GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

URBAN DEVELOPMENT DIRECTORATE (UDD)

PREPARATION OF DEVELOPMENT PLAN FOR KUSHTIA SADAR UPAZILA

MOBILIZATION & INCEPTION REPORT

December 2017

SUBMITTED BY

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in association with

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Original

MOBILIZATION & INCEPTION REPORT

of

‘‘Preparation of Development Plan For Kushtia Sadar Upazila”

SUBMITTED

to

Project Director

‘‘Preparation of Development Plan For Kushtia Sadar Upazila’’
Urban Development Directorate (UDD),
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EXECUTIVE SUMMARY

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This Mobilization and Inception Report is the first official report for "Preparation of Development Plan for Kushtia Sadar Upazila". This project has been initiated in order to prepare a multi-sectoral short and long term investment plan through participatory process and comprises the large tract of urban, semi-urban and rural lands. The report is being submitted in pursuance of the agreement signed between the client, Urban Development Directorate (UDD) and consultant, TROYEE associates in association with ADPC and GEOLYSIS. The intended plans of the Kushtia Sadar Upazila will provide a framework for overall development of the Upazila and a basis of development with Action Plans for public and private agencies following a common goal. The Structure Plan, Urban Area Plan and Action Area Plan will be formulated through a team of domestic consultants under the jurisdiction of Urban Development Directorate (UDD). The proposed work is a comprehensive endeavor which has to be designed to assist the Kushtia Sadar Upazila authorities to cater to the growing need for both the present and the future development in order to cope with the growing demand in respect of service delivery and management.

The prime objective of the project is to prepare a Master Plan for Kushtia Municipality area to control its unplanned development. The objective of the project is also to optimize resources and activities for sustenance of marginal people. There is no long term holistic Development Plan for the Sadar Upazila. It needs to be integrated with the mainstream of development process of the country. So, an interdisciplinary development planning approach is urgent to optimize livelihood of the area.

Urban Development Directorate prepared Land Use Plan for Kushtia Paurashava in 1989 under National Physical Plan. The plans were formulated for 20 years in perspective. It is important to mention here that the plan period for Kushtia Paurashava has been over in 2009. Thus review of these plans is long overdue. The plan of the Kushtia Paurashava was prepared as individual towns in isolation from rest of the Upazila areas. Hence, Kushtia Sadar Upazila is undertaken by UDD to prepare Structure Plan, Urban Area Plan and Action Area Plan with demand from the Honorable Mayor of Kushtia Paurashava being highly recommended by the Parliament Member (MP) and Honorable Minister, Ministry of Information, Mr. Hasanul Haq Inu, MP.

Kushtia Sadar Upazila is the focal point of the Kushtia District and stands in the middle of the Khulna and Rajshahi divisional headquarters with unique geographical importance. Total area of Kushtia Sadar Upazila is 318.22 sq.km. According to population census 2011 (BBS, 2015), Total population of Kushtia Sadar is 5,02,255 having a density figure of 1578 persons per sq.km.

A reconnaissance survey has been conducted in some selected localities of the project areas to understand the general condition of the areas and works to be performed by the consultants during the project period. This provided an overall idea of the development pattern of the areas. In the initial survey, basic information on transportation mode and overall visual scenario of the areas of Sadar Upazila has been captured. This overview pertains not only to the physical features, prospects and problems of the area, but also the ideas, aspirations and mood of the local residents, which are essential to develop methodological approaches in data collection. Besides

the visual observation, discussions were held with the local officials and elites, officials of public and private agencies and a section of general people of various occupation groups.

In the planning process, mauza maps for land management and Digital stereo image for digital modeling and mapping will be used. Digital Photogrammetric Workstation with latest software and technology will be used in the project. There are three levels of engagement of the experts for carrying out the project work, which include Personnel of the Consultant Organizations, Technical Management Committee (TMC) and Steering Committee (SC).

The Mobilization and Inception Report contains altogether seven chapters. The report starts with a short description of background and objectives of this project, information on Kushtia Sadar Upazila in national and regional context, scope of services, methodology, work schedule and tentative demarcation of the project area boundary.

Brief historical profile of Kushtia Sadar Upazila is described in Chapter Two, with geographic location, regional importance, heritage and historic sites, population, urban development pattern and some glimpse of public agencies operating in the city. A very succinct account of various constraints and potentialities of the project area also have been illustrated in this chapter.

The understanding of the consultants regarding Seventh Five Year Plan, Sustainable Development Goals (SDGs), and Poverty Reduction Strategy (PRSP), Annual Development Plan (ADP) for developing further linkage of the national plans and policies with different levels of planning are described in Chapter Three.

Chapter Four explains the approach and methodology for the project planning. The approach and methodology has been developed to accomplish the objectives and activities stated in the ToR. Based on general understanding of the problems and prospects of the project area as well as ToR guidelines, the consultants have developed the approaches and methodologies for this project.

Chapter Five outlines the format of outputs (maps and reports) to be submitted in the process of Preparation of Development Plan for Kushtia Sadar Upazila. It also includes format of different types of surveys and studies.

Details of the project management plan are described in Chapter Six, with the description of Project Organogram, list of Professional Staff, Staffing Schedule and Detailed specification of tasks. Activity schedule presented via Gantt chart articulates completion of the project within 18 months from the date of commencement.

The final part of the report, Chapter Seven, includes the conclusive remarks.

TABLE OF CONTENTS

PREPARATION OF DEVELOPMENT PLAN FOR KUSHTIA SADAR UPAZILA, KUSHTIA DISTRICT

MOBILIZATION & INCEPTION REPORT

Table of Contents

LIST OF TABLES

LIST OF MAPS

LIST OF PHOTOGRAPHS

LIST OF FIGURES

LIST OF ANNEXURES

Chapter: 01

INTRODUCTION

CHAPTER-1
INTRODUCTION

1.1 Introduction

This Mobilization and Inception Report has been prepared as part of the project 'Preparation of Development Plan for Kushtia Sadar Upazila'. The overarching purpose of the report is to provide ideas about the mobilization of resources and personnel that has been undertaken by the consultant. It serves some other complementary but significant objectives e.g. assimilating preliminary information about the project area, validating and demarcating the physical boundary of the project area, setting out the sequence and correlated activities to be performed, building rapport with the focal persons of different organizations relevant to planning process in Kushtia Sadar Upazila, chalking out general approach and methodological issues, and setting the broader context against which the implication of this particular project can be assessed. In a nutshell, it will provide the baseline information for the survey methodology and planning processes and their subsequent implementation.

1.2 Background information of the project

With the required demand letter offered by the Honorable Mayor of Kushtia Municipality being highly recommended by the Parliament Member (MP) and Honorable Minister, Ministry of Information, Mr. Hasanul Haq Inu-MP, UDD has been directed to prepare Development Plan for such Kushtia Sadar Upazila. As a part of this advice, Planning Project entitled, "Preparation of Development Plan for Kushtia Sadar Upazila, Kushtia District" has been undertaken with a view to prepare Structure Plan, Urban Area Plan, and Action Area Plan for the whole Kushtia Sadar Upazila.

1.3 Vision Statement for Kushtia Sadar Upazila

Kushtia Sadar Upazila will be prepared as the city of Livable, Functional, and Inclusive and vibrant towards the center of Urban Resilient in the west Bangladesh by 2040.

The vision of Kushtia Sadar Upazila stands on four pillars which might depend on the role and implementation performances of the proposed plan.

Livability of a city perceived from resident's perspective regarding combination of desired qualities. There are five fundamental aspects of livable cities, which are Robust and complete neighborhoods, Accessibility and sustainable mobility, Diverse and resilient local economy, Vibrant public spaces, and Affordability

Functionality of a city refers to an efficient system with some components though which city serves as administrative, commercial, industrial, religious and cultural hubs for their larger surrounding areas. The essence of functionality are the effectiveness and efficiency of some key systems like Health, Education, Transport, Drainage, Governance, Utility Services etc.

The definition of inclusiveness is an aura or environment of letting people in and making them feel welcome. An example of inclusiveness is when you make your home a comfortable place for all of your friends, family, guests and people you meet. An inclusive city is a city in which the processes of development include a wide variety of citizens and activities. These cities maintain their wealth and creative power by avoiding marginalization, which compromises the richness of interaction upon which cities depend.

Vibrant economy is one that goes beyond financial returns and takes into account the well-being of society and everybody's ability to thrive. It is characterized by dynamic changes in terms of the emergency role of technology and in the process of production. Vibrant economies contribute to the health and well-being of people and communities by providing economic security and access to opportunities. This includes access to education and living wage employment, affordable housing, healthy food, and the kinds of services and amenities that promote strong and healthy families and vibrant and sustainable communities. Economically Vibrant City refers to a place, which has a unique collection of qualities and characteristics – visual, cultural, social, and environmental.

1.4 Mission or Long-Term Policy Framework

Livability with Connectivity	• To plan for affordable housing for the city dwellers with the need of increasing population. • To promote sustainable urban development with well-connected and hierarchical network with the union headquarters and growth centers. • To establish effective hierarchical linkage integrated regional connectivity to promote uninterrupted economic flow of goods and services in order to foster the development in union centers as well as in upazila headquarters and regional centers • Plan for making union and growth centers also an attractive place for living with the provision of education, health and better public facilities.
Functionality	• To ensure well-connected transportation network keeping option for walking and cycling and planning for improved public transport services.
Inclusiveness	• To adopt adaptive comprehensive planning approach for ensuring livable and sustainable living environment. • To plan for capacity building of the agencies/ institution for taking care and look-after development according to higher level plan and efficient management.
Economy	• To plan housing options close to the job location of the major industrial location and facilitate provision of essential infrastructure and services for the estimated workforce of the priority industrial locations. • To encourage compact and clustered industrial growth and promote formal economic activities to ensure economic vibrancy of the area

1.5 Objectives of the Project

The prime objective of the project is to prepare Development Plan for the Kushtia Sadar Upzila including Sadar Municipality area to control its unplanned development. The project will ensure optimization of the resources and sustainable development. There is no long term holistic Development Plan for the Sadar Upazila. Therefore, an interdisciplinary development planning approach is essential. The current project will aim to address the followings,

1) Determine a long-term distribution of population. In other words a desirable rural urban balance and the optimum pattern of urban growth.

2) To canalized government resources to areas with potential for higher output of investment and thus to eliminate existing disparity, meaning to provide equal development scenario for the whole of project area. To guide the spatial pattern of land use development so as to operate the maximum advantage of rural economy. Formulation of Development Plan and Development Control Plan at local level.

3) To guide the spatial pattern of land use development so as to operate the maximum advantage of rural economy.

4) Formulate of Development Plan and Development Control Plan at local level.

5) Prepare a conservation plan for the Kushtia Sadar upazila in order to protect unplanned development, to control environmental degradation, to conserve bio-diversity, to ensure better living environment for the inhabitants.

6) Transformation of National and Regional Policies at the local level.

7) To suggest proper policy guideline to mitigate water logging problem and to ensure availability of safe drinking water in the area.

8) Formulation and Integration of different sectoral strategies for the Upazila.

9) Designing a standard for land use by the UDD as the Statutory Body, Paurashava, Union and other government agencies involved in development, economic growth, employment, housing, utilities and amenities, education, health, recreation and open space etc.

1.6 Scope of Work

The scope of Consultancy Services encompasses for Preparation of three tiers Development Plan for Kushtia Sadar Upazila, which includes Structure Plan, Urban Area Plan, and Action Area Plan.

The project will provide a basis for development agencies, public and private, to proceed on towards a common goal. The Development plan for the Pauraashava and Union Headquarters\Growth Centres would provide a framework for overall development of the Upazila.

The plan would examine the existing situation, draw attention to key problems, assess likely changes and their implications and proposes; with the resources available, how major problems might be tackled.

Planning Components

Development Plan will be prepared for managing and promoting development on the basis of the strategies set by the longer-term structure plan. The Development Plan of Kushtia Sadar Upazila is comprised of the three following components-

a) Structure Plan
b) Urban Area Plan (UAP)/Master Plan
c) Action Area Plan (AAP)

A. The Structure Plan

The Structure Plan will be prepared for the entire jurisdiction of the plan for a period of 20 years.

Structure plan is a policy level plan that conducts detail study on the major sectors of the concerned area and forecast the future with as much accuracy as possible to derive the policies that will help the later stages of the plan to cope with the upcoming challenges. Structure plan provides flexibility to the whole plan package. Structure Plan would delineate area where urbanization would be permitted and restricted area where urbanization would not be permitted and formulate policies for such areas.

The structure plan examined the existing situation, drew attention to key problems, assessed likely changes and their implications and proposed how some major problems might be tackled. Very briefly, the structure plan notes an anticipated population increase in the project area by the end of the plan period and assesses the implications of this growth.

B. The Urban Area Plan/Master Plan

The Urban Area Plan will be prepared for the study area on map focusing developed and recently developing areas, covering the instruction and transtate the strategy of the structure plan.

Urban area plan would be prepared for the Kushtia Municipality and all identified Growth Centers/Union Headquarters of the Sadar Upazila area and to be presented on mauza map with plot boundary. Planning standard has to be formulated for the planning area. The Urban Area Plan will provide an interim mid-term guideline for the 10 years and covers for the development of urban areas and Union Headquarters within Kushtia Sadar Upazila. The Urban Area Plan will consist of the following:

1) Conservation and Development Control Plan through Land Use Plan;
2) Traffic and Transportation Management Plan;
3) Drainage, Sewerage & Environment Management Plan
4) Disaster Management Plan

C. Action Area Plan

The Action Area Plans (AAP) will be prepared for selected areas that are using to be urbanized within next 5 years. The objective of the action plan is to evaluate some projects, which should be implemented during the first five years life of the structure plan. It will provide more detailed planning proposals for specific sub-areas of Kushtia Sadar Upazila.The objective of the action area plan is to evaluate those projects, which should be implemented during the first five years of the plan.

1.7 Specific Activities to be carried by the Consultant

The ToR defines that the following activities are to be undertaken by the consultants to achieve the main objectives of this consultancy assignment:

A. Mobilization, Reconnaissance Survey, Consultation and Submission of Mobilization and Inception Report

B. Mauza Map Processing: Collection of Mauza Maps (CS/RS), Scanning, Digitization, Inventory

C. Submission of Survey Report-1

D. Physical Feature Survey: Physical feature survey will have to be conducted for the whole of project area. Location and dimension (X, Y, Z value) of all existing structures including building type, number of floors, household number, height, and use, settlement boundary etc.

E. Topographic Survey: The topographic database shall be obtained from through the SoB pillars through level machine. Based on the BM's height, stereo images will be converted to real height. Location and alignment of all data obtained from physical feature survey including roads, flood embankments and other drainage divides. Location and alignment of all drainage and irrigation channels/canals showing depth and direction of flow. Closed boundary/outline of homestead, water bodies, swamps, forest etc. junctions, spot heights or land levels at minimum 5 meters in urban area and 10 meters grid in rural area on the whole project in respect to bench mark pillar established by the Survey of Bangladesh (SoB) and to prepare the spot level at close interval as and when required such as dyke, embankment, roads, river bank etc.

F. Land Use Survey: The land use survey (both attribute and spatial) will indicate the use of each plot of land and each building in the study area. The Surveyors will visit each and every site to record existing usage with specified notation and colours. The output of this Survey will be one or more maps showing existing Gross agricultural land use, Residential, Industrial, Commercial, Administrative and Cultural zones, urban fringe area (high, lower), water courses and water bodies, roads demarcating the main zones and plantation/vegetation's

G. Primary and secondary data collection: Traffic & Transportation, Drainage & Environmental, Socio-economic, Economy & Commerce, Collection of documents, secondary information and statistical data regarding demographic, economic, environmental, commerce and other

relevant issues. Collection of information from all Government agencies in respect of their existing and future development projects.

- *Processing, Spatial analysis and Preparation of Maps/Charts/Diagram/Reports.*
- *Submission of Survey Reports along with maps and figures*

H. Higher Level Frameworks: Integration of Strategies, Policies, Plans, Decisions, Programs, Commitments and Wishes made by the Government/Semi-Government/Public Sectors/Corporation/Departments/ Institutions, NGOs and Donors Agencies.

I. Analysis of Outputs, Formulation and Adoption of proper Development Strategies, Plan Proposals, Approaches, Design Principles and Standards appropriate to the Planning Area

- *Submission of Interim Reports along with maps and figures*

J. Integrated Plan: Inputs from Public/Private Sectors, Local Leaders, Communities, Interest Groups, NGOs, and Foreign Investors. Study of Feasibility, Benefit and Cost Ratio, Social, Economic and Environmental Impact Assessment

K. Consultation: Consultation with public representative, local people, Government/Semi-Government/Public Sectors/Corporation/Departments/ Institutions, NGOs and Donors Agencies.

L. Incorporation of Development Proposals in response to the community desires and feedback.

M. Preparation of Mechanism for Development Control, Zoning and Land Management Techniques following the Policies/Guidelines Proposed in land use plan.

N. Preparation of Legal Support Documents to be imposed Legal or Judicial Power/Act, Laws, Rules and Regulations for any sorts of Deviation, Alteration, Modification, Violation or Misuse of Plan or Plan Proposals.

O. Submission of Draft Plan Report along with Maps and Figures: Detail description and design of development plans and planning proposals with alternative development options and plan proposals.

P. Incorporation of Comments collected from formal Public Hearing (30 working days) and Submission of Final Plan as specified in ToR.

Q. Submission of Final Reports (English & Bangla) and Plan Maps

1.8 Study/ Project Area Demarcation

According to the ToR, Kushtia Sadar Upazila will be considered as the Study Area for Development plan. It will cover an area of 318.22 sq. km. (approximately) including the Kushtia Municipality and 12 Unions.

Table-1.1: Name of Paurashava and Unions with area of Kushtia Sadar Upazila

Locality	Area from BBS 2011	Area from Union Parishad	Mauzas	
	Sq. km	Sq. km	No. of Mauzas	No. of Mauza sheets
Ailchara Union	21.48	21.48	2	10
Abdulpur Union	25.10	25.10	9	19
Alampur Union	26.91	26.92	6	17
Ujangram	21.42	21.42	9	17
Gosind Durgapur	22.44	22.44	16	20
Battail	20.93	17.37	2	5
Jiarakhi	23.20	23.55	10	19
Jhaudia	26.72	26.72	8	22
Paitkabari	17.09	17.09	10	16
Manohordi	21.22	21.19	8	16
Harinarayanpur	15.39	17.37	5	11
Hatas Haripur	34.40	20.00	12	22
Kushtia Municipality	13.46	42.81	19	108
Total Area	**318.22**	**303.46**	**116**	**302**

Source: BBS, 2011 and Compiled by Consultant

1.9 Kick-off meeting with UDD and Team Mobilization Meeting

A kick-off meeting was held on 24th September 2017 at UDD, Dhaka office. The agenda of the meeting was to discuss the project approach, client's priorities and to ensure that the deliverables of this project meet client's objectives according to ToR. Objective was to discuss and obtain direction from the senior Management of UDD on the scope of work for the concerned project.

Photograph 1.1: Contract Signing of Preparation of Development Plan of of Kushtia Sadar Upazila with Director, UDD

1.10 Mobilization and setting up Project Office at Kushtia

A full strength study team has been mobilized after signing the contract agreement and approval of the work plan by UDD. Detail activities carried out in connection with the mobilization is outlined below:

- Arrangement of accommodation for consultants
- Arrangement for communication and transport for mobilization
- Calibration of equipment's
- Local Area Networking
- Appointment of support staffs

A team mobilization meeting was held on 2nd October 2017 at consultant's office at Eskaton. The objective of the meeting was to discuss on terms of reference and way forward for completing the assignment with the time stipulated in the contract document.

A full phase project site office will be launch at the Kushtia Paurashava area in the mid of December 2017 and all survey activities will be operated from there (see annexure-D for site office location with pictures).

1.11 Reconnaissance Survey

The key professional staffs made a comprehensive reconnaissance survey of the project area immediately after the mobilization process. The reconnaissance was performed with an overall visit to the entire project area, discussions with key personnel of government, semi-government offices at Upazila, Paurashava. A reconnaissance survey of the project area has been conducted to identify the existing problems, development constraints and future development potentialities of the town and its adjoining areas. This reconnaissance survey has provided the planning team an initial overview of the area that is necessary to set on the task of preparing a Development plan. This overview pertains not only to the physical features, prospects and problems of the area, but also the ideas, aspirations and mood of the local residents, which is very much essential to develop the methodological approach for required data collection.

Photograph 1.2: Opened Drainage System

Photograph 1.3: Narrow local road

Photograph 1.4: Unpaved Pedestrian

Photograph 1.5: Haphazard Open Solid Waste Dumping

Besides the visual observation, discussions were also held with section of resident's local shopkeepers and other people from different walks of life. Few government and non-government agencies were also consulted to find out their views on the issue of preparation of Development Plan. These provided the team with a fair view of the problems and prospects of the area including vision for a Development Plan.

A data collection team was then mobilized to collect the map, drawings and other related information for the project. Detail activities carried out during the reconnaissance survey are outlined below:

- Interaction with the key officials of government, semi-government offices at Upazila, Paurashava and Unions.
- Collection of existing study reports, data / information and maps.

1.12 Inception Meeting

After signing the contract with UDD on 24th September 2017, the Consultants mobilized the project office at Dhaka as well as in Kushtia Sadar Upazila. After mobilization, the project team under the leadership of Team Leader started reviewing the information available from secondary sources and conducted a visit to the project area. The Consultant team conducted Inception Meetings to be more acquainted with the DC, Kushtia, Mayor Office, Kushtia Paurashava, UNO, Kushtia Sadar Upazila, and met with civil society representatives, and government and non-government officials.

Photograph 1.6: Kushtia Sadar Upazila Headquarter

Photograph 1.7: Consultation meeting with DC,Kushtia

Photograph 1.8: Formal Consultation meeting with Upazila Nirbahi Officer (UNO) of Kushtia Sadar Upazila

Photograph 1.9: Consultation meeting with Secretary, Town Planner and Engineers of Kushtia Municipality

Chapter: 02

PROFILE OF KUSHTIA SADAR UPAZILA

CHAPTER-2
PROFILE OF KUSHTIA SADAR UPAZILA

2.1 Location, Area and Physical Setting

Kushtia Sadar Upazila is located between 23°42' to23°59' north latitudes and between 88°55' to 89°04' east longitudes. It is bounded by Pabna Sadar and Ishwardi Upazilas on the north, Harinakunda and Shailkupa Upazilas on the south, Kumarkhali Upazila on the east, Mirpur (Kushtia) and Alamdanga upazilas on the west. Total area of the sadar upazila is 318.22 sq. km.

Map 2.1: Location of Kushtia Sadar Upazila in Bangladesh

Map 2.2: Kushtia sadar upazila map
(Souce: BBS 2016)

According to BBS (2011), Kushtia sadar upazila has 1 municipality and fourteen unions and consists of 167 villages with an average density of 1578 population per square kilometer. There are 117 mauzas in Kushtia Sadar Upazila and list of Mauza with their number of sheets are summarized in a table which is attached in the annexure-A.

Table 2.1: No of administrative units, population, density and literacy rate

Municipality	Union	Mauza	Village	Population		Density (per km^2)	Literacy rate (%)	
				Urban	Rural		2001	2011
1	12	116	167	102988	399267	1578	48.4	53.9

Source: BBS, 2011 and compiled by Consultant

2.2 Historical & Geographical Importance of Kushtia Sadar Upazila in the Regional Context

Historical events

Like other parts of Bengal, Indigo Resistance Movement spread over Kushtia before liberation war. A group of 147 Pak soldiers faced heavy resistance from the local EPR, Police, Ansar, students and general public on their entry to Kushtia on 25 March 1971. On 30 March 1971, the flag of the independent Bangladesh was hoisted in Kushtia. An encounter was held between the freedom fighters and the Pak army at Bangshitala of the Kushtia Sadar Upazila on 5 September in where a number of freedom fighters were killed. The Pak army killed about 12 persons of a single family at 'Kohinoor Lodge' in Mill Para.

