



Government of the People's Republic of Bangladesh
Ministry of Housing and Public Works
Urban Development Directorate (UDD)

Preparation of Development Plan for Fourteen Upazilas

Package :02

**Raipura and Shibpur Upazila, District: Narsingdi &
Ishwarganj Upazila, District: Mymensingh**

DRAFT SURVEY REPORT Agriculture Survey of Shibpur Upazila

August, 2016

**Joint Venture
of**



Sheltech Consultants Pvt. Ltd

and



ARC Bangladesh Ltd



Government of the People's Republic of Bangladesh
Ministry of Housing and Public Works
Urban Development Directorate (UDD)

Preparation of Development Plan for Fourteen Upazilas

Package-02
(Ishwarganj Upazila, Mymensingh; Raipura Upazila and Shibpur
Upazila, Narsingdi)

DRAFT SURVEY REPORT

**Participatory Rural Appraisal (PRA)
of
Ishwarganj Upazila, Mymensingh**

August, 2016

Joint Venture of

**Sheltech Consultants Pvt. Limited
And
Arc-Bangladesh Limited**

JV of SCPL-ABL

Preparation of Development Plan for Fourteen Upazilas Project (Package-02)

Ref: SCPL-ABL/UDD/2016/ PRA Report/Shibpur Upazila

Date:

To

The Project Director

“Preparation of Development Plan for fourteen Upazilas” Project

Urban Development Directorate

82, Segunbagicha, Dhaka, 1000.

Subject: Submission of the Final Participatory Rural Appraisal Report of Shibpur Upazila, Narsingdi

Dear Sir,

We are pleased to submit herewith the Final PRA Report of Shibpur Upazila, Narsingdi for your kind information and further action.

Thanking you and assuring you of our best services.

Your Sincerely,

(Dr. Nurul Islam Nazem)
Team Leader, Package -2

(Md. Azibar Rahman)
Socio-economic Expert, Package -2

Encl: As stated.

Copy to:

1. Project Manager, Package-2, 14 Upazila Project, UDD
2. Director, Sheltech Consultants Pvt. Limited
3. Chairman, Arc-Bangladesh limited, Dhaka

1/E/2 Paribagh (Mazar Road), Shahbagh, Dhaka-1000, Bangladesh

Phone: +880-2-9611171 Fax: +880-2-9611172

Email: scpl.mail@gmail.com

Executive Summary

Upazila is now considered very important echelon of development that will incorporate all social, economic, administrative and infrastructure services for the region. Participatory Rural Appraisal (PRA) is an operative approach to gather information in both urban and rural areas. In this study, nine wards and eleven unions of Shibpur Upazila have been covered through PRA. Varied participants such as rich and poor, well-educated and less educated, man and woman and leaders and common people have been included in this PRA session which helps to find the problems and potentials exclusively. They have discussed about their problems and spoken about potentials. The five major problems identified and prioritized for Municipality are Poor transportation system, Problem of drainage facilities, No gas connection, Lack of street light and Poor medical facilities. Major potentials are also identified to solve these problems such as their availability of agricultural land, flourishing business, hardworking manpower, scope of fishery & poultry farming and nevertheless the remittance. There are several development priorities for Shibpur Paurashava and as well rural unions. It has been found that short-term development priorities in urban areas are those related to availing urban facilities such as improvement of communication system, connection of gas supply, establishing hospitals, drains and street light etc. which urban people generally expect from the Municipality. Their mid-term priorities are entertainment/recreational facilities, Municipality's own building/ Pourabhaban and eradication of drug addiction. Their long term priorities are development of modern transportation system and modern health facilities in the Pourashava which consequently will improve their quality of life in future. People of Shibpur Pourashava have a common understanding that if they could get the Pourabhaban, other development priorities could be achieved easily.

On the other hand, five major problems are prioritized by rural people of Shibpur such as poor communication system; poor employment opportunity; lack of health service; poor law enforcement and lack of drainage system. It has been found that most short-term development priorities in all unions are reducing unemployment, development of transportation, development of modern health services and improvement of literacy rate. Their mid-term priorities are development of transportation system, development of quality education, electricity and gas for all, enhancement of health facilities and development of drainage condition. Their long term priorities are employment generation; development of educational institutions and establishment of different industries. At a glance, development priorities are mostly related to improvement of basic needs i.e. health, education, employment and transportation to improve the quality of life of rural people of Shibpur.

Abbreviation/Acronyms

a.m.	ante meridiem
ABL	Arc Bangladesh Limited
BBS	Bangladesh Bureau of Statistics
CBOs	Community Based Organizations
CSOs	Civil Society Organizations
EPZ	Export Processing Zone
GoB	Government of Bangladesh
GIS	Geographic Information System
HH	Household
hr	hour
i.e.	that is
ICA	Institute of Cultural Affair
km	Kilometer
NGOs	Non-governmental Organizations
p.m.	post meridiem
PRA	Participatory Rural Appraisal
REB	Rural Electrification Board
SCPL	ShelTech Consultants Private Limited
ToP	Technology of Participation
ToR	Terms of Reference
UP	Union Parishad
UDD	Urban Development Directorate

TABLE OF CONTENTS

	Page No.
Letter of Transmittal	i
Executive Summary	ii
List of Abbreviation/Acronyms	iii
Table of Contents	iv
List of Tables	vi
List of Figures	vi
List of Maps	vi
List of Photographs	vi

CHAPTER ONE: PARTICIPATORY RURAL APPRAISAL: APPROACH AND METHODOLOGY

1.1	Introduction	1
1.2	Project Context for PRA	1
1.3	Purpose of PRA	2
	1.3.1 Mapping Resources and Identifying Areas	2
	1.3.2 Identifying Problems and Potentials	2
	1.3.3 Proposing Development Priorities	2
1.4	PRA Tools	2
	1.4.1 Social/Resource Mapping	3
	1.4.2 Venn Diagram (Problems and Potentials)	4
	1.4.3 Technology of Participation (ToP) Consensus Workshop on Development Needs	4
1.5	Participants and Facilitators of PRA Sessions	6
	1.5.1 The Participants	6
	1.5.2 PRA Facilitators	6
1.6	PRA Settings, and Schedule of PRA Sessions	7
1.7	PRA Process	8
	1.7.1 Preparation	8
	1.7.2 Fieldwork	8
	1.7.3 Documentation and Compilation of PRA Sessions	8
1.8	Quality Control Measures	8

CHAPTER TWO: PRAs AT MUNICIPAL WARD LEVEL

2.1	Overview of Shibpur Municipality/Pourashava	9
2.2	Spatial Aspects	11
	2.2.1 Findings of Social Mapping	11
2.3	Major Problems and Potentials	12
	2.3.1 Problems Identification	12
	2.3.2 Problems Prioritization through Venn diagram	13
	2.3.3 Identification of Potentials through Venn Diagram	13
	2.3.4 Identification of Prioritized Problems, Cause, Impact, Potentials	14
2.4	Perceived Development Priorities	16

CHAPTER THREE: PRAs AT UNION LEVEL

CHAPTER THREE: FRAS AT UNION LEVEL		Page No.
3.1	Overview	18
3.2	Spatial Aspects	18
	3.2.1 Findings of Social Mapping	19
3.3	Major Problems and Potentials	19
	3.3.1 Problems Identification	19
	3.3.2 Problems Prioritization through Venn diagram	21

3.3.3	Potentials Identification	21
3.3.4	Identification of Potentials through Venn diagram	21
3.3.5	Identification of Prioritized Problems, Cause, Impacts, Potentials	22
3.4	Perceived Development Priorities for Eleven Unions of Shibpur Upazila	23
3.4.1	Short-term Development Priorities	23
3.4.2	Mid-term Development Priorities	24
3.4.3	Long-term Development Priorities	25

CHAPTER FOUR: CONCLUSIONS

4.1	Key Observations	27
4.2	Limitations of PRA Sessions	27
4.3	Implications of PRA Findings	27

REFERENCE/BIBLIOGRAPHY	29
------------------------	----

APPENDICES

Appendix-I:	Copy of PRA TOR	30
Appendix II:	Individual PRA report of Shibpur Municipality	45
Appendix III:	Individual PRA report at Union Level of Shibpur	62

LIST OF TABLES

	Page No.
Table-1.1 Category of Participants	6
Table-1.2 PRA Team and Organization	7
Table-1.3 Schedule of PRA session	7
Table-2.1 Shibpur Pourashava	10
Table-2.2 Major Problems of Shibpur Pourashava	12
Table-2.3 Problems, Cause, Impact and Potentials	14
Table-2.4 Short Term Development Priorities of Shibpur Pourashava	16
Table-2.5 Mid Term Development Priorities of Shibpur Pourashava	16
Table-2.6 Long Term Development Priorities of Shibpur Pourashava	17
Table-3.1 Major problems of eleven unions of ShibpurUpazila	20
Table-3.2 Major potentials of eleven unions of ShibpurUpazila	21
Table-3.3 Problems, Cause, Impact and Potentials of Shibpur Upazila	22
Table-3.4 Short-term Development Priorities for eleven unions of Shibpur Upazila	24
Table-3.5 Mid-term Development Priorities for eleven unions of Shibpur Upazila	25
Table-3.6 Long-term Development Priorities for eleven unions of Shibpur Upazila	26

LIST OF FIGURES

Figure 2.1 Major Five Potentials of Shibpur Paurashava	14
--	----

LIST OF MAPS

Map 1.1 Shibpur Upazila	1
Map 2.1 Shibpur Paurashava	9
Map 3.1 Shibpur Upazila Unions	18

LIST OF PHOTOGRAPHS

Photograph 2.1 Preparing Social Map of Pourashava	11
Photograph 2.2 Social Map of Paurashava	11
Photograph 2.3 Venn diagram of problems of Shibpur Pourashava	13
Photograph 3.1 Preparing Social Map at Union Level	19
Photograph 3.2 Social Map of one union	19

CHAPTER ONE: PARTICIPATORY RURAL APPRAISAL APPROACH AND PROCESS

1.1 Introduction

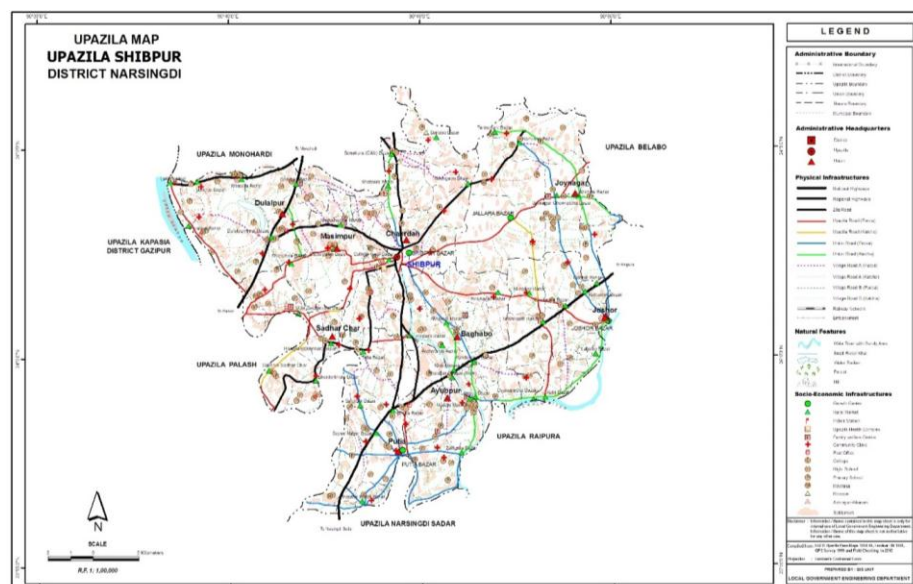
Participatory Rural Appraisal (PRA) is considered to be one of the popular and effective approaches to gather information in rural areas. This approach was developed in early 1990s with considerable shift in paradigm from top-down to bottom-up approach and from blueprint to the learning process. In fact, it is a shift from extractive survey questionnaires to experience sharing by local people. PRA is based on village experiences where communities effectively manage their natural resources.

Participatory methods have gained momentum in recent years as field practices and development experts have sought more effective ways to involve local people in decision-making. It is a way of learning from, and with, community members to investigate, evaluate constraints and opportunities and make timely decisions regarding development projects. It is a method by which a planning team can quickly and systematically collect information for the general analysis of specific topic, question, needs assessment, feasibility studies, identifying and prioritizing projects, and finally, the project evaluation. The PRA tools are implemented to achieve increased accuracy at low costs both in terms of time and money. Participatory appraisals methods are useful for accelerated knowledge, not just overall speed, but rapid rounds of field relations that result in the increasingly precise knowledge. Participation means involving local people in the development of plans and activities designed to change their lives.

1.2 Project Context for PRA

Considering the benefit of PRA, Urban Development Directorate (UDD) under Ministry of Housing and Public Works has taken initiative to collect the information on local problems with causes, impact and local potentials as well as development priorities of the local people for preparing 20 years long development plan of fourteen Upazilas under the Government of Bangladesh (GoB) funded project entitled “Preparation of Development plan for Fourteen Upazilas”. In this regard, UDD management has taken decision to conduct Participatory Rural Appraisal (PRA) Sessions at each Union level in the rural areas and one session each ward under municipality areas (see Map-1). Participatory Rural Appraisal (PRA) session has been conducted on 01 November to 05 November 2015 at Shibpur Upazila where 236 participants were involved. Social Mapping, Problems Identification and Prioritization, Potentials Identification and Prioritization, Cause and Effect Diagram and Technology of Participation (ToP) are the three PRA tools that have been applied for collecting the opinions of community people in preparing development plan for 20 years in Shibpur Upazila.

Map 1.1: Shibpur Upazila



1.3 Purpose of PRA

The main purpose of PRA is to understand local level problems from the people living in the locality. However, there are three main objectives/purposes as described below:

1.3.1 Mapping Resources and Identifying Areas

The PRA method Social mapping have been for collecting the available social, environmental and natural resources with the spatial location of the target area. This also helps the planning team to build a picture of the relevant existing structures and key actors in the target area. This process helps them to understand the social and Institutional context of their work and gives them early and essential information to different individuals, groups, and organizations who are contributing towards social well-being of the Upazila. The purposes of mapping resources are:

- To know the actual scenarios of the target area which will be helpful to the planning team in decision making for future planning.
- To identify different problems and resources in the area through social/resource mapping exercising which will be helpful to select intervention in order to minimize or reduce the problems.

1.3.2 Identifying Problems and Potentials

Venn diagram is a popular and easy PRA tool for identifying the problem including severity, severity of impact of institute/organization with comparison, people's interaction with institute/organization etc. of target area. The Venn diagram tool has been applied for analyzing the available problems with its severity. The causes, effect/ impact and potentials of problems will find out through cause, effect and potential analysis. The purpose of identifying problems and potentials are

- To identify the problems/risks (social and environmental) cause & effects and potentials of the area.
- To suggest potentials in order to minimize or reduce the problems

1.3.3 Proposing Development Priorities

Technology of Participation (ToP) has been applied for classifying the needs in context of short term, medium and long term planning. The short term means 2-5 years, the medium term means 5-10 years and the long term is more than 10 years up to 20 years. In the ToP session of PRA, participants will categorize the identified problems which will identify through social and Venn diagram method. The purposes of Top are:

- To categorize the problems which are identified through the Venn diagram exercise.
- To involve the local people in the planning process which will be helpful to create ownership approach among the local people and can possible to prepare realistic/demand based planning for the area.
- To develop short, medium and long term plan in order to meet the people's needs

1.4 PRA Tools

Three tools namely Social Mapping, Venn diagram and Technology of Participation have been selected to exercise at field level for collecting information from the field as per requirement of the Project. As per decision one PRA has conducted for each union in the case of rural area and one PRA for three wards in the municipal area of Shibpur Upazila.

1.4.1 Social Resource Mapping

Social/Resource mapping is a visual method of showing the relative location of households and the distribution of different types of people (such as male, female, adult, child, landed, landless, literate, and illiterate) together with the social structure and institutions of an area. Union/Paurashava Map, drawing paper, sketch pen; pencils, color pencils, pencil cutter, eraser, gum, sticky wall, masking tape, chalk, floor mat etc. have been needed for social/resource mapping

Purpose of Social Mapping

Social mapping is a useful PRA tool which is helpful in knowing the actual scenarios of the target area that can assist planning team in decision making for future planning. It is also helpful to identify different problems and resources in the area through map exercising that can help to select intervention in order to minimize or reduce the problems. It is the way to involve the local people in the planning process that can help to create ownership approach among the local people and can possibly prepare realistic/demand based planning for the area.

Procedure of Social/Resource Mapping

Social Mapping can be used as an effective ice breaking exercise as well as a tool to investigate the knowledge of the people about their own locality, their resources and their spatial distribution. To prepare the social map following steps were followed.

Step-1:

First the facilitator has selected two or three persons for preparation of social map who have vast knowledge about the study area as well as good hand for drawing/sketches.

Step-2

Explained the purpose to the participants for exercising the social mapping. Logistic Manager has supplied an A3 paper which has pre-drawn boundary of union through digital technology and also supplied other necessary instruments like pencil, eraser, color pencil etc.

Step-3

Asked the participants to mark the North direction of the map and to draw the wards as well as mouza boundary on the supplied paper.

Step-4

Asked the participants to draw all resources in the Union and have explained that “resources” are buildings, organizations, people, or services that are available to the community when they are needed. For example: roads, houses, health facilities (pharmacies, hospitals, clinics etc.), post office, schools/college/madrassa, religious buildings, graveyard, crematorium, water wells, markets, schools, factories, rivers, beel, pond, embankment, flood/hazard prone area, flood shelter, bus stand, launch ghat, agricultural land, forest etc.

Step-5

Asked the participants to mark where different groups in the community are living (i.e. the wealthy persons, the laborers, different religious groups, different ethnic groups etc.).

Step-6

The whole process has been watched carefully and resources in the areas have been identified and marked on the map accordingly..

Step-7

After completion of the map, facilitator has asked to the participants to identify any missing object and requested to incorporate the object (if any) in to the map.

Step-8

The completed map have been presented in the large group for verifying and discussing problems and resources which have noted for next course of action.

1.4.2 Venn Diagram (Problems and Potentials)

Another PRA tool, Venn diagram has been selected for identifying the prioritized problems and potentials for each Union/Ward. The facilitator has explained the way of performing the whole PRA session and divided the participants in to two groups. Some participants (small group) have engaged in preparing social map who have vast knowledge and clear idea about their area and also good hand in map preparation. Some participants have engaged in identifying the problems with prioritization, causes effect/impact as well as identifying potentials with prioritization. The facilitator has selected a person among the participants' for assistance to cut the paper into circular form of different size for Venn diagram and stick them on poster paper. Color poster paper has been cut into circular form according the severity of the problem and sticks them on the white color poster paper. The biggest circular sized paper indicates the most severe problem. The size of the circle has been reduced according to descending order. The main area has been stickled at the center of the poster paper. Necessary correction has been made in the problems diagram by participants. Most of the participants have participated in order to identify the problems and prioritized the problems with causes, impact and potentials. After a long discussion, the participants have come to the consensus to identify the five major problems on priority basis. Then the prioritized problems and potentials were represented by the Venn diagram.

1.4.3 Technology of Participation (ToP) Consensus Workshop on Development Needs

Technology of Participation is very purposeful PRA tool because it is unparalleled for getting people's in-depth knowledge and views about their assets, problems, potentials, development needs and planning aspirations. It is also effective to engage all the group members in contributing thoughts and ideas and participate in generating a clear plan of action for a specific event or activity which is helpful to prepare problem minimizing sustainable plan. Flip chart, sticky wall, spray, masking tape, sticky glue, board pin, Meta cards, white papers, color markers, sign pens, poster papers, registration signup sheets, camera and videos, etc. are needed to prepare ToP. The tool is effective to identify the short, medium and long term development priorities.

Step-1 (This session is called Warm Up)

At the beginning of the session, the facilitator has explained the objectives of the ToP, those are as follows;

- To identify priorities for development and planning for next 20 years by major sectors for sub-regional, structural, urban, rural action plans based on the identified locations, issues, problems and potentials to be gathered from social mapping and Venn diagram.
- To get in people's in-depth knowledge and views about their assets, problems, potentials, development needs and planning aspirations.

- In all cases spatial dimension of local people's information will be checked for development planning purpose.

Step-2 (This session is called Orientation)

The facilitator has ensured all necessary materials including Social/Resource Map, identified problems as well as potentials with prioritization through Venn diagram and hanged on the wall.

Step-3 (This session is called Brainstorming)

The facilitator has asked to participants what they have got in the previous sessions (Problems, Causes, Impact and Potentials) for planning and requested to close their eyes for 1 (one) minute and visualize their dream, what they want to see their upazila as a whole or what they wanted to see taking place in next 20 years in their area.

Step-4 (The session is called Organizing)

Then the facilitator has asked the participants to think individually on the focus question and write 5 ideas in note book in next 5 minutes. The facilitator suggested them to write best two ideas on separate Meta card as well. The Co-Facilitator has collected 1st Meta card and read each card and checked if all are clear on the theme, if not then asked the writer to clarify the content and hanged on the wall, then the facilitator asked the participants for pairing on wall and afterwards he collected the 2nd Meta card in same way.

Step-5 (The session is called Naming)

Then the facilitator has categorized the cards according to the consensus of the participants in considering the similarity and has given a common title of each group. Then all the Meta cards of each group have posted on the wall under the common title.

Step-6 (Conversation on Priorities)

For identifying development priorities for short-term (within 5 years), medium (5-10 years) and long term (10-20 years) planning, the facilitator has asked the followings:

Which of these are you most passionate about?

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

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

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

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

Step-7 (Closing reflection)

At the end of PRA with ToP, the facilitator has asked following questions:

What one thing/term/phrase do you remember from the day?

What one activity you did today?

What did you like? High point?

What didn't you like? Low point?

What did go well? What went wrong?

What one thing you will take from here? Participants will be asked to make a comment or to express one thing they will do after this event.

1.5 PRA Participants and Facilitators

1.5.1 The Participants

15-20 participants have been selected from each union for rural area and each three wards under municipal area. The category of target participants were: Ward Members, Ward/Union Councilors, Teachers, Businessmen/Dealers/Brokers/Traders, NGOs/CSOs/Union, Imams/religious priests or leaders, Farmers/laborers, Journalist, Professional (physician/engineers), Local elite/politician/Others. The participants were also be knowledgeable, showing willingness to participate and local residents. PRA team has communicated frequency to the concerned union parishad officials in order to ensure the participation of different categories of people from the concerned union/ward as mentioned earlier.

