “Swamp” - “Pond” - “Ditch” - “Borrow Pits”
Use_Type	string	50	-	To contain the use of water body such as Private or Public use

12) Shape file name: **Embankment_CL.shp**
Type: **Polyline**

This shape file will contain embankment features of project area. 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
Embankment_name	string	100		To contain the name of the road, if any
Road_ID	string	20	-	To contain the ID of Road
Road_typ	string	20	-	To contain the physical type of the road as follows - "Pucca" - "HBB" - "Katcha"
Road_Class	string	100		To contain the Class of the road - "Primary" - "Secondary" - "Tertiary"
Road_width	numeric		-	To contain average width of the road segment in meter
Embankment_width	numeric		-	To contain average width of the embankment segment in meter
Embankment_length	numeric		-	To contain calculated length of the road segment in meter
Num_Lanes	numeric		-	To contain number of lanes on the road segment such as 1, 2, etc.
Owner	string	100		To contain the name of the department or organizationto which theembankment segment belongs.

13) Shape file name: **DTM_points.shp**
Type: **Point**

This shape file will contain 3D points at regular interval (10m x 10m) inproject area. It must contain four fields as described in the following table:

Field **Name**	Field **Type**	**Width** of the field	No. of **Decimal** Places	**Purpose** of the field
RL	Numeric	20	3	To contain Reduced Level (RL) of a point in meter as referenced with PWD
Easting	Numeric	20	3	To contain X-coordinate of the point
Northing	Numeric	20	3	To contain Y-coordinate of the point

14) Shape file name**BM.shp**
Type: **Point**

This shape file will contain BM Pillars established in the project area. It must contain four fields as described in the following table:

Field **Name**	Field **Type**	**Width** of the field	No. of **Decimal** Places	**Purpose** of the field
RL	Numeric	20	3	To contain Reduced Level (RL) of a point in meter as referenced with PWD
Easting	Numeric	20	3	To contain X-coordinate of the point
Northing	Numeric	20	3	To contain Y-coordinate of the point
Name of the organization	String	100	-	To contain name of the organization
Remarks	String	100	-	To contain remarks, if any.

15) Shape file name: **Contour.shp**
Type: **Polyline**

This shape file will contain the contour lines of the area under project area. It must contain three fields as described in the following table:

Field **Name**	Field **Type**	**Width** of the field	No. of **Decimal** Places	**Purpose** of the field
Contour	Numeric	20	3	To contain the value (RL) of the contours up to three decimal places.
Label	Numeric	6	1	To contain the value of contour up to one decimal place. This can be used to label the contours in map.
Type	String	7	-	To contain the value of this field as follows: - "Index" - "Intermediate" The purpose of this field is to symbolize and label the contours only. (The values must be calculated in such way that after successive 4 thin (Regular) contours there should be one thick (Index) contour in map. That is if 0.00 is a thick (Index) contour then 0.3, 0.6, 0.9, and 1.2 will be (Regular) contours and 1.5 will be thick contour.

16) Shape file name: **Existing_Landuse.shp**
Type: **Polygon**

This shape file will contain existing land use of project area which will be prepared on the basis of physical feature and land use survey. It may 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
Land_use	string	50	-	To contain existing land use as - "Administrative" - "Agriculture" - "Commercial" - "Circulation Network" - "Institutional" - "Flood Flow Zone" - "Industrial" - "Mixed Use" - "Recreational"

				- “Restricted / Special Use” - “Socio-Cultural” - “Transport & Communication” - “Urban Residential” - ”Urban Services” - “Vacant Land” - “Water Body”
Remarks	string	100	-	To contain remarks, if any.

17) Shape file name: **Homestead_polygon.shp**
Type: **Polygon**

This shape file will contain rural homestead areas in project areaas polyline 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
Location	String	20	-	To contain the name of Mauza (Mauza_JL_Sheet) or the locality in which homestead areas lies.
Type				To contain the type of homestead area -Urban -Rural

18) Shape file name: **Bridge_polygon.shp**
Type: **Polygon**

This shape file will contain Bridge/Culvert/Box culvert/Over bridge/Railway Bridgeetc as polygon features in project area. 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
Length	numeric	20	2	To contain the length of the bridge/culvert
Width	numeric	20	2	To contain the width of the bridge/culvert
Abutment	numeric	20	0	To contain the number of abutment
Span	numeric	20	2	To contain the span of the bridge/culvert
Location	String	20	-	To contain the area name (Mauza_JL_Sheet or locality)
Remarks	String	254	-	To contain comments about the bridge such as conditions of abutment, deck, wing wall, etc.

19) Shape file name: **Bridge_Edge_line.shp**
Type: **Polyline**

This shape file will contain Bridge/Culvert/Box culvert/Over bridge/Railway Bridgeetc as polyline features in project area. Each feature must be a multipart feature. 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
Length	numeric	20	2	To contain the length of the bridge/culvert
Width	numeric	20	2	To contain the width of the bridge/culvert

Abutment	numeric	20	0	To contain the number of abutment
Span	numeric	20	2	To contain the span of the bridge/culvert
Location	String	20	-	To contain the area name (locality)
Remarks	String	254	-	To contain comments about the bridge such as conditions of abutment, deck, wing wall, etc.

20) Shape file name: **Bridge_point.shp**
Type: **Point**

This shape file will contain Bridge/Culvert/Box culvert/Over bridge/Railway Bridge etc as point features in project area. It is expected that this shape file will be generated/produced from converting the **Bridge_CL.shp** file into centroids. 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
Length	numeric	20	2	To contain the length of the bridge/culvert
Angle				To contain the Geographic angle of the bridge/culvert
Width	numeric	20	2	To contain the width of the bridge/culvert
Abutment	numeric	20	0	To contain the number of abutment
Span	numeric	20	2	To contain the span of the bridge/culvert
Location	String	20	-	To contain the area name (Mauza_JL_Sheet or locality)
Remarks	String	254	-	To contain comments about the bridge such as conditions of abutment, deck, wing wall, etc.