Marks of the War of Liberation Mass grave

Three spots located at Kushtia Zila School, Kushtia Police Line and on the bank of the Garai river are the marks of the war of liberation mass grave. One sculpture (Muktabangla at Kushtia Islamic University); and one memorial monument (at Bangshitala) are also important landmark of Kushtia Sadar upazila represent another signage of liberation war. Jhaudia Mosque (Mughal period) and Swastipur Mosque (Shayesta Khani period) are the Archaeological heritage and relics in Kushtia Sadar Upazila.

Jhaudia Jamme Mosque is one of the historical places in Kushtia. During the reign of Emperor Shahajan Landlord Ahamad Ali Sufi build up the historical Shahi mosque at his own residence in the Jhaudia union of sadar upazilla. Another historic mosque in Kushtia Sadar Upazila is Swastipur Mosque. It was built in Shayesta Khan period. Lalon, also known as Lalon Sain, Lalon Shah, Lalon Fakir or MahatmaLalon (1772–1890) was a prominent Bengali philosopher, Baul saint, mystic, songwriter, social reformer and thinker, considered an icon of Bengali culture, whose resting place is in Cheuriya, Kushtia, Bangladesh.

Photograph 2.1: Jhaudia Jamme Mosque

In 1963, a mausoleum and research centre was built at the site of his shrine, which is in the periphery of Kushtia paurashava boundary. Thousands of people come to the shrine (known as an Akhra) twice a year, at Dol Purnima in the month of Falgun (February to March) and in October, on the occasion of the anniversary of his death. During these three-day song melas, people, particularly Muslim fakirs and Bauls pay tribute.

Photograph 2.2: Swastipur Mosque

Photograph 2.3: The Shrine of Lalon Fakir

Few more important land marks, tourist spots in Kushtia Sadar Upazila and Kushtia Municipality town area are shown in the maps bellow.

(Source: Kushtia Sadar Upazila in Wikipedia, The Free Encyclopedia. Retrieved at October 17, 2017, from https://en.wikipedia.org/w/index.php?title=Kushtia_Sadar_Upazila&oldid=787814342

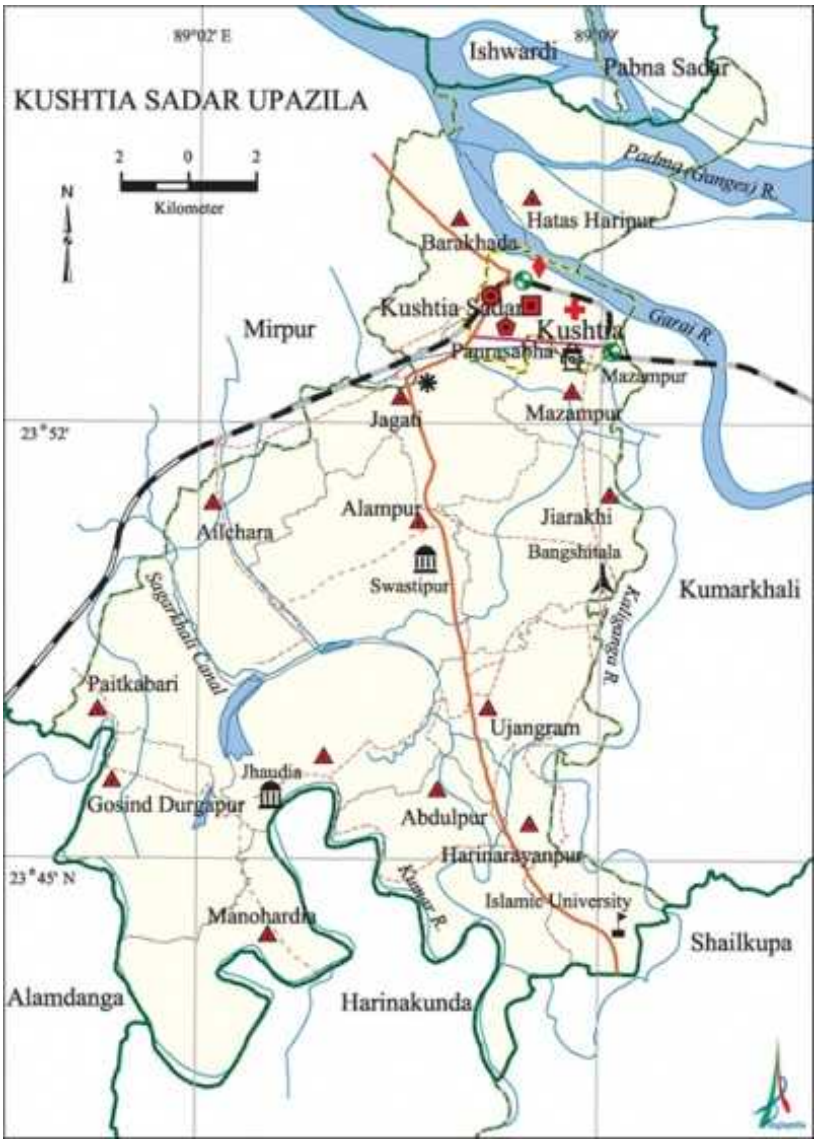


Figure2.1: Kushtia Sadar Upazila (Source: Wikipedia)

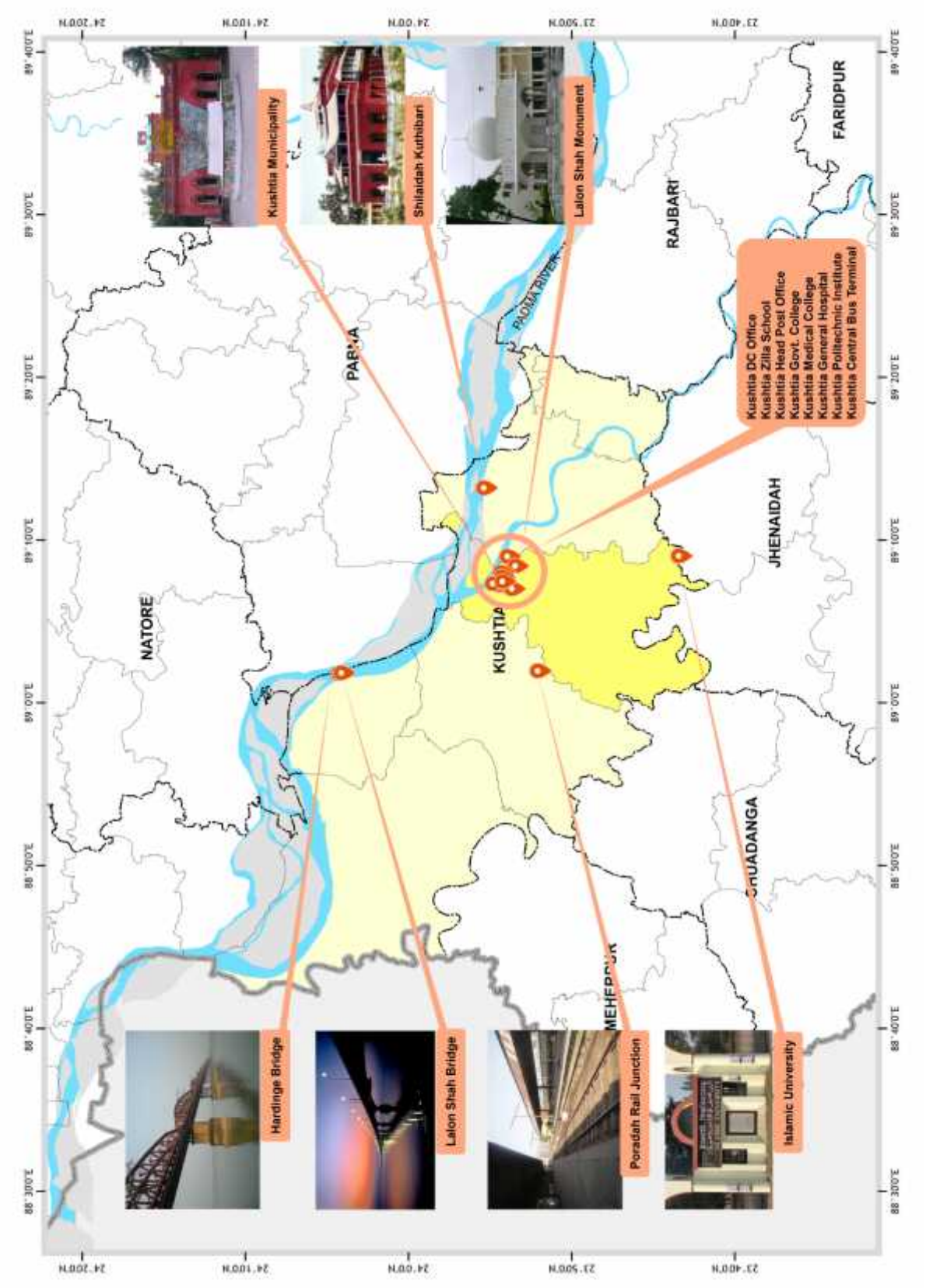


Figure 2.2: Landmarks in Kushtia Sadar Upazila
[Data Source: BBS (2017) and Google Maps. (2017) Kushtia Upazilla retrived at October 17, 2017, from https://www.google.com.bd/maps/place/কুষ্টিয়া+সদর+উপজেলা/]

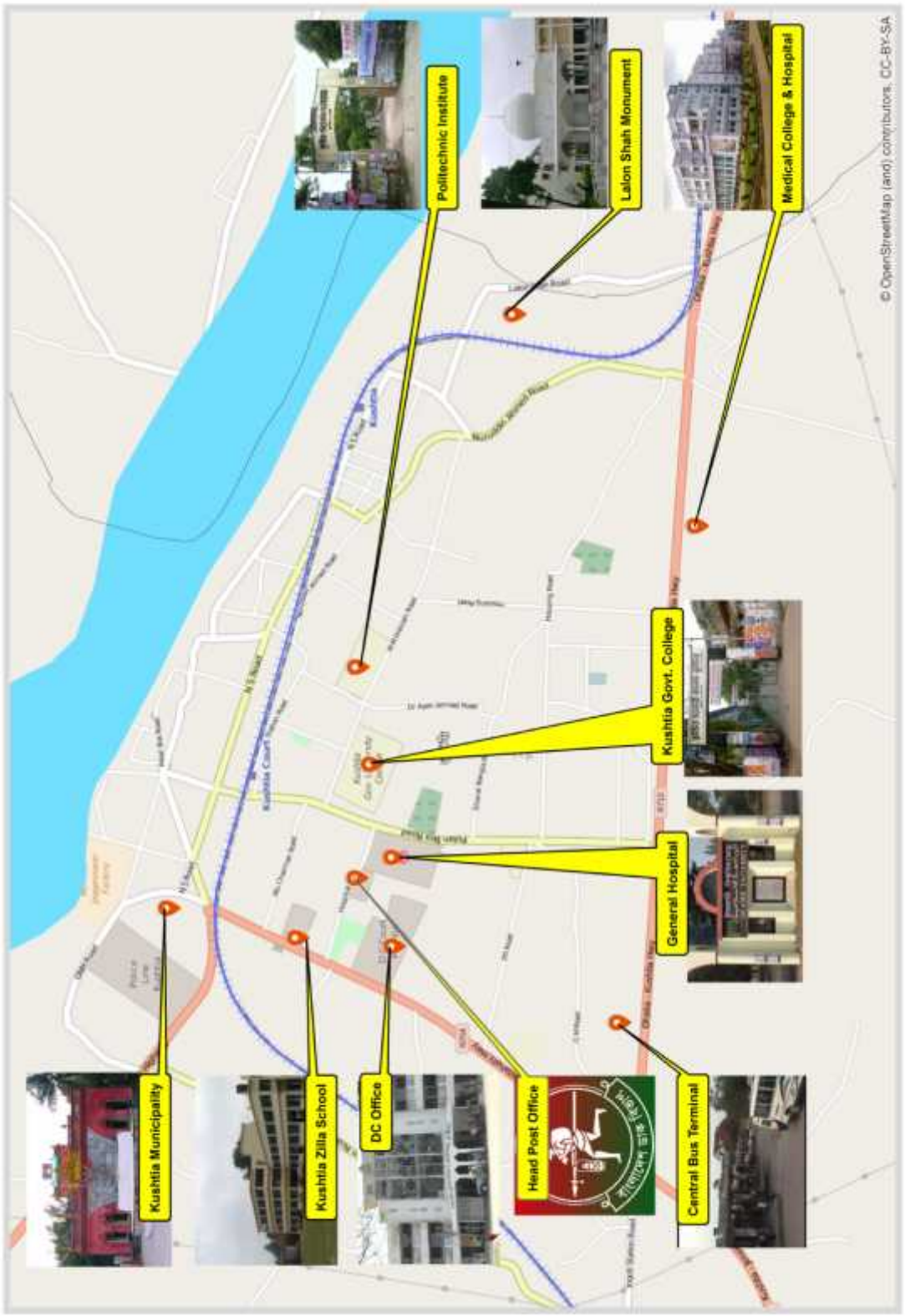


Figure 2.3: Landmarks in Kushtia Municipal Town

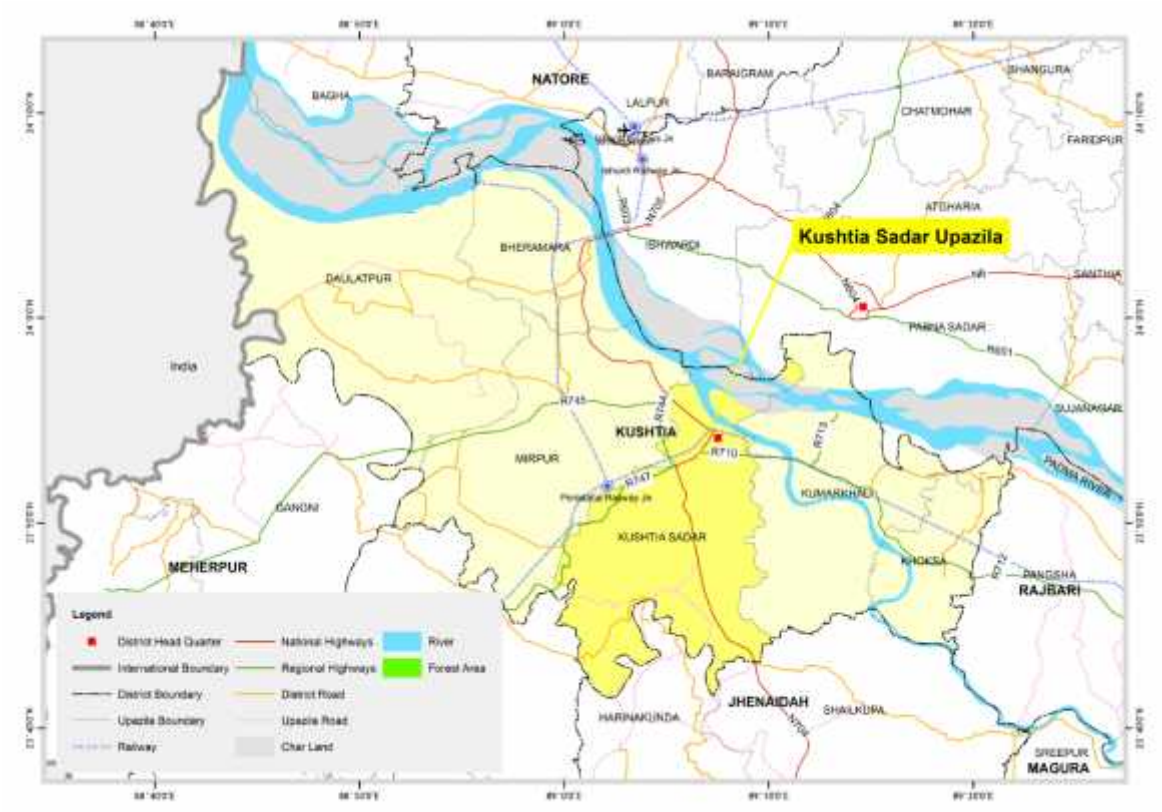
[Data Source: Google Maps. (2017) Kushtia Upazilla retrived at October 17, 2017, from https://www.google.com.bd/maps/place/কুষ্টিয়া+সদর+উপজেলা/]

2.3 Road Networks and Inter-regional Connectivity of Kushtia Sadar Upazila

Road is an important physical feature for any area without which no area can run. Road provides both accessibility and mobility. There are mainly three types of roads; primary road, secondary road and tertiary or access road. Each of these roads has different purpose. Primary road provides mobility and connection between district to district and town to town whereas access road provides accessibility.

Inter-Regional Connectivity

The most important modes of transport in Kushtia Sadar Upazila are road, rail and river way. Both the highway and railway connect Kushtia with districts of North Bengal, South Bengal as well as the capital city Dhaka. Kushtia Sadar Upazila situated beside the mighty river Padma that gives a well water communication of the upazila. There is a road bridge and historically important rail bridge and Hardinge Bridge which are pretty close to this upazila. Regional connectivity shows in the map bellow:



Map 2.3: Regional transport connectivity of Kushtia Sadar Upazila (Source: BBS 2016)

Road Network

Kushtia Sadar Upazila consists of combination of both secondary and tertiary roads. From the field survey it is found, there are some primary and secondary roads of several lane and many access roads. The following table shows the roads classification according to length and type as well as construction type of roads.

Photograph 2.3: Road Connectivity

Table 2.2: Total Length of Road, Railway and River way

Upazila	Road (km)	Railway (km)	Waterway in monsoon (km)	Waterway in round the year (km)
Kushtia Sadar	583	8	15	5

Source: BBS, 2011


Photograph 2.4: Road and Railway transport system in Kushtia Sadar Upazila

Table 2.3: Road length based on road types

Upazila	Pucca road (km)	Semi pucca road (km)	Katcha Road (km)	Total (km)
Kushtia Sadar	296	38	249	583

Source: BBS, 2011

Table 2.4: Road Length based on Road classification of Kushtia

Road Type	Earthen(KM)	Pavement(KM)	Total Length(KM)
Upazila Road	4.38	112.91	117.29
Union Road	9.08	90.40	99.48
Village Road A	104.00	118.35	222.35
Village Road B	502.76	78.02	580.79
Total Roads	**620.23**	**399.68**	**1019.91**

Source: LGED

2.4 Population

Demographic information has been extracted from different Census reports of Bangladesh Bureau of Statistics (BBS).Population of Kushtia Sadar Upazila was 4,23,818 in 2001, while according to BBS 2011, the population of Kushtia Sadar Upazila is 5,02,255 having a density of 1578 person per sq.km.

2.5 Socio-Economic Scenario

The economy of the project area is agro-based dominated by trading of various agro-products. Total 41.5% people are involved in agriculture, 13.9% labourer and 8.53% are in service Paddy, wheat, jute, potato and maize are major cash crops of the area. Jute is cultivated throughout the region and has become less popular as a cash crop. On the other hand paddy and wheat are major cereal crops. In recent years cultivation of maize is becoming popular which generally fetches good income for the cultivators. In the rural settlements, groves of bamboo and betel nut trees are a common picture. The area has potential for the production of oil seed like mustard. Large portions of the manpower are also engaged in service sector. Industrial development in Kushtia is lagging. Agriculture and fishing are still the main source of employment. With the squeeze of agricultural sector in this district, slums and jobless population are increasing in Kushtia Sadar Upazila.

2.6 Urban Development Pattern

Present urbanization of Kushtia Sadar Upazila is influenced by its advantageous location and connectivity with its surrounding upazilas. Gradual increase in its potentiality as a service provider, Kushtia attracted many in-migrants in the recent past. As a result, urbanization took place along with accessibility to the buildable land. Multiple use of land (intensity of land use) took place gradually converting the agricultural land to other uses. As of day, considerable amount of land is under agricultural use and with the development of Kushtia Sadar Upazila, land value is soaring high, displacing the original land owners. Increasing density will have impact on different service will again influence urban development pattern.

2.7 Traffic and Transportation

The road and rail network of Kushtia Sadar Upazila were developed and established according to the needs and not in a planned way. Most of the cases, road network is established after the development of infrastructure, which results poor layout of road network and narrow road and creates several problems like; pedestrian problem, utility services problem, emergency services problem etc. Unauthorized encroachments are common problems along the roadside and major road cross-sections.

Photograph 2.5: Existing Roads and Intersection of Kustia Paurashava

It has been observed that, the town does not appear to demonstrate serious signs of traffic congestion but some traffic congestions are observed in the Bazar area and Bus stand area. It is also observed that road side parking of buses and loading-unloading of passengers is the main causes for traffic congestions and haphazard parking of inter-district buses also create congestion around the bus stand area. Above photographs 2.5 shows the concentration of non-motorized and three-wheelers vehicles in the urban areas of Kushtia Sadar Upazila.

It is hard-headed that the main mode of transport within the upazila is rickshaw and auto rickshaw. Other mode of transport as intra upazila transport could be identified as three wheelers, bus etc. Inter district and long route transport mode are mainly bus and train.

Being a major transit point in the northern region of the state and spreading over to the location of north Bengal, Central Bus Terminal of Kustia Sadar Upazila has an importance. Bus terminal is located at the southern periphery of Kushtia Paurashava boundary and next to housing estate block.

Photograph 2.6: Central Bus Terminal of Kustia Sadar Upazila

2.8 Services and Facilities

2.8.1 Water Supply and Sanitation

Piped water supply system was established in Kushtia municipal area and Upazila town area. Ground water is used as the main source of water supply. Tube-wells are the main source of drinking water. 94.0% general households get the facility of drinking water from tube-well, 4.1% from tap and remaining 1.9% household get water from other sources (BBS 2011). The presence of arsenic has been detected 8.04% in shallow tube-well water of the Sadar upazila (BBS 2011).

About 71.9% of general households of the upazila use sanitary latrines, 23.7% use non-sanitary latrines and remaining 19.69% of households do not have latrine facilities (BBS 2011).

2.8.2 Electricity Connection

The Project Area is served by electricity supplied by Power Development Board (PDB) and Rural Electrification Board (REB). However, according to BBS, a total of 77.5% general household reported to have electricity connection in the entire sadar upazila in 2011 as against 48.3% in 2001.

2.8.3 Health Care Facilities

Kushtia Sadar Upazila Health Complex and other Government hospitals are providing health facilities to the dwellers. Paurashava authority is providing maternal and neonatal care facilities to the urban poor. Overall, the people of the town are getting medical facilities from 6 hospitals and 13 private clinics (BBS 2011).

2.8.4 Educational Facilities

Different institutions, like Government College, Private College, High school, Madrasah, Primary school are performing in this Upazila. The overall literacy rate is about 53.9%.

Table 2.5: Number of educational institutes in Kushtia Sadar Upazila

Educational Institutes	Number
Primary School (both Govt. and Registered)	145
High School (both govt. and Non-govt.)	56
School & College	04
College (both govt. and Non-govt.)	18
Madrasha	17
Koumi Madrasha	22
University (Public or Private)	01

Source: BBS, 2011

Photograph 2.7: Main gate of Kushtia Zila School

Photograph 2.8: Kushtia City College

2.8.5 Community Facilities

Hat, Bazar, Growth Center, Community Clinic and different playgrounds are the main community facilities of Kushtia Paurashava. At local level, there are different clubs which organize different events for the area.

Table 2.6: Existing Community Facilities in Kushtia Sadar Upazila Area

SL No.	Facilities	Number
1	Growth Centre	05
2	Hat/Bazar	35
3	Mosque	252

SL No.	Facilities	Number
4	Temple	67
5	Fire Service	01
6	Cinema Hall	02
7	Public Library	07

Source: BBS, 2011

2.9 Environmental Condition

Overall environmental condition of Kushtia Paurashava as well as Sadar Upazila is not sound enough. It is exposed from the field observation that the existing environment condition of this upazilais not up to the mark. Some residential areas and Bazar area are very congested due to huge pressure of population. Most of dwellers of the Upazila and pourashava town use to dispose solid waste in the vicinity of the household, nearby ditches, canals drains and or vacant lands. Upazila and paurashava towns are collecting solid waste daily but from some specific places with inadequate transportation system. Solid waste from Katcha Bazaar is generally thrown out to the water bodies and polluting the water.