Total 236 participants have attended in the PRA sessions in 10 different study locations of Shibpur Upazila from 01-05 November 2015 towards. PRA session has started at 11:00 a.m. and continued up to 14:30 p.m.

1.5.2 Field Facilitators

As per ToR (see Annexure-I), PRA team has formed comprising one Planner, one Social Scientist (Facilitator), one Graduate from any field (Co-Facilitator cum Rapporteur) and one Logistics Manager. Half day training was given to the team members on the selected PRA tools and techniques. Two teams have worked together in two unions as a part of on the job training for team members at the beginning stage and then teams have worked individually. Name and Designation of PRA team members shown in Table-1.1

Table-1.1: PRA Team and Organization

PRA Team	Organization
Md. Azibar Rahman: Social Expert and key facilitator	Sheltech Consultants Pvt. Limited And Arc-Bangladesh, Dhaka
Rakeeb Askari and Md. Walid Reza: Co-Facilitators	
Mehedi Alam: Logistics Manager	
Md. Rubaiyat Islam: Rapporteur	

1.6 PRA Settings, and Schedule of PRA Sessions

PRA workshops were conducted in a convenient time when the Union Chairman and members along with local knowledgeable and experienced participants were able to spend few hours at a convenient location decided by the local people. Facilitators contacted with local contact persons and arranged timely arrival and facilitation of these workshops. Up officials and the planning team of the Package 2 set several times to discuss the goals and procedures of the PRA. Then the Project Director and his UDD team set with the social expert with other planning team members to finalize the tools of PRA, the detailed steps of PRA techniques followed, and the formats of the sessions, the criteria of participants, and the reporting were settled. Then half day training was given to the team members on the selected PRA tools and techniques. Two teams have worked together in two unions as a part of on the job training for team members at the beginning stage and then teams have worked individually. PRA session has been scheduled before lunch and continued up to 3-4 hours with the participants. After PRA session preparation of materials and social/resource mapping has been conducted. Schedule of PRA sessions conducted in Shibpur can be seen at a glance in Table-1.2.

Table-1.2: Schedule of PRA Session

	Shibpur Upazila		Shibpur Paurashava	
	Name of Union	PRA Date	Name of Ward	PRA Date
01	Sadharchar Union	01-11-2015	All wards	05-11-2015
02	Ayubpur Union	03-11-2015		
03	Baghab Union	03-11-2015		
04	Chokrodha Union	05-11-2015		
05	Dulalpur Union	02-11-2015		
06	Joynagar Union	01-11-2015		
07	Masimpur Union	01-11-2015		
08	Putia Union	01-11-2015		
09	Sadherchar Union	01-11-2015		

1.7 PRA Process

1.7.1 Preparation

Necessary materials like flipchart paper, poster paper, drawing paper, Meta card, A4 size paper, art line pen, sketch pen, wooden pencils, erasers, pencil cutter, scotch tape, scissors, wall mat for displaying Meta card etc have purchased for conducting PRA sessions. Banner and some digital festoons have prepared based on sample and objectives of Social mapping, Venn diagram and Technology of Participation (ToP) for the purpose of practically acquaint to the participants on the methods during PRA sessions. Digital festoon also prepared on Norms of the PRA session for maintaining the discipline in the whole sessions during conduction

1.7.2 Fieldwork

Trained field facilitators have been responsible for contacting, inviting and confirming minimum number of participants of PRA representing the target area (Union Parishad/Municipal Ward) maintaining professional standards and integrity by informing the purpose of contacts, the role of host and consulting agencies of the project, the previous visits and contacts by the project team, the procedure of conducting PRA sessions. PRA sessions were scheduled in consultation with the Ward Members/Ward Councilors, Teachers, Businessmen/Dealers/Brokers/Traders, NGOs/CSOs/Union, Imams/religious priests or leaders, Farmers/laborers, Journalist, Professional (physician/engineers), Local elite/politician/Others of the area. 15-20 participants have been selected from each union for rural area and each three wards under municipal area. PRA session has been held at Union Parishad of all unions. Chairs have been provided for siting of participants. Everybody has been encouraged to talk and not letting someone dominate rather building consensus. Facilitators also confirmed reflection session by asking one male and one female participant to tell briefly their evaluation on the PRA process and finally make all the participants to take oath to continue support in future project activities especially helping consulting firms during other surveys in Shibpur.

1.7.3 Documentation and Compilation of PRA Sessions

Proper & timely documentation was an integral part of these PRA sessions. Facilitators compiled all notes and checked Meta cards, flip charts and sticky wall materials to document individual PRA report covering the group dynamics, description of the Union/Municipality, and outputs like social map, identification of problems and potentials, and long, medium and short term development needs. Individual PRA report has been written at night of the same day of PRA session using Laptop computers. The team took help of digital

photographs taken in the PRA session. Finally, all hard copies of each PRA session have been preserved in separate file with names in it.

1.8 Quality Control Measures

Project management officer of Urban Development Directorate (UDD) has visited the site suddenly with his team. Team leader of this project has also suddenly visited the place. They fixed PRA session with people. Different types of people (from local leader to common people) have participated in this session. After day to day PRA session they finished their documents at night. They also checked sitting arrangement of people who have been participated in that session.

CHAPTER TWO: PRAs At MUNICIPAL WARD LEVEL

2.1 Overview of Shibpur Municipality/Paurashava

Shibpur Paurashava under the administrative jurisdiction of Shibpur Upazila in Narsingdi District has an area of 9.00 sq.km. The boundary of the study area is: **North:** On the north side of the study area, Chokrada Union and Monohordi Upazilla are situated; **West:** On the west side of the study area, Masimpur Union is situated; **South:** On the south side of the study area, Putia Union is located; **East:** On the east side of the study area, Chakradha Union, Bagabo Union and Joynagar Union are located (please see Map 2.1). Some important features of Shibpur Paurashava have been accumulated in Table 2.1.

Map 2.1: Shibpur Paurashava

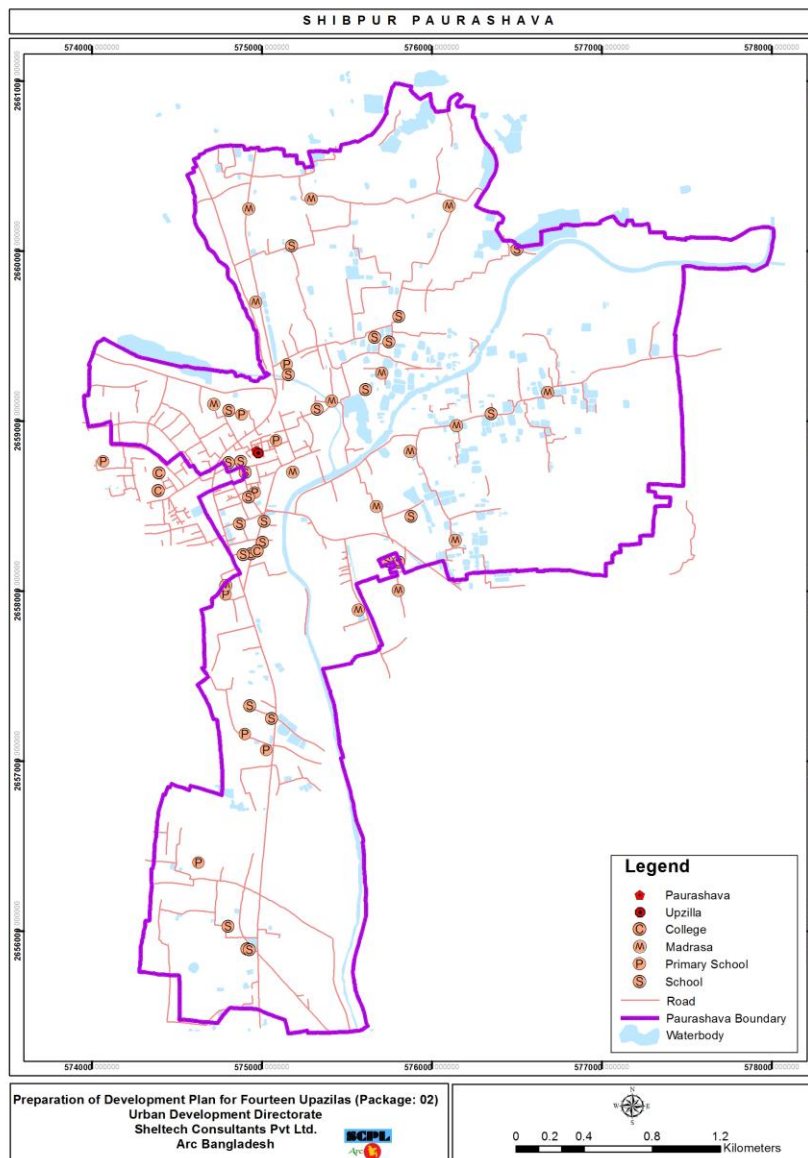


Table 2.1: Shibpur Paurashava	
Features/ Characteristics	Remarks
Population	25000(Muslim 22000and Hindus 3000)
Male	15000
Female	10000
Literacy Rate	85%(Male 45%and female 40%
Hat Bazar	1
High school	3
Junior School	7
Madrasa	3
Govt. Primary school	6
Registered Primary school	2
Health center	1
Union land office	2
Road	9K.M.(Pucca 7K.M. and earthen 2 K.M.
River road	4k.m.
Religious institution	20(Mosque18 and mondir2)
Fire service station	1
Petrol pump	1
Auditorium	1
Freedom fighter bhavan	1
Dakbanglo	1
Post office	1
Restaurant	12
Others(Gas field ,ancient archeology, mineral resources)	
Eidgaon	2
Exhibition field	2

Source: Shibpur Paurashava, 2015

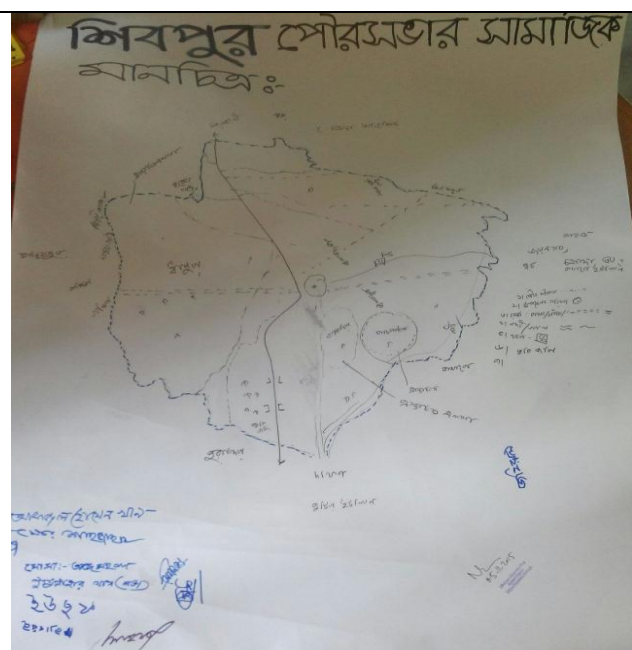
2.2 Spatial Aspects

Social mapping is useful PRA tool which is helpful in knowing the Spatial Aspects of the target area that can assist of planning team in decision making for future planning. It is also helpful to identify different problems and resources in the area through map exercising that can helpful to select intervention in order to minimize or reduce the problems.

The Facilitator has selected two or three persons for preparing the social map of Shibpur Paurashava who have vast knowledge about the area as well as good hand for drawing of map. Then the participants were asked to draw all resources in the Union and have explained that “resources” are buildings, organizations, people, or services that are available to the community when they are needed. “like; roads, houses, health facilities (pharmacies, hospitals, clinics etc.), post office, schools/college/madrassa, religious buildings, graveyard, crematorium, wells, public toilets, markets, schools, factories, rivers, beel, pond, embankment, flood/hazard prone area, cyclone shelter, bus stand, launch ghat, agricultural land, forest, etc.



Photograph 2.1: Preparing Social Map of Paurashava



Photograph 2.2: Social Map of Shibpur Paurashava

2.3 Major Problems and Potentials

2.3.1 Problems Identification

Most of the participants have participated in order to identify the problems and prioritized the problems with causes, impact and potentials. The following problems have been identified during PRA which are as follows:

Table 2.2: Major Problems of Shibpur Paurashava

Major Problems of Shibpur Paurashava	
Type of problems	Ward No
<ul style="list-style-type: none"> • Inadequate drainage system • Waterlogging • Poor communication system and broken road • No street Light • Problem of conservancy management • No gas connection (Ward no 1,2,3,6 and 9) • Inadequate Water supply • Shortage of pure drinking water • Problem of sanitation • No cold storage • Shortage of agricultural machineries services • Inadequate cyclone shelter • Inadequate medical facilities • Shortage of doctor, treatment and medicine • No government college and university • Problem of drug addiction 	All Wards

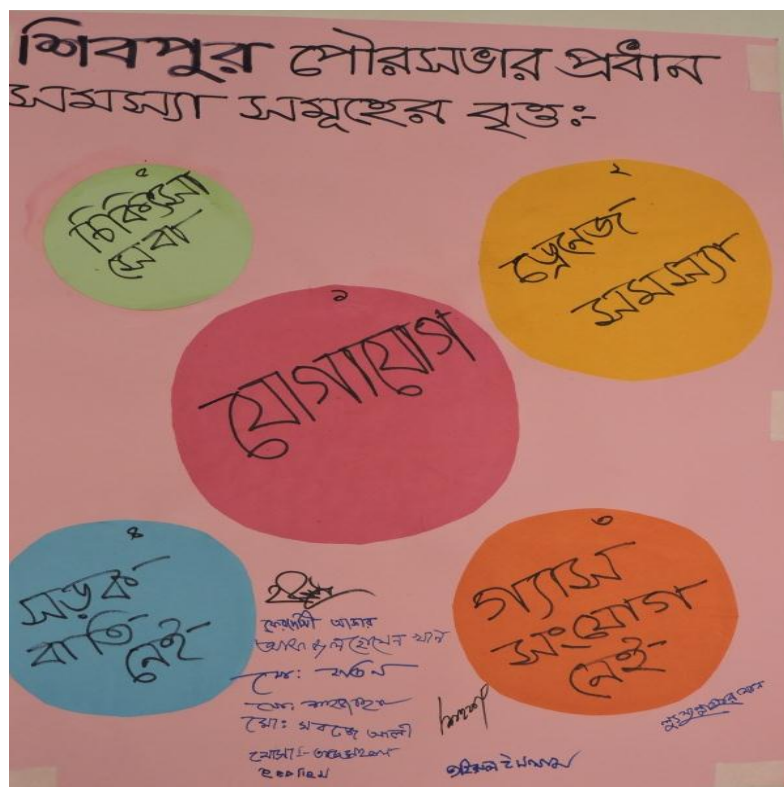
Source: PRA, 2015

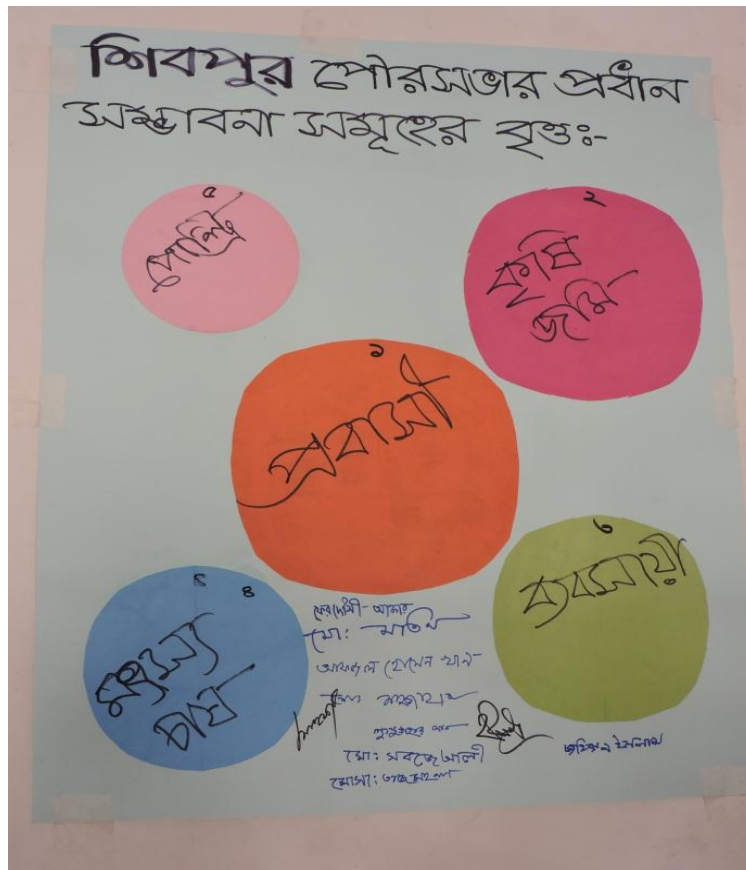
*Note: * Individual PRA at Municipal Ward Level has been attached in Annexure: II*

2.3.2 Problems Prioritization through Venn diagram

After a long discussion, the participants have come to the consensus to identify the 5 major problems as priority basis. The five major problems are as follows;

1. Poor transportation system
2. Problem of drainage facilities
3. No gas connection
4. Lack of street light
5. Poor medical facilities





Photograph 2.4: Major Five Potentials of Shibpur Paurashava

2.3.4 Identification of Prioritized Problems, Cause, Impact, Potentials

After identification of the problems and potentials, the large group has engaged to identify the causes and effect/impact of problems and potentials in the area. The problems, causes, impact and potentials have furnished in the following table;

Table 2.3: Problems, Cause, Impact and Potentials

Identified Problems	Causes	Impact	Potentials/Probability
1. Poor communication system	<ul style="list-style-type: none"> • Broken road • No elected mayor • Shortage of fund 	<ul style="list-style-type: none"> • Often occurs accident and facing • Problem of stealing and robbing. 	<ul style="list-style-type: none"> • Enough space for widening of roads • Hard working people
2. Drainage problem	<ul style="list-style-type: none"> • Lack of drains • Shortage of fund 	<ul style="list-style-type: none"> • Creates water logging • Roads are broken 	<ul style="list-style-type: none"> • Enough land for build drain
3. No gas connection	<ul style="list-style-type: none"> • Bureaucratic complexity • Negligence of top level 	<ul style="list-style-type: none"> • Increase fuel cost • Increase environmental pollution • Municipality citizen Deprive of f municipality facilities • Day by day trees and forest less in the locality 	<ul style="list-style-type: none"> • Gas line supply by the municipality
4.No street lights	<ul style="list-style-type: none"> • Shortage of fund • Existing street lights are damages due to lack of maintenance 	<ul style="list-style-type: none"> • Lack of street light • Law and order situation is not good • People are facing various harassment 	<ul style="list-style-type: none"> • Electricity line already supply in the municipality area
4. Emergency health services	<ul style="list-style-type: none"> • Inadequate hospital/clinic • Shortage of good doctor • Shortage of medicine 	<ul style="list-style-type: none"> • People are facing barrier to health services • People has died due to shortage of emergency health services 	<ul style="list-style-type: none"> • Enough Govt. land to established hospital

Source: PRA, 2015

Note: * Individual PRA at Municipal Ward Level has been attached in Annexure: II

2.4 Perceived Development Priorities

Based on Individual Ward Level PRA reports (please see Annexure: II), the recommended development priorities of Shibpur Paurashava have been outlined in Table-2.4, 2.5 & 2.6. It has been found that short-term development priorities are those related to availing urban facilities such as improvement of communication system, connection of gas supply, establishing hospitals, drains and street light etc. which urban people generally expect from the Municipality. Their mid-term priorities are entertainment/recreational facilities, Municipality's own building/ Pourabhaban and eradication of drug addiction. Their long term priorities are development of modern transportation system and modern health facilities in the Paurashava which consequently will improve their quality of life in future. People of Shibpur Paurashava have a common understanding that if they could get the Pourabhaban, other development priorities could be achieved easily.

Table 2.4: Short Term Development Priorities of Shibpur Paurashava

Short Term Development Priorities	Ward No
<ul style="list-style-type: none"> • Develop modern transportation system • Development of modern health services. • Demand of gas connection • Improve drainage system • Street light • Demand of Dustbin • Demand of drug addiction free Paurashava • Demand of Paurashava election • Demand of Pourabhavan. • Establish recreational facilities 	All Ward

Table 2.5: Mid Term Development Priorities of Shibpur Paurashava

Mid Term Development Priorities	Ward No
<ul style="list-style-type: none"> • Demand of Paurabhavan/Municipality Building. • Develop modern transportation system • Improve drainage system • Development of entertainment system. • Demand of drug addiction free Paurashava 	All Ward

Table 2.5: Long Term Development Priorities of Shibpur Paurashava

Long Term Development Priorities	Ward No
<ul style="list-style-type: none"> • Develop modern transportation system • Establish modern health facilities • Improve recreational facilities • Establish Paurabhaban 	All Ward

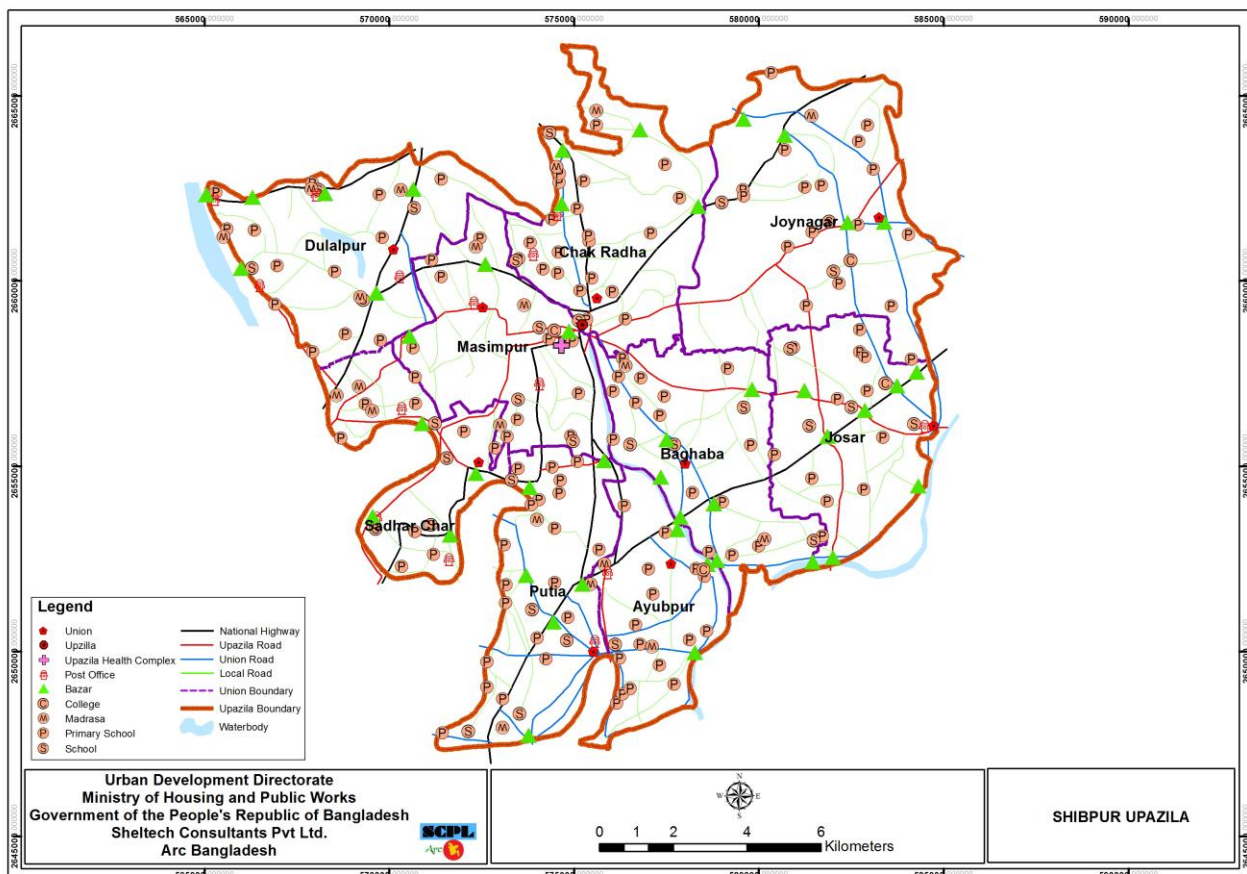
CHAPTER THREE: PRAs at UNION LEVEL

3.1 Overview

The Shibpur, the second biggest upazila of Narsingdi zila in respect of area, came into existence in 1918 and was upgraded to upazila in 1984. It is generally believed that in long past it was a centre of worship of God Shib. The upazila might have derived its name as Shibpur from the name of Shib a hero of mythology. Shibpur Upazila (Narsingdi district) is located in between 23°56' and 24°07' North Latitudes and in between 90°38' and 90°50' East Longitudes. It has an area of 206.89 sq. km. It has 9 Wards, 9 Unions, 132 Mouzas and Mahallas, and 194 villages (BBS, 2011). It is bounded by Monohardi Upazila on the North, Raipura, Narsingdi Sadar and Palash Upazilas on the South, Belabo and Raipura Upazilas on the East, Palash and Kapasia Upazilas on the West. It is formed as Thana on 12 January 1918.