21) Shape file name:**Ex_Drain_CL.shp**
Type: **Polyline**

This shape file will contain the information of existing drains in the projectarea.It must contain three fields as described in the following table:

Field **Name**	Field **Type**	**Width** of the field	No. of **Decimal** Places	**Purpose** of the field
Type	string	20	-	To contain the (construction)type of the drain. The value of the field may be any of the following two - Surface (Katcha) - Surface (Uncovered) - Surface (Covered) - Pipe
Drain_width	numeric	20	2	To contain the width of the drain
Drain_depth	numeric	20	2	To contain the depth of the drain
Drain_radios	numeric	20	2	To contain the radios of the drain
Road_ID	string	20	-	To contain the adjacent Road ID

22) Shape file name: **Boundary_Wall_CL.shp**
Type: **Polyline**

This shape file will contain boundary walls as line features of project area. 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
Type	string	50	-	To contain line features such as Boundary wall.

23) Shape file name: **Water_Supply_Line.shp**
Type: **Polyline**

This shape file will contain water distribution pipe network as line features in project area. 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
Type	string	20	-	To contain type of pipe (Steel, PVC, etc)
Dia	numeric	20	2	Diameter of pipe in mm

24) Shape file name: **Overhead_Tank.shp**
Type: **Point**

This shape file will contain overhead water tanks as point features in project area. 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
Capacity	numeric	20	2	To contain the capacity of the overhead tank.
Catchment	numeric	20	2	To contain the catchment area in sq. meter
Owner				Contains the owner name

25) Shape file name: **Electricity_Supply_Line.shp**
Type: **Polyline**

This shape file will contain High Voltage Electric Lines as line features in project area. 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
capacity	string	20	-	Contains the capacity of each line as 11KV, 33 KV etc.
Owner				Contains the name of Organization

26) Shape file name: **Utilities.shp**
Type: **Point**

This shape file will contain locations of various utility features as described in the following table:

Field **Name**	Field **Type**	**Width** of the field	No. of **Decimal** Places	**Purpose** of the field
Type	string	20	-	To contain - "Electric Pole" - "ElectricTower" - "HighVoltElectricTower" - "Electric Box" - "Power Station" - "Power Sub-station" - "Transformer" - "GasTransmissionCenter - "Light Post" - "Telephone Pole" - "Telephone Box" - "Fire Service Station" - "Traffic Signal Pole"
Remarks	String	100	-	To contain remarks if any
Owner				Contains the name of the owner

27) Shape file name: **Sewerage_CL.shp**
Type: **Polyline**

This shape file will contain sewerage network as line features in [project area. 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
Size	string	20	-	To contain pipe diameter of sewerage line
Type	string	25	-	Contains type of waste water carried by the sewerage line such as storm sewerage or household sewerage line etc.
Location	string	20	-	Contains location of sewerage line
Owner				Contains the name of the owner

28) Shape file name: **Other_polygon.shp**
Type: Polygon

This shape file will contain polygon features of project area. 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
Type	string	50	-	To contain boundary of following features - "Graveyard" - "Crematorium" - "Cemetery" - "Eidgah" - "Restricted Area" - "Airport" - "Brick Field" - "Rikshaw Garage" - "Automobile Garage" - "Slum" - "Monument" - "Open Space" - "Parks" - "Playground" - "Stadium" - "Golf Course" - "Botanical Garden" - "Zoological Park" - "Power Plant/Station" - "Bus Terminal" - "Truck Terminal" - "Water Treatment Plant" - "Sewerage Treatment Plant" - "Waste Disposal Plant" - "Railway Station" - "Bazaar Boundary" - "ForestLand" - "Sand Fill" - "Swimming Pool" - *- Other if necessary*
Owner				Contains the name of the owner

29) Shape file name: **All_point.shp**
Type: **Point**

This shape file will contain point features of project area. 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
Type	string	50	-	- "Airport" - "Brickfield" - "Bridge" - "Bus Terminal" - "Cemetery" - "Church" - "Cinema Hall"

				- "College" - "Crematorium" - "Deep tube well" - "Dustbin" - "Filling Station" - "Graveyard" - "Hand tube well" - "Historic site" - "Hospital/Clinic" - "Madrasa" - "Mazar/Dargah" - "Monument" - "Mosque" - "Museum" - "Oil Reservoir/Depot" - "Over Bridge" - "Pagoda" - "Police Box" - "Police Station" - "Post Office" - "RiverPort" - "School" - "Sluice gate" - "Temple" - "Theater Hall" - "Truck Terminal" - "Under Pass" - "University" - "Well" -"Culvert" *- Other if necessary*
Name	string	50	-	To contain name of the feature, if any
Remark	string			Contains Further Explanation
Owner				Contains the name of the owner

30) Shape file name: **Important_Names.shp**
Type: **Point**

This shape file will contain the names of important places and structures as point features inproject area.

Field **Name**	Field **Type**	**Width** of the field	No. of **Decimal** Places	**Purpose** of the field
Name	String	100	-	To contain - Name of locality, market, bazaar, important

				structure, historic site, university, play ground, poultry farm, river, khal, lake, pond, etc.

31) Shape file name: **Road_Names.shp**
Type: **Annotation/Line**

This shape file will contain the names of important places and structures as point features in project area.

Field **Name**	Field **Type**	**Width** of the field	No. of **Decimal** Places	**Purpose** of the field
Name	String	100	-	To contain the name of road segment.

32) Shape file name: **Proposed_Road_CL.shp**
Type: **Polyline**

This shape file will contain center lines of proposed roads as line features in the project area.

Field **Name**	Field **Type**	**Width** of the field	No. of **Decimal** Places	**Purpose** of the field
Width_m	Number	10	2	To contain width of the proposed road in meter
Width_ft	Number	10	2	To contain width of the proposed road in foot
From_To	String	100	-	To contain the names (of road/place) from where the road starts and to where the road ends.
Prop_type	String	20	-	To contain any of the two - “New” - “Widening”
Type	String	20	-	To contain any of the following - “Underground” - “Ground” - “Flyover” - “Viaduct”
Remarks	String	254	-	To contain comments, if any

41) Shape file name: **Population.shp**
Type: **Polygon**

This shape file will contain polygon features ofunions and wards derived from dissolved Mouzas of the project areaarea. 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
Union_Ward	String	50	-	To contain name of the Mouza
Area_BBS	Number	10	2	
Area_GIS	Number	10	2	
Pop_2001	Number	10	0	
Pop_2011	Number	10	0	

Pop_2021	Number	10	0	
Pop_2035	Number	10	0	
Pop_den_2011				
Thana				
Union				
Geocode	String	11	-	To contain BBS geocode of the Union

42) Shape file name: **Structure_Plan.shp**
Type: **Polygon**

This shape file will contain proposed policy on the **merged mouza map** of the project area. It must contain the fields as described in the following table:

Field **Name**	Field **Type**	**Width** of the field	No. of **Decimal** Places	**Purpose** of the field
Policy_Zone	String	50	-	To contain proposed policy on the plots.
Remarks	String	100	-	To contain remark, if any.