Solid waste management is an obligatory function of Local Government in Bangladesh. This service is an important aspect of maintaining the quality of life and environment of a town or city, but unfortunately it is poorly performed resulting in problems of health, sanitation and environmental degradation. Inadequate financial resources, institutional weakness, improper choice of technology and public apathy towards solid waste management have made this service far from satisfactory. Unless concerted efforts are made for proper waste management, the problem of urban waste will be further aggravated and cause environmental health problems.

2.10 Institutional Development

In our country planning regulations and control are vested upon numerous authorities often resulting in lack of co-ordination which is considered to be one of the major constraints behind hindering the development activities of the local government institutions, like Paurashava. Bearing this in mind, the Government has centered its attention on enhancing and strengthening the local level institutionally to make them competent

in carrying out their responsibilities. Other agencies/institutions that are likely to be the stakeholders/participants of the Development Plan will be taken into confidence by the Upazila authority so as to get the optimum level of co-ordination. The legal framework of the Paurashava and the envisaged obligations that cropped up from the Paurashava Act needs to be clearly understood. Their readiness to accept organizational change and persistent interaction with the planning team and stakeholders during and post plan preparation period will help strengthen the local government institutionally.

2.11 Potentiality and Opportunities for Tourism Development

The main Tourist attraction of Kushtia is Shilaidaha Kuthibari. This beautiful red sprawling building surrounded by a large expanse of trees, plants and flowers, is located about 20 km from Kushtia Town. It upholds the memory of the Nobel Laureate Poet Rabindranath Tagore who made frequent visits to this place and stayed here in connection with the administration of his "Zamidari". The peace and tranquility of this place enthralled him into penning some of his best verses thus contributing further to the enrichment of Bengali Literature. The beautiful mansion carries memory of Nobel laureate poet Rabindranath Tagore (1861-1941) who made frequent visit to this place and used to stay here, in connection with administration of his Zamindari and enriched Bengali literature through his writings during that time. It is located at a distance of about 20 km. from Kushtia town.

The Shrine of Lalon Fakir is another tourist attractive place in Kushtia.The mausoleum of Baul emperor Lalon Shah received shelter in Cheuria of Kumarkhali. After his death, a reconnaissance area (Akhra) was developed around his tomb. It is a place to witness and get an insight of Baul music and its spiritual importance.

Lalon Shah Bridge also known as the Paksey Bridge, is a road bridge in Bangladesh over the river Padma, situated between Ishwardi Upazila of Pabna on the east, and Bheramara Upazila of Kushtia on the west. Named after early 19th century mystic poet Lalon Shah of Chhewuriya, Kushtia District, the bridge was completed in 2004.

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2.12 Natural Hazards

Due to the geographical location, the project area is particularly exposed to flood, storm etc. which may cause severe damage to the population and infrastructure.

River Padma runs along the northern boundary of Kushtia district. Padma becomes active during monsoon and flooding is a common phenomenon for the Sadar Upazila.

Poor solid waste management and without hospital waste management, it may be disastrous for citizens of the Paurashava if it is flooded.

Kushtia Upazila situated in the Western part of Bangladesh, which is the most active seismic zone and had experienced earthquakes of moderate to high intensity in the past, where the shocks of intensity of 9.0 are possible.

2.13 SWOT Analysis

There are a number of physical constrains which are hampering the sustainable growth and development of the Kushtia Sadar Upazila. From the reconnaissance survey, a glimpse of SWOT analysis of Kushtia Sadar upazila is discussed in below:

Strength

1. Kushtia is situated at strategic location which influences its future physical growth.
2. Historic and heritage sites may attract tourist interest.
3. Availability of large undeveloped peripheral areas for planned development of land uses.
4. Large undeveloped land in the city periphery for providing open space recreation.

Weakness

1. Weak enforcement of land development regulations
2. Ineffective implementation of the planning schemes and strategic plans.
3. Lack of coordination among government agencies.
4. Poor solid waste management.
5. Inadequate urban services.
6. Narrow roads, lack of alternate and link roads and absence of pedestrian facility
7. Unplanned establishment of market places and other road side encroachments
8. Problems of proper marketing facilities for agro-products;

Opportunity

1. Implication of new land use policies will cause overspill of population in the periphery and will reduce pressure on housing and services in the core area.
2. Railway line passing through the city.
3. Increasing public awareness

Threat

1. Filling up of water bodies and open spaces.
2. Rapid unplanned development in the flood flow zone.
3. Rising land price in peripheral areas.
4. Uncontrolled mixed use development in peripheral areas.
5. Rural to Urban Migration resulting informal settlements.
6. Disruption of urban economic and living environment arising from persistent shortage of urban infrastructure.

Chapter: 03

NATIONAL DEVELOPMENT PLAN AND POLICIES

CHAPTER-3
National Development Plan and Policies

3.1 Introduction

Bangladesh's planning model is dominated by a centrally planning system where the government sets out policies and implement on sector basis. Either a centrally government body or a local institution of a particular sector under a ministry initiates the planning process with directives from the higher authority. So both the orientation and the process of development planning have been entirely top-down. This chapter explains how Development Plan of Kushtia Sadar Upazila is linked with the National Development Plan/Policy/Guidelines of the country. For this report, National Development Plans like 7th Five Year Plan, Poverty Reduction Strategy Paper (PRSP) etc. have been studied.

3.2 Rationale of Relating National and Local Plan

National development plans are prepared considering the general needs and aspirations of the nation concerning diverse areas of development. National policies, strategies and objectives are set and budget allocation is made accordingly to realize development targets. Sectoral budgets are again broken down in to programs and projects under each sector. Any development initiative at local level must relate to the national level plans in order to achieve cohesion and integrity with overall development of the county to attain the national development objectives. It is therefore necessary to understand and realize how the plan at micro level like Development Plan of Kushtia Sadar Upazila is being related to the national development plan of the country.

The planning components of the current plan package are hierarchically related with each other. Development Plan is at the apex level providing long term policies and strategies for urban development.

3.3 National Development Plans

This Development Plan for Kushtia Sadar Upazila will be prepared focusing the SDG Goal 11 and as per legal binding of Urban Development Directorate under Ministry of Housing and Public Works and in the light of the policy guidelines of the 7th Five Year Plan and other related national documents.

3.3. 1 7th Five Year Plan

The 7th FYP reflects a continuation of the major goals articulated in the 7th FYP. The core targets set in accordance with the vision and goals of the Perspective Plan under the 7th FYP include:

Sector Development

- Significant growth of the agriculture, industry and service sectors;
- Increase the contribution of the manufacturing sector to 21% of GDP by FY20;
- Substantial improvement of exports to $54.1 billion by FY20;
- Achieving a Trade-GDP ratio of 50% by FY20.

Urban Development

- Infrastructural investment and civic facilities in peri-urban growth centres especially around Special Economic Zones;
- Inclusive housing and other civic services for urban inhabitants including for people living in informal settlements and slums;
- Inclusive urban planning based on sustainable land use planning and zoning;
- Increased productivity, access to finance, and policy support for urban micro-small and medium enterprises.

3.3.2 Poverty Reduction Strategy Paper (PRSP)

In September 2000 at the Millennium Summit, the United Nations issued the Millennium Declaration, signed by 189 countries including Bangladesh, committing themselves to a series of targets, most of which are to be achieved by the year 2015. This is known as Millennium Development Goals (MDG). The member countries present a framework for achieving human development and broadening its benefits. The MDG provides a road map for the international community's effort for development. They focused a set of eight goals:

- Eradicate extreme poverty and hunger
- Achieve universal primary education
- Promote gender equality and empower women
- Reduction mortality
- Improve maternal health
- Combat HIV/AIDS, malaria and other diseases
- Ensure environmental sustainability
- Develop a global partnership for development

In persuasion of achieving the MDGs, Poverty Reduction Strategic Paper was published in 2003. The PRSP thus prepared covered the basic philosophy of FYP and ultimately has taken over the place of Five Year Plan. 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) in 2005. PRS aimed at a targeting development activity under different sectors having the main focus on poverty. Issues like environmental sustainability, eradication of poverty and hunger, universal primary education and health related matters are directly related to plan preparation process. In the preparation of Kushtia Sadar Upazila development plan, land use zoning will endeavor to protect the environmentally sensitive areas through conservation, promote education through allocation of appropriate quantity of land for setting up of academics and health facilities. The plan will be directed to reduce urban deprivation through appropriate proposal for strengthening urban economy and adequate provision of utility services.

Review of Poverty Reduction Strategic Paper

National Strategy for Accelerated Poverty Reduction II, sponsored by International Monetary Fund reviewed the PRSP in 2012. Bangladesh is experiencing rapid urbanization. In 2007, the estimated total population was 142.6 million of which 35.7 million was urban. Urbanization is characterized by over crowd and a severe lack of basic facilities in almost all spheres of life.

The major challenges of urbanization in Bangladesh are:

- Unplanned and unguided urbanization with mounting problems
- Absence of strong planning outfit centrally and in urban centers;
- Lack of advance planning for utility services, shelter and infrastructure;
- Absence of an integrated approach to urbanization embracing cluster development of adjacent towns or provision for satellite towns;
- Lack of comprehensive urbanization comprising all civic amenities like parks, lakes, and other recreation facilities;
- Absence of a regulatory framework for utilization of urban public land and waterways to prevent their misuse;
- Inadequate environmental concern for protection of urban waterways, disposal of solid wastes and industrial sludge;
- Lack of concern for urban poor and slum dwellers; and
- Absence of statistical database for urban planning. The high population density calls for a spatial pattern of urbanization composed of urban and peri-urban areas. Planned urbanization will ensure growth and equity taking into consideration a futuristic scenario.

The specific goals urbanization in Bangladesh is to:

- Promote urban development for balanced growth across the country;
- Finalization of national urban development policy and
- Promotes sustainable urbanization for poverty reduction and development

The following strategies will be followed for urban development:

- Planning, guiding and promoting urban development with adequate services for all
- Creating strong planning outfit in relevant ministries and all city corporations
- Making advance planning for utility services, shelter and infrastructure in all urban center
- Planning road infrastructure development and public transportation for a number of cities and towns in a cluster
- Adopting an integrated approach to urbanization embracing cluster development of adjacent towns or provision for satellite towns
- Developing comprehensive urbanization comprising all civic amenities like parks, lakes and other recreation facilities
- Developing policy framework and creating a regulatory framework for utilization of urban public land and rivers for building parks, lakes and civic amenities
- Improving urban environment by protecting urban rivers, regulating disposal of solid wastes and industrial sludge
- Creating an enabling environment including social protection systems and safety nets for urban poor and slum dwellers by building appropriate institutions like cooperatives, micro credit organizations, easy access to credit, improved health facilities, etc.
- Building regulatory authority for citizens' protection against exploitation by home developers and other private utility providers;

- Creating strong mechanism for coordination of infrastructure development and provision of utilities in all urban centers
- Creating a framework for operation of private sector, NGOs, CBOs, PVOs etc. for building infrastructure, recreation facilities and utility services for urban inhabitants
- Building institutions in collaboration with the BBS for creating statistical database for urban planning

In the process of preparation of Development Plan for Kushtia Sadar Upazila, large number of development projects will be identified in different sectors. Implementation of development projects by Upazila Authority, either by its own resource or external assistance will improve the infrastructure and services and will create an environment or utilization of local resources. This will attract more investment in the locality to generate new employment. New employment will generate income for the poor people and shall improve the poverty situation, which is the main objective of PRSP. New jobs will also be created during implementation of various development projects of the Upazila prepare under the Development Plan. New and improved road infrastructure will increase mobility as well as economic activities of the Upazila, which will help to address the problem of unemployment.

The current program of preparation of Development Plan will help to address urban poverty if adequate steps are taken to accelerate urban infrastructure development based on the plan. The new developments will induce new investments in trade and industry and lead to generation of more employment in the services, construction, transport and informal sectors. This will directly assist in reduction of poverty. It will help absorb additional work force produced in urban and rural areas as a result of natural growth of population.

3.4 Annual Development Plan (ADP)

ADP is produced each year by the Planning Commission against Sector/ Sub-Sector/Departments showing allocations from revenue budget and project aid. The departments/division, like LGED, DPHE and LGD who mainly work for urban and rural Development have many nationwide projects which cover local government areas in the country. The nature and magnitude of the approved projects indicate GOB intention to strengthen the urban sector of the country.

Annual Development Program of 2016-2017 has given the highest priority to power, energy, gas and natural resources sector. The project will study the emphasized issues and allocation of budget for Kushtia to incorporate in the planning process of Kushtia Sadar Upazila.

Annual development program will be reviewed for understanding the sector wise national importance and allocation of budgets through ADP. Consultants will also review it in the Action Plan phase. This would make the initiation of projects more practical and make it easier to integrate them into the national planning mechanism. The combined efforts for implementation therefore will have positive contribution towards the future development of Kushtia Sadar Upazila.

3.5 Relevant Acts and Policies

Building Construction Act, 1996

Building Construction Act, 1996 was adapted on 18 July, 1996 by amending the Building Construction Act 1952 and Building Construction Act 1984. This act is the key to provide approval for construction of a building, digging a pond and cutting of hill. This act ensures that all development work through construction must adhere to the Master Plan. The act also provides guideline for land use, building height and parking facilities, building setback and security system. The Act is the key to prevent violation of plan through controlling all construction works.

Open Space and Wetland Conservation Act, 2000

Open Space and Wetland Conservation Act, 2000 was published in a supplementary issue of Bangladesh Gazette on 18.9.2000. This act was adapted for conservation of playground, open space, park and natural wetland in the capital, divisional town, district town and other urban areas.

The act will be the safeguard in conserving the flood flow zone, open space, playground and parks which are essential elements of smooth urban living.

National Forest Policy, 1994

'National Forest Policy-1979' was first formulated in the seventies of the last century and adapted on July 8, 1979 to safeguard the dwindling forest resources of the country. Due to over exploitation, stock of the same got reduced to an extent that became a threat to environmental degradation to an alarming state. In order to preserve the natural environment and prevent climatic degradation it was necessary to take step to augment the supply of forest resources. In this respect a twenty year Master Plan was formulated. To facilitate the afforestation program on the basis of the plan the 'National Forest Policy-1979' was amended and revised and 'National Forest Policy-1994' was adapted on May 31, 1995.

The policy framework will guide the propose conservation of forest resources of the area as part of Action Area Plan.

Private Housing Land Development Rule, 2012

This rule was framed under the Town Improvement Act 1953 (E.B. Act XIII of 1953- Section 102), first in 2004 and revised later in 2012. The Rule deals with the registration procedure for obtaining permission for private land development project. It provides the abiding conditions that have to be fulfilled in order to obtain permission for carrying out a land development project by private sector initiative. Space Standards for various Urban Community Facilities have also been elaborated in the Rule

Urban and Regional Planning Act, 2016 (Draft)

The draft Urban and Regional Planning Act, 2016 is developed by the Ministry of Housing and Public Works to ensure planned development in the country considering the needs of planning in urban, regional and rural contexts.

Objective:

- To increase the efficiency of feasible urbanization
- To establish proper land use management
- To implement Urban and regional Planning (Short, medium, long term)
- To ensure legitimate postulation of fundamental planning for combined progress.
- To ensure planned improvement of land's upper and lower material or mineral asset
- To improve the socio-economic, cultural and political status of the people of Bangladesh.

The Advisory and Executive Councils

The proposed Act provides for the formation of Urban and Regional Planning Advisory Council consisting of 18 members and an Urban and Regional Planning Executive Council with 19 members with a provision for co-option of members, if necessary.

Activities of the council are as follows:

- Planning, approval and implementation of the Urban and Regional planning and land use management rules and regulations, also other ordinance related activities.
- Assist the implementation of the National Government Plan.
- Integrate the development works taken by national organizations with the plans enacted under the Urban and Regional Act, 2014 and vice versa.
- Provide recommendations to control land use management carried out by professionals (involved directly or indirectly with development work) and government and non-government organizations related with plan preparation and implementation.
- Guide the planning and landuse management and related activities of government institutions, agencies and departments.
- Conduct government instructed urban and regional planning and land use management related other activities.
- Define and determine the standards for the planning, landuse management and development related elements, determine planning typology, science based and public participation oriented planning process, development control, relevant public hearing methodology and process.
- Assist different government agencies in the physical planning, land development planning and landuse related all necessary activities through periodic evaluation and guidance.

- The council, if required, can include the Urban Development Directorate to assist the government organizations in the planning and landuse management and other related works.

In addition, the following Acts / Policies will be reviewed:

- The National Urban Sector Policy, 2011
- The National Agriculture Policy, 1999
- The National Industrial Policy 2010
- The Bangladesh Population Policy, 2004
- The National Tourism Policy, 2009
- The National Forest Policy, 1994
- The National Housing Policy, 1993 (Amended 2008)
- The National Land Transport Policy 2004
- The National Land Use Policy 2001
- The Environment Policy,1992
- The National Reservoir Protection Act, 2000
- The East Bengal Building Construction Act, 1952 (Amended 2006)
- The Bangladesh National Building Code (BNBC), 2006
- Population Census,
- Private Housing Land Development Rules 2004, (Amended 2012)
- Building Construction Rules 2008
- Real Estate Development & Management Act, 2010
- Natural Water Body Protection and Preservation of Open Space and Playground Act'2000
- Other relevant rules and regulations issued by the Government from time to time,
- Geology (sedimentation, stratification, fault lines, lineaments etc.)
- Hydrology (contour lines, water bodies/courses, embankments, pump house, related structure etc.)
- Collection of geo-physical maps and report

Chapter: 04

APPROACH AND METHODOLOGY

CHAPTER- 4
APPROACH AND METHODOLOGY

4.1 Introduction

The approach and methodology has been developed to accomplish the stated objectives and activities of the ToR. Before deciding on the approach of the planning process and methodologies, the consultants visited the project area, met representatives of Kushtia Sadar Upazila, other government officials, members of the civil society and general public, where the consultants had valuable discussions. Based on general understanding of the problems of the project area and taking ToR into account, the consultants have developed the approaches and methodologies for the project.

4.2 Technical Approach to the Study

4.2.1 Background of the Consultant's Approach

The Consultant has, to his credit, vast experience and know-how of performing design of projects with similar parameters as those envisaged for the subject project and is therefore fully cognizant and aware of the requirements of UDD. The consultant has extensive experience of planning, management and execution of works in the past decade while working for different Government agencies in Bangladesh, on urban planning, Feasibility Studies, Detailed Engineering Design, and Construction Supervision services etc. This has made them well versed with the local set-up of the Govt. in Bangladesh and elsewhere.

4.2.2 General Approach to the Study

For this project, the Consultant has assigned well qualified and experienced staffs who have been involved in similar and larger projects, where proper coordination, and timely completion of activities, has led to the successful implementation of projects.

The project and its components have been analyzed in logical sequence with respect to the time available for the study. Effort has been made to economize on time, but at the same time ensuring that high quality of work is maintained.

The Consultants has provided, in this proposal, a number of graphical illustrations and schematic presentations for ease of understanding. Consistency is maintained between activities shown in different modes of presentation such as Bar Charts, Flow Charts etc.

4.2.3 Technical approach of the study

Development/Master Plan will be prepared for managing and promoting development on the basis of the strategies set by the longer-term structure plan. The Development/Master Plan of Kushtia Upazila comprise of the following three components

a) Structure Plan

b) Urban Area Plan (UAP)

c) Action Area Plan (AAP)

4.3 Management Approach to the Study

4.3.1 Consultants' Approach and Strategy

The consultants' approach to the assignment will have for accomplishment of the desired output in a timely and systematic manner. For meeting the project objectives in an effective manner, the Consultants' strategic approach would encompass, but not limited to the following-

- Use of state-of-the art current know-how to develop effective solutions for the project component to prepare Development Plan supported with latest software for techno-socio-environ inputs;
- Deployment of highly qualified professional staffs who have worked on similar projects both within the country and abroad with excellent track record and most suitable to the assignment:
- Employ Urban and Rural Development Guidelines, best practices and bring on broad the Stakeholders' perspectives to maximize societal benefits;

4.3.2 Management Organogram

The Consultants' believe that the timely outcome of a good project will be successful if an effective project management effort can be established through formation of an integrated Project Organogram involving Urban Development Directorate (UDD) and other development agencies in the surrounding areas. A key to success depends much on this very aspect of project management.

4.3.3 Consultants Team Management

The consulting team will consist of 12 (twelve) professionals including (i) Team Leader, (ii) Urban Planner, (iii) GIS Expert, (iv) Environmental Expert (v) Architect (vi) Transport Planning Expert (vii) Water Resource Management Expert (viii) Civil Engineer (ix) Junior GIS Experts (x) Data Entry Operators (xi) Surveyors. The whole team will be working under the leadership of the competent and experienced Team Leader. He, in consultation with the key professionals of different disciplines will determine who will be required and when. Accordingly work schedule in conformity with staffing schedule has been revised accordingly after kick-off meeting for the commencement of the work. Khandaker Golam Tawhid will be act as the project coordinator as well as Environmental Expert for the concerned project

The Team Leader in association with Project Coordinator will set up the project management program in such a way that he can achieve all the input-output schedule of activities of the project study with quality assurance in time and present to the client.

The Team Leader and Project Coordinator will maintain a good liaison with the Project Management Office (PMO) and brief the progress of work, status of the project and seek cooperation to resolve the issues relating the project, etc. He will also make good contact with the Upazila and other agencies of the stakeholders.

4.3.4 Co-ordination Meeting

The Team Leader and Project Coordinator will have regular Meetings with Project Management Office and will address the key issues that may hamper the utilization of man-months due to non-availability of data, information and participation in the process of policy formulation, etc. The PMO Office would take urgent steps to make the data available, participate in the project assignment as a Participatory Approach and resolve any problem that may arise. The Consultants' Team Leader will hold regular internal meetings with his staff members and review the work program, and monitor progress according to set objectives of the ToR.

The consultancy services for this proposed project is a concerted effort of experts from different disciplines. All team members will have a spirit to achieve the target in the stipulated time period. Under any circumstances time and man-months will not be overrun.

4.4 Population Forecasts

The 2011 census data will be the basis of all future population projections for the project area. The consultants plan to take the full advantage of census data because of its comprehensive nature. Equal importance will be given to the data from earlier censuses of 2001, 1991 and 1981. District level perspective planning assumptions will be taken into account in all forecasts.

4.5 Tentative Detection of Project Area

Kushtia Sadar Upazila consists of one municipality including 21 Wards and 12 Unions. Its existing total area is 318.22 km^2 with a population of 5,02,255 (BBS 2011). The planning area for the Development Plan will cover the existing entire area of the Kushtia Sadar Upazila. Area and population of the Kushtia Sadar Upazila has been shown in the Table-4.1

Table 4.1: Population and Area of Kushtia Sadar Upazila

Name of District	Name of Upazila	Area (sq.km.)	Urban area	Rural area	Urban Population	Rural Population	Total Population
Kushtia	Kushtia Sadar	318.22	42.81	304.77	1,02,988	3,99,267	5,02,255

Source: BBS, 2011 and Compiled by Consultant

4.6 Compilation of Base Map

Preparation of base map is an important requirement for planning and designing of a project. A composite map of the constituent Mauzas will be prepared by appending through Geo referencing the digital coverage of the Mauza maps of the entire project area. The successive steps in the preparation of the base maps are narrated in the following sections. As per ToR, consultants have to work on RS Mauza maps for the entire project area.

The digitization of scanned maps is one of the possible main sources of positional errors in GIS. The accuracy of data generated by this method of encoding is dependent on many factors viz. the scale and resolution of the source map, the quality of the digitizing technician as well as of software, etc. In GIS, general estimates of the accuracy of digitizing range from as high as ±0.8mm

to as low as ±0.054mm [Reference: Dunn R, Harrison A R, White J C, (1990); Positional accuracy and measurement error in digital database of landuse: an empirical study. International Journal of Geographical Information Systems 4 (4): 385-98.]