Shibpur Upazila is consisted of nine unions named Ayubpur Union, Bagabo Union, Chakradha Union, Dulalpur Union, Jaynagar Union, Masimpur Union, Joshar Union, Putia Union (please see Map 3.1). Area of unions of Shibpur Upazila is 205.4 sq km. Total Population is 2, 54,751 and density is 1282. Average literacy rate of the unions is 48.8 %.

Map 3.1: Unions of Shibpur Upazila



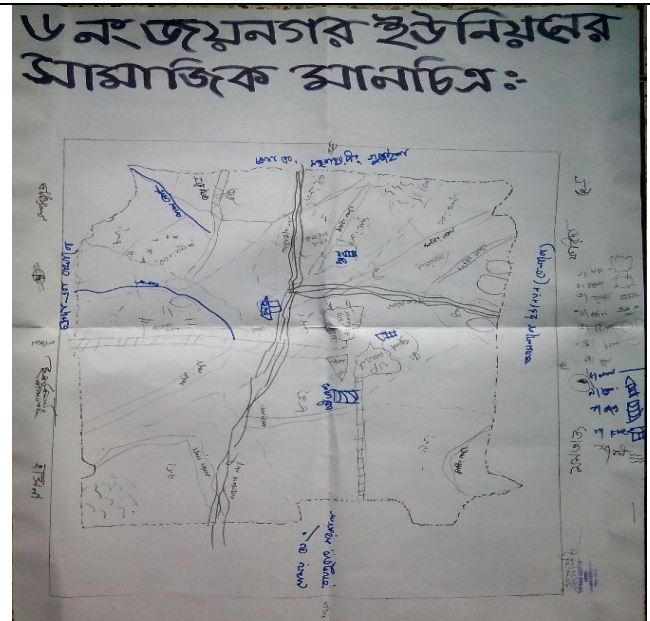
3.2 Spatial Aspects

Social mapping is useful PRA tool which is helpful in knowing the Spatial Aspects of the target area that can assist of planning team in decision making for future planning. It is also helpful to identify different problems and resources in the area through map exercising that can helpful to select intervention in order to minimize or reduce the problems.

The Facilitator has selected two or three persons for preparing the social map of specific union areas who have vast knowledge about the area as well as good hand for drawing of map. Then the participants were asked the participants to draw all resources in the Union and have explained that “resources” are buildings, organizations, people, or services that are available to the community when they are needed. “like; roads, houses, health facilities (pharmacies, hospitals, clinics etc.), post office, schools/college/madrassa, religious buildings, graveyard, crematorium, water wells, public baths, markets, schools, factories, rivers, beel, pond, embankment, flood/hazard prone area, flood shelter, bus stand, launch ghat, agricultural land, forest, etc.



Photograph 3.1.1: Preparing Social Map at Union Level (Joynagar Union)



Photograph 3.1.2: Social Map of one Union (Joynagar Union)

3.3 Major Problems and Potentials

3.3.1 Problems Identification

Most of the participants have participated in order to identify the problems and prioritized the problems with causes, effect/impact and potentials. The following problems have been identified during PRA which are as follows:

Table 3.1: Major problems of nine unions of Shibpur Upazila

1.	Water logging	1, 2, 3, 4
2.	Lack of drainage system	1, 2, 6, 7, 8
3.	Lack of health services	1, 2, 3, 4, 5, 7, 9
4.	No job opportunity	All (except 4)
5.	Poor communication system	All
6.	Environmental pollution	7, 8
7.	No gas/Fuel	1, 3, 5, 8
8.	Unplanned electricity connection	2, 4, 5, 7, 9
9.	No excavation of river/canal	6
10.	Unplanned excavation of pond	1, 6
11.	Deforestation	3
12.	Lack of sanitation system	3, 7, 9
13.	Dearth of pure drinking water	5, 6, 9
14.	Lack of canal digging	5, 6, 9
15.	Poor law enforcement system	2, 3, 6, 7, 8, 9
16.	Lack of playground and cultural hub	2, 7
17.	Problem of drug addiction.	6, 7, 9

Source: PRA Survey, 2015

Note: * 1= Ayubpur Union, 2 = Bagabo Union, 3 = Chakradha Union,
4 = Dulalpur Union, 5 = Joynagar Union, 6 = Joynagar Union,
7 = Joshar Union, 8 = Putia Union, 9 = Sadherchar Union,

3.3.2 Problems Prioritization through Venn diagram

After a long discussion, the participants have come to the consensus to identify the 5 major problems as priority basis. The five major problems are as follows;

1. Poor Communication System
2. Poor Employment opportunity
3. Lack of health service
4. Poor law enforcement system
5. Lack of drainage system

3.3.3 Potentials Identification

Table 3.2: Major potentials of nine unions of Shibpur Upazila

Sl.	Major Potentials	Unions*
1.	Bill and water bodies	1
2.	Agricultural	1, 3, 4, 5, 9
3.	Fisheries.	All (Except 6 & 7)
4.	Poultry	All (Except 6)
5.	Remittance	1, 5, 8, 9
6.	Hardworking People.	1, 3, 8
7.	Small and cottage industry	1, 7
8.	Tourism	2, 7
9.	Industrialization	2, 9
10.	Cultivating of vegetables and fruits	5, 7
11.	Skilled and active human resource	5, 6, 7, 9
12.	Gas field	7
13.	Cultivation of vegetables and fruits	3
14.	Highway	4, 5, 8
15.	Archeological site	8
16.	Cattle rearing	5, 8, 9

Source: PRA Survey, 2015

Note: * 1= Ayubpur Union, 2 = Bagabo Union, 3 = Chakradha Union,

4 = Dulalpur Union, 5 = Joynagar Union, 6 = Joynagar Union,

7 = Joshar Union, 8 = Putia Union, 9 = Sadherchar Union,

3.3.3 Identification of Potentials through Venn diagram

After identification of problems with prioritization, the next step has to identify the potentials of the respective area which may be used as resources during planning. The potentials are as follows;

1. Poultry
2. Fisheries.
3. Agricultural
4. Remittance
5. Skilled and active human resource

3.3.4. Identification of Prioritized Problems, Cause, Impact, Potentials

After identification of the problems and potentials, the large group has engaged to identify the causes and effect/impact of problems and potentials in the area. The problems, causes, impact and potentials have furnished in the following table:

Table 3.3: Problems, Cause, Impact and Potentials of Shibpur Upazila

Identified Problems	Causes	Impact	Potentials/Probability
1. Poor communication system	<ul style="list-style-type: none"> Broken roads Narrow roads 	<ul style="list-style-type: none"> Increase communication system. Problem of transportation for various products. Increase transport cost. 	<ul style="list-style-type: none"> Sand and soil in the area Hardworking people
2. Poor Employment opportunity	<ul style="list-style-type: none"> No employment 	<ul style="list-style-type: none"> Drug addiction Stealing and robbing 	<ul style="list-style-type: none"> Vocational training Employment opportunity
3. Lack of health service	<ul style="list-style-type: none"> Lack of doctor Lack of medicine Lack of ambulance Underdeveloped union health complex Underdeveloped transportation 	<ul style="list-style-type: none"> Poor people are depriving from health treatment Delivery and pregnant women are not getting proper treatment in proper time 	<ul style="list-style-type: none"> Existing community clinic
4. Poor law enforcement system	<ul style="list-style-type: none"> For this situation due to unemployment. No opportunity to work in local industries for the local people. Administration and police are self-destroyed mentality 	<ul style="list-style-type: none"> Increase terrorism ,stealing and robbing Increase social instability 	<ul style="list-style-type: none"> Any support from local administration.
5. Lack of drainage system	<ul style="list-style-type: none"> No drain for enough water passing No drain for passing water in entire union. 	<ul style="list-style-type: none"> Every year affected by water logging Increase financial losses 	<ul style="list-style-type: none"> Enough land and any development

3.4 Perceived Development Priorities for eleven unions of Shibpur Upazila of Narsingdi District.

Based on Individual Ward Level PRA reports (please see Annexure: III), the recommended development priorities of Shibpur Upazila's Unions have been outlined in Table-3.4, 3.5 & 3.6. It has been found that most short-term development priorities in all unions are reducing unemployment, development of transportation, development of modern health services and improvement of literacy rate. Their mid-term priorities are development of transportation system, development of quality education, electricity and gas for all, enhancement of health facilities and development of drainage condition. Their long term priorities are employment generation; development of educational institutions and establishment of different industries. At a glance, development priorities are mostly related to improvement of basic needs i.e. health, education, employment and transportation to improve the quality of life of rural people of Shibpur.

Table 3.4: Short term Development Priorities for nine unions of Shibpur Upazila

Short Term Development Priorities	Unions
• Demand of for gas connection.	1, 2 , 7
• Demand for cold storage	1, 7
• Literacy rate increase	1, 5 , 6 , 7
• Reducing unemployment	All
• Development of transportation	All
• Development of fisheries	1
• Development of modern health services	All
• River and canal dredging.	3,
• Demand of established new school building	1, 3
• Drug free society	2, 9
• Reduction of water logging	3,

Note: * 1= Ayubpur Union, 2 = Bagabo Union, 3 = Chakradha Union,

4 = Dulalpur Union, 5 = Joynagar Union, 6 = Joynagar Union,

7 = Joshar Union, 8 = Putia Union, 9 = Sadherchar Union,

Table 3.5: Midterm Development Priorities for nine unions of Shibpur Upazila

Mid Term Development Priorities	Unions
• Cold storage	1
• Development of transportation	1, 2, 4, 7, 8, 9
• Developed quality educational system	1, 3, 4, 5
• Electricity and gas for all	1, 3, 5, 8
• Demand of Educational institute	1, 2, 8
• Development of employment	1, 9
• Enhancement of health amenities	2, 4, 8
• Demand of developed drainage system	5, 6, 8

Note: * 1= Ayubpur Union, 2 = Bagabo Union, 3 = Chakradha Union,
4 = Dulalpur Union, 5 = Joynagar Union, 6 = Joynagar Union,
7 = Joshar Union, 8 = Putia Union, 9 = Sadherchar Union,

Table 3.6: Long term Development Priorities for nine unions of Shibpur Upazila

Long Term Development Priorities	Unions
• Demand of cold storage	1, 8
• Demand of development of transportation.	1, 6
• Demand of employment generation	All
• Develop educational institution	1, 4, 5, 6, 7
• Demand of establishing industries	2, 3, 5, 6
• Demand of technical training for women	4

Note: * 1= Ayubpur Union, 2 = Bagabo Union, 3 = Chakradha Union,
4 = Dulalpur Union, 5 = Joynagar Union, 6 = Joynagar Union,
7 = Joshar Union, 8 = Putia Union, 9 = Sadherchar Union,

CHAPTER FOUR: CONCLUSION

4.1 Key Observations

The key observations of PRA study are:

- From the social mapping, it is evident that Shibpur Paurashava and all 09 unions are having almost common problems. All the problems or issues indicated or identified by the local skilled persons with the spatial location of the issues.
- Most of the participants have participated in order to identify the problems and prioritized the problems with causes, impact and potentials. Total 38 no of problems have been identified from the study areas, of which Insufficient Educational Facilities, Unemployment, Water logging, Poor communication system and Poor medical facilities are the common problems in all locations. Again, Lack of vocational training, Electricity Problem and some social problems like drug addiction, early marriage, and corruption are also identified as their less important problems. Among all the study areas, in spite of being a Paurashava, Shibpur Paurashava is also suffering from lack of medical facilities, educational, communication, Absence of gas connection, waterlogging and so on.
- From the opinions of local people, there is no gas connection in the study locations. The people from Joynagar, Bagabo, Dulalpur are suffering from Insufficient Electricity Supply. All the study areas' communication systems are very poor except Chakradha and Joshar Union. Masimpur, Aiubpur, Putia, Sadherchar, Dulalpur and Shibpur Paurashava are experiencing serious water logging among all other areas due to lack of drainage system. There is a limitations of improved, modern hospital, experienced doctor and other medical facilities in all the areas. In the educational sector Dulalpur, Joynagar, Bagabo are suffering most in all other areas. Again the people also spoke about Lack of industries, Lack of Playground/ Park and cultural amenities, Unemployment as their less prominent problems.
- The local inhabitants also identify the potentials of the respective area which may be used as resources during planning. Most of the participants mentioned Agricultural land (Paddy), Fisheries, Fruit garden, Poultry Farm, Foreign Remittance and Cattle Rearing as their main potential to development among all the identified potentials.
- The participants have demanded the development in many aspects which needs to be fulfilled for improving their lifestyle as well as environment. The demands are not same for all the areas and sometime the demands are asked by more than one participant. It is found that, most of the demands are concentrated in the communication, education, electricity, employment sector and found almost all the area. On the other hand, gas supply, auditorium, park facilities are asked by few people from one or two union

4.2 Limitations of PRA Sessions

PRA teams have faced many challenges during the sessions which are summarized as follows;

- Session couldn't not possible to start in notified time 9.00 AM due to lack of participants
- It was very difficult to draw the boundary of the Wards and Union.
- It was very difficult to express the affected area in the unit and cost of assets damaged also.
- It was difficult to complete three PRA methods within 3.5 H.
- People are in confusion that whether the plan will implement in future or not.

4.3 Implications of PRA Findings

There are certain important implications of PRA findings. First, the findings are first hand, gathered for directly from the people who face the problems. Outsiders' views are not usually appropriate for decision making at local level.

Second, PRA methodological processes are kind of techniques which make the participants aware of the area, context of the activities at local level and exercise thinking of their own for identifying and solving problems. Even if they perceive some of the issues wrong, the facilitators can bring them on the right track.

Third, since PRA sessions include diversified participants, such as rich and poor, well-educated and less educated, man and woman and leaders and common people, it gives an inclusive process of getting insights into the problems. Through such exercise real issues and problems can be observed by the facilitators and planners.

Finally, PRA findings can be used as cross check for other findings generated through conventional methods. PRA also gives the participants a level of confidence and a feeling that they are important actors in the development of their own area.

REFERENCE/BIBLIOGRAPHY

BBS (2011) Population Census-2011, Bangladesh Bureau of Statistics

ICA Bangladesh. (2015). www.ica-bangladesh.org. Dhaka: ICA Bangladesh.

ToP Network. (2015). www.top-network.org retrieved December 2, 2015.

UDD. (2015). TOR. Dhaka: Urban Development Directorate.



Government of the People's Republic of Bangladesh
Ministry of Housing and Public Works
Urban Development Directorate (UDD)

“Preparation of Development Plan for Fourteen Upazilas”

Participatory Rapid Appraisal (PRA) Guideline

A. Purpose of PRA

- i) To involve the local people in the planning process by letting the local people identify their own problems, potentials, development needs and planning priorities for next 20 years.
- ii) To match PRA findings matching with technical analysis of different sectoral findings, particularly for spatial analysis and GIS mapping, and to supplement other data sources.
- iii) To make participants own the project and its activities towards realizing participatory planning approach.

B. PRA Tools to be used:

1. Social Mapping
2. Venn Diagram
3. Technology of Participation (ToP™) Consensus Workshop

C. Duration of PRA Session: 3 hours 30 minutes – 4 hours

D. Venue: UP meeting room for union level PRA, school or community space for municipal ward level PRA

E. Field Facilitators:

Facilitator and Co-Facilitator and Rapporteur: These three persons will be responsible for communication with and confirming participants, facilitating sessions and documenting. Among three, two persons will interchangeably play role as facilitator and co-facilitator and are responsible to communicate, coordinate and facilitate the PRA session; material distribution, assist facilitators and participants and one person responsible for taking notes, record and take photos/videos of the PRA Session.

F. PRA Participants

For each PRA, 15-20 persons who are knowledgeable, willing and local representing Union or municipal wards are must. The participants include --- Ward Members/Ward Councillors, Teachers, Businessmen/dealers/brokers/traders, NGOs/CBOs/Clubs, Imams/religious priests or leaders, Farmers/labourer, Journalist, Professional (physician/engineers), Local elite/politician/Other.

G. Roles of Field Facilitators in the Field

1. Collection of Materials and Contact Lists

Field facilitators will ensure collection of materials including maps and logistics, official letter, and contact lists and any other administrative and logistics in consultation with the management. In case of any issue, social expert needs to be informed by field facilitators for necessary action. No excuse for any delay or failure will be desirable for the greater interest of the project.

2. Selection and invitation of participants

Trained field facilitators are responsible for contacting, inviting and confirming minimum number of participants of PRA representing the target area (UnionP/Municipal Ward). With due respect and professional standards, they must inform about their purpose of contacts, the host and consulting agencies of the project, previous visits by the project team and as following the PRA session and their roles, the procedure of conducting the session will describe to participant by the PRA team.

3. Facilitate Sessions and reflection for better facilitation

As trained, field facilitators are solely responsible for facilitating PRA sessions in each Union/Municipal Ward of project Upazillas using selected tools to ensure PRA outcomes. At the end of each day, they will do peer discussion and reflect on what they did and how they can do better in next sessions.

4. Documentation and compilation of PRA

After completing a PRA session, field facilitators will write and compile all notes and check PRA documents, and document individual PRA report as per the prescribed/ standard format (Annexure 1). For every PRA session, one report will be prepared by field facilitators covering objectives, methods, team description, group dynamics, description and analysis of the community and its context, and outputs like social map, identification of problems and potentials, and long-, medium- and short term development needs.

5. Report preparation of PRA/deliverable

Field facilitators ensure quality, reliability and validity of PRA outcomes keeping in mind that PRA analysis will be matched with other technical analysis (13 surveys including socioeconomic survey) and compile all PRA reports and field notes to submit to social expert/assigned person for the final deliverable – a working paper. The team leader will integrate PRA findings and socioeconomic survey data with other spatial topographic, hydrogeological, and environmental, land use, transport data during the comprehensive development planning stage.

H. Session Format

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

Facilitators will maintain the following format for each session of 3.5-4 hours.

- i) Registration (sign up)
- ii) Opening, introductions, expectations
- iii) Social mapping
- iv) Venn diagram
- v) Lunch break

- vi) Technology of Participation (ToP) Consensus Workshop
- vii) Reflection and closing

I. Distribution of PRAs by Upazila, Ups and Municipality

Upazilla	No. of Unions	No. of Municipal Wards	No. of PRA
Sagata	10	-	10
Sonatola	7	9	16
Sariakandi	12	9	21
Total	29	18	47

J. Timeline for PRA Sessions

Upazilla	PRA
Sagatha	June 8-12, 2015 (Monday -Friday)
Sonatola	June 13-17, 2015 (Saturday-Wednesday)
Sariakandi	June 18-24, 2015 (Thursday-Wednesday)
Draft Report	June 30, 2015 (Tuesday)

K. Process Description of Tools

Social Mapping

Objectives

- ❖ To map local area's assets, resources and features (natural, physical, environmental, social, economic etc.)
- ❖ to locate problems and resources in the area through map
- ❖ To prepare a map based on resource base of the area

Timeframe:

45 minutes – 60 minutes

Materials needed:

Union/Pourashava Map, Drawing paper/Flipchart paper, Colour markers/Sketch pen; Pencils, Pencil cutter, Eraser, Gum, Sticky wall, Masking Tape, Chalk, Floor mat/Carpet etc.

Norms

Set norms or remind pre-set norms for this group learning exercise and one of the norms is that it is not necessary for everyone to agree on everything but needs most people's agreement. However, everyone in the group deserves respect. Participants should refrain from judging, interrupting or ridiculing others, and should respect the privacy of others by maintaining confidentiality.