APPENDIX-3
Landuse Survey Format

Appendix- 3
Landuse Survey Format

Appendix- 3 (A): Land use Occupancy Type and Use Class

Occupancy Type		Code	Nature of Use or Occupancy
A:	Residential	A1	Detached single family dwelling
		A2	Flats or apartments
		A3	Mess, boarding house dorms, hostels
		A4	Minimum standard housing
		A5	Hostels & lodging hours
B:	Educational	B1	Educational facilities
		B2	Pre-school facilities
C:	Institutional	C1	Child care Institutional
		C2	Custodial institutions for physically handicapped
		C3	Custodial institutions for physically capable
		C4	Penal mental institutions
D:	Health care	D1	Normal medical facilities
		D2	Emergency medical facilities
E:	Assembly	E1	Large assembly with fixed seat
		E2	Small assembly with fixed seat
		E3	Large assembly with fixed seat
		E4	Small assembly with fixed seat
		E5	Sports facilities
F:	Business Mercantile	F1	Offices
		F2	Small shops & markets
		F3	Large shops & markets
		F4	Garages & petrol stations
		F5	Essential services
		F6	Footloose business/ mechanism
G:	Industrial	G1	Low hazard industries
		G2	Moderate hazard industries
H:	Storage	H1	Less fire risk storage
		H2	Moderate fire risk storage
J:	Hazardous	J1	Explosion hazard buildings
		J2	Chemical hazard buildings
K:	Misc.	K1	Private garages & special structures
		K2	Fences, tanks & towers
L:	Open Space	L1	Cropping including forestry
		L2	Fishing
		L3	Livestock
		L4	Recreational
		L5	Reserved
M:	Mixed use	M1	As applicable

Appendix-3 (B): Summary of Permitted and Conditional Uses

LEGENDS PERMITTED USE O CONDITIONAL USE C PLAN REVIEW REQUIRED P NOT PERMITTED N	PLANNING ZONES	MAIN FLOOD FLOW	SUB FLOOD FLOW	WATER SUPPLY PROTECTION	MIXED USE-PLANNED	MIXED USE-SPONTANEOUS	INDUSTRIAL-LOW HAZARD	INDUSTRY-MODERATE HAZARD	OPEN SPACE	RESTICTED-AIRPORT	RESTRICTED-FLOOD PROTECTION	RESTRICTED-MILITARY/PUBLIC	RESTRICTED-ROAD/UTILITY	RESTRICTED SPECIAL
LAND USES														
AGRICULTURE, FORESTRY & GRAZING		O	O	O	N	N	N	N	O					
AQUACULTURE & FISHERIES		O	O	O	N	N	N	N	O					
BRICKFIELDS		O	O	O	N	N	N	N	N					
CAUSEWAYS: ROAD, RAILWAY		O	O	O	O	O	O	O	C					
CEMETARIES / GRAVEYARD		N	N	N	C	C	C	C	C					
CINEAMAS		N	N	N	C	C	N	N	N					
CLINICS, MEDICAL		N	N	N	O	O	O	C	N					
CLUBS, PRIVATE		N	N	N	O	O	C	N	O					
COLLEGES & UNIVERSITIES		N	N	N	P	P	N	N	N					
DOCKS & JETTIES		O	O	O	O	O	O	O	N					
DWELLINGS, FARM		N	O	O	O	O	N	N	O					
DWELLINGS, MINIMAL HOUSING		N	C	N	O	O	C	N	N					
DWELLINGS, SINGLE/MULTI FAMILY.		N	C	N	O	O	N	N	N					
EMBASSIES, HIGH COMMISSIONS		N	N	N	O	O	N	N	N					
EXPLOSIVES MANUFACTURE & STORAGE		N	C	N	N	N	N	C	N					
FLOOD MANAGEMENT STRUCTURES		O	O	O	O	O	O	O	O					
GOLF COURSES		P	P	P	N	N	N	N	P					
HOSPITALS (WITH MORGUE)		N	N	N	P	P	N	N	N					
HOTEL GUEST HOUSE		N	N	N	O	O	N	N	N					
HOTEL INTERNATIONAL CLASS		N	N	N	P	P	N	N	N					
INDUSTRIAL CLASS 2		N	N	N	C	C	O	O	N					
INDUSTRIAL CLASS 3		N	C	N	N	N	C	O	N					
INDUSTRIAL CLASS 4		N	N	N	N	N	N	O	N					
INSTITUIONS		N	O	N	O	O	O	N	N					
MAJOR DEVELOPMENT		N	N	N	C	C	C	C	N					
OFFICES / SERVICES		N	N	C	O	O	C	C	N					
PARKING FACILITIES, COMMERCIAL		N	N	N	C	C	O	O	N					
PETROL STATIONS		N	C	N	C	C	O	O	N					
PRISONS		N	P	N	P	P	P	N	N					
PUBLIC USES & STRUCTURES		N	O	O	O	O	O	O	N					
RECREATION FACILITIES, OUTDOOR		O	O	O	O	O	O	N	O					
RELIGIOUS USES & STRUCTURES		N	O	O	O	O	O	N	O					
REPAIR SHOPS, MAJOR		N	N	N	N	N	O	O	N					
REPAIR SHOPS, MINOR		N	O	N	O	O	O	O	N					
RETAIL SHOPS & RESTAURANTS		N	C	N	O	O	C	C	N					
RETENTION PONDS		N	N	N	O	O	O	O	O					
SALVAGE, SCRAP STORAGE & PROCESSING		N	N	N	N	N	C	C	N					
SCHOOLS, PRIVATE		N	N	N	C	C	N	N	N					
SCHOOLS: GOVERNMENT, RELIGIOUS		N	N	N	O	O	N	N	N					
SHIP & BOAT SERVICING		N	O	N	N	N	O	O	N					
SHOPPING CENTRES / LARGE MARKETS		N	N	N	P	P	N	N	N					
STADIUM, SPORTS		N	N	N	P	P	N	N	N					