Preparation of project area map comprises the following item of works:

- Collection of RS Mauza Maps.
- Scanning of Mauza Maps.
- Digitization of Mauza Maps

  Step-1: Preparing the Manuscript.

  Manuscript-1 : Point Features

  Manuscript-2 & 3 : Polygon & Line Features.

  Step-2: Converting Digitized Maps Shape or Geo-database format.

  Step-3: Edit Plot Check.
- Geo-referencing or Projecting of Mauza Maps.

  Step-1: Selection of TICs

  Step-2: Update TICs

  Step-3: Transform Shape or Geo-data from digitized unit to real world coordinate
- Preparation of Mosaic Mauza Maps & Demarcating the Administrative and Project Boundary
- Preparation of Layout of Project area Map.
- Submission of the Project Area Map and Report

4.6.1 Collection of Mauza Maps

The RS Mauza maps are the basis of the base map for the project area. The project area will be delineated on Mauza sheets. Mauza maps have been collected from the Deputy Commissioner's Office, Kushtia and DLRS covering the entire project area. The Mauza sheets having distortion due to rapping or pasting of cloths/tape have been avoided during collection of Mauza maps. Original copies of Mauza maps were supposed to be collected. As original Mauza sheets were not available, photocopy versions of the same have to be collected from DLRS.

4.6.2 Scanning of Mauza Maps

Large line scanning technology, most suitable for map scanning where distortion and deviation is nearly nil, will be used for scanning Mauza maps. During scanning operation, care shall be taken to maintain the geographical north line alignment. Specifications to be used for scanning Mauza maps are tabulated in **Table 4.1**. Necessary processing shall be done to get rid of the noises on the image of unwarranted marks and spots attributed to senile reasons. Also, the technical specifications of the scanner to be used for the purpose are provided in **Table 4.2**. The scanned image files of each individual Mauza shall be saved in TIFF and JPEG format organized and named individually. The tentative nomenclature of image files is provided in **Table 4.3**. All the image files of scanned Mauza maps shall be structurally organized and backed up in sufficient number of CD electronic media and shall be handed over to Project Director Office of the concerned project as end product of this exercise.

Table 4.2: Specifications for Scanned Images

Image type	Grayscale
Image format	TIFF
Image Resolution	300 dpi
Bit depth & Level	8 or 16 Bit (256)
Image Scale	100% (1:1)

Table 4.3: Nomenclature of Image Files (Example)

File Name	XX_XXX_XX			
	XX			Initial Code used for District & Thana/Upazila (1st digit for District and 2nd digit for Thana/Upazila)
		XXX		JL No. (3 digits string)
			XX	Sheet No. (2 digit string)

Example: "KS_003_01.tiff" represents the image file in TIFF format of Mauza having JL no. 3 & sheet no. 1 of Kushtia Sadar Upazila of Kushtia district. Underscores are used as separators of Initial Code, JL No & Sheet No fields.

4.6.3 Digitization of Mauza Maps

On screen digitization method will be used for digitization of Mauza maps. ArcGIS or AutoCAD software will be used for this purpose. All features (Line, Point and Annotation) will be stored in different feature types in shape or geo-database file with separate ID or code number. Proposed manuscripts for digitization of Mauza maps are given in Table 4.4 and 4.5. Polygon features would be built using the line, point and annotation features using ArcGIS software. To keep uniqueness of all features, the ID or code numbers of respective features will be finalized as per suggestion and discussion with Kushtia Sadar Upazila. Following steps would be followed during the process of digitization of individual Mauza maps:

A. Preparing the Manuscript.

B. Converting Digitized Maps to Shape/Geo-database Format

C. Edit Plot Check.

Preparing the Manuscript

Feature wise, two types of manuscripts shall be developed for digitizing the Mauza maps where all the features of Mauza sheets shall be stored as shape file with a unique ID or code number for respective features. Details for the two types of manuscripts are described below:

Manuscript-1: Point Features- This manuscript will contain all point features of the Mauza Maps like Plot Number, Bench Mark, Travers Station, GT Station, Iron Pillar, Other Pillars, etc. Every

point shall be digitized and stored with a numeric user ID (Code) representing feature type. Details for Manuscript-1 are given in **Table 4.4**.

Table 4.4: Sample Feature Description for Digitization Manuscript-1

Sl. No.	Feature Type	Shape Type	Shape Name	Code (ID)
1.	Mauza Name	Point	xx_xxx_xxP	As on Mauza sheets
2.	JL No.	Point		As on Mauza sheets
3.	Sheet No.	Point		As on Mauza sheets
4.	Plot No.	Point		As on Mauza sheets
5.	Unidentified Plot Number (not readable)	Point		99999
6.	Boundary Pillar	Point		41
7.	Bench Mark	Point		42
8.	Iron Pillar	Point		43
9.	Travers Station (Old)	Point		44
10.	Travers Station (New)	Point		45
11.	GT Station	Point		46
12.	Other Pillars	Point		47
13.	Pucca Well	Point		51
14.	Tube Well	Point		52
15.	Mosque	Point		53
16.	Temple	Point		54
17.	Adjacent Mauza/Sheet	Point		61
18.	Any other point feature	Point		88
19.	Demarcation Pillar	Point		71
20.	Settlement Pillar	Point		72
21.	Stone	Point		73
22.	Station	Point		74
23.	Pucca Pillar	Point		75
24.	Municipality Pillar	Point		76
25.	CS Iron Pillar	Point		77

Manuscript-2 & 3: Line & Polygon Features- This manuscript will contain all line and/or closed boundary type features, such as Mauza boundary, sheet boundary, plot boundary, road, halot, khal, railway, pond & water bodies, structures, etc. All the features shall be digitized and stored as line having unique ID (Code) representing feature type. Details for Manuscript-2 & 3 are given in **Table 4.5**.

Table 4.5: Feature Description for Digitization Manuscript-2 & 3

Sl. No.	Feature Type	Shape Type	Shape Name	Code (ID)
1.	Mauza Boundary	Line	xx_xxx_xxL	11
2.	Sheet Boundary	Line		12
3.	Mauza/Sheet Match-line	Line		13
4.	Plot Boundary	Line		14
5.	Road	Line		21
6.	Halot	Line		22
7.	Khal (Canal)	Line		23
8.	River	Line		24
9.	Rail Line	Line		25
10.	Slope	Line		26
11.	North Line	Line		27
12.	Unknown line	Line		99
13.	Permanent Structure (Dalan)	Polygon	xx_xxx_xxS	31
14.	Tin Shade Structure	Polygon		32
15.	Other Structure	Polygon		33
16.	Pan Baraz	Polygon		34
17.	Pond/Water-body	Polygon		35

Table 4.6: Attribute Database Format for Digitized Mauza Map

Field Name	Description	Data Example
Mz_ver	Mauza Map Version	RS
Layer	Name of the Feature which the field contains	Mauza Boundary Sheet Boundary Mauza/Sheet Match-line Plot Boundary

Field Name	Description	Data Example
		Road Halot, etc
Layer_Code	ID of different Features	11, 12, 22, 31, etc.
M_Code	Mauza Code	KS_003_01 This code represents the example for the Mauza having JL no. 3, Sheet no. 1 of Sukdebpur Mauza.
Mauza	Name of the Mauza (as in Mauza Map)	Sukdebpur
JL_No	JL Number (as in Mauza Map)	003
Sheet_No	Sheet Number (as in Mauza Map)	01, 02, 03, etc. (this would be '00' where the Mauza is within a single sheet)
M_Thana	Name of Thana (as in Mauza Map)	Kushtia Sadar
M District	Name of District (as in Mauza Map)	Kushtia
Scale	Original Scale of the Mauza Map (as in Mauza Map)	16" = 1 Mile, 64" = 1 Mile, etc.
Sv_Period	Survey Period (as in Mauza Map)	1950, 1967-69, etc.
Revenue_No	Revenue Survey Number (as in Mauza Map)	153, 196, etc.

Converting Digitized Maps to Shape/Geo-database Format

Line, point and annotation features of digitized Mauza sheets/maps would be stored in shape/geo-database (ArcGIS) or dwg (Autodesk) format. Later on these lines, point/annotation features would be used to build polygon database of Mauza maps using ArcGIS.

Edit Plot Check

After digitization of Mauza maps, edit plots of Mauza maps will be produced containing all the features and boundaries with different legend. The digitized Mauza maps will be checked and verified by superimposing on the original Mauza maps using the light table. All possible errors (missing arcs, dislocation arcs, and wrong or missing polygons, labels, ID etc.) will be solved with this edit plot checking and final digital Mauza maps will be prepared. After digitization and necessary edit plot check, both soft and hard copy of all the digital Mauza maps will be supplied to Project Director of Preparation of Development Plan for Kushtia Sadar Upazila for preservation**.**

4.6.4 Projecting or Geo-referencing of Mauza Maps

Map projection is the conversion of data from geographical location (latitude and longitude) on a sphere or spheroid to a representative location (two dimensional coordinates such as northing and easting) on a flat surface. A mathematical conversion is used to create a flat map from the spherical surface of earth. This mathematical conversion or transformation of three-dimensional earth surface into a two dimensional flat map is called 'Projection'.

Geo-referencing of digitized Mauza sheets/maps is the projection of Mauza maps from digitized unit to real world coordinate units or transformation of coverage from digitized units to projected units. As per meeting minutes of TMC meeting, Universal Transverse Mercator for Bangladesh projection system (BUTM 2010) shall be used for all spatial data and maps. The detailed parameters of BUTM 2010 projection system is presented below:

Projection System Parameters

- Scale : As per ToR
- Map size : As per ToR
- Plotting by : GIS software (ArcGIS 10.3 or latest)
- Projection System : Universal Transverse Mercator for Bangladesh (BUTM 2010)
- Map Printouts : Plotter Printouts
- GIS Software : GIS (ArcGIS 10.3)
- Spheroid (Ellipsoid) : WGS 1984
- Datum : WGS 1984
- Unit : Meter

Other Parameters

- Central Meridian : 90.00000000
- Latitude of Projection Origin : 0.00000000
- Scale factor : 0.9996
- False Easting : 500000.00000000
- False Northing : 0.00000000
- Vertical Datum : mSoB

Geo-referencing or projection steps to be followed for preparing the digital Mauza map area are as follows:

A. Selection of TICs
B. GCP Survey
C. Update TICs
D. Transform Shape or Geo-database from digitized units to real world coordinates

A. <u>Selection of TICS</u>

TIC is a registration or geographic control point (GCP) of coverage. TICs register coverage coordinates to a common coordinate system (e.g., BTM: Bangladesh Transverse Mercator) and, therefore, relate locations of features in a coverage to locations on the earth's surface.

There are Four (4) Ground Control Points (GCP) will be selected on each Mauza sheets identical with the real field condition, such as corner of permanent buildings, monuments, traverse points, sharp corner of the Mauza plots, road crossings, corner of the hydraulic structures or any permanent structures etc. After determining points representing tics located on digitized Mauza maps, a master tic file for each Mauza sheets will be developed where each TIC will be identified by identical record and ID numbers with digitizer units of each TIC.

Table 4.7: Master TIC File

$RECNO	IDTIC	XTIC (Long)	YTIC (Lat)
1	1	3558.971000	4896.196000
2	2	4164.081000	4481.901000
3	3	6133.143000	3524.487000
4	4	2944.344000	2374.604000

As per ToR specification, projection system shall be used for all spatial data and maps will be BUTM-2010 and Spheroid will be WGS 1984.

B. GCP Survey

After selection of GCP in each Mauza sheets, GCP survey will be carried out using both GPS and Total Station survey technique. Moreover, the point feature data from physical feature survey using Total Station & RTK GPS or DGPS will also be used as TIC. GCP survey data will be processed and projected in to BUTM-2010 of WGS 1984 Spheroid and will be stored in GIS database. Later on respective projected GCP of each Mauza sheets will be used as TIC for geo-referencing of that particular Mauza sheet.

C. Updating TICS

After confirmation of the tic points and completion of GCP survey of those confirmed TIC points, the tic files of each Mauza sheets will be updated by the surveyed and projected TIC values against each individual TIC ID.

Table 4.8: Updated/Projected TIC

IDTIC	XTIC (Long)	YTIC (Lat)
1	358338.817649	695522.639837
2	358389.235429	695488.312768
3	358554.598643	695407.337652
4	358285.719539	695312.398354

D. Transform Coverage from Digitized Units to Projected Units

When a map is digitized, the x and y coordinates are held initially in digitizer measurements and stored in digitizer units. To make this information meaningful and also to impose a scale factor, it is necessary to convert these measurements to the real-world coordinate system in the same projection as the original map. This process is known as transformation.

The ARC command TRANSFORM changes coverage coordinates using either an affine or a projective transformation function. The affine transformation function is based on three or more control points (TICs) which calculate change in scale, shift in x direction, shift in y direction and any rotation for the output coverage. The projective transformation compensates for a linear tilt in the z dimension which is useful for transforming oblique aerial photos.

For transformation of Mauza maps, affine transformation function will be applied uniformly to all coordinates, scaling, rotating, and shifting all features in the output coverage. Before TRANSFORM, the output coverage contains only the projected tics (which is updated from master tic file). TRANSFORM uses corresponding Tic IDs to compare the input coverage tics to those of the output coverage. The calculated transformation will be applied to all feature coordinates in the input coverage as they are copied to the output coverage. Thus all feature coordinates will be transformed into required projected system (BUTM-2010) for the output coverage.

As the updated TIC tables contain already projected TIC values from GCP survey result, the digitized Mauza coverage is directly transformed in to projection coordinate system.

DIGITIZED UNITS ⟶ BUTM-2010 PROJECTION COORDINATE

TRANSFORM generates and displays a report on the screen showing comparisons between input and output coverage TICs, the parameters used for the transformation from which the accuracy for transformation could be identified.

4.7 Demarcation of Project Area Boundary

4.7.1 Preparation of Mosaic Mauza Maps

After geo-referencing the Mauza sheets, a mosaic Mauza map of the project area will be found having all the Mauza features (point, line, and polygon) with GCP points in different layers. GIS team will demarcate the boundary of the administrative and project area incorporating all the Mauzas according to the gazette notification outlining the Kushtia Sadar Upazila area. Later on by field verification, the project boundary will be finalized.

4.7.2 Preparation of Layout of Project Area Map

Final map coverage and lay out of project area map (mosaic Mauza of project area) will be done as per specification suggested by Project Management Office using GIS based ArcGIS 10 or latest version. All the features of Mauza maps including plot number, sheet, Mauza and project boundary will be identified & shown in the project area maps in separate layer. Both soft and hard copy of base/project area map will be supplied to Project Director as per specification and scale mentioned in the ToR.

4.7.3 Submission of the Project Area Map and Report

A Project area Map along with the Report as per specification in ToR will be prepared and submitted. The Report will cover the following items:

- Methodology for BM establishment,
- Methodology of GCP Survey.
- Methodology of collecting, scanning, digitizing & geo-referencing of Mauza maps.
- Methodology of Demarcating Project area.

4.8 Physical Surveys (Topographic, Physical Feature and Landuse Survey)

As per ToR specification and requirement, Physical Surveys will cover the following items:

- Physical Features Survey,
- Topographic and Infrastructures Survey and
- Landuse Survey.

Detailed methodologies of conducting physical surveys are described in the following sections below.

4.8.1 Mobilization of Survey Team

Survey Manager along with survey & equipment experts, GPS and Total Station surveyors will be mobilized immediately after approval of the Mobilization and Inception Report (methodology & work plan) by the project authority of Kushtia Sadar Upazila.

4.8.2 Equipment, Hardware and Software to be used

A large number of advanced survey equipment's including Unmanned Aerial Vehicle (UAV), Real Time Kinematic Global Positioning System (RTK-GPS) and Differential Global Positioning System (DGPS), Total Station (TS), Digital Levels will be deployed for conducting topographic, physical feature & landuse surveys. A local area network (LAN) comprising numbers of desktop computers with processor speed of Core I3 and I5, colored printer, plotter and scanner will be used for data processing and mapping purposes at Dhaka office.

Photograph-4.1: UAV/Drone to be used for Kushtia Sadar Upazila Development Plan Survey

4.8.3 Methodology of Physical Surveys (Topographic, Physical Feature & Landuse)

Unmanned Aerial Vehicle (UAV)/Drone based on advanced survey technique will be used for conducting physical feature, topographic, physical infrastructure and land use survey. Relevant survey techniques to be used for conducting all types of physical surveys are narrated below:

A. Flight Planning

UAV flight planning is comprised of the following steps:

a. Conversion of project requirements to specifications in terms of area to be mapped, desired map scale and contour interval. The determination of these specifications depends on the required accuracy of the final map and on cost constraints. More accurate maps are more costly and take longer to compile.

b. Determination of photogrammetric specifications in terms of flight height, the number of photographs needed the number of strips needed, flight lines, approximate location for exposure stations, and equipment to be used. Specifications should also be developed for ground control, aerial triangulation, and compilation methodology.

c. Development of a schedule for aerial photography, field work, and map compilation. The schedule should be coordinated among the various groups involved in the project. A critical coordination is between the field crew placing the targets and the aerial photography crew. Targets should be placed as close as possible to the time of photography. A project timetable with completion dates for different tasks and the approximate cost associated with them should be developed as well.

d. Defining the expected deliverables, including details on what features are to be mapped and their graphic representation.

B. Aerial Photography

The aerial photography process consists of the following:

a. Verify that the weather conditions are suitable for flying. Flying under conditions of low visibility or potential strong turbulence should be avoided. Bad weather conditions could not only produce unacceptable photographic results, but also risk the flying crew. The following procedure will be performed in order to:

b. Mount the aerial camera according to the established procedure. Test the camera to ensure that it functions properly.

c. Fly the designed routes and take the photographs according to plans.

d. Process the film according to specification to ensure radio metrically and geometrically quality images.

e. If necessary, print on the negatives the missing photo information (titles), such as serial number, date, project information, etc.

f. Inspect the photographs for image quality and for coverage completeness. Verify that all the photographs have enough end laps to assure stereoscopic coverage of the entire project area. A similar inspection should be made to verify complete side lap coverage. Incomplete end and side lap coverage or coverage gaps could void the entire aerial photography and require re-planning or re-flying. Another inspection that has to be made is identifying the preset targets. Target inspection includes checking whether they are visible; appear in a stereo coverage and whether there are enough of them to ensure reliable results. If some targets are missing, or the entire project was not targeted, points that can be identified and surveyed on the ground should be selected and marked on paper prints. A copy of the prints and a description of the points selected should then be submitted to the surveying crew for field measurements.

g. Select photographs that will be used for data compilation and develop.

C. Ground Control

The second element of the photogrammetric process is control, which is used to establish the position and orientation of the camera at the instant of exposure. The necessity, accuracy and the rigor of photogrammetric control depends on the particular product sought. Photo mosaics used for annotation, cultural studies, public meetings, and other varied purposes may not require any control. Rectified aerial photographs, used mainly for photo plan sheets, may require partial control in the form of measured distances. Field measured distances are scaled down to match corresponding distances on the photograph. However, most common photogrammetric products, such as mapping and ortho photography, require full control (x, y, z) information. The minimum full control to establish a stereo model is two points (x, y) with known horizontal positions (for scaling) and three points (x, y, z) with known elevations (for orientation). Using this bare minimum is unacceptable; therefore, additional control is required for a processing a stereo model.

The following Technique to be used for Ground Control:

Total Station Survey:

Total Station (TS) is combination of electronic theodolite, distance meter and leveling machine with on-board computer having graphic icon menu with LCD display and built-in MS-Dos operating system. It can measure and store the positioning data of a target point in digital form. It consists of a microprocessor with special software for operation, data capture, storage & processing, transmission and receiving to/from a computer. The data can be stored in internal memory or in external memory card. It transmits ledger beam towards the target where a reflector (i.e. prism) is placed and receives the reflected beam by which calculate the distance, bearing and 3-D coordinate of that target point with respect to the reference points whose coordinates are known. The measurements to be done by a Total Station survey are as follows:

- Distance measurement.
- 3-dimensional co-ordinate measurement (x, y, z).
- Traverse-style co-ordinate measurement.
- Resection.
- Offset measurement.
- Missing line measurement.
- Remote elevation measurement.

Establishment of Bench Marks (BM):

For RTK GPS and Total Station Survey, establishment of adequate and uniformly distributed Bench Mark is very crucial. Since all the subsequent survey operations are dependent on and related to the Bench Mark, any error simply multiplies and compounds to a huge total deviation. As such accuracy of Bench Mark coordinate values both along horizontal and vertical axes is of utmost importance.

The location and the number of BM and TBM will be selected by a comprehensive reconnaissance survey of the study area which will be used for the geo-referencing purpose of the stereo satellite image. The consultant has collected information of some Reference BM and GPS pillars from Survey of Bangladesh (SOB). The ID with related information of the reference BM and GPS pillars available in Kushtia Sadar Upazila are furnished herewith in the following table 4.1.

Table 4.9 Reference BM & GPS Pillar information in Kushtia Sadar Upazila

SL No.	ID No	Location	Height above MSL (m)	UTM		
				UTM Zone	Easting	Northing
01.	BM 6170	Residence of Regional Manager of BADC, Village: Chourhash, Kushtia Sadar, Kushtia	13.8107	45Q	714527.348	2646627.281
02.	BM 667	Compound of Barakhada Union Parishad, Village: Barakhada, Kushtia	13.3434	-	-	-

		Sadar, Kushtia				
03.	BM 668	Alampur Union Parishad Compound, Village: Sastipur, Kushtia Sadar, Kushtia	12.698	-	-	-
04.	BM 7356	Pathikabari Khajurtala School, Village: Pathikabari, Kushtia Sadar, Kushtia	12.6291	-	-	-
05.	BM 669	Khater Ali College Compound, Village: Lakshmipur, Kushtia Sadar, Kushtia	9.6575	-	-	-
06.	GPS 5222A	The Old Kushtia High School field, Village: Salda, Kushtia Sadar, Kushtia	13.0832	-	-	-
07.	GPS 5601	Dowarka Dash Agorwala Women College compound, Village: Shibpur, Kushtia Sadar, Kushtia	-	45Q	718270.023	2629274.764
08.	BM 6172	The compound of Electric Sub-Station of Islamic University,Village: Santidanga, Kushtia Sadar, Kushtia	11.5939	-	-	-
09.	BM 1903A	Kushtia Circuit House Compound, Kushtia Sadar Upazila, Kushtia	13.1171	-	-	-

Source: Survey of Bangladesh (SOB), 2017

Establishment of Co-ordinates (x, y, z) of BM Pillars

Establishment of co-ordinates {x, y, z i.e. latitude/northing, longitude/easting & Reduce Level (RL) in MSL} of BM Pillars need extensive GPS survey and data processing work. The total work comprises the following items:

- Selection of reference BM (x, y, z)
- Baseline survey by RTK-GPS Static Method.
- Network Adjustment

Selection of Reference BM

Selection of existing reference BM inside or around the project area is essential for establishment of new BM network for the project area. Reference BM provides geo-reference (x, y) and elevation

(z) with respect to a datum i.e. the co-ordinates of the BM pillars. For establishing co-ordinates of the new BMs, the available SoB BMs of the project area has already been identified.

D. Aerial Triangulation

Aerial triangulation, or aero-triangulation, is the process of determining X, Y, and Z ground coordinates of individual points based on measurements from photographs. Aerial triangulation is used extensively for many purposes. One of the principal applications is densifying ground control through strips or a block of photos to be used in subsequent photogrammetric operations. When used for this purpose it is often called bridging, because it allows the computation of necessary control points between those measured in the field. In a large project, with dozens of photographs, the effort and cost of providing the needed control using field surveys is prohibitive. Aerial triangulation is used to provide the necessary control for each stereo model with only a limited number of field surveyed control point. Other advantages of aerial triangulation are:

- The control densification is done in the office, thus minimizing delays and hardships due to adverse weather conditions.
- Field surveys in difficult or unsafe areas are minimized.
- Access to much of the (private or public) property within a project area is not required.
- The aerial triangulation process provides accuracy and consistency checks for the field surveyed control points.