Steps

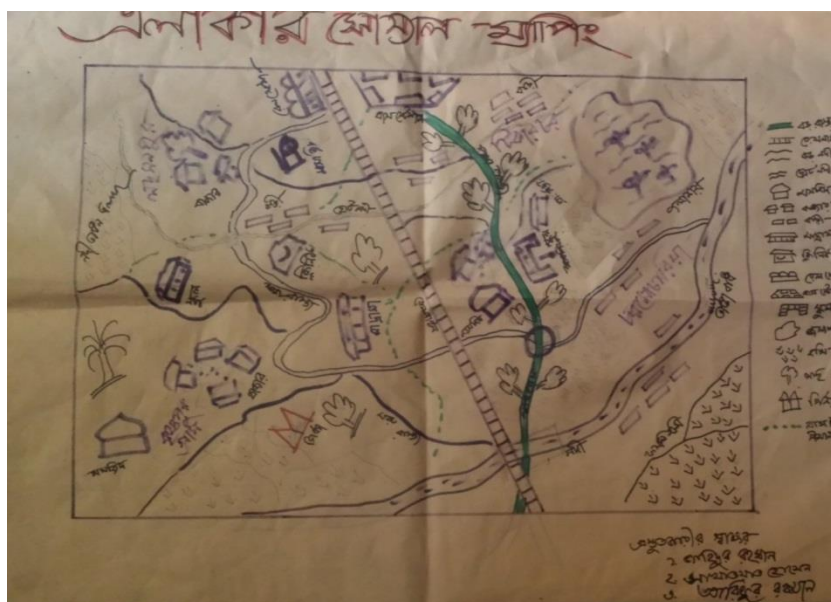
- (a) The facilitator will explain the procedure of the preparation of social mapping to the participants in an easy and simple manner.
- (b) The facilitator will elect person (s) for drawing the social map on the basis of group discussion and request the other participants to the person involve in social mapping.
- (c) Hang the Union/Pourashava map (if available) in a suitable place where all participants can look it clearly. If not available, explain that you are asking them to imagine about the existing

scenarios of their union/target wards of pourashava and draw that image on drawing paper or on the ground.

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

(d) Some participants may not be accustomed to using a writing utensil, so encouragement and patience are needed. Some participants may not be accustomed to using a writing utensil, so encouragement and patience are needed. One alternative is to clear an area of dirt or sand and ask people to create a map using objects found in area. Reassure the participants that things do not have to be drawn exactly – the map is only to get a general idea of what the community looks like. One alternative is to clear an area of dirt or sand and ask people to create a map using objects found in area. Reassure the participants that things do not have to be drawn exactly – the map is only to get a general idea of what the community looks like. The boundary of the area will draw cautiously, and then the map will be drawn collectively with the help of marker or sign pen. Then ask to the participants to draw the wards as well as mouza boundary on the floor or on the paper.

(e) Ask the participants to draw all of the resources in the Union/Target Wards of Pourashava. Different types of resources such as road, pond, agricultural land, river, homesteads, school etc. will be located on the map by using marker or sign pen. (Explain that “resources” are buildings, organizations, people, or services that are available to the area when they are needed. “like roads, houses, health facilities (pharmacies, hospitals, clinics etc.), post office, schools/college/madrasha, religious buildings, graveyard, crematorium, water wells, public baths, markets, schools, factories, rivers, beel, pond, embankment, flood/hazard prone area, flood shelter, bus stand, launch ghat, agricultural land, forest, etc.).



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

(g) Ask the participants to mark the north direction of the map and to draw the boundary of the Union/ Wards of Pourashava on the floor with chalk on floor or on paper by wooden pencil.

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

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

- (j) Facilitators will observe all activities closely and ask to the participants whether all existing features have drawn correctly or not. If the participants agreed that all available features have drawn on the map correctly and no need to adding or deleting any object. Then the map will draw on the paper without changing any object in case of map drawn on the ground.
- ❖ Ask participants to mark where different groups in the community live (i.e. the wealthy, the labourers, different religious groups, different ethnic groups etc.).
 - ❖ Ask them to identify the various community resources by name or with a symbol which can easy understand to third person.
 - ❖ Ask the participants whether all features have drawn on the paper correctly or not. If the participants agreed that all features have drawn on the paper correctly.
 - ❖ Then Facilitators will thank to participants for providing their input and product a nice purposeful map.

Venn Diagram

Objectives

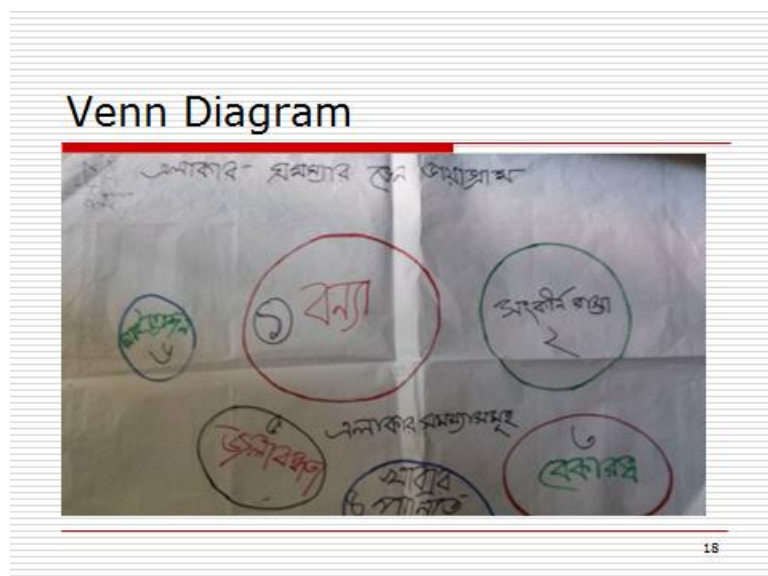
- ❖ To identify the problems/risks/threats of the areas, potentials of the area, causes and effects the major problems
- ❖ To identify the severity and impacts of problems

Norms

Set norms or remind pre-set norms for this group learning exercise and one of the norms is that it is not necessary for everyone to agree on everything but needs most people's agreement. However, everyone in the group deserves respect. Participants should refrain from judging, interrupting or ridiculing others, and should respect the privacy of others by maintaining confidentiality.

Materials: Poster Paper (white and colour), Marker Pen, Sign Pen, Scissors, Glue stick, Masking tape, Wall or Black Board, Sticker, Table or Floor and Color Paper may be used (if necessary)

Material: Poster Paper (white and colour), Sign Pen, Scissors, Glue stick, Masking tape, Wall or Black Board



Procedure of Venn Diagram:

Problem identification

- The facilitator will select a person among the participants' for assistance, who would cut the paper into circular form of different size for venn diagram and stick them on poster paper.
- The facilitator will identify the problems of the basis of their severity e.g., 1,2,3... with the help of participants'.
- Colour poster paper is cut into circular form according the severity of the problems and would stick them on the white colour poster paper.

- (d) The biggest circular sized paper will indicate the most severe problem i.e., no. 01 problem and the size of the circle will reduce according to descending order.
- (e) The main area will be stickled at the centre of the poster paper.
- (f) The problems would be arranged according their importance for aesthetics.
- (g) Necessary correction will be made in the problems diagram by participants.

Potentials identification

Same as Problem Identification

Venn Diagram

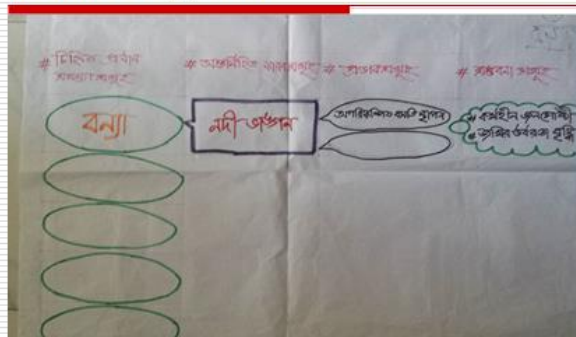


19

Cause and effects of Problems and Potentials

- (a) Facilitator will select a person among participants to write the cause & effects
- (b) Facilitator will try to involve all participants in discussion to identify the cause & effects
- (c) Necessary correction will be made in the cause& effects diagram by participants.
- (a) Facilitator will select a person among participants to write the potentials
- (b) Facilitator will try to involve all participants in discussion to identify the potentials to solve the problems of the area
- (c) Necessary correction will be made in the potentials by participants.

Venn Diagram



20

Technology of Participation (ToP™) Workshop
(www.ica-international.org, www.ica-bangladesh.org)

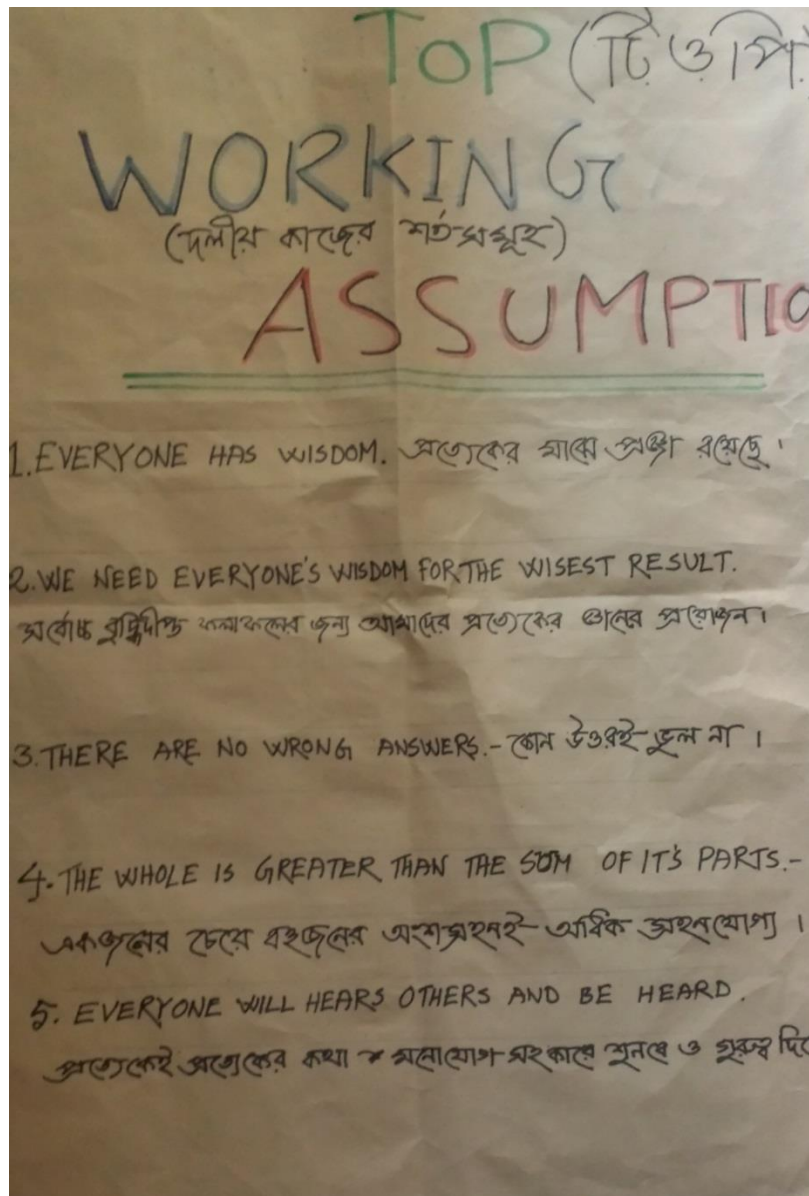
Objectives

- A. To identify priorities for development and planning for next 20 years by major sectors for sub-regional, structural, urban, rural action plans based on the identified locations, issues, problems and potentials to be gathered from social mapping and Venn diagram.
- B. To get getting people's in-depth knowledge and views about their assets, problems, potentials, development needs and planning aspirations.
- C. In all cases spatial dimension of local people's information will be checked for development planning purpose.

Materials

First field facilitators will ensure materials needed --- flip chart, sticky wall, spray, masking tape, sticky glue, board pin, meta cards, white papers, color markers, sign pens, poster papers, registration sign up sheets, camera and videos, etc.

They will hang social map, venn diagrams, tables from previous sessions, day agenda, working assumptions, norms etc. on wall visible to all participants.

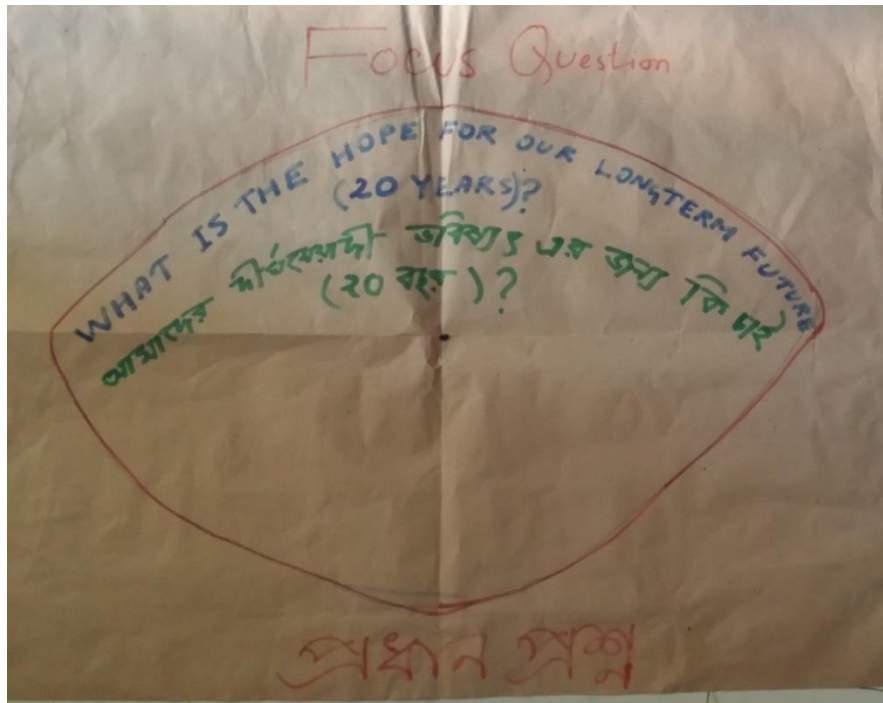


Introductions and Context (10 minutes)

Then ToP session will start with explaining the context (purpose, aims and goals and the process) of ToP session. A warm up or ice breaking exercise at the beginning may be made in the beginning of ToP.

Participants will be reminded of group norms (5 working assumptions (everybody has wisdom, no wrong answers, hear others and be heard) and others (raise hand to speak or ask for anything etc.) and also meta card instructions (1 idea per card, 5-6 words per idea, and Write BIG).

At the start, the facilitator will remind of the whole group - what they got from previous sessions (resources/assets, potentials, problems, risks etc.) showing map and diagrams hanged on room wall or sticky wall or flip chart stand. Then the facilitator will ask participants to look at the focus question if they are clear on the question wording or meanings.



Brainstorming (20 minutes)

The facilitator will read out the focus question --- What they want to see take place in next 20 years in their area.

The facilitator will ask all participants to close eyes for 2 minutes and dream of what they want to see practical things/events/actions in 20 years which will be visible if they take photograph after 20 years.

Then the facilitator will ask participants to brainstorm individually the focus question and write their ideas in note books in next 5 minutes. The facilitator will ask them to write ideas in meta cards following instructions (indicating the poster on wall) and keep 3-5 key/best ideas ready at hand to hand in to cofacilitator. The ideas written on cards will be posted on the wall. The co facilitator will keep meta-cards in hand and distribute those proportionally on tables/floor. The facilitator will the ask participants to write their 5 major ideas in meta-cards. The facilitator and co-facilitators will go to different participants in the room and check if they need any help.

The facilitator will check if they want more time (better to keep time schedule), otherwise will ask participants to select best 3 cards and keep in hands ready for instruction to post on wall.

Organizing (10 minutes)

The facilitator will ask the best card first from each person, the co-facilitator will collect and give to the facilitator. The facilitator will read each card and check if all are clear, if not ask the writer to clarify the intent of the card. The facilitator will put 1st cards on the sticky wall or board. Then the facilitator will ask participants for pairing on wall and he will ask for 2nd best card same way. Afterwards, the facilitator will ask participants for pairing on wall and he will ask participants

which cards can be pair. Some cards will be fit easily as pair and some will not. The facilitator then will ask to give next card which are different so far. Those cards will be read out and put under pair cards for clustering if fit based on suggestion from participants. And then final cards will asked if ideas not appeared yet. The facilitator will organize the longest cluster on the left hand side of the facilitator and the remaining accordingly based on participants' agreement.

ToP



15

Naming (20 minutes)

After clustering cards based on participants' suggestion, for preliminary naming, the facilitator will read out cards of each cluster starting from the longest one (in terms of size) and ask participants label the cluster of ideas with two or few words based on the intents/intuition of cards. Thus all clusters will be roughly labeled.

Then the facilitator will let the group name the first column of ideas stating the underlying intents of each card. Then all participants will be divided into groups in terms of number of clusters/columns of cards and let each group name the remaining columns in their own group. The names of other clusters were put on the sticky wall and asked for consensus. Thus all clusters were named and at the end of this session. Participants will be instructed to post the column of cards with Final title on top with signs similar on all cards for not mistaking to post if displaced.

Conversation on Priorities (30 minutes)

For identifying development priorities for short-term (within 5 years), medium (5-10 years) and long term (10-20 years) planning, the facilitator will do and ask the followings:

Read the names of the clusters out loud.

Which of these are you most passionate about?

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

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

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

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

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

Focus Question?						
Short-term			Medium-term		Long-term	
Title	Title	Title	Title	Title	Title	Title
Idea	Idea	Idea	Idea	Idea	Idea	Idea

Closing Reflection

At the end of PRA with ToP, the facilitator will ask following questions:

What one thing/term/phrase do you remember from the day?

What one activity you did today?

What did you like? High point?

What didn't you like? Low point?

What did go well? What went wrong?

What one thing you will take from here? Participants will be asked to make a comment or to express one thing they will do after this event.

The Guest of honour or the designated person will do a closing speech and the team will thank the participants for their cooperation and working together for development for all.

Annexure 1

PRA Documentation

Name of Upazilla:

Nam of Union:

Municipal Ward:

Date:

Time:

Venue:

List of Participants:

Sl.	Name	Ward	Village/Moholla	Occupation	

Process Description:

Findings:

Social Mapping (includes text with spatial dimension and 1 diagram with photos of participants and activities)

Venn Diagram (includes text with spatial dimension and 3 diagrams with photos of participants and action photos)

ToP Workshop (includes text with spatial dimension and 2 tables/charts with participants and action photos)

Conclusion:

Annexure-I: Copy of PRA ToR

Annexure-II: Individual PRA Report of Shibpur Paurashava

1. INTRODUCTION

Participatory Rapid Appraisal (PRA) method is applied for the rural people to enhance and analyze their knowledge of life and conditions, to plan and act and to monitor and evaluate. The role of the outsider is that of a catalyst, a facilitator of processes within a community which is prepared to alter their situation. A PRA approach was held on November 05, 2015 at Sibpur Paurashava where 25 participants were present. Among the PRA techniques, the viable PRA techniques such as Social Mapping, Identification of Problems & Potentials, Cause Effect Diagram, and Technology of Participation (TOP) have been applied for this project which will fulfill our project goal.

2. STUDY AREA PROFILE

Shibpur Paurashava is under the administration jurisdiction of Shibpur Upazila in Narsingdi District. It has an area of 9.0 km². The boundary of the study area is stated below:

North: On the north the study area is follows Chokrada Union and Monohordi Upazila

South: On the south the study area follows Putia Union

East: On the east the boundary of the study area is part of Chokroda Union, Bagabo Union and Jaynagar Union

West: On the west the study area runs along the boundary of Masimpur Union.

Table 2.1: Physiographic & Demographic Information of Sadharchar Union

AT A GLANCE	
Features/ Characteristics	Remarks
Population	25000(Muslim 22000and Hindus 3000)
Male	15000
Female	10000
Literacy Rate	85%(Male 45%and female 40%
Hat Bazar	1
High school	3
Junior School	7
Madrasa	3
Govt. Primary school	6
Registered Primary school	2
Health center	1
Union land office	2
Road	9K.M.(Pucca 7K.M. and earthen 2 K.M.
River road	4k.m.
Religious institution	20(Mosque18 and mondir2)
Fire service station	1

Petrol pump	1
Auditorium	1
Freedom fighter bhavan	1
Dakbanglo	1
Post office	1
Restaurant	12
Others(Gas field ,ancient archeology, mineral resources)	
Eidgaon	2
Exhibition field	2

Source: Shibpur Paurashava, 2015

3. STEPS OF PRA APPROACH

There were 25 participants in PRA Session of Shibpur Paurashava and administration. The participants were included of U.N.O.(Administrator of Paurashava) and 06 ward members (4 male and 2 female members) and Assistant Engineer and other elite persons such as teacher, farmer, businessmen, social worker, political leader, student, electrician, Storekeeper, Freedom fighter, Service holder ,N.G.O, Tax collector, Doctor ,Information officer, entrepreneur, License inspector and local people etc. PRA was lasted from 10.15am to 2.30 pm. Two facilitators by turn lead the session to facilitate the whole group session. While the participants are associated with Social Mapping, Identification of Problems & Potentials, Cause Effect Diagram and at last Technology of Participation (TOP).

After saying the purpose of Development Project for 20 years, the schedule of PRA Session is explained by the facilitator and the participants have identified the problems and potentials of the jurisdiction area using Venn diagram and Cause Effect Diagram. Besides this Task, two or three persons from the group were selected to draw the Social Map of the union and other participants were involved to find out the Problems & Potentials and Cause Effect Diagram on the basis of problems. When these two tasks were finished, the map has shown to the participants to locate the problems/potentials sides which have spatial implication to the map. After they were done with mapping, problem and potential identification is further updated by Venn diagram and Cause Effect Diagram. At last, the participants were told to see dream for 20 years where the dreams will be categorized in this part known as Technology of Participation (TOP).

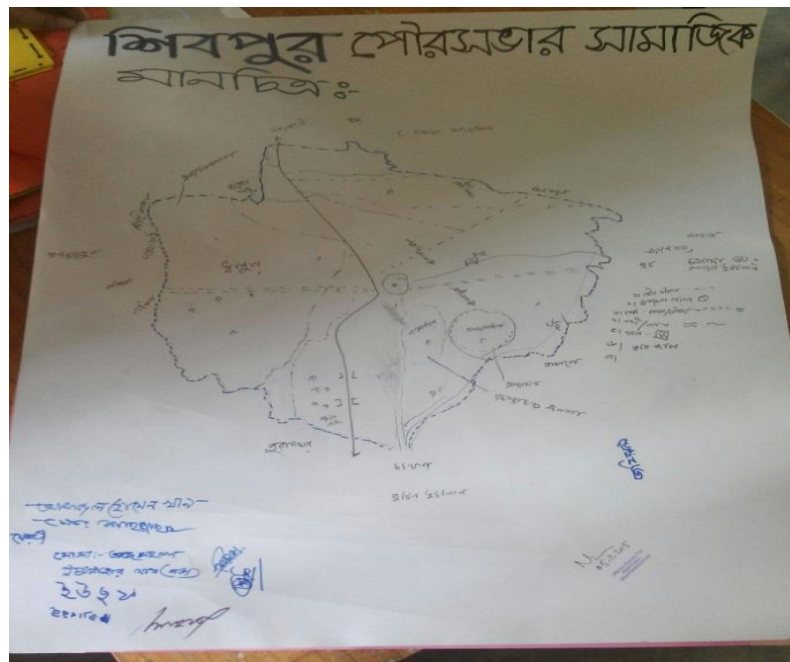
[illegible]

4. PRA TECHNIQUE

4.1 Social Mapping

Social Mapping can be used as an effective ice breaking exercise as well as a tool to investigate the knowledge of the people about their own locality, their resources and their spatial distribution. To prepare the social map following steps were followed.