LEGENDS PERMITTED USE O CONDITIONAL USE C PLAN REVIEW REQUIRED P NOT PERMITTED N	PLANNING ZONES	MAIN FLOOD FLOW	SUB FLOOD FLOW	WATER SUPPLY PROTECTION	MIXED USE-PLANNED	MIXED USE-SPONTANEOUS	INDUSTRIAL-LOW HAZARD	INDUSTRY-MODERATE HAZARD	OPEN SPACE	RESTICTED-AIRPORT	RESTRICTED-FLOOD PROTECTION	RESTRICTED-MILITARY/PUBLIC	RESTRICTED-ROAD/UTILITY	RESTRICTED SPECIAL
TERMINALS. TRAIN, BUS, FREIGHT		N	P	N	P	P	P	P	N					
TRADE CENTRES		N	N	N	P	P	N	N	N					
UTILITY INSTALLATIONS TYPE A		N	O	O	O	O	O	O	N					
UTILITY INSTALLATIONS TYPE B		O	O	O	P	P	P	P	N					
WAREHOUSING & DISTRIBUTION		N	N	N	C	C	O	O	N					
WASTE DISPOSAL & PROCESSING/MINARATOR		N	N	N	N	N	P	P	N					

APPENDIX-4

Documents Related to Collection of Satellite Image

BDBL Bhaban (6th Floor-West)
12, Kawran Bazar
Dhaka-1215, Bangladesh
Tel: +880-2-9116193, 9111946
Fax: +880-2-8116490
E-mail: info@decodebd.com
Web: www.decodebd.com

the decode ltd.

Date: 9th May, 2015

To
Mr. Selim Reza
Director & CEO
House of Consultants Ltd. (HCL)
Dhaka, Bangladesh
Mobile: 01771900600, Phone- 02 9894206
Email: reza@hclbd.org
Web: www.hclbd.org

Dear Sir,
As per your email on May7, 2015 we are pleased to offer you the following price quotation for Stereo Satellite Image-

Stereo (3D) Satellite Image-

Sl	Item	Description	Area SqKm	Unit Price	Total Price
1	Stereo Image, Rangunia	GeoEye-1/WV-1/WV-2, **Stereo**, 0.5 Panchromatic, ***Archive*** Cloud-0%. Image date 3/11/2014	100.00		
2	Stereo Image, Ramu	GeoEye-1/WV-1/WV-2, **Stereo**, 0.5 Panchromatic, ***Archive*** Cloud-0%. Image date 8/12/2014	100.00		
3		**Total**			

Image date
Rangunia -03/11/2014
Ramu -08/12/2014

General Terms and condition:

- **Maximum cloud coverage 15%**
- ***This price is for single user license. (https://www.digitalglobe.com/terms-use)***
- **100% payment is required with the purchase order.**
- **General delivery time 90 days from the purchase order. But it may delay depends on cloud and weather condition for new acquisition.**
- **All prices are excluding VAT & TAX (if any/applicable)**
- **Price is valid for two weeks.**

9/5/2015

We hope this price will be accepted by you. Please feel free to contact us if you have any question or you need any clarification.

Thank you

09.05.2015

B.M. Rabaul Islam
Production Manager and Chief Technical Officer
Mob: 01678134846
Email: ris@decodemap.com
www.decodemap.com

11/05/15

22/04/2015

10.5.2015

.. image descriptions are satisfactory as per my knowledge and to get cloud free data archive is the right choice because only archive can give recent cloud free data otherwise fresh aquisition will take time up to coming Nov & Dec.

Photogrammetric Expert
P-5.

BDBL Bhaban (6th Floor-West)
12, Kawran Bazar
Dhaka-1215, Bangladesh
Tel: +880-2-9116193, 9111946
Fax: +880-2-8116490
E-mail: info@decodebd.com
Web: www.decodebd.com

the decode ltd.

Date: 09 May, 2015

To
Mr. Selim Reza
Director & CEO
House of Consultants Ltd. (HCL)
Dhaka, Bangladesh
Mobile: 01771900600, Phone- 02 9894206
Email: reza@hclbd.org
Web: www.hclbd.org

Dear Sir,

This is to confirm the receipt of purchase order Ref No.- HCL.P.2015.1237, Dated: May 09, 2015 for purchasing of GeoEye-1/WV-1/WV-2, Stereo, 0.5 meter Panchromatic, Archive image.

Thank you

09.05.2015

B.M. Rabaul Islam
Production Manager and Chief Technical Officer
Mob: 01678134846
Email: ris@decodemap.com
www.decodemap.com

decode The ultimate solution for 3D Animation & Video Editing

2966

House No.49(1st floor),Satmasjid Rd.
Dhanmondi R/A, Dhaka 1209
Ph.911 6193, Fax: 816490

MONEY RECEIPT

Received with thanks sum of Tk. ---

from HCL-DM-WATCH JOINT venture

against bill no. For satellite emise purchase

by cheque/cash 3115068 HBL Dt RN: 1102617726

date 09/05/2015

9/5/15

Authorized Signature

APPENDIX-5

Copies of Legal Contract Agreement of Hiring Site Offices

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

৳১০০ ৳১০০

একশত টাকা

কচ ১০৬০২৬৫

বাড়ি ভাড়া চুক্তিপত্র

এই বাড়ি-ভাড়া চুক্তিপত্র অদ্য ১লা মে, ২০১৫ ইং তারিখে নিম্নবর্ণিত পক্ষদ্বয়ের মধ্যে বিস্তারিত আলাপ-আলোচনার মাধ্যমে নিম্নলিখিত শর্তাবলীতে সম্মত হইয়া সম্পাদিত হইলঃ

মোহাম্মদ শহীদুল্লাহ সিকদার, সাবেক চেয়ারম্যান, হাজারকুল ইউপি,
বর্তমান ঠিকানা: উপজেলা পরিষদ গেইট, বন্দর, কক্সবাজার
মোবাইল: ০১৮১৮০৫৪৭৭১, ০১৮১৮৭৫৮০৬৬ (BKash)