E. Stereo Compilation

The most commonly used photogrammetric instrument is the stereo plotter. A stereo plotter is used to reconstruct the actual orientation and geometric integrity of an image at the instant of exposure and to collect three-dimensional (3D) data. Data collection with a stereo plotter is a two-stage process. The first stage is orientation, which consists of:

1. **Inner orientation** – Orient each photograph with respect to the geometry of the camera.
2. **Relative orientation** – Orient two photographs with respect to each other to form a stereo model.
3. **Absolute orientation** – Orient and scale the stereo model to the ground. In some instruments the relative and absolute orientation are performed simultaneously. The simultaneous solution of these orientations is called **exterior orientation**.

In the second stage, the operator views the image of the ground in 3D. Data collection is performs by placing a floating mark on the images of the feature that is surveyed and record its X,Y,Z coordinates. Line features, such as roads or contours, can be digitized, point by point, or traced and recorded continuously.

F. Stereoscopic Data Collection and Mapping

Photogrammetry can be used to collect a variety of data, presented in the following formats:

Planimetric maps – Planimetric maps are map that represents only the horizontal features of the mapped area. Planimetric maps display features such as roads, sidewalks, buildings, river banks, shore lines, manholes, trees etc. No elevation information appears on planimetric maps.

Topographic maps – Topographic maps are maps on which both horizontal and vertical features of the mapped are represented. In addition to the above mentioned planimetric features, a topographic map depicts elevation information as contours and/or as spot elevations.

DEM's – Digital Elevation Model (DEM) or Digital Terrain Model (DTM) are dense networks of spot elevations represented by X, Y, Z coordinates. The DEM points are collected in a regular grid with break points which depict the characteristics of the topography. DEM's are used to draw contours and are an essential ingredient for the production of orthophotos.

In highway applications, DEMS can be used for producing cross sections, road profiles, and earth work computations. The advantage of using DEM's for volume computations is that the computation and the generation of the associated plots are almost automatic if the design was made under the same coordinate system. This is another good reason to use state plane coordinates and a unique elevation datum in all work. One should be aware that an appropriate photo scale must be used to obtain centimeter level elevations.

Special purpose maps – Special purpose maps are maps that are designed to meet special needs or depict a special theme. The rule is that if you can see it on the aerial photograph, you can map it with photogrammetry. For example, a right-of-way map can be produced if all property corners are either targeted or can be identified on the photographs. Another example is a wetland map showing the delineation of wetland areas.

G. Monoscoping Mapping and Updates

Aerial photographs can be used to produce photomaps mainly for indexing, referencing and general studies. Photomaps can be composed of a single photograph or of several photo parts mosaicked together. This is not an accurate metric product, but serves as a valuable means to present spatial information.

Monoscopic based photogrammetry is also used for minor updates of maps. The update that results from this process is of a lesser accuracy and is intended more for maintaining feature inventory at an approximate spatial location. Map updates are accomplished by locally rubber sheeting (superimposing) the photographic image and the map. A few common features are identified on the map and on the photograph. The photograph is then scaled and/or tilted to locally match the corresponding features.

H. Field Completion

Photogrammetry can be used for mapping only what is visible on the photographs. Thus, if important features are obscured by trees, man-made structures or steep topography, they cannot be mapped. Therefore, a field completion activity has to take place to map the missing features. The field completion phase of the project should be used for accuracy testing of the map.

I. Drafting

Drafting of photogrammetrically derived maps is performed with CAD software. It consists of the following:

- Sheet Layout

- Sheet Format
- Scale Change
- Edit and Final Corrections

All of these parameters should be part of the project specifications and should be performed accordingly.

J. Accuracy and Errors

The attainable accuracy of a photogrammetric product depends on two main factors. The first is the scale of the photographs from which the product is derived and the second is related to errors in the photogrammetric process.

The scale of the photograph determines the ground resolution. If the smallest identifiable ground feature on the photograph is a 0.1 m2 (1 ft2) object, then the mapping accuracy from this photograph, assuming perfect data compilation, is limited to no better than 0.3 m (±1 ft). Selecting the appropriate photo scale for a particular product depends on product specifications. For example, the photo scale for topographic mapping is a function of the required map scale, the contour interval, and the quality of the photogrammetric plotter. A required accuracy can be met by either using smaller scale photographs and high-quality equipment or larger scale photos with less accurate photogrammetric equipment. The photo scale is always smaller than the map scale but the ratio between these two scales should never be larger than eight.

The second factor controlling the accuracy of a photogrammetric product is the total amount of errors accumulated during its derivation. In photogrammetry, as in any other surveying and mapping procedures, there are systematic errors and random errors, assuming all blunders have been removed.

K. Quality Control

A final report on the quality and accuracy of the maps should accompany the submission of the final product. The report should review the accuracy of the control. The procedure used to determine the map's spatial and content accuracy should be documented as well. A statement, such as "this map meets the National Map Accuracy Standards" or "this map meets the project requirements", is unacceptable. Any claim of accuracy or standard must be substantiated by an actual test and analysis. The testing methodology used and the findings of its implementation should be documented in a final report.

L. Accuracy and Quality Issues of Photogrammetry

The elements that contribute errors to an orthophoto product are:

- **Camera** (characteristics and calibration)
- **Scanner** (characteristics calibration and resolution or image scale)
- **Ground Control** (accuracy, distribution, and abundance)
- **Aerial Triangulation** (design, measurement, and computation)
- **Digital Elevation Modeling (DEM)** - (method of compilation; quality of the source material; characteristics of the terrain; sampling spacing, with or without break lines; type of break lines

used; method of interpolation into pixel grid and availability of height information on or above surface features, such as buildings.)

- **Rectification process** (method and software) - When all of these errors are propagated and summed up following a valid error theory methodology, one can assess the spatial accuracy of the final product.

Aerial Photography

Aerial photography is the taking of photographs of the ground from an elevated position. Usually the camera is not supported by a ground-based structure. Platforms for aerial photography include fixed-wing aircraft, helicopters, Unmanned Aircraft Systems (UAS), balloons, stand-alone telescoping and vehicle-mounted poles etc. Mounted cameras may be triggered remotely or automatically; hand-held photographs may be taken by a photographer.

Photograph-4.2: Sample Aerial Photography using the UAV/Drone

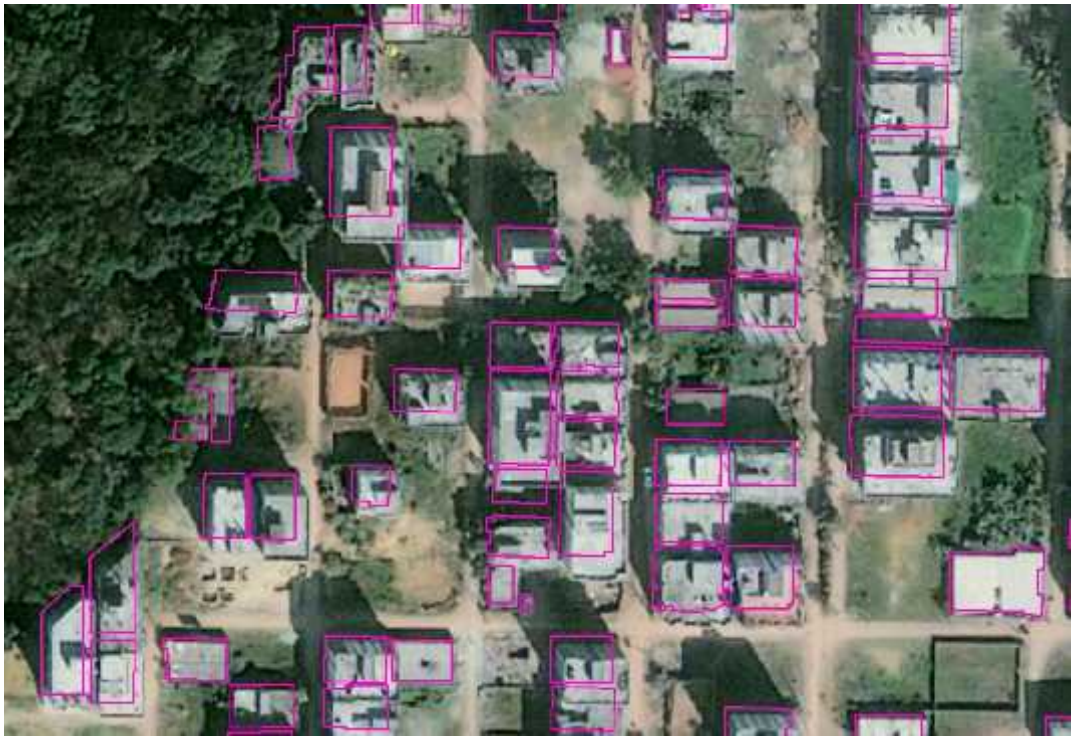
Aerial photography should not be confused with air-to-air photography, where one or more aircraft are used as chase planes that "chase" and photograph other aircraft in flight.

Digital Elevation Model

A Digital Elevation Model (DEM) is a digital model or 3D representation of a terrain's surface, created from terrain elevation data.

4.9 Physical Features Survey

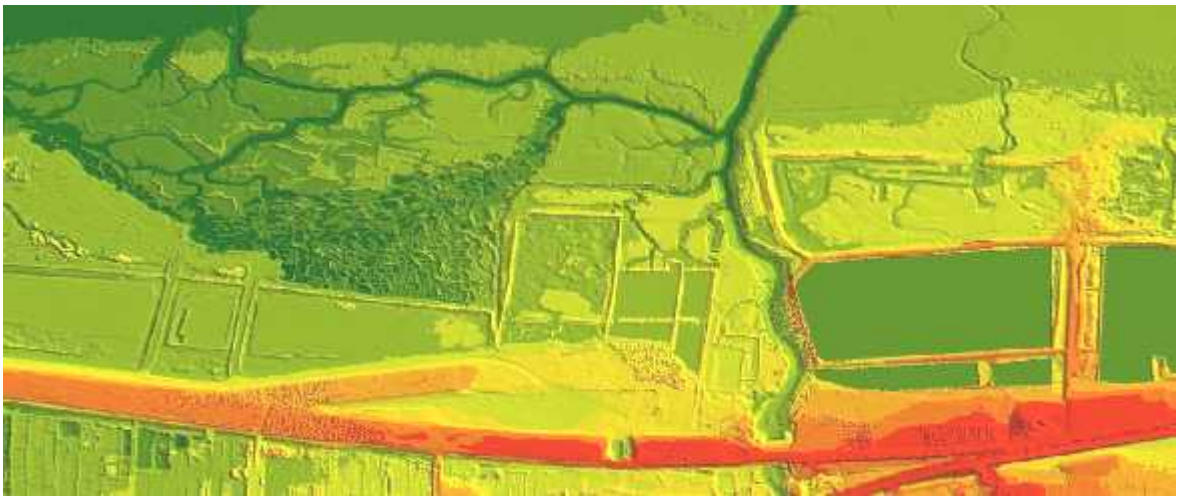
Before deployment of the survey team, base map for conducting field level surveys shall be prepared using both high resolution satellite image and Mauza maps of the project area. Base map shall be compiled with major road network of the project area, important infrastructures, permanent & prominent physical features/structures etc. superimposed on Mauza maps having all Mauza features. Physical features shall be surveyed using UAV survey technique. Location of all existing structures and installations along with types in respect of use, construction and number of storey will be surveyed. Names of structures, type of construction, uses and storied 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 supply structures, roads etc. Data will be recorded with separate ID or code number for each feature (as 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 with specified code or ID. Physical feature survey information will be presented on RS Mauza maps.



Photograph-4.3: Sample Physical Feature Survey and Mapping

4.10 Topographic Survey

Topographic and Physical Infrastructures will be surveyed using both Total Station (TS) and UAV technique. Land levels/spot levels and cross-sections and alignments of drains will be surveyed by UAV. Alignment and closed boundaries like road, river, khal, marshland, homestead, large water bodies etc. will be surveyed by DGPS/TS. As per ToR the items will be covered by Topographic Survey.



Photograph-4.4: Sample Digital Elevation Model (DEM)

4.11 Land use Survey

Landuse survey basically records the use of land by its functional activity such as residential, industrial or commercial etc. Total Station and DGPS based topographic and physical features survey data will be used for landuse map preparation. During Topographic and physical feature survey, each survey feature/structure will be recorded with individual ID or code. Later on landuse features will be extracted or identified and classified using the recorded code and separated in different layers during data processing stage, from where the category wise landuse map will be drawn using the identification layers of each landuse feature. Later on the landuse map will be updated through field checking and verification. The landuse map will be prepared indicating the board categories of landuse described in ToR.

As stated before, utilizing the physical features survey overlay on Mauza map the landuse map will be prepared indicating the categories of land (as mentioned in the format of landuse survey in ToR). The Landuse Map will be prepared on RS Mauza base at 1" = 165' or 1:1980 scales.

4.12 Data Processing of Physical Surveys

GPS data will be stored in WGS84 format (latitude, longitude, ellipsoidal height in meter) and later on will be projected and stored in BUTM (Northing, Easting, ellipsoidal height in meter) projection system. As, Total Station data will be stored in BUTM-2010 projection system therefore TS data will be transfer to GIS database directly.

All spatial information or data from different survey such as line and point features, structures' dimensions etc. will be processed and stored under a comprehensive GIS database (ESRI Shape/Geodata). Geographic information System (GIS) software such as Arc GIS 9 or higher version will be used for processing & analyzing of survey data and preparing map. The well-known Triangulated Irregular Network (TIN) and Grid method will be applied to draw the contours of the land surface. All data will be provided in digital format (x, y, z) as well as hard copy.

4.12.1 Preparation of Physical Survey Maps

Geographic information System (GIS) software such as ArcGIS 10.1 will be used for processing of physical survey data. As there is no mention in the ToR regarding the legend, layout and other specification of physical survey maps (layout, size etc.) will be finalized in consultation with the project authority of Kushtia Sadar Upazila during map preparation process, the well-known Triangulated Irregular Network (TIN) method will be applied to draw contour lines. AS per ToR the consultants will prepare the survey maps incorporating the features of RS Mauza maps and other features as mentioned in the Survey Formats (Physical Feature, Landuse, Topographic and Physical Infrastructure Survey Format). Both soft and hard format will be supplied according to format of Base Map, Physical Feature, Landuse and others maps as provided in the ToR.

4.12.2 Field Verification of Physical Survey Maps

After preparation of physical survey maps, one set of colored maps (topographic and physical infrastructure, physical feature and landuse) will be plotted in 1:1980 scales for field level verification. The field level checking will be supervised and monitored by the joint team of Kushtia Sadar Upazila and consultants.

4.12.3 Updating and Finalization of Physical Survey Maps

Based on field verification, the necessary updating of physical survey maps will be done and final map layout will be produced for submission to Kushtia Sadar Upazila. Before preparing final map layout, necessary approval on draft map layout will be taken from Kushtia Sadar Upazila on title, legend and size of the maps.

4.13 Traffic and Transportation Survey

Transportation linkages are integral to any settlement planning. In fact the growth and development of towns and cities are so much dependent on the condition of the transportation, that any deterioration in the later automatically signify decline of the respective towns. Position is also true in the sense that improved transportation enhances the growth possibilities of the settlements falling in their alignments. History is replete with examples of this relationship of rise and fall of great cities with change in communication linkages. Detailed study of present availability and future development prospects of transportation is therefore of paramount importance. The following paragraphs stand witness to our concern of these vital aspects.

The project area is served by two modes: road and railway transportation and the study will cover all the modes. The consultants will collect, collate and review all relevant data from the past studies and reports on traffic. Reviewing this information will help identify the data gaps and the data need for and extent of additional surveys and investigations require preparing report.

The Activities to be performed:

- Household Interview Survey: to collect information of travel behavior both for urban and rural areas

- Identification of critical transport links and hubs in the study area: through physical feature survey and FGD with development authorities
- Identification of traffic hotspots: for congestion and heavy traffic
- Freight Survey: it will be performed by combined survey at Entry/Exit points and with freight transport association and business association
- Analyze the landuse and activity pattern to rhetoric between them
- Assessment of external links and adjacent activities
- Water transport: present connectivity and passenger/fright volume and potential routes and infrastructure
- Rail Transport: passenger and freight volume from local and regional destination
- Traffic survey: at critical intersection during peak hours on a neutral day
- Public Transport Survey: identification of routes, frequency and modal practices
- OD Survey: at entry/exit location and at terminals both for passenger and freight
- Address any plan, program, and project by other agencies
- Prepare a transport plan compatible with landuse and development schemes

There is no airport in the study area or on its vicinity. So, study on Air Transport has been dropped.

4.13.1 Transportation Infrastructure and Facilities

This component of information is essentially the preparation of an inventory of the existing facilities available in the study area for the transportation of passengers and goods by all the modes of road, rail and river. The infrastructure data gathering program will fall into these three modal groups. The required information will be collected from the relevant authorities as well as field surveys to be conducted by the consultants. In addition to these data gathering exercise from primary and secondary sources, an overview appraisal will be developed of the interaction of model groups, particularly in relation to spatial development pattern and future development. The consultant will review existing information and where necessary carry out surveys to obtain further information on available facilities for the two modes in the area. Major information to be collected by mode is mentioned below:

I Road

- Road network by hierarchy,
- Physical condition of roads (row, x-sectional elements, pavement type and condition etc.),
- Geometrics of major road intersections,
- Truck routes, and their loading and unloading areas,
- Bus route and terminals,
- Traffic control, management, and signaling, and
- Parking

II Railway

- Location of existing station
- Physical condition of facilities
- Railway route
- Inter model transfer facilities
- Passenger volume and their OD

II Water

- Location of existing terminals for passenger and freight
- Frequency and type of vessel
- Routes

4.13.2 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 recognized authorities for different types of vehicles and their owners and operators associations. However some field surveys and verifications will be required specially related to non-motorized vehicles. Major information to be collected by mode includes the following.

I Road

- Number of motorized vehicles by their types, condition and ownership,
- Number of buses by route,
- Extent of and forms of public transportation services, their service conditions, fare levels etc.,
- Number of trucks, their condition and ownership,
- Number of tempos and their service route, fare level, extent of service,
- Number of rickshaws and fare levels,
- Number of all other types of NMVs,
- Types of goods carried, and
- Information on cost by different modes

II Railway

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

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

4.13.3 Volume and Movement Patterns

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

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

The methodology to be followed to determine volume and movement pattern of traffic are discussed below:

I. Road

The road side interview method will be followed. With the assistance of the police, vehicles of all types will be stopped and questioned regarding their origin and destination and other journey data. The surveyors will enter all these information's in a preceded form.

The interview sites will be located as near as possible to the zone boundaries. Each interview team will be consisted of five members, two members for each direction and a team leader. In each direction one member will be for making a classified count of all vehicles and pedestrians passing, and the other member conducting the actual interviews. Mutual hand-held counters will be used for counting purpose. Sampling procedure will be used for taking interviews. Sample size and survey hours will be determined from field conditions. Depending on field conditions in most locations, survey hours will be between 12-18 hours. A parking survey will also be carried out at major parking locations to determine accumulation, parking duration, turnover utilization, extent of illegal parking and cordon counts to determine net vehicles in core zones.

II Railway

Direct counting of arriving and departing passengers in the study area will be conducted at the stations. These data will be supplemented by data collected from the services operations.

For good traffic, a destination survey will be made between traffic in relatively large and small units. In the case of large mechanized units, inquiries will be made with the shipper, jute and other bulk commodity traders.

4.13.4 Analysis of Volume and Movement Patterns

After completion of traffic volume surveys as discussed above, sufficient information will have to be collected and collated to proceed further with the planning activities. The collected information will be collated and analyzed with the help of a wide variety of computer programs. The final selection of the package for data collation, statistical and spatial analysis, matrix building etc. will be assessed during actual designing of the surveys and at the data collection stage.

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

Data base and Spreadsheet Programs

- FoxPro, MS Access
- MS Excel/ ArcGIS and TransCAD

Data Collection and Analysis

- SPSS
- RIAS

Capacity Assessment

- HCM

4.13.5 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 to travel. The origins and destinations of the traffic are among the most important of these characters.

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

There are two type of Origin-Destination Survey (O-D Survey). They are Transit Terminal Survey and Home Interview Survey. The purpose of O-D survey is to collect data about:

- Household characteristics
- Number of persons who live there
- Number of vehicles
- Occupation of the head
- Income etc.
- Location of the origin and destination of the trip (where trips begin & end)
- Time at trip started & ended (when trips begin & end)
- Mode & route of travel
- Purpose of trip

The Techniques of O-D Survey are

- Home interviews
- Telephone interviews
- On-board transit surveys
- Mailed questionnaires
- Pick-up postal cards

4.14 Housing, Slums and Squatters Settlement Survey

A separate housing sector, slums and squatter settlement survey will be carried out as required in the ToR. The main purpose of this study is to prepare an inventory of housing in the study area. For each major housing area, a summary of population, density, housing conditions, provision of services, sanitation, drainage, employment, tenure and income levels have to be determined. Slums & Squatters study will be carried out by Questionnaire survey. Detailed questionnaire/survey format will be developed. The sample size & questionnaire for the survey will be approved by PD, UDD in advance.

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. 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. Similar to the population and migration study (described later) the study area will be divided into 5 primary areas. After discussion with PD, UDD, a suitable housing typology will be developed for each of these 5 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 3%-5% sample size will be large enough to make the findings for each sub-group statistically reliable.

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

After analysis, all relevant collected data will be presented in suitable tabular form. Any change in housing condition from that of 1991 or 2001census record will be analyzed.

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. After their identification on a map, sample survey areas will be selected. Again a stratified weighted random sampling method will be used for household level survey of the selected slum and squatter settlements. The questionnaire will be similar to the housing study but will be more elaborate and will include additional information on socio-economic characteristics, demographic characteristics, employment, migration, community organization, attitudes, priorities for development etc.

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. A separate report along with land use recommendation and development plan for slum and squatter settlements will be produced.

4.15 Household/Socio-Economic Survey

Planning is principally directed towards people and their needs such as housing, shopping, employment, education, and health services. Detailed information on population is, therefore, essential for deciding land requirement for these needs as well as allocating land between various competing uses. The urban planner must therefore study the existing population in terms of its size, structure, socio-economic characteristics and spatial distribution. He must also equip himself to make predictions about future population in order to assess probable needs in terms of schools, houses, shops, offices, factories and the like, over forthcoming periods of time. Socio-economic data can be collected from secondary sources and primary source through questionnaire survey.

Data on socio-economic condition will be collected from both secondary sources. General information on Demography, Family size, Age, Religion, Education, Employment and Occupation Pattern, Land Ownership Pattern, Land Value, Land Utilization, Income Level, Health and

Recreation Facilities, etc. will be collected from the primary sources through a specially designed socio-economic questionnaire survey.

A compact and extensive coded questionnaire, suitable for processing by computer will be prepared and finalized in consultation with PD, UDD. The questionnaire will capture a wide variety of information on the basis of the following format:

Household Survey Format

Item		Illustrated
1.	Demographic information	Age, sex, growth rate, household size, migration etc.
2.	Family Size	No. of household, No. of family member
3.	Age, Religious group	Age specific group, Religious status
4.	Educational Status	Primary, Secondary, higher & others
4.	Occupation Pattern	Government, private, formal, informal and others
6.	Income Level	Lower, medium and higher (income range)
7.	Ownership Pattern	Land ownership information, transfer procedures etc.
8.	Land Value	Low land, ditch land, built-up, buildable land etc.
9.	Health Facilities	Type of facilities in hospital, private clinic and dispensary etc.
10.	Recreation Facilities	Type of facilities (Active and passive)
11.	House	Ownership, type, use, condition, duration of living, building approval.
12.	Municipal services	Accessibility, condition, road condition
13.	Natural calamity	Flood, water logging, erosion, siltation

During field survey, proper supervision will be ensured by the experienced surveyors for quality data and in case of necessary, repeat interviews and spot checking will be done.

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.