- First we have selected two or three persons for preparation of social map who know well about their area.
- We try to explain the purpose of the exercise to the participants. Request them to start off with drawing boundary demarcation and the prominent physical features of their locality.
- Identify valuable resources such as School, Hospital, Road, Market, Masque, Pond, River, Canal, Government Office, etc.
- To represent a central and important landmark.
- Watching the process alertly. Finding out the main problems and resource areas in the areas from the discussions take note in detail as much as possible.
- Once the mapping is over, ask some people to check the map and identify the problem areas.
- Ensure that everyone has access to the resources they need
- Avoid duplication of services and resources
- Enhance services
- Identify flexible funding strategies
- Cultivate new partnerships and relationships



Photograph 4.1: Social Map of Shibpur Union

4.2 Identification of Problems

The participants were asked to inform the problems most in their locality which will give a total scenario about their demanding areas. This approach was done by hearing every point and with the discussion from the participants. The pointed/ faced problems are sought out in A2 paper sheet which is shown to all and from the list of problems 5 major problems are identified through Venn diagram. The following problems are identified:

- Problem of drainage
- Problem of waterlogging
- Problem of Communication and transportation (Shortage of road, broken road, Shortage of footpath and earthen road)
- No Road Light
- Problem of conservancy management
- No gas connection(Ward no 1,2,3,6and 9)
- No Water supply line
- Shortage of pure drinking water
- Problem of sanitation
- No cold storage
- Shortage of agricultural machineries services
- Shortage of public toilet
- Problem of shelter center
- No hospital by Paurashava supervision
- Shortage of doctor, treatment and medicine
- No government college and university
- Problem of drug addiction
- No attention of top level repair and plan wised hat bazar
- Stealing and robbery
- Unplanned housing
- Problem of unemployment
- No industrialization
- No direct communication with capital city
- No Pourabhavan (now works at Rented building)
- Shortage of budget
- Problem of Paurashava election
- No technical and vocational institution
- No training facilities

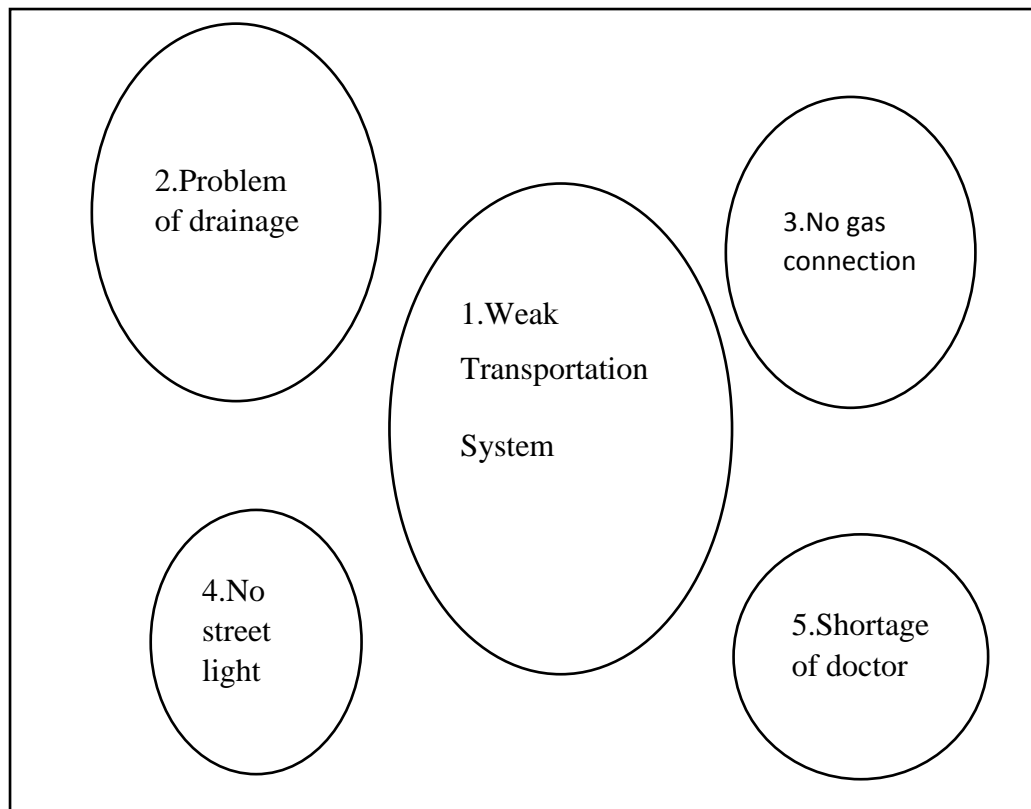
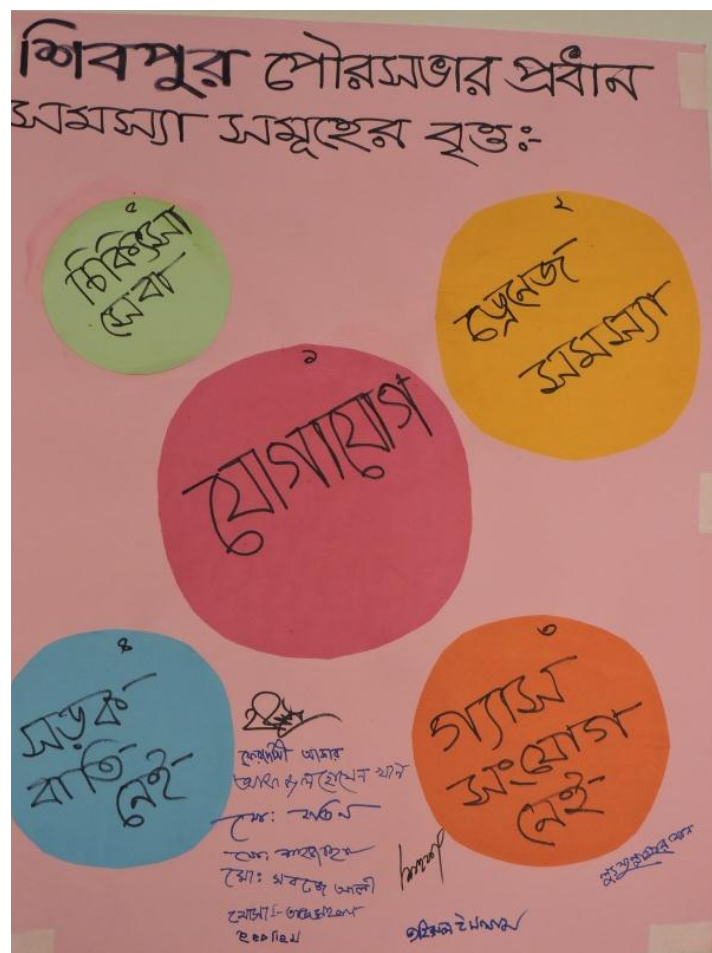


Figure 4.1: Venn diagram for Problems Prioritization



Photograph 4.2: Problem Identification

4.3 Identification of Potentials

After knowing the problems, the next step was to identify the potentials of the respective area according to the previous stage. The sought out potential list is followed as below:

- Water bodies (Ward no 6)
- Agricultural land (Rice and vegetables)
- Business
- Agricultural land (Rice and vegetable)
- Hard working people
- Restaurant
- Sweetmeats (Ajits sweet)
- Phul Pitha
- Dry fish
- Foreign remittance
- School
- Service holder

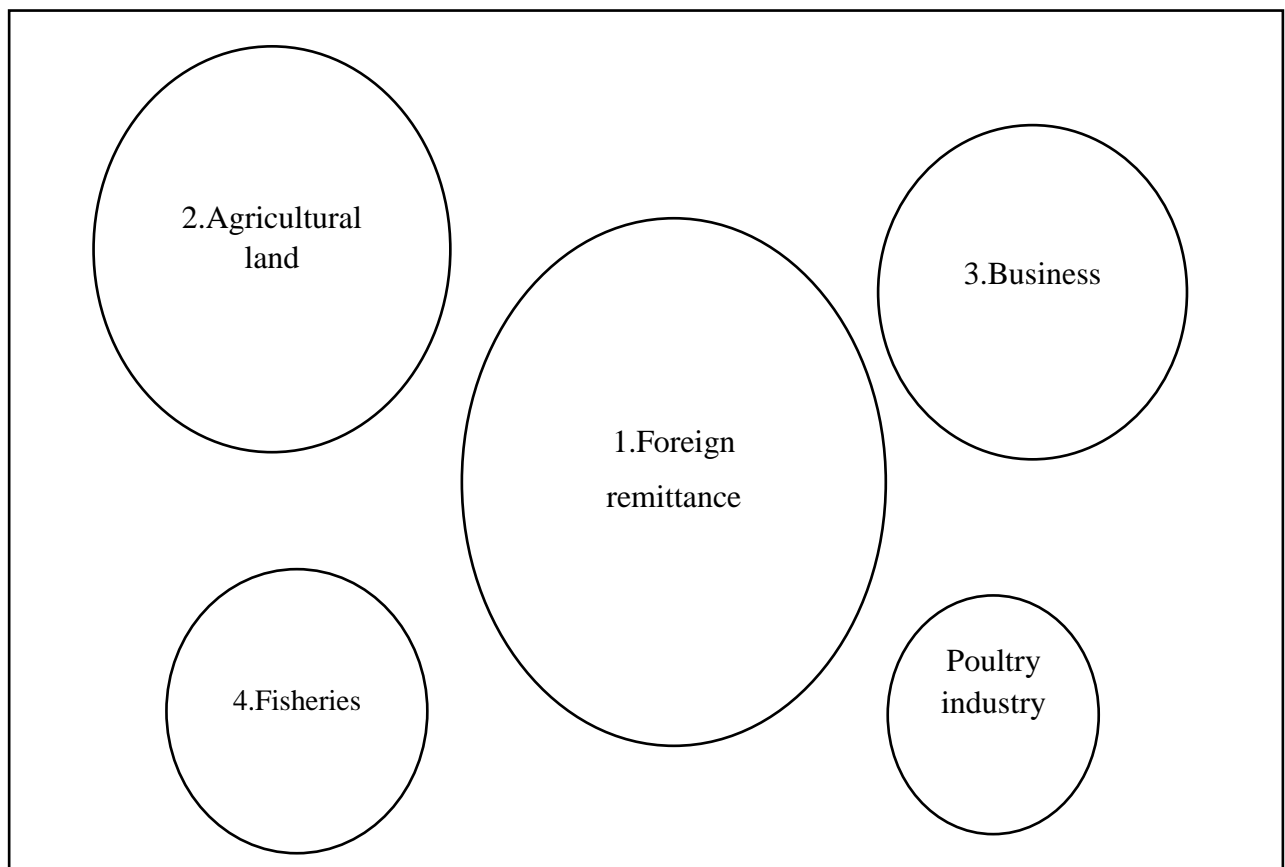
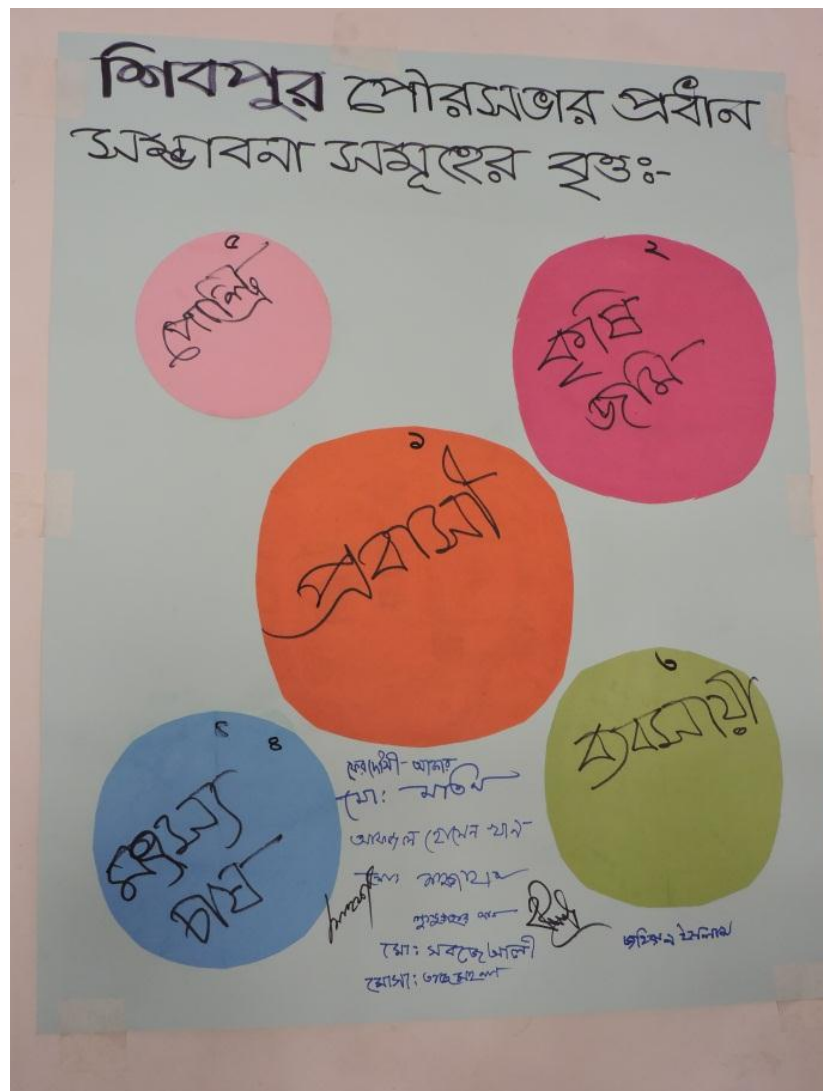


Figure 4.2: Venn diagram for Potentials Prioritization



Photograph 4.3: Potential Identification

4.4 Identification of Prioritized Problems, Cause, Effect, Potentials

Identified Problems	Causes	Impact	Potentials/Probability
1. Problem of Communication and transportation	<ul style="list-style-type: none"> • Broken and maintenance less road • No elected mayor • Shortage of budget 	<ul style="list-style-type: none"> • Hampered of communication • Often occurs accident and facing stealing and robbery • Problem of emergency health services • Hampered to go school for children 	<ul style="list-style-type: none"> • Enough space to establish roads • Hard working people
2.Drainage problem	<ul style="list-style-type: none"> • No drains • Shortage of budget. 	<ul style="list-style-type: none"> • Creates water logging • Roads are broken 	<ul style="list-style-type: none"> • Enough land for build drain
3.No gas connection	<ul style="list-style-type: none"> • Bureaucratic complexity • Negligence of top level 	<ul style="list-style-type: none"> • Increase fuel cost • Increase environmental pollution • Municipality citizen Deprive of municipality facilities • Day by day trees and forest less in the locality 	<ul style="list-style-type: none"> • Gas line supply by the municipality
4.No road lights	<ul style="list-style-type: none"> • Shortage of budget • Existing road lights are getting damages due to short of maintenance 	<ul style="list-style-type: none"> • After evening arise darkness in the municipal area • Increase stealing and robbery • People are facing various harassments 	<ul style="list-style-type: none"> • Electricity line already supply in the municipality
5.Emergency health services	<ul style="list-style-type: none"> • No hospital in the area of Paurashava • Shortage of good doctor • Shortage of medicine 	<ul style="list-style-type: none"> • People are facing barrier to health services • People has died due to shortage of emergency health services 	<ul style="list-style-type: none"> • Enough Govt. land to established hospital

4.5 TECHNOLOGY OF PARTICIPATION (ToP)

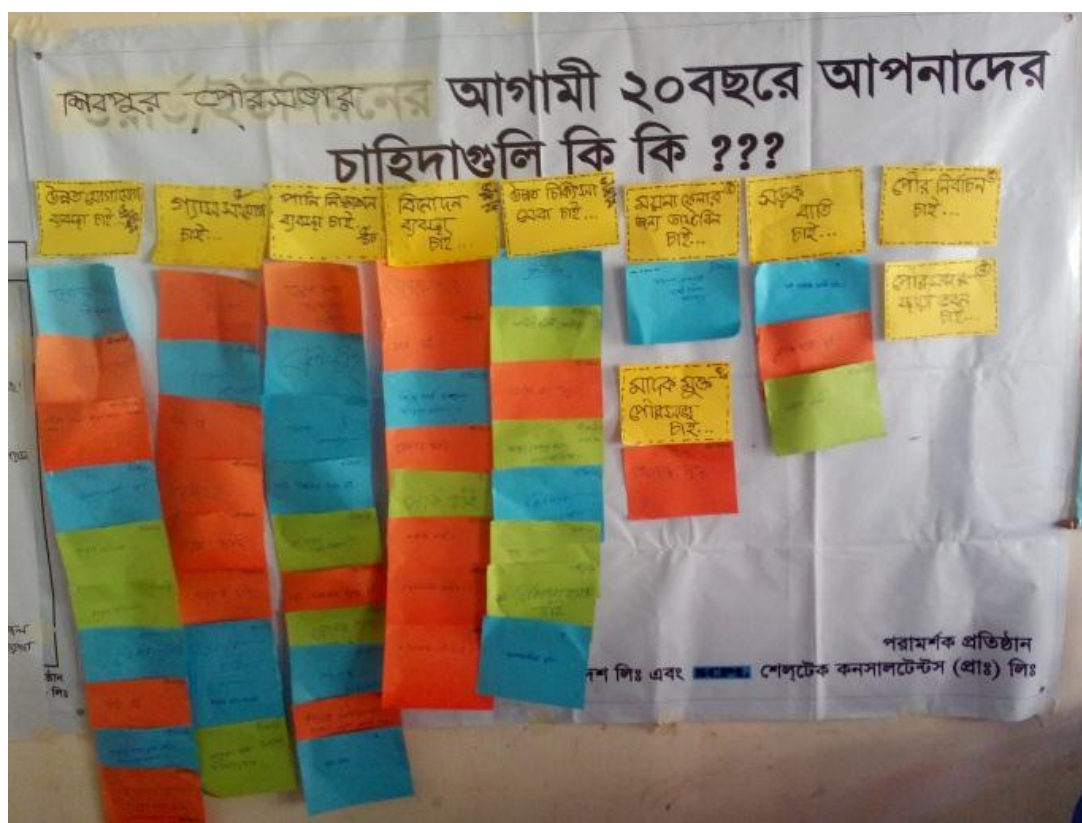
In the last phase, the people involvement is very important which will have great impact on the Development Plan for 20 years. This approach is done by the following ways:

- People were asked to dream/think for 20 years within 1 minutes.
- The facilitators provided pages for writing their dreams within 3 words and identify their desired time period besides their dream.
- After the collection of dreams, the collected dream is categorized with the discussion of the participants and provides a title name for the categorized list.
- Each dream is listed according to the category in “Development plan for 20 years” which is visible to all.
- At last, the categorized dream were attributed/sited in three phases of development namely Short term (within 0-5 years), Midterm (5-10) and Long term (10-20).