..... বাড়ির মালিক/১ম পক্ষ।

Joint Venture of House of Consultants Ltd. (HCL) and Disaster Management Watch (dm.Watch), বাড়ি নং-ব-১৫৪, সড়ক নং-২২, ডি.ও.এইচ.এস., মহাখালী, ঢাকা-১২০৬, এর পক্ষে জনাব সেলিম রেজা, ম্যানেজিং ডাইরেক্টর, হাউজ অব্ কনসালটেন্টস্ লিঃ ..... ভাড়াটিয়া/দ্বিতীয় পক্ষ।

(M: ০১৭২৭২১০৩৬৫)

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

৳১০০ ৳১০০

একশত টাকা

১০৬০২৬৭

শর্তাবলী

১। অত্র বাড়ি-ভাড়া চুক্তিপত্র ১লা মে, ২০১৫ ইং তারিখ হইতে ৩১শে অক্টোবর, ২০১৫ ইং তারিখ পর্যন্ত ৬ (ছয়) মাসের জন্য বলবৎ থাকিবে। প্রয়োজন হইলে আলোচনা সাপেক্ষে সময় বর্ধিত করা যাইবে।

২। ভাড়া বাড়িটি অফিস-কাম-রেসিডেন্স হিসাবে ব্যবহার করা হইবে।

৩। মাসিক বাড়ি-ভাড়া ৩,০০০/- (তিন হাজার) টাকা ধার্য্য করা হইল এবং ২য় পক্ষ (ভাড়াটিয়া) ১ম পক্ষকে (বাড়ির মালিক) প্রতি মাসের ১০ তারিখের মধ্যে বাড়ি ভাড়া অগ্রিম প্রদান করিবেন।

৪। ২য় পক্ষ সকল প্রকার বিল যথা বিদ্যুৎ, পানি, গ্যাস, ইত্যাদি (যেটা প্রযোজ্য), যথা সময়ে পরিশোধ করিবেন।

৫। চুক্তিপত্র সম্পাদনের দিন হইতে ৬ (ছয়) মাসের মধ্যে ১ম পক্ষ ভাড়া বৃদ্ধি করিতে পারিবেন না।

৬। মেয়াদ পূর্তির পূর্বে যদি ২য় পক্ষ, ভাড়াটিয়া বাড়িটি ছাড়িয়া দিতে চাহেন, অথবা ১ম পক্ষ তাহার নিজস্ব প্রয়োজনে ব্যবহার করিতে চাহেন, তবে এক পক্ষ অপর পক্ষকে ১ (এক) মাস পূর্বে অবহিত করিবেন।

পৃষ্ঠা ৩ এর ২

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

৳১০০ ৳১০০

একশত টাকা

১০৬০২৬৯

এতদ্বারা আমরা উভয় পক্ষ সরল মনে, সুস্থ্য শরীরে, অন্যের বিনা প্ররোচনায় অত্র বাড়ি ভাড়া চুক্তিপত্র পড়িয়া, বুঝিয়া, ইহার মর্ম ভালভাবে উপলব্ধি করিয়া উপস্থিত স্বাক্ষীগনের সম্মুক্ষে নিজ নিজ সহি/স্বাক্ষর সম্পাদন করিয়া দিলাম । ইতি,

তারিখঃ ১লা মে, ২০১৫ ইং।

১ম পক্ষ/বাড়ির মালিকের স্বাক্ষর

২য় পক্ষ/ভাড়াটিয়ার স্বাক্ষর
সেলিম রেজা, ম্যানেজিং ডাইরেক্টর
হউজ অব্ কনসালটেন্টস্ লিঃ

স্বাক্ষীগনের স্বাক্ষরঃ

১। মোহাম্মদ [illegible], পিং [illegible]
[illegible], [illegible], [illegible]
২। মোহাম্মদ [illegible] পিতা: মোহাম্মদ [illegible],
[illegible], [illegible], [illegible]।

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

৳১০০ ৳১০০

একশত টাকা

কচ ৪৫৬৩৩২৬

বাড়ি ভাড়া চুক্তিপত্র

এই বাড়ি-ভাড়া চুক্তিপত্র অদ্য ১লা মে, ২০১৫ ইং।তারিখে নিম্নবর্ণিত পক্ষদ্বয়ের মধ্যে বিস্তারিত আলাপ-আলোচনার মাধ্যমে নিম্নলিখিত শর্তাবলীতে সম্মত হইয়া সম্পাদিত হইলঃ

হাজী মো:- হারুন অর রশিদ, পিতা:- মৃত মোহাম্মদ বশর রাংগুনীয়া পৌর এলাকা, ৩নং ওয়ার্ড, রাংগুনীয়া, তয় তলা বাসস্থান পার্শ্বে; ০১৯১৫৬৩৬৩৬৩.

..... বাড়ির মালিক/১ম পক্ষ।

Joint Venture of House of Consultants Ltd. (HCL) and Disaster Management Watch (dm.Watch), বাড়ি নং-ব-১৫৪, সড়ক নং-২২, ডি.ও.এইচ.এস., মহাখালী, ঢাকা-১২০৬, এর পক্ষে জনাব সেলিম রেজা, ম্যানেজিং ডাইরেক্টর, হাউজ অব্ কনসালটেন্টস্ লিঃ ..... ভাড়াটিয়া/দ্বিতীয় পক্ষ।

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

৳১০০ ৳১০০

একশত টাকা

কচ ৪৫৬৩৩২৭

শর্তাবলী

১। অত্র বাড়ি-ভাড়া চুক্তিপত্র ১লা মে, ২০১৫ ইং তারিখ হইতে ৩১শে অক্টোবর, ২০১৫ ইং তারিখ পর্যন্ত ৬ (ছয়) মাসের জন্য বলবৎ থাকিবে। প্রয়োজন হইলে আলোচনা সাপেক্ষে সময় বর্ধিত করা যাইবে।

২। ভাড়া বাড়িটি অফিস-কাম-রেসিডেন্স হিসাবে ব্যবহার করা হইবে।

৩। মাসিক বাড়ি-ভাড়া [illegible] টাকা ধার্য্য করা হইল এবং ২য় পক্ষ (ভাড়াটিয়া) ১ম পক্ষকে (বাড়ির মালিক) প্রতি মাসের ১০ তারিখের মধ্যে বাড়ি ভাড়া অগ্রিম প্রদান করিবেন।

৪। ২য় পক্ষ সকল প্রকার বিল যথা বিদ্যুৎ, পানি, গ্যাস, ইত্যাদি (যেটা প্রযোজ্য), যথা সময়ে পরিশোধ করিবেন।