- Holding information like area of holding, number and types of housing structure;
- Housing size, age, sex composition, educational, employment and occupational status, income, expenditure, etc;
- Land tenureship structure, nature of land, utilization of land, income from land,
- Holding information like house structure, service provision such as electricity, gas supply, water supply connection, etc;
- Sanitation information, type of latrine, sewerage, drainage system, etc.;
- Holding information about urban facilities such as road, telephone, hospital, clinic, community center, etc.; and
- Information about household's attitude towards development works and initiatives.

4.16 Population and Migration Survey/Study

The consultants are required to analyze demographic and household data on past growth rates and trends of migration for the district and the study area. These analyses are required to consider likely growth factors affecting greater Kushtia District's population in general and estimate broad population within the district over the next 20 years. The methodologies to be followed to carry out these tasks are discussed next.

Data from both the secondary and primary sources will be utilized to accomplish the specified objectives of the study. The 2011 census publications (the district and community series volumes) can provide valuable information on demographic structure, migration and other data related to this study. Although these data have their merit because of comprehensiveness for the entire area, for being a little outdated, and as not all the required information will be available from census publications, a detailed household survey will be conducted. The sample survey will be conducted with the help of a coded questionnaire suitable for processing by computer. The questionnaire will be prepared in consultation with PD, UDD and will be pre-tested before actual survey is carried out. The questionnaire will be designed for the following purposes:

- to find the demographic characteristics of the population,
- to find the socio-economic characteristics of the population,
- to reveal the migration trend and characteristics in the area, and
- to project population for 20 years

For sampling purposes we propose to divide the study area as established urban, newly urbanized within the study area, newly growing area, and rural area. The localities in the study area will be identified depending on this classification. Depending on the actual number of units, some areas from each of these four categories will be selected for the sample frames. A complete list of households will be prepared for these selected units, and will be our sampling frame. The households will be again divided as migrant and non-migrant and as household and non-household units. Total size of the sample will be decided after consultation with PD, UDD. It is expected that the size would be about 2% of the total sample universe. Providing weightage on each group, households will be selected randomly for questionnaire survey.

All relevant data collected through questionnaire survey will be presented in appropriate tabular form. Any change in the trend to that of 2011's census report will be analysed. The survey is also expected to produce evidence on fertility rate in the study area. The population projection will be made both at the aggregate level by time series analysis and at the disaggregate level by cohort survival method. However, monthly national level assumptions regarding survival and fertility rate will be used for disaggregate projections.

4.17 Investment and Employment Survey

An employment and investment survey of the study area is required to be carried out through collection of secondary data and sample survey of major centers of employment. The TOR also requires to project economic activity and workforce by broad employment sectors. The informal sector plays a very significant role in our urban economics, as such; a major proportion of

employment is in this sector. The nature, characteristics, growth and other things of this sector is significantly different from those of the formal sector. While most of the required information on the formal sector can be obtained from the secondary sources, information regarding informal sector activities has to be collected from the primary source through sample surveys of the major centers of employment. Accordingly, it is essential that the two sectors be studied separately.

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 publish regular reports that contain information on employment, investment, production etc. Furthermore, official records of City Corporation 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 questionnaire. About 1% of both the units will be surveyed. 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 city 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 City Corporation. We propose to 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 City Corporation authority and other concerned agencies.

In order prepare the development and action plan consultant has to consider the economic activities and action plan study team will survey and collect existing economic activities and their degree of actions over the total economy of the upazila and study the potential economic sectors to be incorporated to the final plan.

4.18 Drainage and Utility Survey and Study

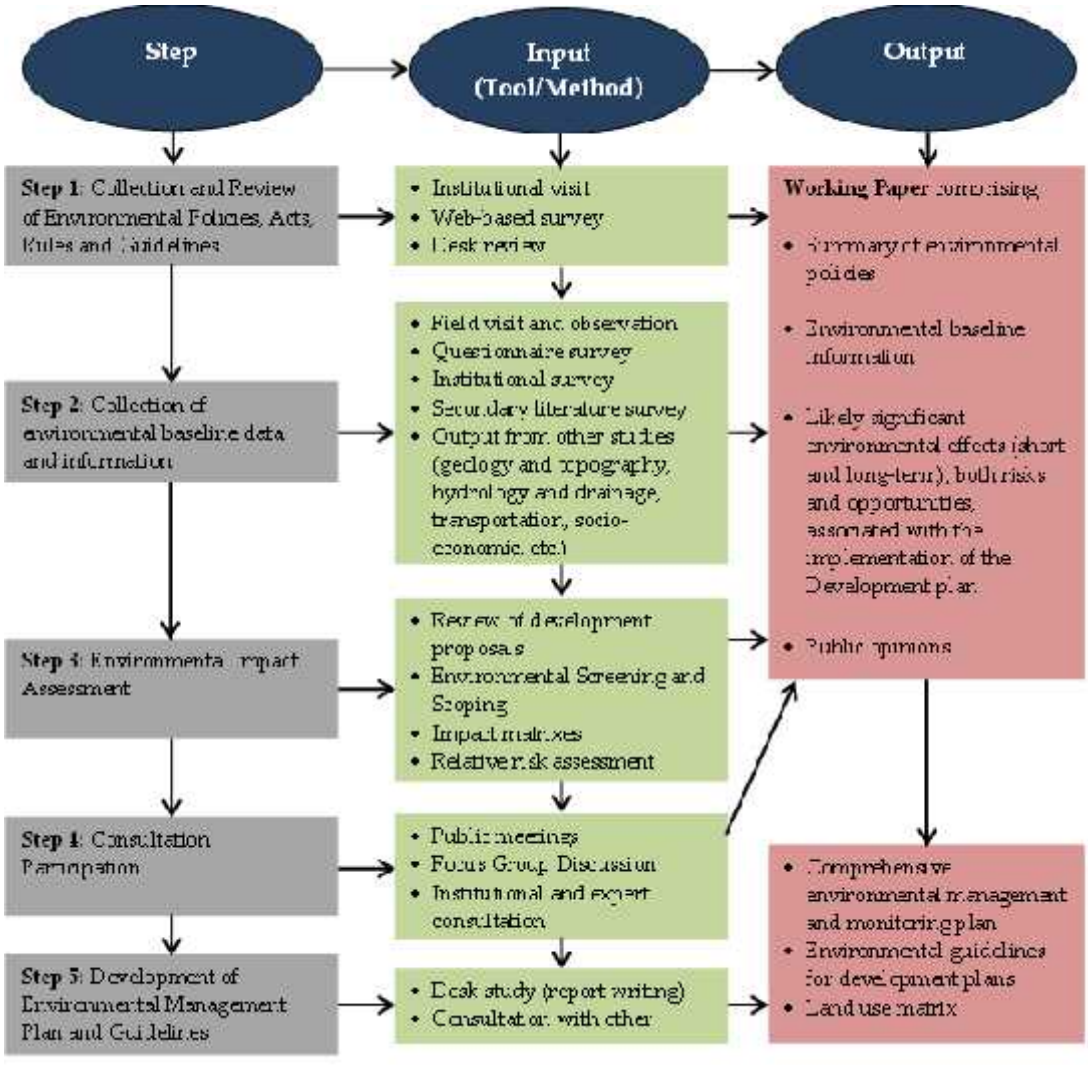
The protection of environmental with the provision of mitigation measures and monitoring plan in any physical and utilities development process is the prime consideration starting from its planning to implementation and operation& maintenance. The aim of the environmental study is to improve the general environment in the project and surrounding area and keep the parameters up to the tolerable limit of the human health and ecosystem including water, air and sound. In the urban area special consideration is made in water supply, sanitation, solid waste management, drainage, flooding, air, sound, food and health hazards, etc. The consultants will carry out Initial Environmental Examination prior to formulation of plan along with the survey activities in an

integrated manner so that some of the interrelated parameters can be collected with respective surveys. In addition, special PRA will carry out to get the basic information of urban environment. Environmental Impact Assessment (EIA) of the project due to planning of land-use/land management, infrastructure planning, physical facilities planning, transportation planning, etc. will be duly assessed and mitigation measures for the negative impacts be suggested to incorporate in the planning. In addition, an Environmental Monitoring Plan (EMP) will be prepared to follow during construction and operation and maintenance. The environmental study will be carried out in the line with standard guidance outline of DOE, ADB, World Bank as applicable to Bangladesh. The studies to be carry out to explore natural drainage system, climatic condition, flora & fauna, environmental hazard areas etc. A detailed questionnaire/survey format will be developed by consultant and will be approved by PROJECT AUTHORITY, UDD.

Items	Illustrated
Drainage study	Drainage system, water logging, outfalls, water level runoff, catchment area, cross section, depth, water follow etc.

4.19 Environmental Survey and Study

Following methodology will be adopted to conduct the environmental survey and study:



Identification of Environmental Issues

Conceptually, the Environmental Impact Assessment (EIA) will encompass determination of existing environmental status, assessment of probable environmental impacts due to specific activities of the proposed project and recommendation of measures that would mitigate or minimize the environmental impacts. Both Primary and Secondary data for physical environment, ecological environment, economic resource and social resource would be utilized.

Items	Illustrated
Environmental Study	Climatic condition, natural clematis, Natural Resources Air Quality, rainfall, temperature, Pollution etc. (based on secondary source)

4.20 Scheme Identification Survey

The identification of specific projects, which are deemed to be of priority importance for the orderly social, economic and environment development, is regarded as an integral part of the planning process. Consultants after full consultation with representative authorities and stakeholders and in the light of the three tiers master plan will be specifically proposed Action Area Plan identify priority projects from each sector.

- Infrastructure related to Road, transportation, Water supply, sanitation, waste disposal and social services.
- low cost housing (now construction or upgrading of existing)
- Employment opportunity.
- water supply and sanitation waste disposal
- flood control

Selected schemes would be described, together with appropriate Maps, Plans and section, in accordance with the following pro-forma:

Format for Scheme Identification Survey

Name of Project	
Description of Project	
Objective of the Project	
Implementing Authority	
Feasibility report	
Project cost (including foreign exchange)	
Financing	
Land requirement	
Impact assessment (institutional, income, employment, socio-economic, environment)	
Duration	
Catchments area	

4.21 Others Relevant Survey and Study

4.21.1 Housing

The team will review the national housing policies and conduct study on existing condition in the Upazila. The housing study will include housing land and density, housing ownership pattern, govt. housing, private housing, housing estates, informal housing, housing type based on construction materials, compliance with building construction rules, demand and supply of land for housing, stock and backlog of housing, room occupancy and floor area, building height, housing finance, housing problems and challenges, future development plans and programs, etc. The detailed information related to housing condition will be collected mainly from National Housing Authority office as well as through physical features and socio-economic survey in the study area, and available secondary sources.

4.21.2 Health

The team will review the general health situation in Bangladesh and in Kushtia Sadar Upazila. The health study will further include existing health care facilities provided by public, private and NGO sector, availability of doctors, nurse equipment and other facilities, quality of services, type of common degasses in the area, medical services availed of by households, infant and child mortality rate, crude birth and death rate, life expectancy at birth, demand and supply of health services, problems and challenges, future development plans and programs, etc. The health services related information will be collected mainly from Civil Surgeon Office, Upazila Health Complex, Paurashava as well as through physical features and socio-economic survey in the study area, and available secondary sources.

4.21.3 Education

The study related to education facilities and services will include literature rate of different age group, existing education infrastructure and facilities both formal and informal, teacher-student ratio, quality of education, etc. The team will try further to explore the reason for not attending primary school as well as problems and challenges, and future development plans and programs in education services in the area. The required information related to education facilities and services will be collected from District Education Office, Upazila Education Office and relevant NGOs as well as through physical features and socio-economic survey in the study area, and available secondary sources.

4.21.4 Sanitation

The sanitation study will include household sanitation condition as well as availability and condition of sanitary latrine, pit latrine, community toilet, public toilet, etc. The problems and challenges associated with sanitation as well as future development plans and programs in the area will also be analyzed. Sanitation data will also be extracted from socio-economic survey and discussion with the municipality.

4.21.5 Energy

The study on energy will include the consumption pattern of fuel and electricity, area of electricity coverage, demand and supply of electricity, problems and challenges associated with supply of electricity and future development plans and programs. Data will be extracted from socio-economic survey as well as discussion with Power Development Board and the municipality.

4.21.6 Heritage, Archeology and Tourism Management

Kushtia region has an ancient heritage of archaeological traditional culture and history. There are many places of great interest such as Shelaidah Kuthibari, Lalon's Mausoleum, Mujib Nagar, Amjhupi Rest House, Jhoudia Mosque, etc. in this region. Many other places of historical interest are spread all over the district which may be treated as tourist spots. Kushtia has a bright prospect of attracting tourists from home and abroad if many historical places are turned into tourist spots. The team will conduct a comprehensive study and analysis of heritage, archeology and tourism Management under this study with greater importance. The detailed information of potential heritage, archeology and tourist area within the study area and its neighborhoods will be collected from Archeological Department and Bangladesh Parjatan Corporation as well as through review of historical documents, field visit, discussion with most familiar persons and the tourist coming from different parts of the country. A semi-structured questionnaire will be used for survey. Data will also be extracted from physical feature survey and socio-economic survey. The team will also try to ascertain the problems and challenges in tourism development in this region.

4.22 Database Preparation

Survey data processing

All collected topographic data, physical features data, socioeconomic data, transportation data, drainage and environmental data as well as other all secondary source data will be processed and compiled for analysis and to plan process.

Development of GIS data base

Geo-referenced mauza data, all topographic data and physical data, all attribute data in same projection will be finalized and stored as GIS data format for further analysis and map preparation.

Development of Map layout and legend

Guided by the TOR and Consulting with PD and PM, consultants will finalized the legend and layers of the GIS data and finalize the map layout. Then following the map layout and legend properties consultant will prepare and finalize the map as per demand of planning process and the ToR.

Preparation and Submission of Survey Report along with Maps

After survey and data compilation as per project demand, guided by the PD, planning team will prepare the maps layout according to ToR and survey report will be generated for submission.

Chapter: 05

OUTPUTS AND FORMATS

CHAPTER-5
OUTPUTS AND FORMATS

5.1 Introduction

Reports and maps are the final output of the preparation of Development Plan for Kushtia Sadar Upazila. The requirements of submitting reports, maps and other ancillary materials have been specified in the ToR. The reports and maps have to be submitted in both hard and soft copies. On the other hand, some ancillary materials like, Bench Mark Pillars have to be erected in suitable locations of the project area.

5.2 Format of Reports to be submitted by Consultant (Both Digital and Hard Copy)

The consultant will submit the following Reports in both hard and digital copy. Each report will be presented and illustrated in a clear and concise professional manner including maps, plans, diagrams and others graphics. Schedule of Submission:

Table 5.1 Format of Reports to be submitted by the Consultant

Report Title	Language	Nos. of Copy	Period of Submission (time from contract agreement)	Binding Status
Mobilization and Inception Report	English	20	End of 1nd month	Spiral Binding
Survey Report-I	English	20	End of 2nd month	Spiral Binding
Survey Report-II	English	20	End of 8th month	Spiral Binding
Interim Report	English	20	End of 10th month	Spiral Binding
Draft Final Report (Structure Plan)	English	20	End of 12th month	Spiral Binding
Draft Final Report (Structure Plan, Urban Area Plan and Action Area Plan)	English	20	End of 15th month	Spiral Binding
Final Report	English	100	End of 18th month	Hard Binding
Final Report	Bangla	50	End of 18th month	Hard Binding
Project Completion Report	English	20	End of 18th month	Spiral Binding (with Maps and CDs)

5.3 Format for Submission of Maps and Drawings

The consultant will collect and prepare the following maps as per Terms of Reference (ToR).

Table 5.2 Format of Maps and Drawings to be submitted by the Consultant

Category	Description of map	Map Scale	No. of Set	Form of Map
Mauza Map	Original Sheet	1:330 or another Mauza map Scale	1 set	Hard Copy
	Geo-referenced Digital Version/GIS version	1:330 or another Mauza map Scale	1 set	Soft Copy
Physical Feature Map and Land Use Map	Shape file or another GIS original format	1:1980	1 set	Soft Copy and Hard Copy
Structure Plan Map	Shape file or another GIS original format	Map size: 30'x40' sheet(scale to be adjusted according to the mentioned size)	100 copy in the folder of all structure plan report	Soft Copy and Hard Copy
Urban Area Plan Map	Shape file or another GIS original format	1:990 scale or as per decision of the PD	4 sets	Soft Copy and Hard Copy
Action Area Plan Map	Shape file or another GIS original format	1:990 scale or as per decision of the PD	4 sets	Soft Copy and Hard Copy
Working Map	Shape file or another GIS original format	1:990 scale for the whole upazila area	2 sets	Soft Copy and Hard Copy

5.4 Format for Submission of Soft copy

- Maps: Shapefile, geodatabase file with both spatial and attribute information & MXD files of map layouts etc. All the map sheets shall be delivered in PDF format
- Soft copy of the maps will submit in BUTM-2010 Projection System
- Reports: DOC &PDF
- Image: TIFF
- Presentation: PPT
- Primary & Secondary Data: Access, Excel, DOC, SPSS
- Drawing: Shapefile, DXF, DWG
- Data will be submit on CD/DVD/Flash drive with marking contents and date

5.5 Format to be used for Preparation of maps

The following format will be followed for preparation of all kinds of map:

Table 5.3 Format to be used for Preparation of Maps by the Consultant

Feature	Illustration
BM	BM ID, Reduced Level (RL), Easting (X-coordinate), Northing (Y-coordinate), location description of the BM
Administrative Boundaries	District boundary, Thana boundary, Union Boundary, Paurashava boundary, Ward boundary, Mauza boundary, Sheet boundary
Khas land	Plot number, Area, existing use
Spot heights	Reduced Level (RL), Easting (X-coordinate), Northing (Y-coordinate)
Contour lines	contain the value (RL), type (Index, Intermediate)
Land use	Land Use type (Administrative, Agriculture, Commercial, Educational, Graveyard, Health, Industrial, Miscellaneous, Mixed Use, Open spaces, Places of Worship, Recreational, Residential, Restricted, Transportation,

Feature	Illustration
	Water bodies), data base will contain detail category as per survey format
Structure	Structure type (Pucca, Semi-pucca, Katcha), structure use data base will contain detail category as per survey format, structure name, year of construction, under construction, owner's name of the structure, Holding number, adjacent road name, locality name, ward/union name
Road	road name, road number, type of the road (Pucca, Semi-pucca, Katcha), category of the road (Primary, Secondary, Access), road width
Footpath	road name, width
Drain/sewerage	type, width, category, depth
Water Pipe Network	Type, Diameter (secondary source)
Overhead Tanks	Capacity, catchment area
Electric Lines	Capacity, type
Gas line	Diameter, Pressure (secondary source)
Utility and servicers facilities	Type (Electric Pole, Electric Tower, High Volt, Electric Tower, Electric Box, Power Station, Power Sub-station, Transformer, Gas Transmission Center, Light Post, Telephone Pole, Telephone Box, Fire Service Station, Traffic Signal Pole)
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

Feature	Illustration
	Plant, Waste Disposal facilities, Railway Station, Bazaar, Forest Land, Swimming Pool, slums, embankment, homestead etc.), Name, location
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, Well, Police Station, Police Box, Post Office, Brickfield, River Port, Bus Terminal, Truck Terminal, Airport, Over Bridge, Under Pass, Bridge, Culvert), name, location
Water bodies	Type (Rivers, Khals, Irrigation Canals, Lakes, Swamps, Ponds, Ditches, Borrow Pits), usages (Private, Public)
Bridge/ Culvert/box	Length, Width, Abutment, Span, Location

Chapter: 06

PROJECT MANAGEMENT PLAN

CHAPTER-6
PROJECT MANAGEMENT PLAN

6.1 Commencement of Works

After the contract signed with Urban Development Directorate (UDD), the consultant started project activities, which include arrangement of office space, mobilization of consultants, preparation of activity schedule and work plan for completion of the project. The project activities are scheduled for different phases of work, such as mobilization and inception report, survey report, interim report, draft report and final report.

6.2 Project Management Profile

The performances and outputs of the professional staffs will be guided by the Team Leader as per ToR who in turn will seek decisions and guidance from Project Director of the project as well as the Kushtia Sadar Upazila Authority. Constant interaction and consultation will be made by the Team Leader with the Project Director and Upazila Authority and other stakeholders/ service providers for feedback and necessary inputs into the preparation of Development Plan of Kushtia Sadar Upazila. The consultants will support each other in relevant matters and share their knowledge and expertise to accomplish the tasks stipulated in the ToR. Effective team efforts will help to produce the beneficial outcomes of the project.

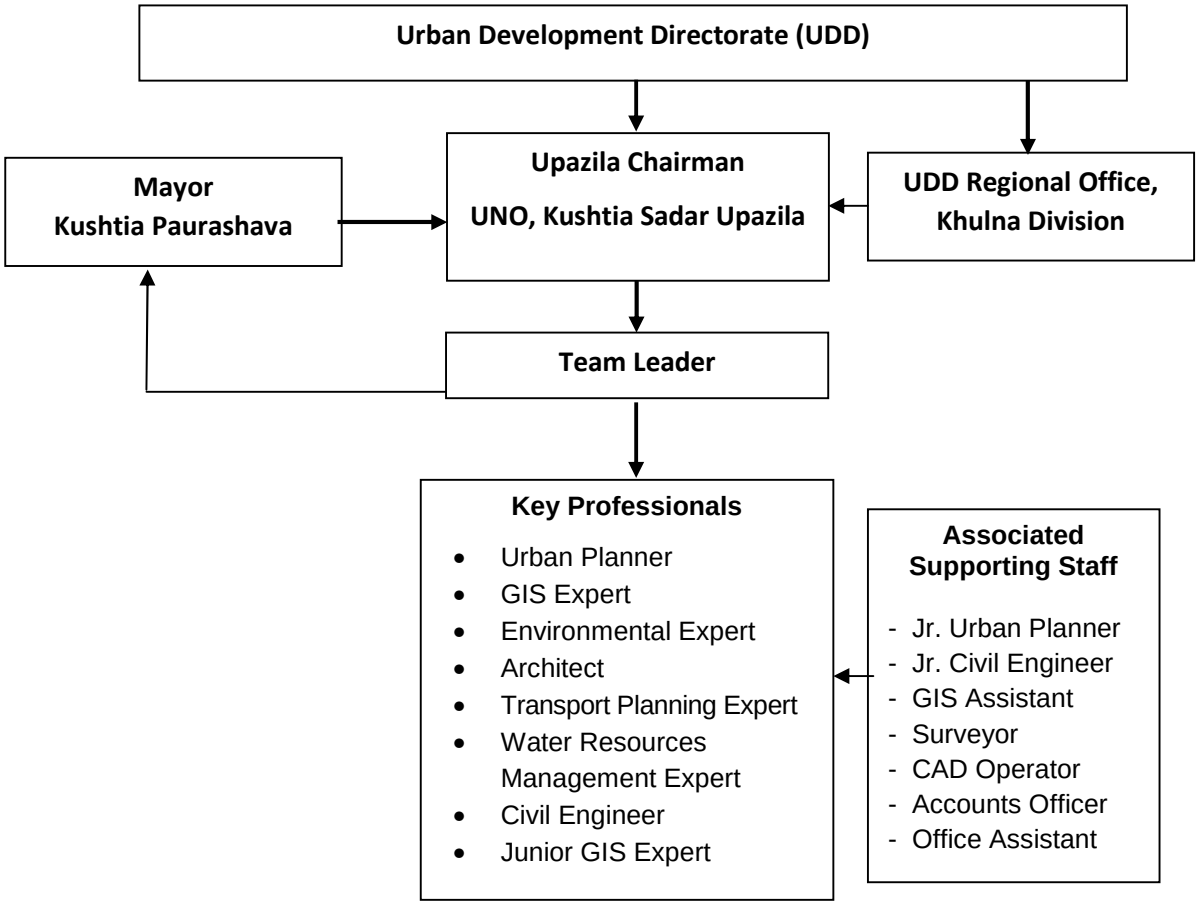


Figure 6.1: Project Organogram

Staffing Schedule

Sl No	NAME OF STAFF & POSITION	STAFF-MONTH INPUT																		Home	Field	Total
		SURVEY STAGE								PLANNING STAGE												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			
1	Mohammad Fazle Reza Sumon **Team Leader**																			14	4	18
2	Dr. Kazi Saiful Islam **Urban Planner**																			14	4	18
3	Dipak Saha **GIS Expert**																			5	4	9
4	Khondoker Golam Tawhid **Environmental Expert**																			2	1	3
5	Mohammad Zakaria Russel **Architect**																			2	1	3
6	Dr. Ahsanul Kabir **Transport Planning Expert**																			4.5	1.5	6
7	Md. Motiur Rahman **Water Resource Management Expert**																			4.5	1.5	6
8	Rashedul Islam **Civil Engineer**																			2	4	6
9	Mohammad Azizul Arif **Junior GIS Expert**																			6	3	9
10	Rehana Akhter **Data entry operator**																			12	0	12
11	Md. Sohag **Surveyor -1**																			0	3	3
12	Mohammad Rakibul Islam **Surveyor -2**																			0	3	3

LEGEND **Continuous** ——— **Intermittent** - - - -

6.3 Staffing Schedule

The staffing requirement and duration of input of individual team member for the project have been assessed on the basis of the work program. Before development of a staffing schedule of the project team, the consultants require full understanding of the input-output requirements of the project and ways of integration of multi-sectoral activities in a coordinated and sequential manner in accordance with objective of the project and ToR. Staffing Schedule of the proposed personnel showing involvement and duration of each professionals is presented in Figure-6.2.It provides an allocation of 78 man-months for 9 key professionals.