Table 4.1: Demand of People for Development Plan for 20 Years, Sibpur Paurashava

Demand	Remarks
Develop modern transportation system	<ul style="list-style-type: none"> • Demand development of communication • All of earthen road in the union to be pucca • Needs road • Demand periodic road maintenance • Demand pucca road for well communication
Demand Development of modern health services.	<ul style="list-style-type: none"> • Demand health center • Demand Community clinic. • Demand good doctor. • Demand hospital for well health service • Demand health service system • Demand hospital
Demand gas connection	<ul style="list-style-type: none"> • Demand gas line • Demand gas connection • Demand gas • Demand gas in 5 years • Demand gas in one year
Demand water drainage system	<ul style="list-style-type: none"> • Solve problem of drain • Need drain • Solve drainage system • Solve water passing system • Need drain(Water passing) • Solve problem of drain • Demand brick drain for urban development

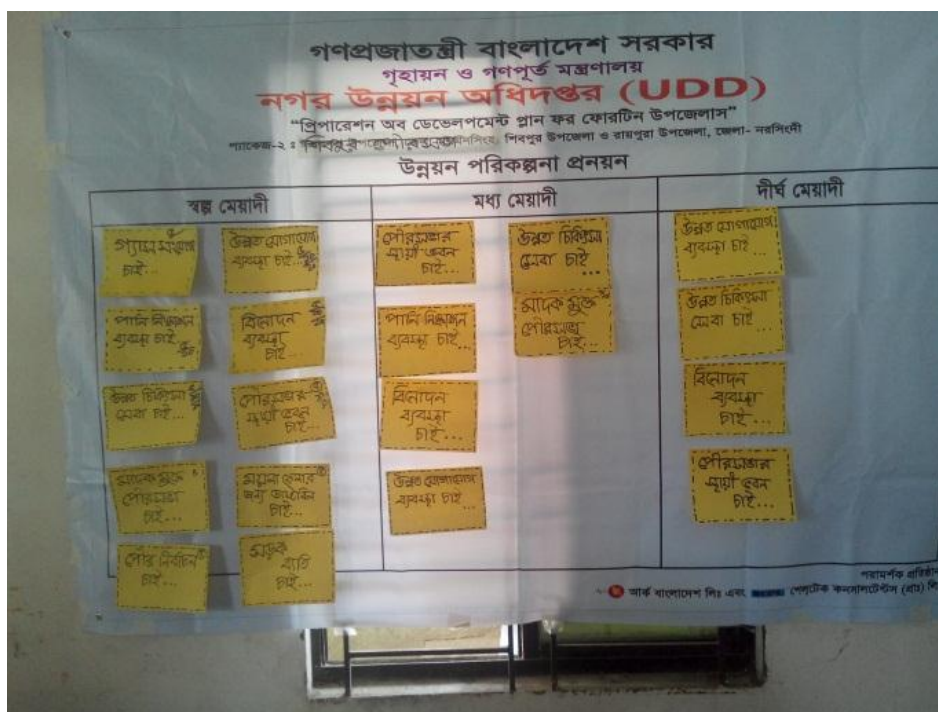
Demand road light	<ul style="list-style-type: none"> • Demand road light to all roads • Demand road light
Demand development of entertainment system.	<ul style="list-style-type: none"> • Demand Beautiful park • Demand park • Demand children park in 5 years • Demand zoo • Demand playground • Demand community center • Demand play ground
Demand Dustbin	<ul style="list-style-type: none"> • Demand dustbin for conservancy reserve • Demand dustbin for wastage reserve
Demand drug addiction free Paurashava	<ul style="list-style-type: none"> • Demand drug free
Demand of Paurashava election	
Demand of Paurobhavan	



Photograph 4.4: Identification of Demand in Preparation of Development Plan for 20 years

Table 4.2: Identification of Development Plan for Shibpur Paurashava

Short term	Midterm	Long term
<ul style="list-style-type: none"> • Develop modern transportation system • Demand Development of modern health services. • Demand gas connection • Demand water drainage system • Demand road light • Demand development of entertainment system. • Demand Dustbin • Demand drug addiction free Paurashava • Demand Paurashava election • Demand Pourabhavan. 	<ul style="list-style-type: none"> • Demand Pourabhavan. • Develop modern transportation system • Demand water drainage system • Demand development of entertainment system. • Develop modern transportation system • Demand drug addiction free Paurashava • 	<ul style="list-style-type: none"> • Develop modern transportation system • Demand Development of modern health services. • Demand development of entertainment system. • Demand Pourabhavan. •



Photograph 4.5: Identification of Development Plan for Shibpur Paurashava

5. CONCLUSION



Photograph 4.6 Group photo session with Shivpur Paurashava

In this study, the present and future scenarios are explored by using Participatory Rural Appraisal (PRA) method. Several participatory tools have been used to ensure the active participation of village people. Participatory Rural Appraisal (PRA) allows local people to address their own priorities to identify problems, potentials and demands. It helps to identify the vulnerable group and the reasons behind the deprivation. By this study, different kinds of problems have come out in a more comprehensive way. By the active participation of people they want their demand to be fulfilled and government initiation. **Thank you.**

Annexure-III: Individual PRA Report at Union Level of Shibpur

1.0 Ayubpur Union

1.1 Overview

Ayubpur Union is under the administrative jurisdiction of Shibpur Upazila in Narsingdi District has an area of 12.60 km². The boundary of the study area is stated below:

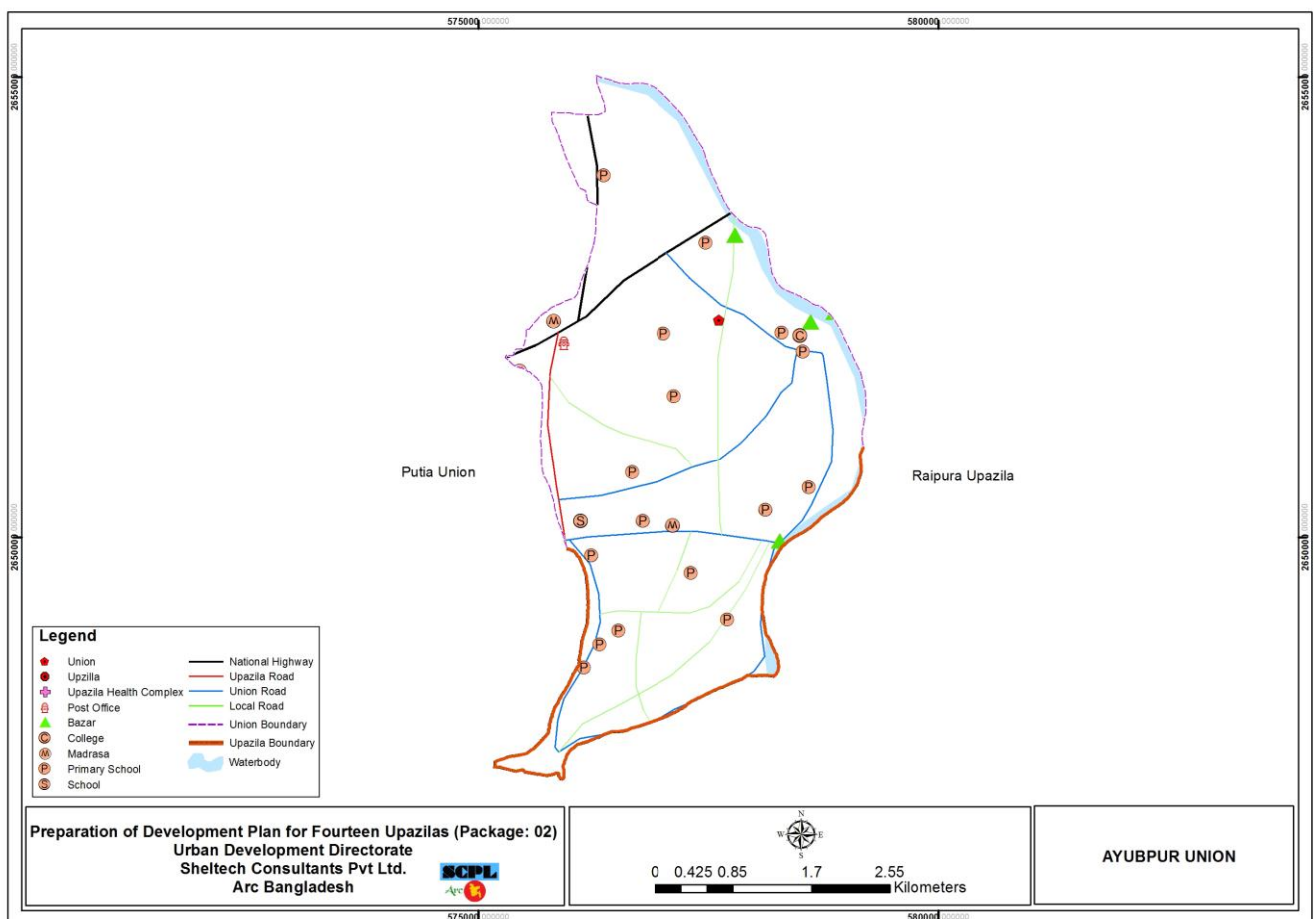
North: On the north side of the study area, Masimpur Union and River Paharia are located.

South: On the south side of the study area, Hazipur Union (Narsingdi Sadar Upazilla) is situated.

East: On the east side of the study area, Bagabo Union and DoggarChar (Raypura Upazilla) are located

West: On the west side of the study area, Putia Union and Haridhoa khal are located

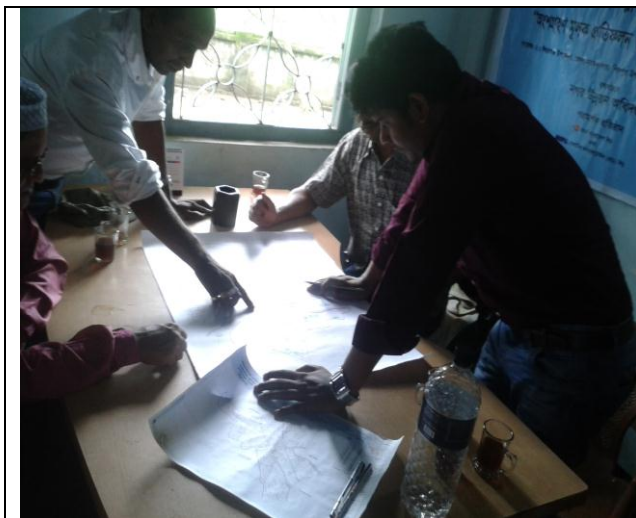
Map 1.1: Ayubpur Union



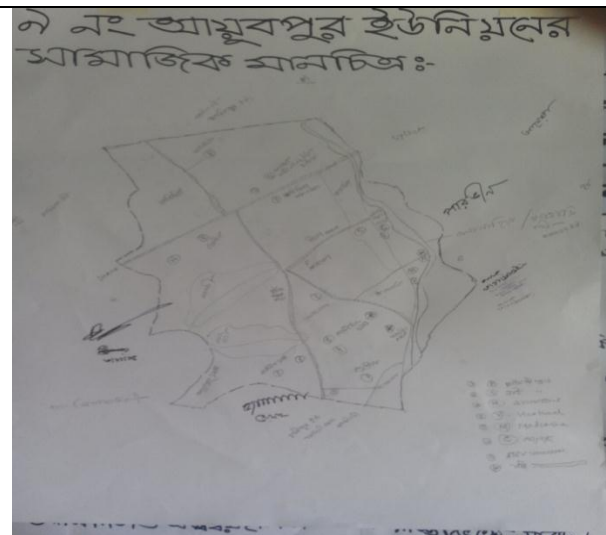
1.2 Spatial Aspects

Social mapping is useful PRA tool which is helpful in knowing the Spatial Aspects of the target area that can assist of planning team in decision making for future planning. It is also helpful to identify different problems and resources in the area through map exercising that can helpful to select intervention in order to minimize or reduce the problems.

The Facilitator has selected two or three persons for preparing the social map of Ayubpur Union who have vast knowledge about the area as well as good hand for drawing of map. Then the participants were asked the participants to draw all resources in the Union and have explained that “resources” are buildings, organizations, people, or services that are available to the community when they are needed. “like; roads, houses, health facilities (pharmacies, hospitals, clinics etc.), post office, schools/college/madrassa, religious buildings, graveyard, crematorium, water wells, public baths, markets, schools, factories, rivers, beel, pond, embankment, flood/hazard prone area, flood shelter, bus stand, launch ghat, agricultural land, forest, etc.



Photograph 1.1: Preparing Social Map



Photograph 1.2: Social Map of Ayubpur Union

1.3 Major Problems and Potentials

1.3. A Problems Identification

Most of the participants have identified the problems and prioritized the problems with causes, impact and potentials. The following problems have been identified during PRA which are as follows:

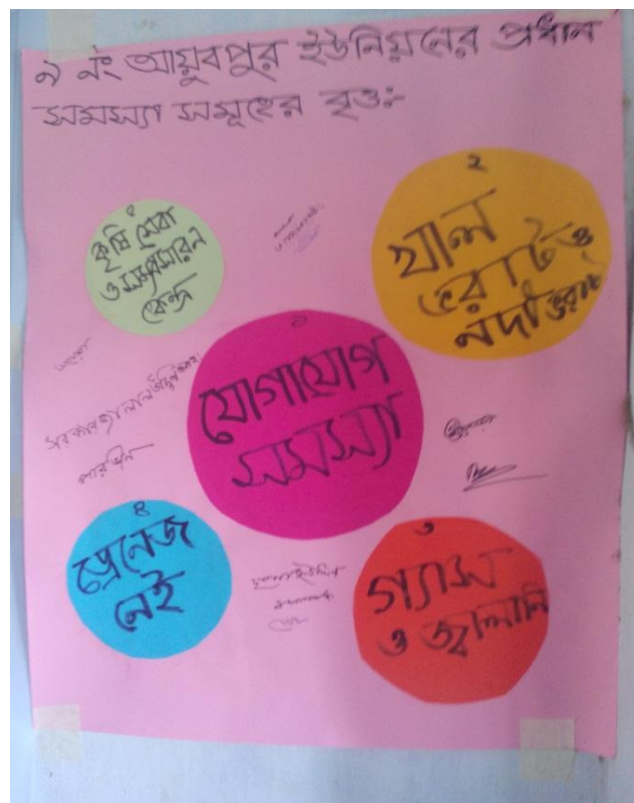
- Water logging (Ward No.4 and 6)
- Lack of drainage system
- Lack of health services.
- Lack of physicians and medicines.
- Poor communication system(Earthen road, broken road and ditch)
- No construction of Mosque and Madrasa.
- Environmental pollution (Poisonous industrial by-product).
- No gas/Fuel
- Unplanned electricity connection.

- No excavation of river/canal (Paharia River, Ward no1,2,4,5,7,8 and 9)
- Problem of unplanned excavation of pond (Ward No 4, 5,6and 7).
- Lack of agricultural services and extension centre.

1.3.B Problems Prioritization through Venn Diagram

After a long discussion, the participants have come to the consensus to identify the 5 major problems as priority basis. The five major problems are as follows;

1. Poor Transportation System
2. Dredging problem of canal and river
3. Problem of gas and fuel.
4. lack of drainage system
5. Agricultural services and extension center

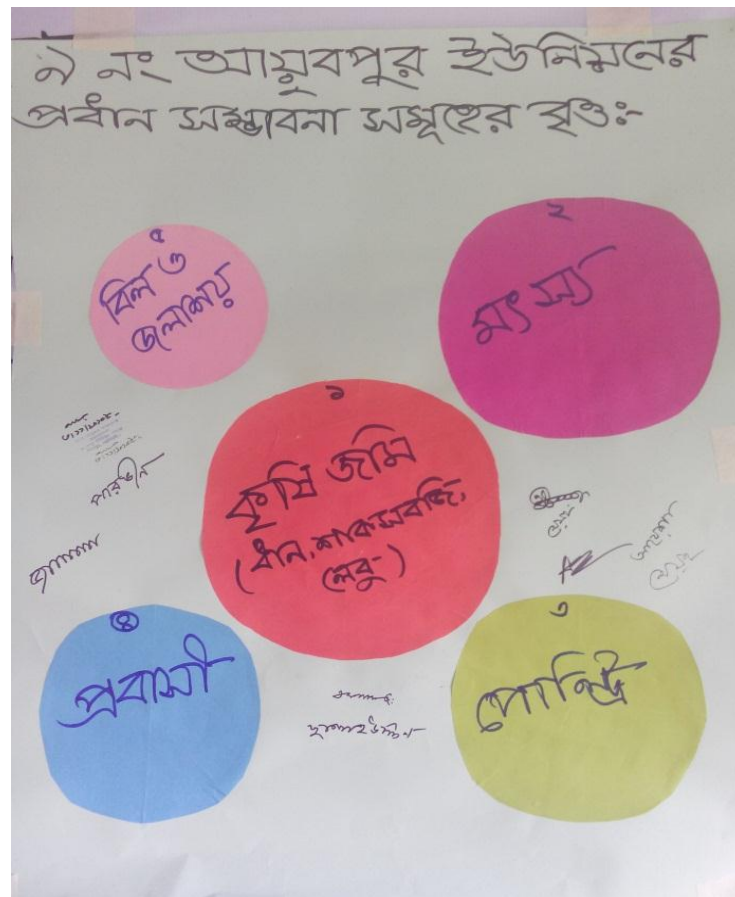


Photograph 1.3: Venn diagram of Major Five Problems

1.3. C Identification of Potentials through Venn Diagram

After identification of problems with prioritization, the next step has to identify the potentials of the respective area which may be used as resources during planning. The potentials are as follows;

- Bill and water bodies
- Agricultural land(rice, vegetable and lemon)
- Fisheries.
- poultry
- Remittance
- Hardworking People.
- Small and cottage industry(Bamboo and cane)



Photograph 1.4: Major Five Potentials

1.3. D Identification of Prioritized Problems, Cause, Impact, Potentials

After identification of the problems and potentials, the large group has engaged to identify the causes and effect/impact of problems and potentials in the area. The problems, causes, impact and potentials have furnished in the following table:

Table 1.1: Problems, Cause, Impact and Potentials

Identified Problems	Causes	Impact	Potentials/Probability
1. Poor Transportation System	<ul style="list-style-type: none"> • Broken roads and ditch 	<ul style="list-style-type: none"> • Increase communication system. • Problem of transportation for various products. • Increase transport cost. 	<ul style="list-style-type: none"> • Hardworking people
2. Problem of river and canal dredging.	<ul style="list-style-type: none"> • No dredging in necessary and timely • Shortage of budget 	<ul style="list-style-type: none"> • Agricultural lands flooded • In the dry season water crisis for irrigation to agriculture. 	<ul style="list-style-type: none"> • Existing 2 rivers and canals for dredging.
3. Inadequate gas and fuel.	<ul style="list-style-type: none"> • Bureaucratic complexity 	<ul style="list-style-type: none"> • Increase fuel cost. • Damages Trees and forest • Polluted environment 	<ul style="list-style-type: none"> • Existing gas line in the union.
4. Shortage of drainage.	<ul style="list-style-type: none"> • Lack of coordination among different organization 	<ul style="list-style-type: none"> • Roads are broken. • The rainy season often flooded by water. 	<ul style="list-style-type: none"> • Enough land for construction
5. Lack of agricultural extension service.	<ul style="list-style-type: none"> • Bureaucratic complexity 	<ul style="list-style-type: none"> • Farmers are not getting any proper guideline • Less of production in agriculture. • Largely economical losses. 	<ul style="list-style-type: none"> • Peoples are interested to donate their land for established agricultural extension services centre.

1.4 Perceived Development Priorities

The recommended development priorities of Ayubpur Union are as follows;

Table 1.2: Development Priorities for Ayubpur Union

Short term	Midterm	Long term
<ul style="list-style-type: none"> • Development of transportation. • Developed modern health services • River and canal dredging. • Developed religious institution. • Development of fisheries • Developed quality educational system. • Developed modern drainage system • Stop drug addiction and business. • Cold storage • Employment opportunity 	<ul style="list-style-type: none"> • Cold storage • River and canal dredging • Development of transportation. • Development of fisheries • Developed modern health services • Developed quality educational system. • Electricity and gas for all • Employment opportunity 	<ul style="list-style-type: none"> • Demand of cold storage • Demand of development of transportation. • Demand of employment • Develop educational institution.

1.5 List of Participants

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: শিবপুর
Union: নন্দীয়াশিবপুর
Venue: ইউ.পি. কমপ্লেক্স

Date: ০০/১১/২০১৫
Time: সন্ধ্যা - ১০:০০

Sl No.	Name	Designation	Address: Ward/Village	Phone number	Signature
1	ডায়াকার হায়াত	উপসভাপতি	কনস্ট্রাকশন/০১২১২৭৯৪৪		
2	প্রশান্ত কুমার	সচিব	মহালা/০১২১২৭৯৪৪	০১৭২৬৫৩৭৩	
3	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
4	আবদুল হক	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
5	আবদুল হক	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
6	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
7	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
8	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
9	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
10	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
11	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
12	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
13	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
14	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
15	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
16	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
17	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
18	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: শিবপুর
Union: নন্দীয়াশিবপুর
Venue: ইউ.পি. কমপ্লেক্স

Date: ০০/১১/২০১৫
Time: সন্ধ্যা - ১০:০০

Sl No.	Name	Designation	Address: Ward/Village	Phone number	Signature
19	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
20	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
21	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
22	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
23	শ্রী: কুমার	সচিব	০১৭২৬৫৩৭৩	০১৭২৬৫৩৭৩	
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

2.0 Bagabo Union

2.1 Overview

Bagabo Union under the administrative jurisdiction of Raipura Upazila in Norshindi District has an area of 03.30 km². The boundary of the study area is stated below:

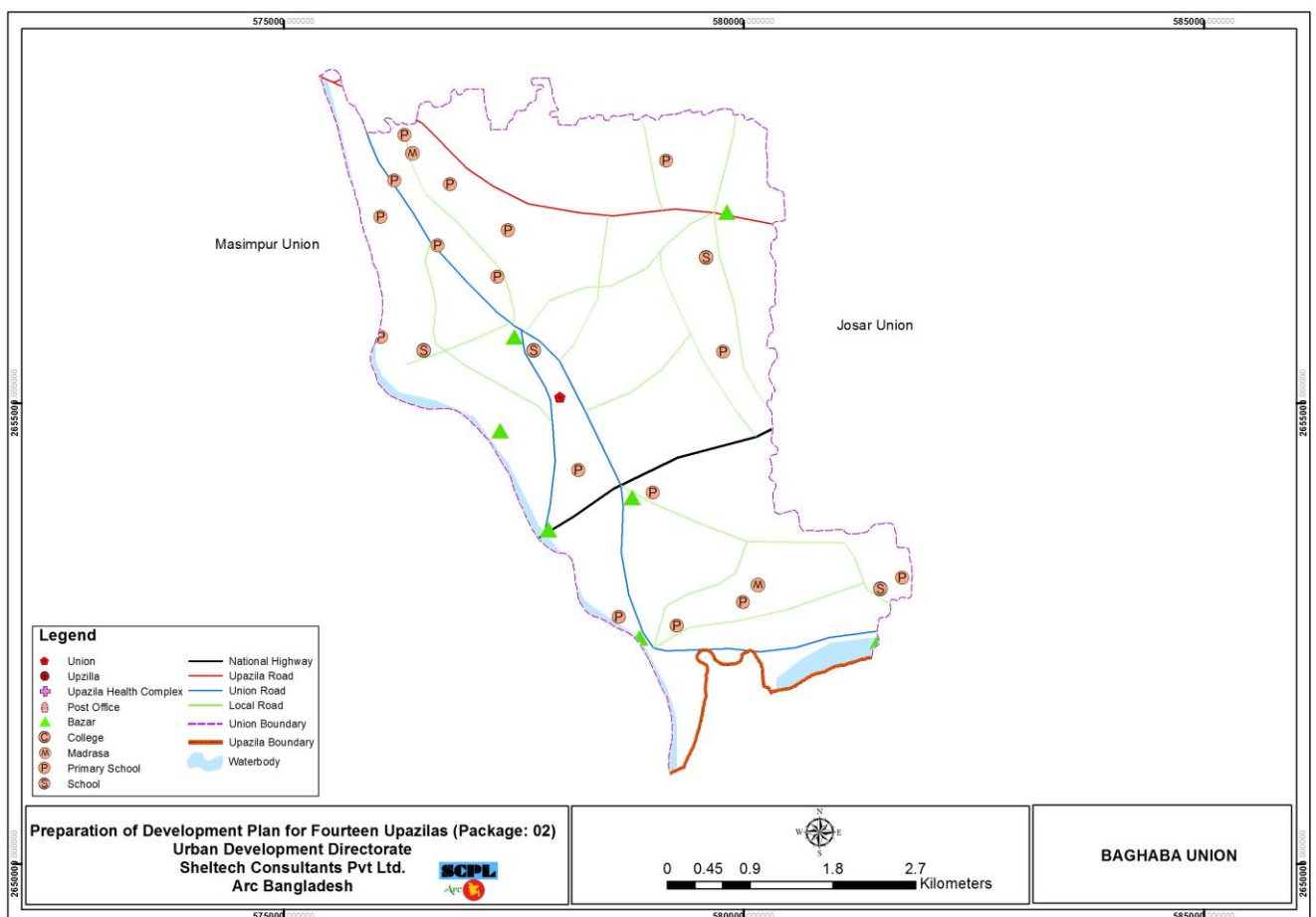
North: On the north of the study area, Chakradha and Joynogor union are located

South: On the south of the study area, Arial Kha River and Raipura Upazila are situated.