৫। চুক্তিপত্র সম্পাদনের দিন হইতে ৬ (ছয়) মাসের মধ্যে ১ম পক্ষ ভাড়া বৃদ্ধি করিতে পারিবেন না।

৬। মেয়াদ পূর্তির পূর্বে যদি ২য় পক্ষ, ভাড়াটিয়া বাড়িটি ছাড়িয়া দিতে চাহেন, অথবা ১ম পক্ষ তাহার নিজস্ব প্রয়োজনে ব্যবহার করিতে চাহেন, তবে এক পক্ষ অপর পক্ষকে ১ (এক) মাস পূর্বে অবহিত করিবেন।

পৃষ্ঠা ৩ এর ২

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

৳১০০  ৳১০০

একশত টাকা

কচ ৪৫৬৩৩২৮

এতদ্বারা আমরা উভয় পক্ষ সরল মনে, সুস্থ্য শরীরে, অন্যের বিনা প্ররোচনায় অত্র বাড়ি ভাড়া চুক্তিপত্র পড়িয়া, বুঝিয়া, ইহার মর্ম ভালভাবে উপলব্ধি করিয়া উপস্থিত স্বাক্ষীগনের সম্মুক্ষে নিজ নিজ সহি/স্বাক্ষর সম্পাদন করিয়া দিলাম । ইতি,

তারিখঃ ১লা মে, ২০১৫ ইং।

১ম পক্ষ/বাড়ির মালিকের স্বাক্ষর

২য় পক্ষ/ভাড়াটিয়ার স্বাক্ষর
সেলিম রেজা, ম্যানেজিং ডাইরেক্টর
হাউজ অব্ কনসালটেন্টস্ লিঃ

স্বাক্ষীগনের স্বাক্ষরঃ

১।

২।

Project/Site office in Ramu Upazila

Project/Site office in Rangunia Upazila

APPENDIX-6

Photos and Attendance List

Appendix-6

Photographic Representation of Ramu and Rangunia Upazila during FGD, Courtyard Meeting and Tea Stall Meeting

Photograph 1: FGD with Press Media at Press Club (RamuUpazila)

Photograph 2: FGD with Local People at Joyarinala Union Parishad (RamuUpazila)

Photograph 3: Tea StallMeeting at JoyarinalaBazar, JoyarinalaRamu

Photograph 4: FGD with Business Groups at Ramu Bazar BanikSamiti Office, Ramu.

Photograph 5: Tea Stall Meeting at Tebgor Bazar, Rashidnagar Union, Ramu

Photograph 6: FGD with UNO,UnionChairman,Councilor and Women Councilor at RamuUpazila

Photograph 7: FGD with Local Community at BRDP office room, Ramu

Photograph 8: FDG with Teachers at Ramu College, Ramu

Photograph 9: FGD with Buddhist Community at Fatekharpul, RamuSadar Union

Photograph 10: Court Yard Meeting with Local Community, Uttar Mithachari, Joyarinala, Ramu

Photograph 11: Tea Stall Meeting at Chakmarkul Bazar, Chakmarkul Union, Ramu

Photograph 12: Courtyard Meeting at Rangunia Club, RanguniaUpazila

Photograph 13: Tea StallMeeting at Eisapur Bazar, Pourashava, Rangunia

Photograph 14: FGD with Local Community Leaders at Posra Union Parishad, Rangunia

Photograph 15: Tea Stall Meeting at Posra Bazar, Posra Union, Rangunia

Photograph 16: FGD withUpazila Chairman, Rangunia

২৮ [illegible]

২৯ [illegible]

৩০ নুরুল হুদা

৩১ লতিফুর রহমান

৩২

৩৩

৩৪

মত বিনিময় সভা

স্থান: কোনারপাড়া [illegible] সরকারি প্রাথমিক বিদ্যালয়
কোনারপাড়া [illegible], [illegible], [illegible]
তারিখ: ১৭-০২-২০১৫ ইং

[illegible] সভা অনুষ্ঠিত হয়। [illegible] [illegible] সভায় [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] করেন। [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] ঘোষণা করেন।

[illegible]

[illegible]

উপস্থিত [illegible]

[illegible]

১. [illegible]

২. [illegible] সাং [illegible]

[illegible] সাং [illegible]

৩.

৪. [illegible] - [illegible]

৫. [illegible] - [illegible]

17.02.2015

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Focus Group Discussion (FGD) Ramu Upazila

Date: 18 February 2015

ATTENDANCE SHEET

SN	Name	Designation	Organization	Mobile Number	E-mail Address	Signature
	মুহাম্মদ আক্তার	M.U.P.	কানুনগো	01826 2980		
	মরিয়ম খাতুন	কানুনগো ও ট্রেজারার	M.U.P	0183 015 1076		
	মোস্তাক আহমদ	সচিব	ইউপি U.P.	01818 29114		26/02/15

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SN	Name	Designation	Organization	Mobile Number	E-mail Address	Signature
১	আবদুল মালেক/সিকদার			01815-131771		[signature]
2.	Abul Kashem Sagor	Staff Reporter Daily Samudrakanta		01816-161448	kashemramu@gmail	[signature]
2.	MD Abu Hannan	Librarian Ramu		01834680091	×	[signature]
৩।	এম. শাহ আলম	Bijoy tv		01830-109517	mshahalam Bijoytv @gmail.com	[signature]
৪।	উবাইদুল হক রোমান	দৈনিক ইনকিলাব ও রামু প্রতিনিধি		01840006544	Hamacor12@gmail.com	
৫।	সোয়েব সাঈদ	সভাপতি রামু রিপোর্টার্স ইউনিটি	বার্তা সম্পাদক রামু নিউজ	01817-646825	shoaibsayed@gmail.com	[signature]
৬	খালেদ শহীদ	রামু প্রতিনিধি	সমকাল, কালের কণ্ঠ, কক্সবাজার বাংলা	01819-60066	khaledshahidramu@gmail.com	[signature]
	প্রকাশ সিকদার	নিজস্ব প্রতিনিধি	দৈনিক আমাদের কক্সবাজার	01819535828	prakash.cox@gmail.com	[signature]
	নুরুল ইসলাম সেলিম	সম্পাদক/ রামু কাগজ	সভাপতি রামু প্রেসক্লাব	01811-866409 01753895913		[signature]