6.4 Tasks and Responsibilities of Professionals

Proposed key personnel's selected for the consultancy services for Preparation of Development Plan for Kushtia Sadar Upazila are highly qualified and are specialized in their respective fields. Thoughtful consideration was made for selecting the team of consultants who are most suitable for the assignment. The tasks and responsibilities as per ToR of the professionals are given below:

Task of the Key Personnel:

Name of Staff	Position	Task Assigned
Mohammad Fazle Reza Sumon	Team Leader	- To prepare work program in consultation with Project Director. - To coordinate among the consultant team. - To prepare work programme for the team. - To compile report, working papers, sectoral studies and prepare report for submission to the PD. - Preparation of working paper, reports and plan of the project as assigned by the PD. - To review the existing plans and implementation problems. - To prepare land use planning guidelines. - To prepare land use matrix. - To identify and plan development project for the area. - To interpret the recommendations of sectoral studies into spatial form. - To prepare land use plan according to sectoral studies of the Structure Plan. - To formulate plan implementation strategy and policy - Any other related job assigned by the PD.
Dr. Kazi Saiful Islam	Urban Planner	- To prepare work program in consultation with Project Director. - To coordinate among the consultant team. - To prepare work programme for the team. - To compile report, working papers, sectoral studies and prepare report for submission to the PD. - Preparation of working paper, reports and plan of the project as assigned by the PD. - To review the existing plans and implementation problems.

Name of Staff	Position	Task Assigned
		- To prepare land use planning guidelines. - To prepare land use matrix. - To identify and plan development project for the area. - To interpret the recommendations of sectoral studies into spatial form. - To prepare land use plan according to sectoral studies of the Structure Plan. - To formulate plan implementation strategy and policy - Any other related job assigned by the PD.
Dipok Chandra Saha	GIS Expert	- To prepare Physical feature and topographic map from the surveyed data. - To prepare Map of the region from 3d satellite image. - To supervise, manage and monitor digital database of the project. - To prepare guideline for GIS database development and to ensure the quality of map and related work. - Installation and troubleshooting of GIS in UDD project office and Head office. - Preparation of working paper, reports and plan of the project as assigned by the PD. - Any other related job assigned by the PD.
Khondoker Golam Tawhid	Environmental Expert	- Prepare guidelines for environmental related component of development plans according to Environmental laws, policies and other published documents. - Prepare land use matrix and land use planning guidelines for the region environmental view point. - To delineate region considering environmental parameters. - To identify areas with environmental hazards. - To suggest hazard mitigation measures. - Preparation of working paper and reports as assigned by the PD. - To prepare Environmental Management Plan. - Any other related job assigned by the PD.
Md. Zakaria Ibne Razzaque	Architect	- To work directly under the PD in through understanding about site plan/action area plan related issues. - To assist the PD in preparation of work program of the team leader of consulting firm. - To monitor and supervise the progress of work by all components with reference to project objectives and activities and report directly to the PD about project status. - To identify important archaeological structure of the project area and develop conservation strategy. - To review National Tourism Management Plan and prepare specified policy guidelines for the project. - To assist PD to integrate his input in planning process through Team Leader by preparing working papers.

Name of Staff	Position	Task Assigned
		- Any other related job assigned by the PD.
Dr. Ahsanul Kabir	Transport Planning Expert	- To conduct different traffic surveys and studies, and also analyse transportation network of the project area and ensure quality of data collected. - To propose a transportation network to establish an efficient inter and intra town circulation system. - To develop traffic prediction model of 20-years period for the project area. - To work with a multi-disciplinary team to integrate the output of the traffic surveys and transportation studies with both attribute and spatial data of different other components of the project. - Preparation of working paper and analytical report based on study and survey. - Any other related job assigned by the PD.
Md. Motiur Rahman	Water Resources Management Expert	- Prepare guidelines for water related component of Development plan for project area according to NWMP 2001. - To prepare land use planning guidelines considering hydrological situation of mainland of the sub region. - To prepare guidelines for mitigating water logging problem. - To investigate the existing arsenic contamination problem - To facilitate meetings of the project consultants with involved agencies. - To assist the PD and other project personnel in trough understanding of hydrological related issues. - Review national environmental policy ant others environmental laws to prepare specific policy guidelines for the project. - Preparation of working paper and reports as assigned by the PD. - To prepare Environmental Management Plan. - Any other related job assigned by the PD.
K. M. Rashedul Islam	Civil Engineer	- To supervise, co-ordinate and monitor physical feature, topographical and land use survey and to ensure quality and accuracy of survey data. - To analyse land use and topographical survey results including general infrastructure and soil. - To prepare foundation design criteria, drainage and flood control mechanism - Preparation of working paper and reports as assigned by the PD. - Any other related job assigned by the PD.
Mohammad Azizul Arif	Junior GIS Expert	- To prepare Physical feature and topographical map from the surveyed data. - To prepare Map of the region from satellite image. - To supervise, manage and monitor digital database of the project. - To prepare guidelines for GIS database development

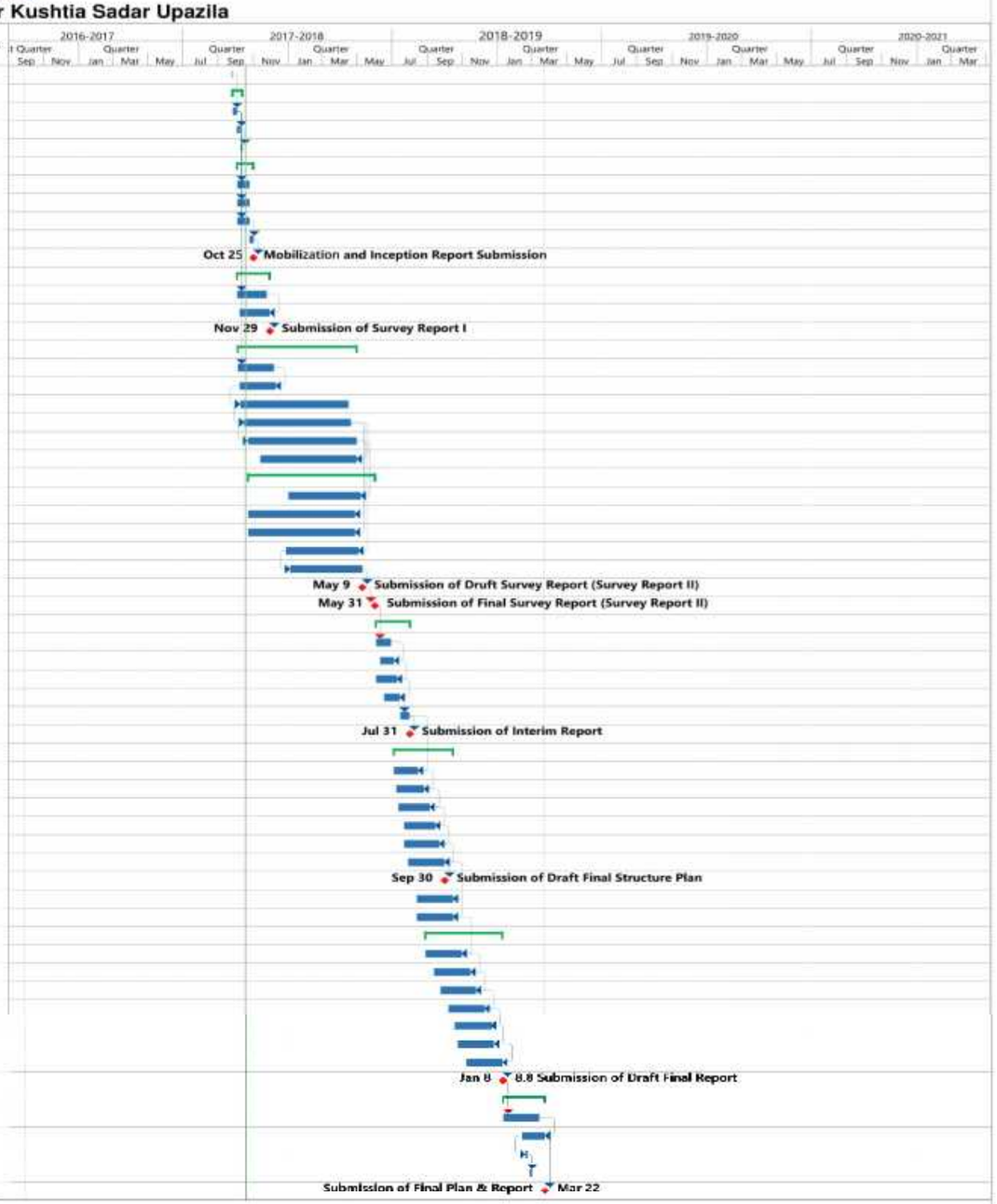
Name of Staff	Position	Task Assigned
		from Physical feature and topographical survey for the project. - Installation and troubleshooting of GIS in UDD project office and head office. - Preparation of working paper, reports and plan of the project as assigned by the PD. - Any other related job assigned by the PD.

6.5 Activity Schedule

An effective time schedule is required for successful completion of the project on time. The consultants have made an in-depth assessment of the tasks to be accomplished in different phases as per ToR, particularly for detailed survey and preparation of documents. The detailed schedule of activities of the project is depicted in the following table.

REVISED WORK SCHEDULE
Preparation of Development Plan for Kushtia Sadar Upazila

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Contract Signing after Notification of Award**	**1 day**	**Sun Sep 24, '17**	**Sun Sep 24, '17**	
2	**STEP-1: Mobilization, Reconnaissance Survey, Project Design and Submission of Inception Report**	**13 days**	**Tue Sep 26, '17**	**Thu Oct 12, '17**	
3	1-1 Mobilization of Project Team	5 days	Tue Sep 26, '17	Mon Oct 2, '17	1FS+1 eday
4	1.2 Conduct of Reconnaissance Survey	4 days	Tue Oct 3, '17	Sun Oct 8, '17	3
5	1.3 Preparation of Mobilization Report	3 days	Tue Oct 10, '17	Thu Oct 12, '17	4FS+1 eday
6	**STEP-2: Collection of Maps, Basic Statistics and Information**	**20 days**	**Wed Oct 4, '17**	**Tue Oct 31, '17**	
7	2.1 Collection of Geo-Physical Maps and Reports (Geology, Hydrology and Major Soil Type	15 days	Wed Oct 4, '17	Tue Oct 24, '17	3FS+1 eday
8	2.2 Collection of Topographical Maps and Reports (Physical Features, Infrastructures and Landuse)	15 days	Wed Oct 4, '17	Tue Oct 24, '17	3FS+1 day
9	2.3 Collection of Basics Statistics: Present Activities (Socio-Economic Census and Employment)	15 days	Wed Oct 4, '17	Tue Oct 24, '17	3FS+1 day
10	2.4 Preparation of Inception Report	5 days	Wed Oct 20, '17	Tue Oct 24, '17	5
11	Mobilization and Inception Report Submission	1 days	Tue Oct 24, '17	Tue Oct 25, '17	6
12	**STEP-3: Preparation and Compilation of Base Map and Demarcation of Project Boundary/ Area/ Locaiotn**	**41 days**	**Wed Oct 4, '17**	**Wed Nov 29, '17**	
13	3.1 Collection, Scanning Maps and Digitization of Mouza Maps	37 days	Wed Oct 4, '17	Thu Nov 23, '17	3FS+1 eday
14	3.2 Edit Plot Check of Digitized Coverage of Individual Mauza Sheet	38 days	Sun Oct 8, '17	Tue Nov 28, '17	13FF+5 edays
15	Submission of Survey Report I	0 days	Wed Nov 29, '17	Wed Nov 29, '17	14FS+1 day
16	**STEP-4: Satellite Image Processing by using Photogrammetric Method**	**147 days**	**Thu Oct 5, '17**	**Sun Apr 29, '18**	
17	4.1 UAV Stereo Image Collection	45 days	Thu Oct 5, '17	Wed Dec 6, '17	3FS+2 edays
18	4.2 Aerial Triangulation/Image Processing (3D Stereo Imagery)	45 days	Sun Oct 8, '17	Sat Dec 9, '17	17FF+3 edays
19	4.3 Digital Mapping from Stereo Model	135 days	Mon Oct 9, '17	Sun Apr 15, '18	18SS+1 eday
20	4.4 Field Check & Attribute Data Collection	134 days	Mon Oct 16, '17	Thu Apr 19, '18	19SS+7 edays
21	4.5 Map Updating	135 days	Mon Oct 23, '17	Sun Apr 29, '18	20SS+7 edays
22	4.6 DTM/DEM/TIN/ Contour Generation	120 days	Mon Nov 13, '17	Sun Apr 29, '18	21FF
23	**STEP-5: Survey Activities**	**159 days**	**Mon Oct 23, '17**	**Thu May 31, '18**	
24	5.1 Topographical Ground Truthing Survey	90 days	Mon Jan 1, '18	Sun May 6, '18	21FF+7 edays
25	5.2 Physical Infrastructure Survey	134 days	Mon Oct 23, '17	Thu Apr 26, '18	20FF+7 edays
26	5.3 Landuse Survey Updating	134 days	Mon Oct 23, '17	Thu Apr 26, '18	20FF+7 edays
27	5.4 Sectoral studies including Socio-Economic Survey and Study of Urban and Rural Economy and Social Infrastructure	90 days	Thu Dec 28, '17	Wed May 2, '18	20FF+13 edays
28	5.5 Compilation of Studies and Survey Findings	90 days	Thu Jan 4, '18	Wed May 9, '18	27SS+7 edays
29	Submission of Druft Survey Report (Survey Report II)	0 days	Wed May 9, '18	Wed May 9, '18	28
30	Submission of Final Survey Report (Survey Report II)	0 days	Thu May 31, '18	Thu May 31, '18	29FS+22 edays
31	**STEP-6: Data Processing, Analysis, Interpretation, Presentation and Formulation of Working Papers**	**43 days**	**Sun Jun 3, '18**	**Tue Jul 31, '18**	
32	6.1 Analysis of Existing situation and local demand	20 days	Sun Jun 3, '18	Thu Jun 28, '18	30
33	6.2 Identification of Problem Area	18 days	Sun Jun 10, '18	Tue Jul 3, '18	32FF+5 edays
34	6.3 Formulation of Planning Standard	26 days	Sun Jun 3, '18	Sun Jul 8, '18	33FF+5 edays
35	6.4 Formulation of Policies	20 days	Sun Jun 17, '18	Fri Jul 13, '18	34FF+5 edays
36	6.5 Analysis of alternative strategies	12 days	Sun Jul 15, '18	Mon Jul 30, '18	35
37	Submission of Interim Report	0 days	Tue Jul 31, '18	Tue Jul 31, '18	36FS+1 day
38	**STEP-7: Preparation of Planning Package for the Project**	**73 days**	**Wed Jul 4, '18**	**Sun Oct 14, '18**	
39	7.1 Preparation of Sub-Regional Strategic Plan	30 days	Wed Jul 4, '18	Tue Aug 14, '18	36FF+15 edays
40	7.2 Shift-Share Analysis and Input-Output Analysis for Drawing Future Socio-Economic Development Scenario	35 days	Sun Jul 8, '18	Fri Aug 24, '18	39FF+10 edays
41	7.3 Sub-Regional Plan on the basis of diferent Regional Study	38 days	Thu Jul 12, '18	Mon Sep 3, '18	40FF+10 edays
42	7.4 Regional Stucture Zoning Category	40 days	Sun Jul 22, '18	Thu Sep 13, '18	41FF+10 edays
43	7.5 Conservation Plan under Sub-Regional Plan	45 days	Sun Jul 22, '18	Thu Sep 20, '18	42FF+7 edays
44	7.6 Strucrure Plan	45 days	Sun Jul 29, '18	Sat Sep 29, '18	43FF+9 edays
45	Submission of Draft Final Structure Plan	0 days	Sun Sep 30, '18	Sun Sep 30, '18	44FS+1 day
46	7.7 Urban Area Plan	45 days	Mon Aug 13, '18	Sun Oct 14, '18	44FF+15 edays
47	7.8 Action Area Plan	45 days	Mon Aug 13, '18	Sun Oct 14, '18	46FF
48	**STEP-8: Submission of Draft Final Report**	**96 days**	**Tue Aug 28, '18**	**Tue Jan 8, '19**	
49	8.1 Integrated Plan: Impact Assessment, Economic and Financial Viability, Social and Environmental Impact Assessment	45 days	Tue Aug 28, '18	Mon Oct 29, '18	47FF+15 edays
50	8.2 Incorporation of Development Proposal in Response to PRA	45 days	Wed Sep 12, '18	Tue Nov 13, '18	49FF+15 edays
51	8.3 Landuse Planning and Development Control Policies & Proposal	45 days	Sun Sep 23, '18	Fri Nov 23, '18	50FF+10 edays
52	8.4 Institutional Issues	45 days	Sun Oct 7, '18	Sat Dec 8, '18	51FF+15 edays
53	8.5 Identification of Project Priority	45 days	Wed Oct 17, '18	Tue Dec 18, '18	52FF+13 edays
54	8.6 Legal Supporting Documents for Implementation	45 days	Mon Oct 22, '18	Sun Dec 23, '18	53FF+5 edays
55	8.7 Preparation of Draft Plan & Draft Final Report	45 days	Tue Nov 6, '18	Mon Jan 7, '19	54FF+15 edays
56	8.8 Submission of Draft Final Report	0 days	Tue Jan 8, '19	Tue Jan 8, '19	55FS+1 day
57	**STEP-9: Submission of Final Report & Maps**	**52 days**	**Wed Jan 9, '19**	**Fri Mar 22, '19**	
58	9.1 Public Hearing on Draft Plan	45 days	Wed Jan 9, '19	Tue Mar 12, '19	56
59	9.2 Preparation of Final Plan and Report by Updating/Incorporating of Comments of Formal Public Hearing on Draft Plan	10 days	Sun Feb 10, '19	Fri Mar 22, '19	58FF+13 edays
60	9.3 Training on Georeferenced Survey and 3D Photogrammetric Image Interpretation	5 days	Sun Feb 17, '19	Tue Feb 19, '19	59SS+5 edays
61	9.4 Training on Other survey & Inter-planning database	3 days	Mon Feb 25, '19	Wed Feb 27, '19	60FS+5 edays
62	Submission of Final Plan & Report	0 days	Fri Mar 22, '19	Fri Mar 22, '19	61



Gantt Chart 19-Feb-17 Split Milestone Summary Project Summary Deadline Progress

Chapter: 07

CONCLUSION

CHAPTER-7
CONCLUSION

The Mobilization and Inception Report has been prepared keeping in mind the Terms of Reference of the project. This will guide project activities including field surveys, data collection and analysis and preparation of reports and maps. The project area profile based on initial survey, maps and data collection from secondary sources, has been useful in understanding the characteristics of the project Upazila, its general condition in physical and socio-economic development. Subsequent stages of project work will largely be dependent on the Inception output.

It is understood that the deficiency in infrastructure of the project Upazila, is currently holding back the faster progress in development. This can be improved substantially, if planned development of the areas is ensured through Structure Plan, Urban Area Plan and Action Area Plan as visualized through the current project. Thus the commencement of this project under the Urban Development Directorate (UDD) is very relevant and timely in line with national policies and regional development strategies as well as sustaining Sustainable Development Goal 11.

ANNEXTURES

Annexure 01: Documents of Satellite Image Procurement

HARRIS MapMart
10465 Park Meadows Dr.
Suite 201
Lone Tree, CO 80124

Phone: *303.759.5050*
Internet: *http://www.mapmart.com*
e-mail: *mapmartinformation@harris.com*

Quote No.: QTO-027489
Date: 9/20/2017
Valid Until: 10/20/2017
View via Web at: http://www.harrisgeospatial.com

Sales Rep:

Ship To:

Azizul Arif
Geolysis Ltd.
521 New Eskaton Road
Country is Bangladesh Province is UNDEFINED
Dhaka, 1000
Bangladesh
azizularif@gmail.com
+8801715011606

Bill To:

Azizul Arif
Geolysis Ltd.
521 New Eskaton Road
Country is Bangladesh Province is UNDEFINED
Dhaka, 1000
Bangladesh
azizularif@gmail.com
+8801715011606

Part Number	Description	Unit Price	Units (sq. km)	Extended Price (USD)
801SATE0469	Airbus DS Pleaides One Plan Stereo Tasking - Achievable	14,674.00	1	$14,674.00
			Sub Total	$14,674.00
			Sales Tax	$0.00
			Total	$14,674.00

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Phone: 303.759.5050
Internet: http://www.mapmart.com
e-mail: mapmartinformation@harris.com

TERMS AND CONDITIONS FOR SALE OF DATA PRODUCTS AND SERVICES

("Terms and Conditions")

1 DEFINITIONS. As used throughout these Terms and Conditions, the following terms shall have the meanings as set forth below:

- a. "Seller" means Harris Corporation d/b/a MapMart ("Harris MapMart"), operating in the State of Colorado.
- b. "Buyer" means the person, firm, corporation, government entity or academic institution that is purchasing Seller's product(s).
- c. "Products" shall mean data, services and other material provided by Seller to Buyer.
- d. "License Agreement(s)" means the license(s) provided with the Products that govern their use.
- e. "Documentation" means written information (whether contained in user or technical manuals, training manuals, specifications or otherwise) pertaining to the Products and made available by Seller in any manner (including CD-ROM or on-line).
- f. The Products, and Documentation offered for sale qualify as "commercial items" as that term is defined in the Federal Acquisition Regulation ("FAR") (48 C.F.R.) 2.101. Notwithstanding any other FAR or other contractual clause into which this sale may be incorporated, the end user, whether that be commercial or Government, will acquire the Products and Documentation with only those rights set forth in the License Agreement.

2 QUOTE VALIDITY. This price quotation shall be valid for 30 days from the issue date.

3 ACCEPTANCE OF CONTRACT. Seller's acceptance of any purchase order issued by Buyer shall be expressly limited to the terms and conditions set forth herein and any others expressly set forth or referenced in Seller's acknowledgment form. Any additional or different terms set forth or referenced in Buyer's purchase order that conflict with these terms and conditions are hereby objected to by Seller and shall not be deemed a part of any resulting order. These terms and conditions represent the entire agreement between the Buyer and Seller pertaining to the subject matter of this order and shall supersede all prior oral and written agreements, proposals, communications and documents.

4 RESTRICTIONS ON USE. The Products shall not be resold or otherwise distributed by Buyer to any third party in the same form as provided by Seller to Buyer without the prior written consent of Seller.