East: On the east of the study area, Joshor union is situated.

West: On the west of the study area, Masimpur and Ayubpur union are situated.

Map 2.1: Bagabo Union



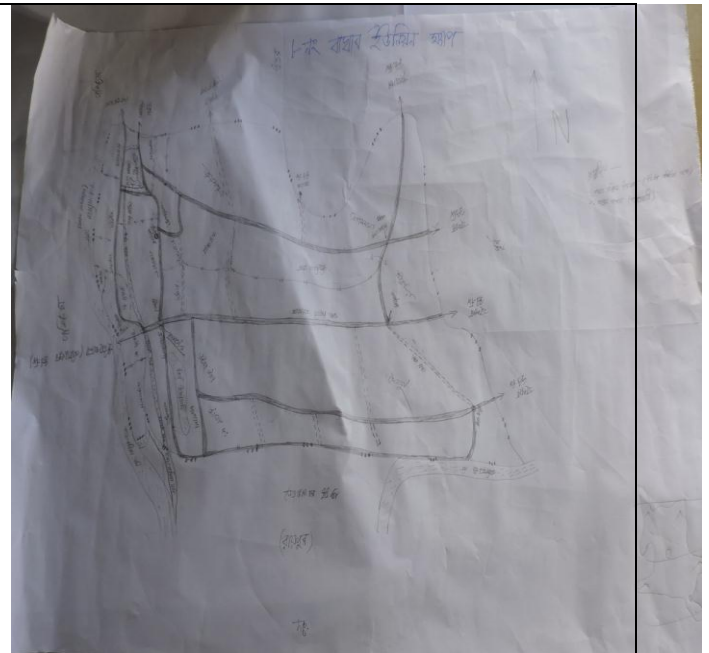
2.2 Spatial Aspects

Social mapping is useful PRA tool which is helpful in knowing the Spatial Aspects of the target area that can assist of planning team in decision making for future planning. It is also helpful to identify different problems and resources in the area through map exercising that can helpful to select intervention in order to minimize or reduce the problems.

The Facilitator has selected two or three persons for preparing the social map of Bagabo Union who have vast knowledge about the area as well as good hand for drawing of map. Then the participants were asked the participants to draw all resources in the Union and have explained that “resources” are buildings, organizations, people, or services that are available to the community when they are needed. “like; roads, houses, health facilities (pharmacies, hospitals, clinics etc.), post office, schools/college/madrassa, religious buildings, graveyard, crematorium, water wells, public baths, markets, schools, factories, rivers, beel, pond, embankment, flood/hazard prone area, flood shelter, bus stand, launch ghat, agricultural land, forest, etc.



Photograph 2.1: Preparing Social Map



Photograph 2.2: Social Map of Bagabo Union

2.3 Major Problems and Potentials

2.3.a Problems Identification

Most of the participants have participated in order to identify the problems and prioritized the problems with causes, effect/impact and potentials. The following problems have been identified during PRA which are as follows:

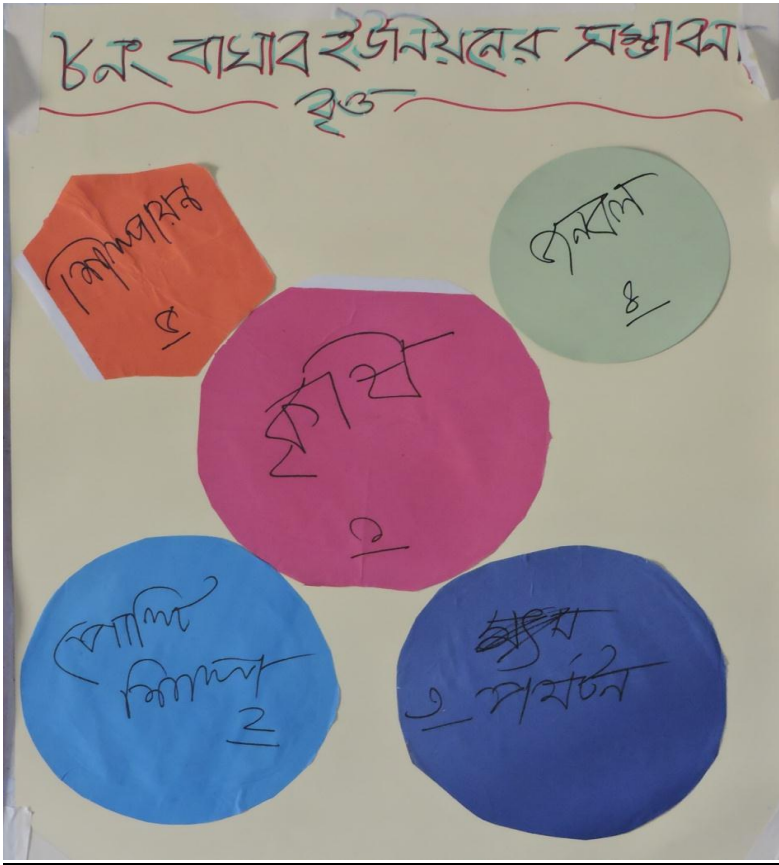
- Poor road maintenance
- No job opportunity
- Limitation in transports communication
- Development of educational infrastructure

- Need of government allocation
- Increase of unemployment and poverty
- Lack of proper market value/ lack of marketing
- No cold storage
- No industries
- Water logging
- Lack of electricity
- Lack of vocational training
- Theft and robbery
- Early marriage
- Lack of bridge and culvert
- Lack of teachers in primary school
- Lack of religious institution

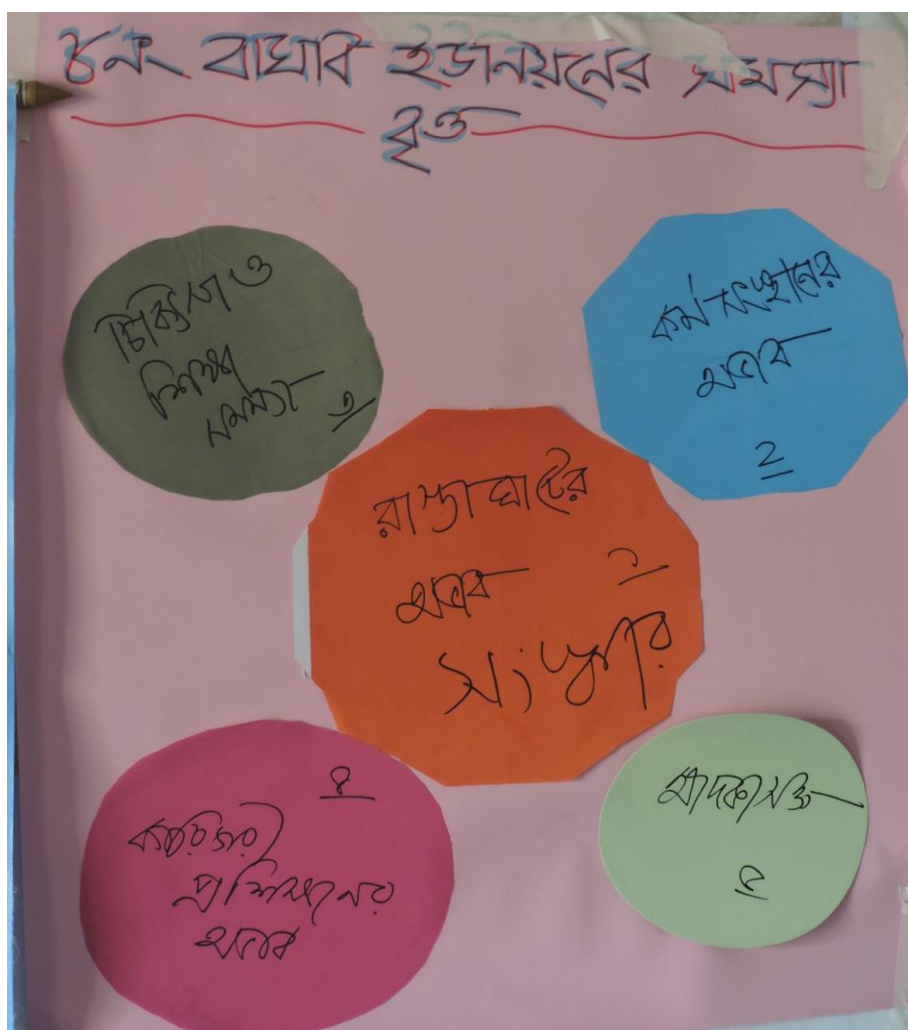
2.3.b Problems Prioritization through Venn Diagram

After a long discussion, the participants have come to the consensus to identify the 5 major problems as priority basis. The five major problems are as follows;

1. Lack of road repairing
2. Lack of employment
3. Problem of education and health service
4. Lack of vocational institution
5. Problem of drug addiction



Photograph 2.4: Major Five Potential



Photograph 2.3: Venn diagram of Major Five Problems

2.3.c Identification of Potentials through Venn Diagram

After identification of problems with prioritization, the next step has to identify the potentials of the respective area which may be used as resources during planning. The potentials are as follows;

- High land
- Poultry firm
- Fisheries
- training
- Tourism
- Industrialization
- Working people

2.3.d Identification of Prioritized Problems, Cause, Impact, Potentials

After identification of the problems and potentials, the large group has engaged to identify the causes and impact of problems and potentials in the area. The problems, causes, impact and potentials have furnished in the following table;

Table 2.1: Problems, Cause, Impact and Potentials

Identified Problems	Causes	Impact	Potentials/Probability
1. Poor Transportation System	<ul style="list-style-type: none"> Broken roads and ditch lack of supervision of local government 	<ul style="list-style-type: none"> Increase communication problem. Problem of transportation for various products. Increase transport cost. Problem of getting medical treatment. 	<ul style="list-style-type: none"> Hardworking people Easy marketing
2. Lack of employment	<ul style="list-style-type: none"> There is no industries. The allotted land is not using for industries 	<ul style="list-style-type: none"> Young people are being drug addicted. 	<ul style="list-style-type: none"> Hardworking people .
3. Lack of Medical and educational Institution	<ul style="list-style-type: none"> No health complex No skilled doctors and enough medicines. Lack of teacher 12 buildings are at risk 	<ul style="list-style-type: none"> Unemployment is increased Mortality rate increased Population is increased 	<ul style="list-style-type: none"> The people will get quick treatment Health consciousness will be increased Time consumption will be decreased.
4. Drug addiction	<ul style="list-style-type: none"> Students are dropped out from schools 	<ul style="list-style-type: none"> Eve-teasing and theft are increased 	<ul style="list-style-type: none"> Social development will be done
5. Lack of vocational training Institute	<ul style="list-style-type: none"> The equipment of vocational training are not enough. Girls face problems in tailoring 	<ul style="list-style-type: none"> Girls and women are going to be unemployed. 	<ul style="list-style-type: none"> people will be economically developed

2.4 Perceived Development Priorities

The recommended development priorities of Bagabo Union are as follows;

Table 2.2: Identification of Development Plan for Bagabo Union

Short term	Midterm	Long term
<ul style="list-style-type: none"> Demand of developed road communication Demand of concrete road Demand of bus station in Kundrapara and Demand of drag free society 	<ul style="list-style-type: none"> Demand of developed educational institution. Demand of girls school Demand of college in Bagabo Demand of a govt. college Demand of 100% education rate Demand of a govt. hospital Demand of ensure 100% health treatment 	<ul style="list-style-type: none"> Demand of establishing industries Remove unemployment

2.5 List of Participants

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: শিবপুর
Union: বাগাবা
Venue: বাগাবা

Date: ০৩.০১.২০১৫
Time: ১০.০০

Sl No.	Name	Designation	Address: Ward/Village	Phone number	Signature
1	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭০৬২৪০২	
2	শ্রীঃ আব্দুল হাকিম	মহানন্দ	আব্দুল হাকিম	০১৭২১৩৫৭৮	
3	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭৬৪৩৫০৮	
4	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৮২৫৫১৭২	
5	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭৬২৫৭০৬৮	
6	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭২৭৩০৫০৬	
7	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭৩১৪৩৩৬৩	
8	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭৫৭৭৭৭৭	
9	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭২৫৩০৬০৬	
10	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭৩৩৭৭৭৭	
11	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭৬০২৭৬৩	
12	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭২৬৭১০	
13	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭৪০৭৭৮	
14	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭৪০৭৭৮	
15	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭৬২১৭১১	
16	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭৬৬৭৭৭	
17	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭৬৬৭৭৭	

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: শিবপুর
Union: বাগাবা
Venue: বাগাবা

Date: ০৩/০১/২০১৫
Time: ১০.০০

Sl No.	Name	Designation	Address: Ward/Village	Phone number	Signature
1	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭৬৭৭৭৭	
2	শ্রীঃ আব্দুল হাকিম	ইউ.এস.এস.ও	আব্দুল হাকিম	০১৭১৭৭৭৭	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					

3.0 Chakradha Union

3.1 Overview

Chakradha Union under the administrative jurisdiction of Raipura Upazila in Narsingdi District has an area of 03.30 km². The boundary of the study area is stated below:

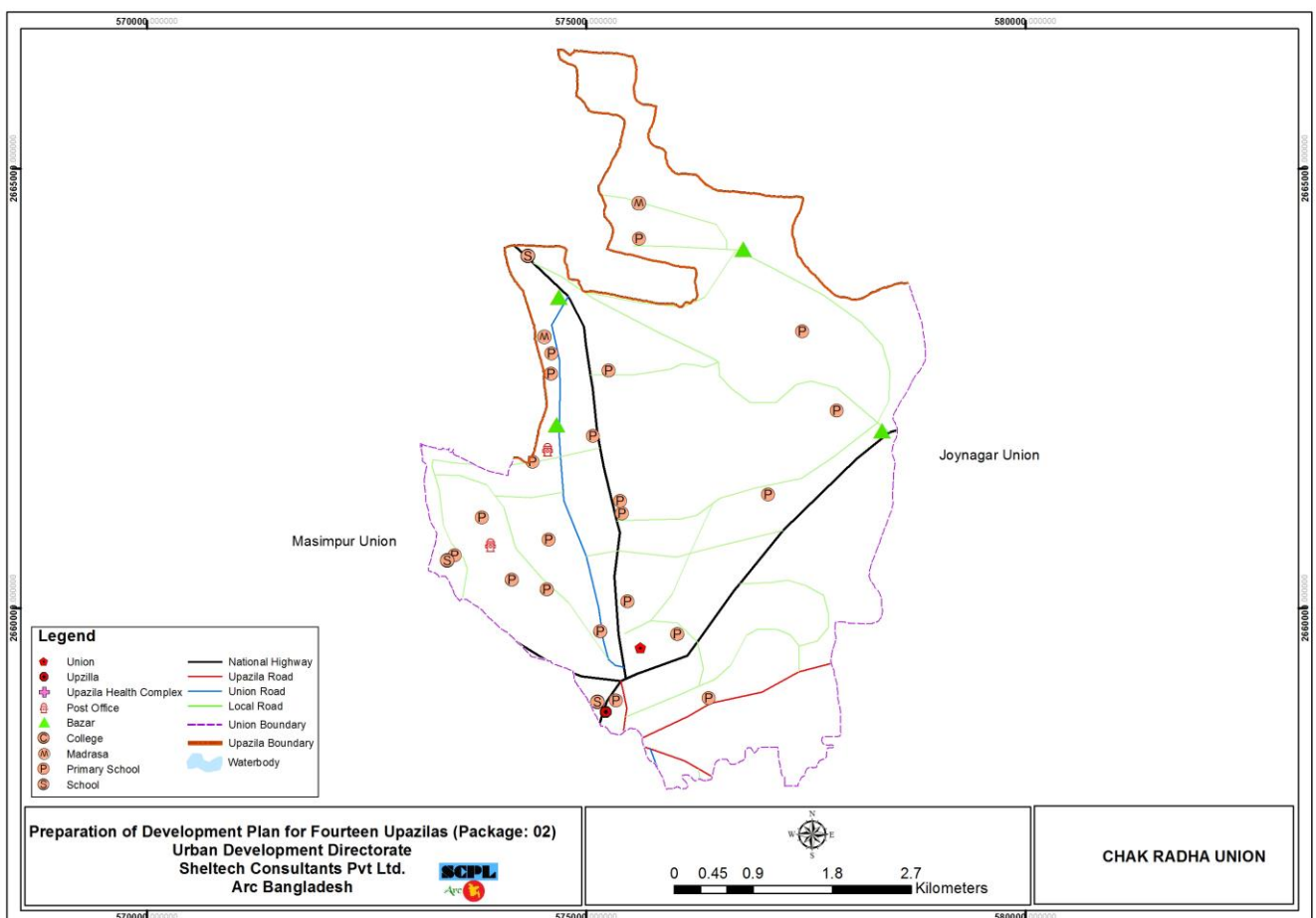
North: On the north side of the study area, Monohordi upazila is situated.

South: On the south side of the study area, is Shibpur paurashava is located.

East: On the east side of the study area, Joynagar union is situated.

West: On the west side of the study area, Masimpur union is located.

Map 3.1: Chakradha Union



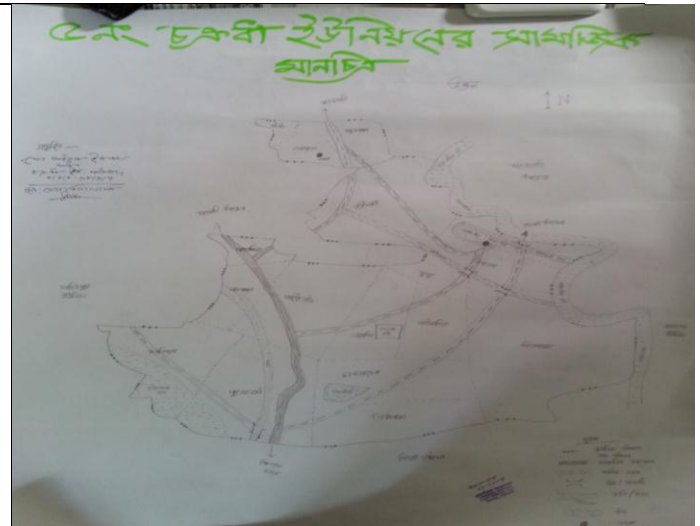
3.2 Spatial Aspects

Social mapping is useful PRA tool which is helpful in knowing the Spatial Aspects of the target area that can assist of planning team in decision making for future planning. It is also helpful to identify different problems and resources in the area through map exercising that can helpful to select intervention in order to minimize or reduce the problems.

The Facilitator has selected two or three persons for preparing the social map of Chakradha Union who have vast knowledge about the area as well as good hand for drawing of map. Then the participants were asked the participants to draw all resources in the Union and have explained that “resources” are buildings, organizations, people, or services that are available to the community when they are needed. “like; roads, houses, health facilities (pharmacies, hospitals, clinics etc.), post office, schools/college/madrassa, religious buildings, graveyard, crematorium, water wells, public baths, markets, schools, factories, rivers, beel, pond, embankment, flood/hazard prone area, flood shelter, bus stand, launch ghat, agricultural land, forest, etc.



Photograph 3.1: Preparing Social Map



Photograph 3.2: Social Map of Chakradha Union

3.3 Major Problems and Potentials

3.3.a Problems Identification

Most of the participants have participated in order to identify the problems and prioritized the problems with causes, impact and potentials. The following problems have been identified during PRA which are as follows:

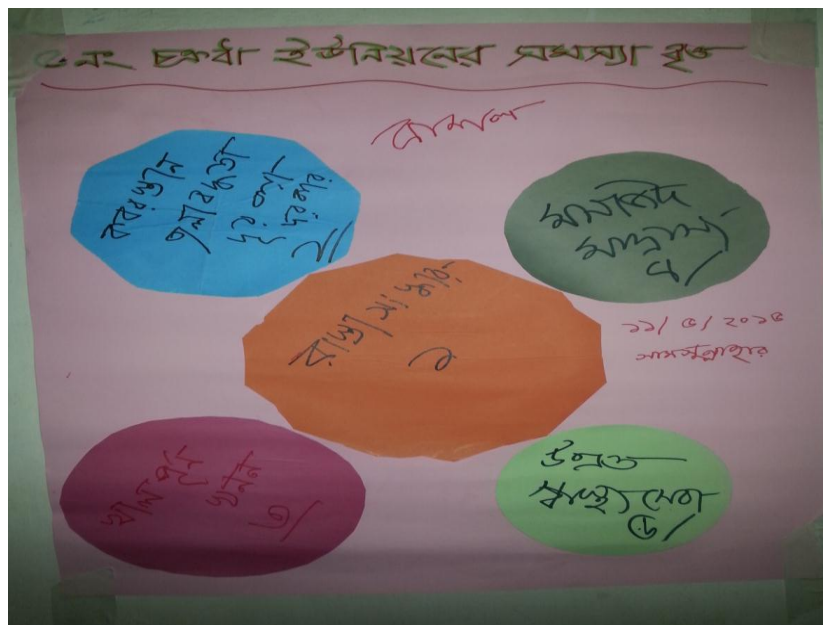
- No gas connection in ward no 2, 3, 5, 7 and 8
- Need cold Storage
- Health Complex and hospital
- lack of doctor
- Agricultural problem
- Road repairing
- lack of drainage especially in ward no 3
- Problem of electricity

- Need of educational institutions, college
- dustbin and disposal problem
- water logging
- lack of allowance of adult, widow and disable person
- Lack of graveyard
- Lack of vocational training of women
- Unemployment
- Lack of security
- Deforestation
- repairing of religious institution (temple)
- Secured sanitation system
- need of playground and cultural auditorium

3.3.b Problems Prioritization through Venn Diagram

After a long discussion, the participants have come to the consensus to identify the 5 major problems as priority basis. The five major problems are as follows;

1. Problem transportation system
2. Lack of graveyard and problem of ditch
3. Lack of canal digging
4. Lack of mosque and madrasha
5. Lack of developed health service