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SN	Name	Designation	Organization	Mobile Number	E-mail Address	Signature
০১	রওশন আক্তার [illegible]	মহিলা প্যানেল চেয়ারম্যান		01823969093	কচ্ছপিয়া ইউনিয়ন পরিষদ	
	ফাতেমা বেগম			01817722[illegible] 8202	জুয়ারিয়ানালা ইউনিয়ন	
	AFSANA JUSMIN PAPY	M.U.P		01825600050 01836590159	FATAKARKUL	
	ALMARZINA	M.U.P		01825711336	[illegible]KMARKUL	
	নাদিমা আক্তার	M.U.P		018[illegible]3287	কাউয়ারখোপ	
	স্বরূপা পাল	[illegible]	[illegible]	01820402503	swarupa[illegible]@gmail.com	
	মৃনাল বড়ুয়া	সচিব	[illegible]	01815131318	baruamrinal25@yahoo.com	
	[illegible]	সচিব [illegible]	[illegible]	01826140490		
	আব্দুল [illegible]	সচিব [illegible]	[illegible]	01703593310		
	[illegible]	[illegible]	[illegible]	01840329050	[illegible]@gmail.com	

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১	MD. MASUD HOSSAIN	UNO	UNO OFFICE	01735173205	unoramu@mopa.gov.bd	
২	[illegible]	[illegible]	[illegible]	01819833485		
৩	[illegible]	[illegible]	[illegible]	01818700282		
৪	[illegible]	[illegible]	[illegible]	01870[illegible]4		
৫	[illegible]	[illegible]	[illegible]	[illegible]		
৬	[illegible]	MLP	[illegible]	01824[illegible]		
৭	[illegible]	MLP	[illegible]	01811201661		
৮	[illegible]	[illegible]	[illegible]	01818129114		
৯	[illegible]	[illegible]	[illegible]	01815156415		
১০	[illegible]	[illegible]	[illegible]	01715-198416	Kadamcox21@yahoo.com	

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21.	Jesmin Salam	Lecturer	Ramu college			
22.	Abul Monsur Md. Zahir	Asst. Prof.	Do	01817785600	amnzahir@gmail.com	
23.	Jasmin Nori	Lecturer	Do	01818008212		

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14	Mahamud Honaia	Lecturer	Ramu College	01817764687		
15	MD Belal Uddin	Lecturer	Ramu College	01815334240		
16	Monir Ahmed	Lecturer	Ramu College	01829416047	lecturer monir monir@gmail.com	
17	Sultana Rajia	Lecturer	Ramu College	01840013705		
18	Humyra Akter	Lecturer	Ramu college	01816025619		
19	Shahidul Hoque Kajal	Asst. Prof.	Ramu College	0819 519 740	shahidulkajal73@gmail.com	
20	Bhuban Barua	Librarian	Ramu College	01819084159	bbramucollege@gmail.com	

FGD

Teachers
Ramu College

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Ramu 18.02.2015

ATTENDANCE SHEET

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01	Md. Abdul Hoque	Principal	Ramu College	01819704498	ramucollege@gmail.com	
02	Md Shafar Alam	Asistant professors	Ramu Clleg	01817744 105		
03	Mahammad Abu Tahar	Member. Ramu college Governing body				
4.	[illegible]	[illegible]				
5.	Mirza mul Hoq	Assistant Prof.	Ramu college	01816007776		18.02.15
6.	Md. AbuTahar	Asst. prof.	Ramu College	01670312381		
7.	Pranati Kar Gupta.	Assist. Prof.	Ramu college			
8.	Baleita Barua	Computer Demonestrator	Ramu college 01818715542			
9	Mohammad Alamgir	Lecturer, Ramu college,	0189-956430		badshabd@ymail.com	
10.	Monasi Barua	Demonstrator	Ramu College	01727-149771		

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NGO

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ATTENDANCE SHEET

SN	Name	Designation	Organization	Mobile Number	E-mail Address	Signature
01.	SYED YASIN ARAFAT	URDO	BRDB	01922647230	arafatsujan14@gmail.com	[signature]
02	Mozahidul Alam	[illegible]	[illegible]	01820752402	—	[signature]
03	Supananda Barua	UCO Ramu	Asti Ramu (ASAS)	0181297655	supananda.cox@gmail.com	[signature]
04	MD Rabel					[signature]
05	Azijul Mustofa					[signature]
06	Nurnahar Begum					[signature]
07	Asmaul Hosna			01825615953		[signature]
08	Koliza Begum.					[signature]
09	Raseda Begum.			0185-9695571		[signature]
10	Shahina Akter.					[signature]

11. Sobekamer
12. Shamsunnehar.

[signature]