5 PRODUCTS DELIVERY. Seller will retain a copy of the Products for up to 30 days after initial delivery to Buyer to address potential data loss or corruption during transmission. If data loss or corruption occurs, Buyer must alert Seller within the 30 day period to receive replacement Products. Buyer will bear the cost for additional production time, shipping, and/or media.

6 WARRANTY. Seller warrants that the Products are provided without viruses, Trojan Horses, Time Bombs or other similar deficiencies upon initial delivery to Customer and that the use of such Products by customer shall not infringe the intellectual property rights of third parties. Seller does not warrant the accuracy or completeness of the data provided. Other than as set forth herein, the Products are provided "as is" without warranty of any kind, express or implied. Seller shall not be liable for any incidental, consequential or special damages and in no event shall Seller be liable to Customer or any third party for any claim arising out of or in connection with the Products in excess of the amounts paid hereunder by Customer to Seller with the respect to the Products giving rise to such claim.

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8 AUDIT. Notwithstanding any language or provisions in this contract to the contrary, Buyer shall not be allowed the right to audit or examine Seller's books and records unless required by applicable law.

9 CHANGES. No changes, extras or other work shall be authorized unless agreed to by both parties as evidenced by a written amendment to this order signed by duly authorized representatives of Buyer and Seller.

10 TITLE AND RISK OF LOSS. Risk of loss shall pass to Buyer upon delivery of the Products, and/or Documentation. It is hereby acknowledged and agreed that Buyer shall not obtain title to the Products. In lieu thereof, Buyer shall obtain the license rights granted in the License Agreement.

11 PAYMENT. Upon acceptance of purchase terms, Buyer shall arrange payment for all Products by 1) credit card payment using the link provided, 2) remitting a purchase order, 3) arranging a wire transfer to the account information provided, or 4) agreeing to the terms of a standard NET 30 invoice from Harris Corporation. Payment will be deemed to have been made when received at Seller's facilities or when electronically deposited at Seller's designated financial institution.

12 APPLICABLE LAW. The validity, performance, and construction of the contract arising from the acceptance of this offer by commercial entities shall be governed as follows:

- a. For commercial entities, the laws of the State of Colorado without regard to its choice of law rules.
- b. For US state and local governments and/or higher education schools governed by state laws, contracts shall be governed by the laws of the state in which they are located without reference to conflict of laws principles.
- c. For the US government, contracts shall be governed by US Federal Laws.
- d. U.S. Federal Laws shall govern all matters of intellectual property.
- e. Contracts will not be governed by the United Nations Convention on Contracts for the international Sale of Goods, the application of which is expressly excluded.

13 TAXES. As may be applicable by law, any and all taxes, assessments, or duties, which may be imposed upon the production shipment, installation, or sale of the Products covered hereby, shall be the sole responsibility of and shall be paid by Buyer.

14 INDEMNITY. Seller shall defend or settle at its expense a claim or suit against Buyer arising out of or in connection with an assertion that the Products infringe any U.S. copyright or U.S. registered patent. Seller shall indemnify and hold Buyer harmless from and against the damages, costs and expenses (including, without limitation, reasonable legal and expert witness fees), if any, finally awarded in such suit or the amount of the settlement thereof, provided that Seller is notified in writing of the existence of such claim by Buyer within five (5) business days of Buyer's first learning of the same, and provided that Seller is given full authority to control the defense, cost and settlement of the claim. Seller will not be obligated to defend or otherwise indemnify Buyer in any lawsuit or as to any claim which arises from or relates to: (1) any combination of the Products with another product not supplied by Seller; (2) if such a claim is based upon use of the Products for purposes for which it was not designed; or (3) if the Products has been modified by any party other than Seller. In lieu of the foregoing indemnification obligations, Seller shall have the option, at its expense, either to procure for Buyer the right to continue using the Products or to replace or modify the Products so that it becomes non-infringing, or to refund to Buyer the amount actually paid by the Buyer for the Products.

15 EXPORT RESTRICTIONS. The Products and Documentation is subject to U.S. export controls and may be subject to additional export and import regulations of the country in which the Products are obtained. Buyer agrees that it will not use or otherwise export or re-export the Products except as authorized by United States law and the laws of the jurisdiction in which the Products were obtained. In particular, but without limitation, the Products may not be exported or re-exported into any U.S.-embargoed countries; to anyone on the U.S. Treasury Department's

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16 ENTIRE AGREEMENT. This Agreement sets forth the entire agreement and understanding between Seller and Buyer and may not be modified except by a writing duly signed by both parties.

One Plan Tasking Proposal			
Date (YYYY-MM-DD)	2017-11-23		
To	SICORP		
Customer Reference		Tasking Id.	Area of Interest (km²)
Harris_Kushtia Sadar (Bangladesh)		ICR_FC_181328	327
Application Theme	Energy		
Satellite	Pléiades		
Acquisition Period (YYYY-MM-DD)	Start: 2017-11-23 / End: 2018-01-01		
Cloud Cover	10% maximum		
Acquisition Mode	Stereo		
Max. Incidence Angle	+/- 25°		
B/H	Min: 0.4 - Max: 0.7 (Roll viewing angle < 20°)		
Feasibility Results			

Annexure 02: List of Collected Mauzas for Preparation of Development Plan for Kushtia Sadar Upazila

SL. No	District Name	Upazila Name	Mouza Name	Mouza Type	JL. No.	Sheet No.	Total Sheets
1	Kushtia	Kushtia Sadar	Kachuadama	BRS	1	1	1
2	Kushtia	Kushtia Sadar	Mohanagar	BRS	2	1	1
3	Kushtia	Kushtia Sadar	Sukdebpur	BRS	3	1	1
4	Kushtia	Kushtia Sadar	Gopinath Pur	BRS	4	1	1
5	Kushtia	Kushtia Sadar	Alokdia	BRS	5	1	1
6	Kushtia	Kushtia Sadar	Barokhada	BRS	6	1-3	3
7	Kushtia	Kushtia Sadar	Jogia	BRS	7	1-3	3
8	Kushtia	Kushtia Sadar	Mangole Baria	BRS	8	1	1
9	Kushtia	Kushtia Sadar	Salda	BRS	9	1-2	2
10	Kushtia	Kushtia Sadar	Old Kushtia	BRS	10	1	1
11	Kushtia	Kushtia Sadar	Salda Arzi	BRS	11	1	1
12	Kushtia	Kushtia Sadar	Khas Joanpur	BRS	12	1	1
13	Kushtia	Kushtia Sadar	Chua Para	BRS	13	1-3	3
15	Kushtia	Kushtia Sadar	Salda Arzi	BRS	15	1	1
16	Kushtia	Kushtia Sadar	Bhobanipur/Old Kushtia	BRS	16	1	1
17	Kushtia	Kushtia Sadar	Roghunathpur	BRS	17	1-2	2
18	Kushtia	Kushtia Sadar	Hataspur	BRS	18	1-4	4
19	Kushtia	Kushtia Sadar	Boaildoho	BRS	19	1-4	4
20	Kushtia	Kushtia Sadar	Bahadur Khali	BRS	20	1-12	12
21	Kushtia	Kushtia Sadar	Kalishankarpur	BRS	21	1-21	21
22	Kushtia	Kushtia Sadar	Chouras	BRS	22	1-24	24
23	Kushtia	Kushtia Sadar	Mijompur	BRS	23	1-20	20
24	Kushtia	Kushtia Sadar	Harakrishnopur	BRS	24	1-4	4
25	Kushtia	Kushtia Sadar	Baradi	BRS	25	1-4	4
26	Kushtia	Kushtia Sadar	Minapara	BRS	26	1	1
27	Kushtia	Kushtia Sadar	Dhakajal Para	BRS	27	1-2	2
28	Kushtia	Kushtia Sadar	Fulbari	BRS	28	1	1
29	Kushtia	Kushtia Sadar	Chechua	BRS	29	1	1
30	Kushtia	Kushtia Sadar	Jogoti	BRS	30	1	1
31	Kushtia	Kushtia Sadar	Kumargara	BRS	31	1	1
32	Kushtia	Kushtia Sadar	Harra	BRS	32	1-2	2
33	Kushtia	Kushtia Sadar	Molla Teghoria	BRS	33	1-2	2
34	Kushtia	Kushtia Sadar	Rahini	BRS	34	1-2	2
35	Kushtia	Kushtia Sadar	Nagar Mohammadpur	BRS	35	1	1
36	Kushtia	Kushtia Sadar	Jogonnathpur	BRS	36	1	1
37	Kushtia	Kushtia Sadar	Nurpur	BRS	37	1	1

SL. No	District Name	Upazila Name	Mouza Name	Mouza Type	JL. No.	Sheet No.	Total Sheets
38	Kushtia	Kushtia Sadar	Ziarakhi	BRS	38	1-3	3
39	Kushtia	Kushtia Sadar	Meton	BRS	39	1	1
40	Kushtia	Kushtia Sadar	Boreataki Para	BRS	40	1-2	2
41	Kushtia	Kushtia Sadar	Boattali	BRS	41	1-4	4
42	Kushtia	Kushtia Sadar	Kobur Hat	BRS	42	1-3	3
43	Kushtia	Kushtia Sadar	Simulia	BRS	43	1-6	6
44	Kushtia	Kushtia Sadar	Boro Ailchara	BRS	44	1-6	6
45	Kushtia	Kushtia Sadar	Nolkola	BRS	45	1	1
46	Kushtia	Kushtia Sadar	Khejur Tola	BRS	46	1-2	2
47	Kushtia	Kushtia Sadar	daowari Vita	BRS	47	1	1
48	Kushtia	Kushtia Sadar	Kaliazi	BRS	48	1	1
49	Kushtia	Kushtia Sadar	Gopalpur	BRS	49	1-2	2
50	Kushtia	Kushtia Sadar	Majila	BRS	50	1-2	2
51	Kushtia	Kushtia Sadar	Fakirabad	BRS	51	1	1
52	Kushtia	Kushtia Sadar	Paitkabari	BRS	52	1-3	3
53	Kushtia	Kushtia Sadar	North Magura	BRS	53	1	1
54	Kushtia	Kushtia Sadar	South Magura	BRS	54	1	1
55	Kushtia	Kushtia Sadar	Shosha Dhama	BRS	55	1	1
56	Kushtia	Kushtia Sadar	Digha	BRS	56	1	1
57	Kushtia	Kushtia Sadar	Harudia	BRS	57	1-2	2
58	Kushtia	Kushtia Sadar	Nandia	BRS	58	1	1
59	Kushtia	Kushtia Sadar	Nazirpur Khordo Ailchara	BRS	59	1-4	4
60	Kushtia	Kushtia Sadar	Chapaigachi	BRS	60	1	1
61	Kushtia	Kushtia Sadar	Dohokola	BRS	61	1-3	3
62	Kushtia	Kushtia Sadar	Nawapara	BRS	62	1-2	2
63	Kushtia	Kushtia Sadar	Sostipur	BRS	63	1-2	2
64	Kushtia	Kushtia Sadar	Belghoria	BRS	64	1-2	2
65	Kushtia	Kushtia Sadar	KanchanPur	BRS	65	1-5	5
66	Kushtia	Kushtia Sadar	Kamalapur	BRS	66	1-2	2
67	Kushtia	Kushtia Sadar	Bongshitola	BRS	67	1	1
68	Kushtia	Kushtia Sadar	Boroitupi Durbachara	BRS	68	1-3	3
69	Kushtia	Kushtia Sadar	Shampur	BRS	69	1	1
70	Kushtia	Kushtia Sadar	Mrittikapur	BRS	70	1-2	2
71	Kushtia	Kushtia Sadar	Baroi Para	BRS	71	1-2	2
72	Kushtia	Kushtia Sadar	Madhpur	BRS	72	1-3	3
73	Kushtia	Kushtia Sadar	Sonaidanga	BRS	73	1-2	2
74	Kushtia	Kushtia Sadar	Gajnabipur	BRS	74	1	1
75	Kushtia	Kushtia Sadar	Alampur	BRS	75	1-3	3
76	Kushtia	Kushtia Sadar	Ujangram	BRS	76	1-2	2
77	Kushtia	Kushtia Sadar	Bilangdia	BRS	77	1-6	6

SL. No	District Name	Upazila Name	Mouza Name	Mouza Type	JL. No.	Sheet No.	Total Sheets
78	Kushtia	Kushtia Sadar	Goddabakhoil	BRS	78	1	1
79	Kushtia	Kushtia Sadar	Bujorbakhoil	BRS	79	1	1
80	Kushtia	Kushtia Sadar	Ashtanagar	BRS	80	1-2	2
81	Kushtia	Kushtia Sadar	Majpara	BRS	81	1-4	4
82	Kushtia	Kushtia Sadar	Sadimpara	BRS	82	1	1
83	Kushtia	Kushtia Sadar	Bamangram	BRS	83	1-3	3
84	Kushtia	Kushtia Sadar	Arpara	BRS	84	1-2	2
85	Kushtia	Kushtia Sadar	Gosai Durgapur	BRS	85	1	1
86	Kushtia	Kushtia Sadar	Gangdi	BRS	86	1	1
87	Kushtia	Kushtia Sadar	Char Natna	BRS	87	1	1
88	Kushtia	Kushtia Sadar	Karimpur	BRS	88	1	1
89	Kushtia	Kushtia Sadar	Natna	BRS	89	1	1
90	Kushtia	Kushtia Sadar	Shankardia	BRS	90	1-3	3
91	Kushtia	Kushtia Sadar	Narhardia	BRS	91	1	1
92	Kushtia	Kushtia Sadar	Baspur	BRS	92	1	1
93	Kushtia	Kushtia Sadar	Nrisingpur	BRS	93	1-2	2
94	Kushtia	Kushtia Sadar	Balrampur	BRS	94	1-3	3
95	Kushtia	Kushtia Sadar	Chaymari	BRS	95	1-3	3
96	Kushtia	Kushtia Sadar	radhanagar	BRS	96	1	1
97	Kushtia	Kushtia Sadar	Narayandi	BRS	97	1-2	2
98	Kushtia	Kushtia Sadar	Gangaborkandi	BRS	98	1	1
99	Kushtia	Kushtia Sadar	Kandorpadia	BRS	99	1-3	3
100	Kushtia	Kushtia Sadar	Asha nagar	BRS	100	1	1
101	Kushtia	Kushtia Sadar	Hativanga	BRS	101	1	1
102	Kushtia	Kushtia Sadar	Jhaudia	BRS	102	1-4	4
103	Kushtia	Kushtia Sadar	Kashinathpur	BRS	103	1	1
104	Kushtia	Kushtia Sadar	Hatia	BRS	104	1-3	3
105	Kushtia	Kushtia Sadar	Gopalpur	BRS	105	1	1
106	Kushtia	Kushtia Sadar	Deripara	BRS	106	1-3	3
107	Kushtia	Kushtia Sadar	West Abdalpur	BRS	107	1-4	4
108	Kushtia	Kushtia Sadar	Bishnudia	BRS	108	1	1
109	Kushtia	Kushtia Sadar	Shahapur	BRS	109	1	1
110	Kushtia	Kushtia Sadar	Panthapara	BRS	110	1-2	2
111	Kushtia	Kushtia Sadar	Mohisha danga	BRS	111	1	1
112	Kushtia	Kushtia Sadar	Bil Korari	BRS	112	1	1
113	Kushtia	Kushtia Sadar	Horinarayanpur	BRS	113	1-4	4
114	Kushtia	Kushtia Sadar	East Abdalpur	BRS	114	1-3	3
115	Kushtia	Kushtia Sadar	Kittinagar	BRS	115	1	1
116	Kushtia	Kushtia Sadar	Lakshmipur	BRS	116	1-4	4
117	Kushtia	Kushtia Sadar	Piarpur	BRS	117	1-2	2

SL. No	District Name	Upazila Name	Mouza Name	Mouza Type	JL. No.	Sheet No.	Total Sheets
118	Kushtia	Kushtia Sadar	Sugripur	BRS	118	1	1
119	Kushtia	Kushtia Sadar	Shantivanga	BRS	119	1-2	2

Annexure 03: Mauza Map Scanning and Digitization

1.0 Specifications for Scanning of Mauza Maps

1.1 Specifications for Scanned Images

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

1.2 Naming convention for scanned image images of Mauza Maps

File Name	**XX_XXX_XX**					
	XX					Code represents District and Thana names of the Mauza map. 1st character represents the District and the 2nd one Thana
		_				An underscore as a separator
			XXX			JL No. of the respective Mauza (3 digits)
				_		An underscore to separate JL No. and Sheet No.
					XX	Number of respective sheet No. (2 digits)
Example: **KS_003_01.tiff** represents the image file in **tiff** format of the sheet no. **01** of Sukdebpur Mauza having JL no. 3, of Sadar Thana, Kushtia District.						

2.0 Specifications for Digitization of Mauza Maps

Using the scanned images four shape files will be created for each Mauza map sheet by onscreen digitizing.

Digitization shape file name: **xx_xxx_xx_P**
xx_xxx_xx_N
xx_xxx_xx_L
xx_xxx_xx_M
xx_xxx_xx_S

2.1 Shp file name: xx_xxx_xx_P

Type: ***Point Feature***

[Example: **KS_003_01_P.shp** represents the shape file containing plot numbers of Sukdebpur Mauza having JL No. 3, sheet no. 1 of Sadar Thana, Kushtia District]

Code (ID)	Feature Name/Item
41	Boundary Pillar
42	Bench Mark
43	Iron Pillar
44	Traverse Station (Old)
45	Traverse Station (New)
46	GT Station
47	Other Pillars
51	Pucca Well
52	Tube Well
53	Mosque
54	Temple/Mondir
55	Eidgah
56	Girza
57	Mot
58	Daak Bangla
59	Factory
61	Adjacent Mauza/Sheet
62	Other Info
63	Electric Pole (EP)
64	Telephone Pole (TP)
65	Lamp Post (LP)
66	Electric Lamp Pole (ELP)
67	Deep Tube Well
68	Shallow Tube Well
71	Demarcation Pillar
72	Settlement Pillar
73	Stone
74	Station
3	Pucca Pillar
76	Municipality Pillar
77	CS Iron Pillar
88	Other Point Feature

Database structure of digitized Mauza maps:

Field Name	Field Type	Width of the field	Purpose of the field
Project	String	50	Project Location (i.e. Kushtia, etc.)
Mz_Ver	String	2	Mauza version (i.e. CS/RS)
M_Code	String	9	Code of a specific Mauza. For example, **KS_003_01_P.shp** represents the shape file containing point features of sheet no. 01 of Sukdebpur Mauza having JL no. 3, of Sadar Thana, Kushtia District.
Layer_Code	Numeric	2	Feature Code which represents the Code for declared type of the plot, i.e. 14 (Plot), 21 (Road), 23 (Khal/Canal), 24 (River), 29 (Katcha Sadak)
Layer	String	50	Feature Type which represents the declared Type of the plot, i.e. Plot (14), Road (21), Khal/Canal (23), River (24), Katcha Sadak (29)
Plot_No	Numeric	6	To contain *dag* number (plot number)
Mauza	String	50	To contain name of the Mauza
JL_No	Numeric	3	To contain JL number of the Mauza
Sheet_No	Numeric	2	To contain sheet no the Mauza
M_District	String	25	To contain the District name of a Mauza
M_Thana	String	25	To contain the Thana name of a Mauza
Scale	String	25	To contain Mauza scale (original)
Sv_Period	String	25	To contain period of the Mauza survey
Revenue_No	String	25	To contain Revenue survey number

2.2 Shp file name:xx_xxx_xx_N

Type: ***Point Feature***

[Example: **KS_003_01_N.shp** represents the shape file containing plot numbers of Sukdebpur Mauza having JL No. 3, sheet no. 1 of Sadar Thana, Kushtia District]

Code (ID)	Feature Name/Item
14	Plot

2.3 Shp file name:xx_xxx_xx_L

Type: ***Line Feature***

[Example: **KS_003_01_L.shp** represents the shape file containing plot numbers of Sukdebpur Mauza having JL No. 3, sheet no. 1 of Sadar Thana, Kushtia District]

Code (ID)	Feature Name/Item
11	BND (Mauza)
12	BND (Sheet)
13	Match Line
14	Plot
16	Embankment
17	Hill
18	Beel
21	Road
22	Halot/Ghata/Path
23	Khal/Canal
24	River
25	Rail Line
Code (ID)	**Feature Name/Item**
26	Slope
27	North Line
28	PuccaSadak
29	KatchaSadak
30	Dahor
31	Permanent Structure (Dalan)
32	Tin Shed Structure
33	Other Structure
34	Pan Baraz
35	Pond/Water-body
36	Graveyard
99	Unknown Line

2.4 Shp file name:xx_xxx_xx_M

Type: ***Polygon Feature***

[Example: **KS_003_01_M.shp** represents the shape file containing plot numbers of Sukdebpur Mauza having JL No. 3, sheet no. 1 of Sadar Thana, Kushtia District]

Code (ID)	Feature Name/Item
14	Plot
21	Road
22	Halot/Ghata/Dahor/Path
23	Khal/Canal
24	River
28	PuccaSadak
29	KatchaSadak

2.5 Shp file name: xx_xxx_xx_S

Type: ***Polygon Feature***

[Example: **KS_003_01_S.shp** represents the shape file containing plot numbers of Sukdebpur Mauza having JL No. 3, sheet no. 1 of Sadar Thana, Kushtia District]

Code (ID)	Feature Name/Item
16	Embankment
17	Hill
18	Beel
26	Slope
31	Permanent Structure (Dalan)
32	Tin Shed Structure
33	Other Structure
34	Pan Baraz
35	Pond/Water-body
36	Graveyard

Annexure 04: Location of Project office at Kushtia

Our site project office at Kushtia is located at the west side of Kushtia-Jhenaidah Highway and 20m north from Kushtia Sadar Upazila more. The name of the building is Rahat Vila. We rent 3rd floor of these Building.

Source: www.google.com.bd/maps/place/23°54'01.5"N+89°07'02.7"E

Annexure 05: TMC Meeting Comments and Adjustment on Report

SL. No.	TMC Meeting Comments	Adjustment on Report	Remarks of the Consultant
1.	Meeting minutes and summary of preliminary consultation meeting and Reconnaissance Survey should be included in Inception report.	**See Chapter 1; Section 1.11 and 1.12**	Meeting minutes not prepare because it was introducing meeting with DC of Kushtia District, Mayor of Kushtia Paurashava, UNO of Kushtia Sadar Upazila
2.	Clarify the Specification of Scan and Digitization as per TOR.	**See Chapter 4; Section 4.6.1 and 4.6.2**	Corrected
3.	Clarify the Specification of Projection System as per TOR	**See Chapter 4; Section 4.6.4**	Corrected
4.	Give Importance in Edge Matching of Mauza Sheet	**See Chapter 4; Section 4.7.2**	Corrected
5.	Clarify the Detail Specification of Resolution of DEM	**See Chapter 4; Section 4.8.3**	Corrected
6.	Sampling Technique of different survey	**This was not inserted in the ToC of this report**	This will illustrated in the Survey Report-1 with Questionnaire format
7.	Model for Drainage and Hydrology Study	**See Chapter 4; Section 4.18**	Discussed in the meeting and Drainage model will not use in this project due to time and budget constraints and not mentioned in ToR
8.	Update Paurashava Information from district wise Atlas of BBS	**See Chapter 1; section 1.8**	Corrected
9.	Give importance to Demarcate Tourism Area	**See Chapter 2; Section 2.11**	Corrected
10.	Clinical Waste Management	**See Chapter 4; Section 4.19**	Corrected
11.	Insert Local/ Site office information in Inception report	**See Chapter 1; Section 1.10 and Annexure 04**	Corrected
12.	Clarify Vision and Mission Statement of the Project	**See Chapter 1; Section 1.3 and 1.4**	Corrected
13.	Deliver Weekly and Monthly Work Schedule	**Attached a format in the annexure**	Will submit monthly progress report to PMO
14.	Final Survey Methodology		Will mentioned in the Survey Report-1 with questionnaire format
15.	Clarify the Specification of GIS database	**See Annexure 03**	Corrected
16.	Source of different Maps and Images should be included	**See Chapter 2; Section 2.2 and 2.3**	Corrected