দৈনিক
সকালের কক্সবাজার

দুই তারকা

রামু উপজেলা উন্নয়ন পরিকল্পনা প্রণয়নে সাংবাদিকদের সাথে সভা অনুষ্ঠিত

রামু প্রতিনিধি

আগামী ২৫ ৫

ডুলা ফকির (

জেলা প্রাথমিক

উপজেলা

বেতন নি

রাতের আধারে কৃষকের বোরো

বড় দুই তারকা

রামু উন্নয়ন পরিকল্পনা

বিদেশী রাষ্ট্রদূত

মাটি ও মানুষের দৈনিক
আমাদের কক্সবাজার

সাংবাদিকদের সাথে মতবিনিময়কালে-শাহীন আহমেদ

নগর উন্নয়নে রামু উপজেলা হবে একটি আধুনিক শহর

রামু প্রতিনিধি ■

'প্রিপারেশন অব ডেভেলপমেন্ট প্লান ফর ফোরটিন উপজেলাস' প্রকল্পের আওতায় রামু উপজেলার উন্নয়ন পরিকল্পনা প্রণয়ন কার্যক্রম পরিচিত উপলক্ষে সাংবাদিকদের সাথে মতবিনিময় সভা অনুষ্ঠিত হয়েছে। গতকাল মঙ্গলবার (১৭ ফেব্রুয়ারি) বিকাল ৫টায় রামু প্রেস ক্লাবে আয়োজিত এ মতবিনিময় সভায় জানানো হয়, দেশের ১৪ টি উপজেলায় পৃষ্ঠায়ন ও গণপূর্ত মন্ত্রণালয় নগর উন্নয়ন অধিদপ্তরের সহায়তায় চলতি বছরের শুরু থেকে উপজেলা পরিষদ, উপজেলা প্রশাসন, পৌরসভা ও ইউনিয়ন পরিষদ উন্নয়ন পরিকল্পনা প্রণয়ন শুরু হয়েছে। এরমধ্যে চট্টগ্রামের রাঙ্গুনিয়া এবং কক্সবাজারের রামু উপজেলা অন্তর্ভুক্ত হয়েছে। ফলে আগামী ২০ বছরের জন্য রামু উপজেলার উন্নয়ন পরিকল্পনা প্রণয়নে জনগণের সহযোগিতা কামনা করা হয়। উন্নয়ন পরিকল্পনার মাধ্যমে রামুর প্রতিবেশ অবকাঠামো পরিকল্পনা, উপ- অঞ্চল পরিকল্পনা, শহর এলাকার পরিকল্পনা, বিষয় অঞ্চল পরিকল্পনা, উন্নয়ন পরিকল্পনা প্রণয়ণে রামু উপজেলা হবে একটি আধুনিক শহর। তাই বিভিন্ন পেশার লোকজন নিয়ে প্রকল্প এলাকার অভিড়া উন্নয়ন পরিকল্পনা প্রণয়ন ও নীতিমালা তথা উন্নয়ন পরিকল্পনা সিস্টিকরণের মাধ্যমে কাজ করবে। সভায় বক্তব্য রাখেন, 'প্রিপারেশন অব ডেভেলপমেন্ট প্লান ফর ফোরটিন উপজেলাস' প্রকল্পের পরিচালক শাহীন আহমেদ, পরামর্শক প্রতিষ্ঠান হাটজ অফ কনসালটেন্টস ও ডিজাস্টার ম্যানেজমেন্ট ওয়াচ এর এমডি এসএস বিদ্যা বরণ সরকার, সমাজ বিজ্ঞানী শহীদুল ইসলাম, নগর উন্নয়ন অধিদপ্তরের রেজাকার মো. রাজু আহমেদ, রামু প্রেস ক্লাব সভাপতি নুরুল ইসলাম সেলিম, সাবেক সভাপতি খালেদ শহীদ, অর্থ সম্পাদক সোহেব সাইদ, সাংবাদিক ওবাইদুল হক নোমান, আবুল কাশেম সাগর, প্রকাশ সিকদার, শাহ আলম, আবদুল মালেক সিকদার প্রমুখ।

রাঃ গুনিয়া উপজেলা পরিষদ

Date 19.02.2015

FGD

	নাম/পদবী	মোবাইল নম্বর	স্বাক্ষর
১।	মুহাম্মদ আবু সাহ	01817722985 01753382340	
২।	মো: আলাউদ্দিন আল আজাদ উপজেলা পরিষদ, চেয়ারম্যান, রাঙ্গুনিয়া	01819366706	
৩।	দীপক বড়ুয়া	01819252137	
৪।	মো: গিয়াস উদ্দিন তালুকদার	01818-880310	
৫।	মো: জহুরুল আলম	01819628842	
৬।	মোহাম্মদ জামাল মাঝি	- 01850177567	
৭।	মো: আবুল কাশেম উপজেলা মহিলা বিষয়ক কর্মকর্তা	01825-257011	
৮।	মোহাম্মদ নুরুল আলম	01862098756	
৯।	কাঞ্চন চক্রবর্তী (ভাঃ ও/মেলা) উপজেলা নির্বাহী কর্মকর্তা	01867-923492	
১০।	মো: [illegible] উপজেলা - [illegible]	01816 085014	
১১।	বিপ্লব চৌধুরী -	01815 648316 -	
১২।	মো: [illegible]	01716 176016 -	

রাঙ্গুনিয়া পৌরসভা

রায়োজন ক্লাব

FGD

Date 19.02.2015

	নাম	মোবাইল নম্বর	স্বাক্ষর
১।	[illegible]	01816456645	
২।	মো: [illegible]	01819173094	
৩।	[illegible]	01819-621247	
৪।	[illegible]	01819627011	
৫।	[illegible]	01830955181	
৬।	[illegible]	01830109345	

"Preparation of Development Plan for Fourteen Upazilas"
Package 05-(Rangunia Upazila and Ramu Upazila)
Focus Group Discussion (FGD) Ramu Upazila

Date: 17 February 2015

বণিক সমিতি

ATTENDANCE SHEET

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	Prof. Rafiqul Alam Chy	President, Ramu Choumohony	Ramu Chamber of Commerce.	01727971777	Arafiq1cc@gmail.com	
	Sajal Barua	Caretaker	" "	01814816932		
	[illegible]	[illegible]	[illegible]	01816436493		
	[illegible]	[illegible]	[illegible]	01818208981		
	আবুল কাশেম	অতিরিক্ত সহকারী	বণিক সমবায় সমিতি	01819226225		
	[illegible]	[illegible]	[illegible]	01818180989		

FGD

"Preparation of Development Plan for Fourteen Upazilas"

Package 05-(Rangunia Upazila and Ramu Upazila)

Focus Group Discussion (FGD) Rangunia Upazila

Date: 19 February 2015

ATTENDANCE SHEET

SN	Name	Designation	Organization	Mobile Number	E-mail Address	Signature
	Nazrul Islam			01834068187		[illegible]
	[illegible]	[illegible]		01732549182		[illegible]
	Md. Bipin Chy	Pomara - Brahman Para Bazar Dokan		01811988401		[illegible]
	Nur Mohammad	Kirisha 01725011605	Kirisha Kakib Para	01725011605		[illegible]
	[illegible]			01622882800		[illegible]
	ডা: [illegible], 01720657281, Doctor					[illegible]
	মো: [illegible]	[illegible]		01810526254		
	মো: [illegible]	[illegible]		01817732544		[illegible]
	[illegible]			01743900962 [illegible]		[illegible]
	[illegible]			01815439429		
	[illegible]	[illegible]		01815-603391		[illegible]

"PREPARATION OF DEVELOPMENT PLAN FOR FOURTEEN UPAZILAS" PROJECT

Joint Venture of

HOUSE OF CONSULTANTS LIMITED

and

dm.Watch Disaster Management Watch [dm.Watch]