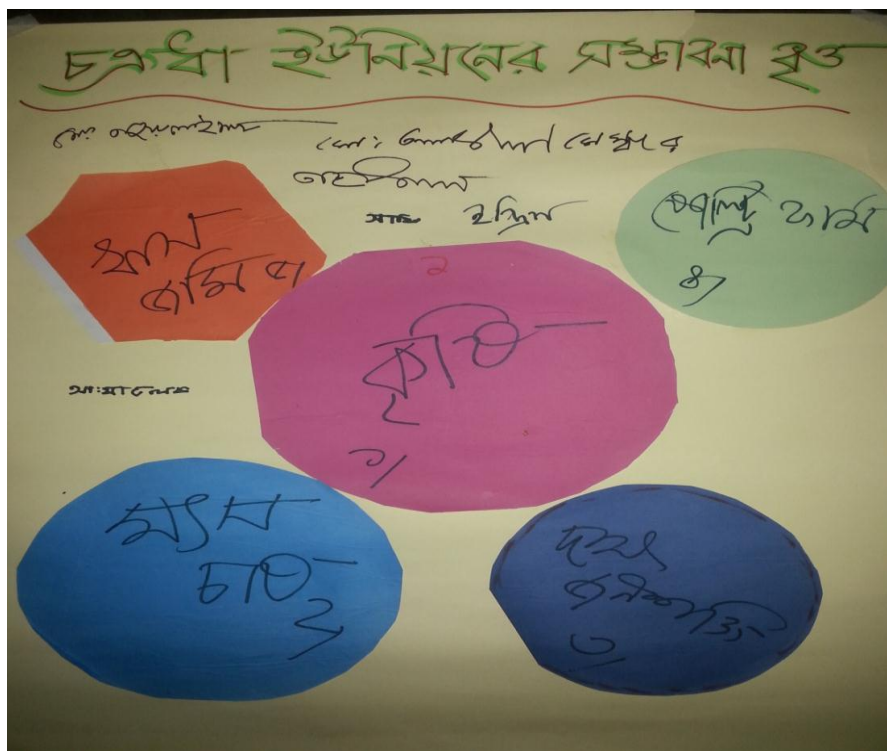


Photograph 3.3: Major five Problems

3.3.c Identification of Potentials through Venn Diagram

After identification of problems with prioritization, the next step has to identify the potentials of the respective area which may be used as resources during planning. The potentials are as follows;

- Cultivating of vegetables and fruits
- Poultry farm
- Agriculture
- Skilled human resources
- Khas land
- Fisheries
- Handicraft



Photograph 3.4: Major Five Potentials

3.3.d Identification of Prioritized Problems, Cause, Impact, Potentials

After identification of the problems and potentials, the large group has engaged to identify the causes and effect/impact of problems and potentials in the area. The problems, causes, effect/impact and potentials have furnished in the following table

Table 3.1: Problems, Causes, Impact and Potentials

Identified Problems	Causes	Impact	Potentials/Probability
1. Insufficient medical facility	<ul style="list-style-type: none"> • lack of enough skilled doctors, • communication problems, • lack of modern medical equipment and insufficient medicine • Local authority and government hasn't taken initiatives for building up a hospital. 	<ul style="list-style-type: none"> • People of Chakrodha are suffering from different problems, such as- loss of time & money, deprived from services. 	<ul style="list-style-type: none"> • medical facilities will be ensured for the large amount of poor people • Medical cost will be lessen as for potentials.
2. Lack of cultural activities and play ground	<ul style="list-style-type: none"> • There is no financial allotment • Lack of enough and exact place of playground. 	<ul style="list-style-type: none"> • The young generations are intended to drug addiction and misdemeanors 	<ul style="list-style-type: none"> • Cultural activities will help to cultural development of the young generations.
3. Establishing Upzila	<ul style="list-style-type: none"> • Legal authority and government didn't take initiatives. 	<ul style="list-style-type: none"> • Distance between people and administration is increased. • Lack of security and people are victim of discrimination. 	<ul style="list-style-type: none"> • Job opportunity for the people will be created. • Administrative service will be reached at the door of the people.
4. Cold storage	<ul style="list-style-type: none"> • Lack of proper initiative and financial scope. 	<ul style="list-style-type: none"> • The vegetables and fruits are got rotten and the farmers face a great financial loss • Farmers don't get the reasonable price of the products 	<ul style="list-style-type: none"> • Marketing will be easy; farmers will get financial benefit and reasonable price.

3.4 Perceived Development Priorities

The recommended development Priorities for Chakradha Union are as follows;

Table 3.2: Development Priorities for Chakradha Union

Short term	Midterm	Long term
<ul style="list-style-type: none"> • Demand of developed road communication • Demand of concrete road • Demand of bus station in Kundrapara and FT over bridge • Demand of ensure 100% health treatment • Demand of a health complex in Chokrodha union • Demand of a hospital • Demand of a soil damping on graveyard • Want making graveyard higher • Drive away water logging in graveyard 	<ul style="list-style-type: none"> • Illumination of illiteracy • Demand of school • Demand of madrasah • Want gas connection 	<ul style="list-style-type: none"> • Demand of establishing industries • Drive away of unemployment • Demand of digital union

3.5 List of Participants

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: Shibpur
Union: Chokkoshila
Venue: Up Complex

Date: 05-11-2015
Time: 10:30

Sl No.	Name	Designation	Address: Ward/Village	Phone number	Signature
1	Mr. H. A. Uddin	Fixed Person	06 W	0192836028	
2	Mr. H. A. Uddin	UP Member	06 W	01916278546	
3	Mr. H. A. Uddin	UP Member	06 W	0198538997	
4	Mr. H. A. Uddin	UP Member	06 W	0198538997	
5	Mr. H. A. Uddin	UP Member	06 W	0198538997	
6	Mr. H. A. Uddin	UP Member	06 W	0198538997	
7	Mr. H. A. Uddin	UP Member	06 W	0198538997	
8	Mr. H. A. Uddin	UP Member	06 W	0198538997	
9	Mr. H. A. Uddin	UP Member	06 W	0198538997	
10	Mr. H. A. Uddin	UP Member	06 W	0198538997	
11	Mr. H. A. Uddin	UP Member	06 W	0198538997	
12	Mr. H. A. Uddin	UP Member	06 W	0198538997	
13	Mr. H. A. Uddin	UP Member	06 W	0198538997	
14	Mr. H. A. Uddin	UP Member	06 W	0198538997	
15	Mr. H. A. Uddin	UP Member	06 W	0198538997	
16	Mr. H. A. Uddin	UP Member	06 W	0198538997	
17	Mr. H. A. Uddin	UP Member	06 W	0198538997	
18	Mr. H. A. Uddin	UP Member	06 W	0198538997	

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: Shibpur
Union: Chokkoshila
Venue: Up Complex

Date: 05-11-2015
Time: 10:30

Sl No.	Name	Designation	Address: Ward/Village	Phone number	Signature
1	Mr. H. A. Uddin	UP Member	06 W	0198538997	
2	Mr. H. A. Uddin	UP Member	06 W	0198538997	
3	Mr. H. A. Uddin	UP Member	06 W	0198538997	
4	Mr. H. A. Uddin	UP Member	06 W	0198538997	
5	Mr. H. A. Uddin	UP Member	06 W	0198538997	
6	Mr. H. A. Uddin	UP Member	06 W	0198538997	
7	Mr. H. A. Uddin	UP Member	06 W	0198538997	
8	Mr. H. A. Uddin	UP Member	06 W	0198538997	
9	Mr. H. A. Uddin	UP Member	06 W	0198538997	
10	Mr. H. A. Uddin	UP Member	06 W	0198538997	
11	Mr. H. A. Uddin	UP Member	06 W	0198538997	
12	Mr. H. A. Uddin	UP Member	06 W	0198538997	
13	Mr. H. A. Uddin	UP Member	06 W	0198538997	
14	Mr. H. A. Uddin	UP Member	06 W	0198538997	
15	Mr. H. A. Uddin	UP Member	06 W	0198538997	
16	Mr. H. A. Uddin	UP Member	06 W	0198538997	
17	Mr. H. A. Uddin	UP Member	06 W	0198538997	
18	Mr. H. A. Uddin	UP Member	06 W	0198538997	

4.0 Dulalpur Union

4.1 Overview

Dulalpur Union under the administrative jurisdiction of Raipura Upazila in Norshindi District has an area of 03.30 km². The boundary of the study area is stated below:

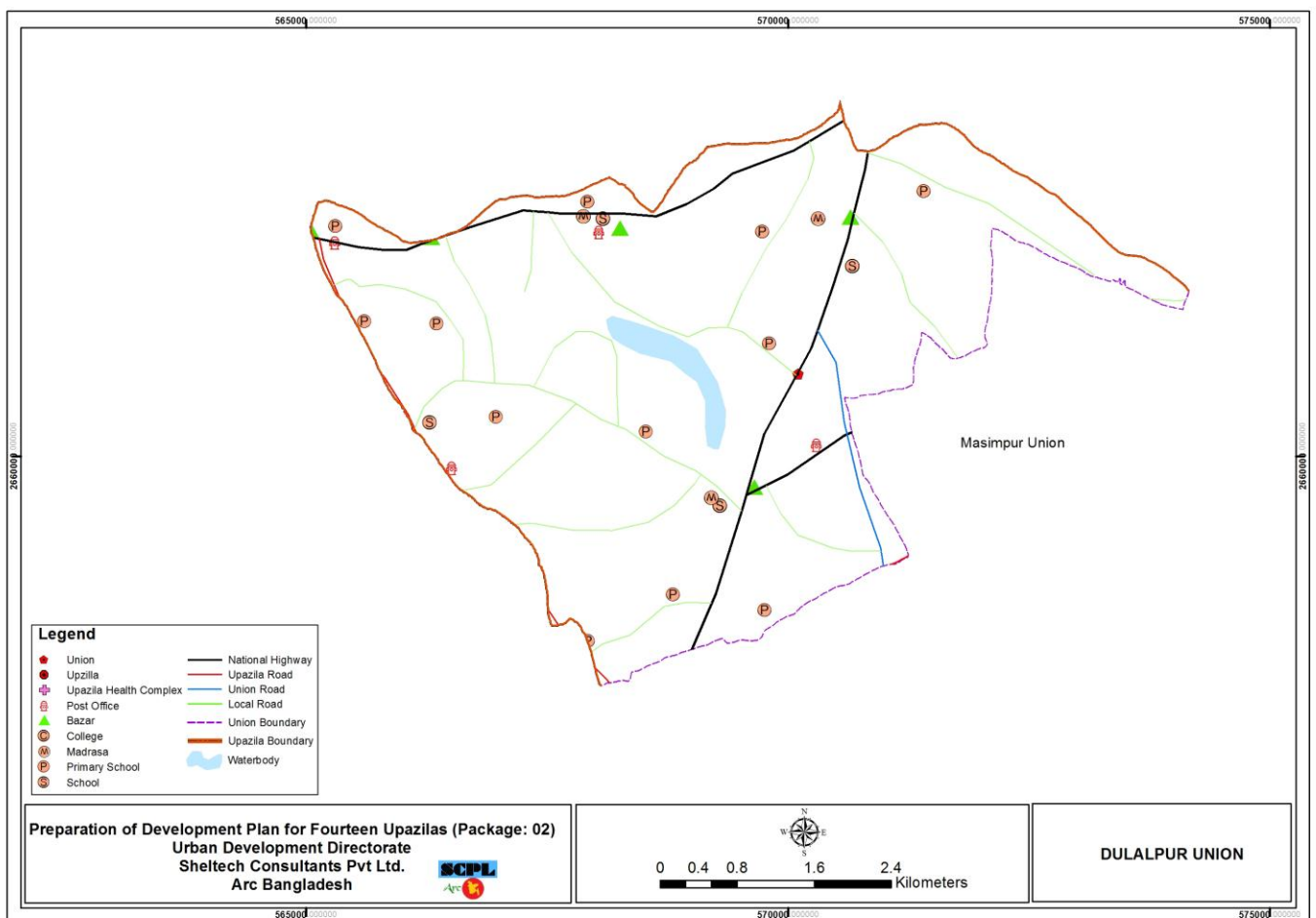
North: On the north side of the study area, Monohordi upazila is situated

West: West side of the study area is surrounded by Shitolokkha River

South: On the south side of the study area, Palash Upazila is located

East: On the east side of the study area, Masimpur union is located

Map 4.1: Dulalpur Union



4.2 Spatial Aspects

Social mapping is useful PRA tool which is helpful in knowing the Spatial Aspects of the target area that can assist of planning team in decision making for future planning. It is also helpful to identify different problems and resources in the area through map exercising that can helpful to select intervention in order to minimize or reduce the problems.

The Facilitator has selected two or three persons for preparing the social map of Dulalpur Union who have vast knowledge about the area as well as good hand for drawing of map. Then the participants were asked the participants to draw all resources in the Union and have explained that “resources” are buildings, organizations, people, or services that are available to the community when they are needed. “like; roads, houses, health facilities (pharmacies, hospitals, clinics etc.), post office, schools/college/madrassa, religious buildings, graveyard, crematorium, water wells, public baths, markets, schools, factories, rivers, beel, pond, embankment, flood/hazard prone area, flood shelter, bus stand, launch ghat, agricultural land, forest, etc.



Figure 4.1: Counselling in preparing Social Map

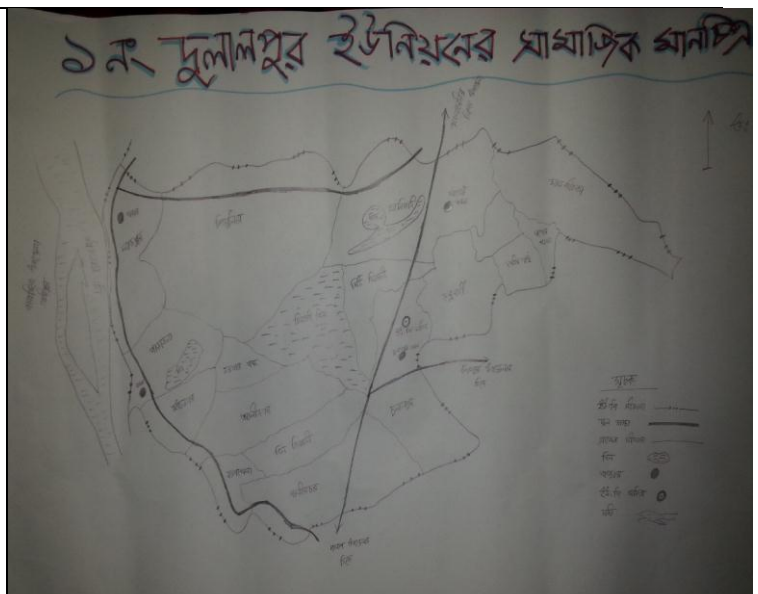


Figure 4.2: Social Map of Dulalpur Union

4.3 Major Problems and Potentials

4.3.a Problems Identification

Most of the participants have participated in order to identify the problems and prioritized the problems with causes, impact and potentials. The following problems have identified during PRA which are as follows:

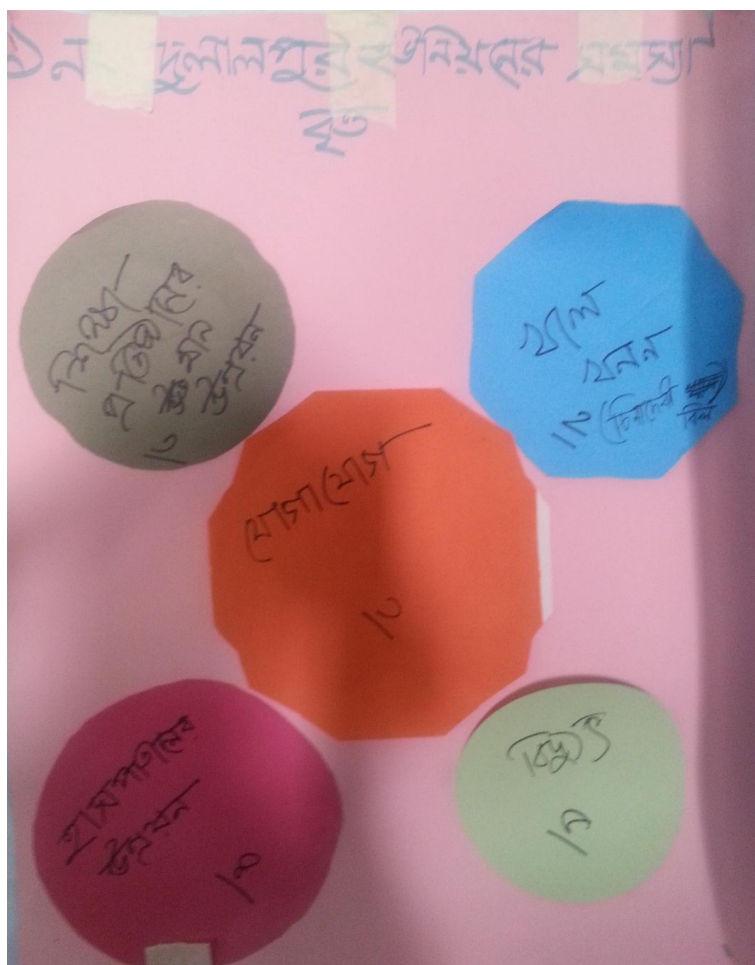
- Road re-construction in the village
- Healthy sanitation
- Canal digging
- Bridge on dam

- Planned Housing
- Electricity
- Religious institutions
- Health complex infrastructure developments
- Developments of educational infrastructure
- Making technical educational institution
- Stopping early marriage
- Water logging at Chinadevi Khal

4.3.b Problems Prioritization through Venn Diagram

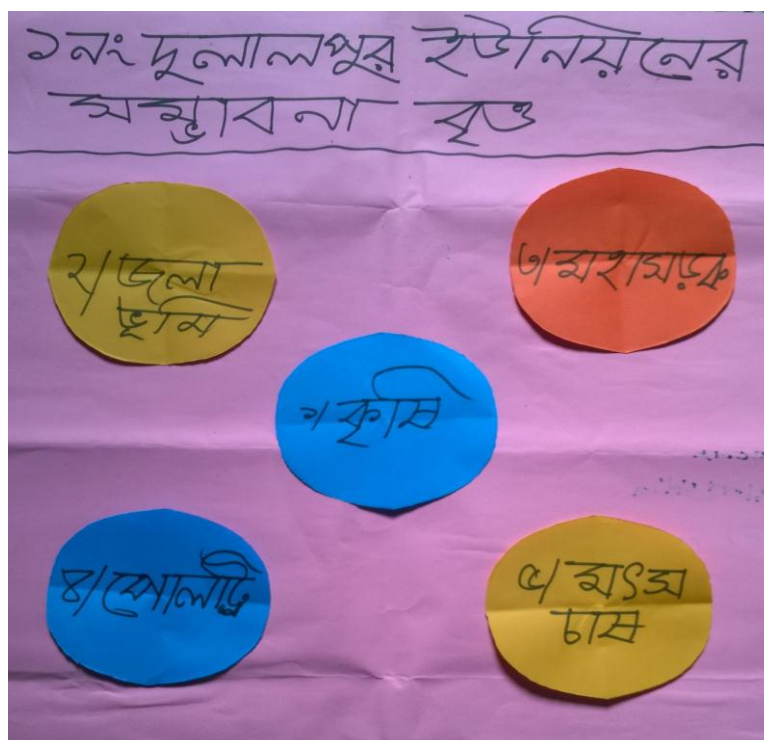
After long discussion, the participants have come into the consensus to identify the 5 (five) major problems as priority basis. The five major problems are as follows;

1. Weak transportation system
2. Lack of canal digging
3. Undeveloped educational institution
4. Problem of hospital
5. Lack of electricity



4.3.c Identification of Potentials through Venn Diagram

1. Agriculture
2. Water body
3. High way
4. Poultry farm
5. Fisheries



Photograph 4.4: Major Five Potentials

4.3.d Identification of Prioritized Problems, Cause, Impact, Potentials

After identification of the problems and potentials, the large group has engaged to identify the causes and effect/impact of problems and potentials in the area. The problems, causes, effect/impact and potentials have furnished in the following table.

Table 4.1: Problems, Cause, Impact and Potentials

Identified Problems	Causes	Impact	Potentials/Probability
1.Weak Transportation System	<ul style="list-style-type: none"> Broken roads Narrow roads 	<ul style="list-style-type: none"> Increase communication system. Problem of transportation for various products. Increase transport cost. 	<ul style="list-style-type: none"> Sand and soil in the area Hardworking people
2. Problem of river and canal dredging.	<ul style="list-style-type: none"> No dredging in necessary and timely Shortage of budget 	<ul style="list-style-type: none"> Flooded agricultural lands and area before rainy season. In the dry season water crisis for irrigation 	<ul style="list-style-type: none"> Existing 2 rivers and canals for dredging.

Identified Problems	Causes	Impact	Potentials/Probability
3. Lack of Medical Facilities	<ul style="list-style-type: none"> Inadequate Health Service Provider(Clinic/Hospital) Inadequate Doctor/Specialist Doctor Lack of medicine in the Health Complex/Community Clinic Lack of Ambulance 	<ul style="list-style-type: none"> Ill-health and suffering Life risk Money loss for treatment Poverty 	
4. Insufficient Electricity Supply	<ul style="list-style-type: none"> Increased the Demand of Production did not increased as per Demand of 	<ul style="list-style-type: none"> Hampered the preparation of lessons of student Hampered the irrigation Hampered the normal production Economical loss 	
5. Lack of Educational development	<ul style="list-style-type: none"> lack of educational amenities poor infrastructure 	<ul style="list-style-type: none"> Students do not find their hopeful education Life risk Poverty 	

4.4 Perceived Development Priorities

The recommended development Priorities for Dulalpur Union is as follows

Table 4.2: Development Priorities for Dulalpur Union

Short term	Midterm	Long term
<ul style="list-style-type: none"> • Demand of developed road communication • Demand of concrete road • Demand of guide wall beside the road • Demand of bridge • Demand of corruption free society • Health complex • New community clinic • Demand of medicine 	<ul style="list-style-type: none"> • Enhancement of health amenities • Development of education system • New primary school in 8 no. ward • Demand of health complex • New community clinic • Demand of medicine 	<ul style="list-style-type: none"> • Creation of new employments • Creation industry • Demand of technical training for women • Want to see a sub-city • Demand of gas connection • Planned housing

4.5 List of Participants

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: শিবপুর
Union: ১ নং দুলাপুর
Venue: স্বকল্পিত লোকজন মিলন/ঘর

Date: ০২/০২/২০০৮
Time: ৩ ঘটনা ২০ টা ৩০ মিনিট

Sl No.	Name	Designation	Address: Ward/Village	Phone number	Signature
1	মুহাম্মদ হুসেইন	ডায়েরী	১ নং	০১৭১৪০৭৬০	
2	আবু হান্নান	মেম্বর	৪ নং	০১৭১০৩৬৪৬৬	
3	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
4	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
5	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
6	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
7	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
8	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
9	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
10	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
11	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
12	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
13	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
14	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
15	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
16	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
17	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	
18	আবুল কালাম	মেম্বর	৭ নং	০১৭২০১৬২১২৩	

5.0 Joynagar Union

5.1 Overview

Joynagar Union under the administrative jurisdiction of Shibpur Upazila in Narsingdi District has an area of 22.03 km². The boundary of the study area is stated below:

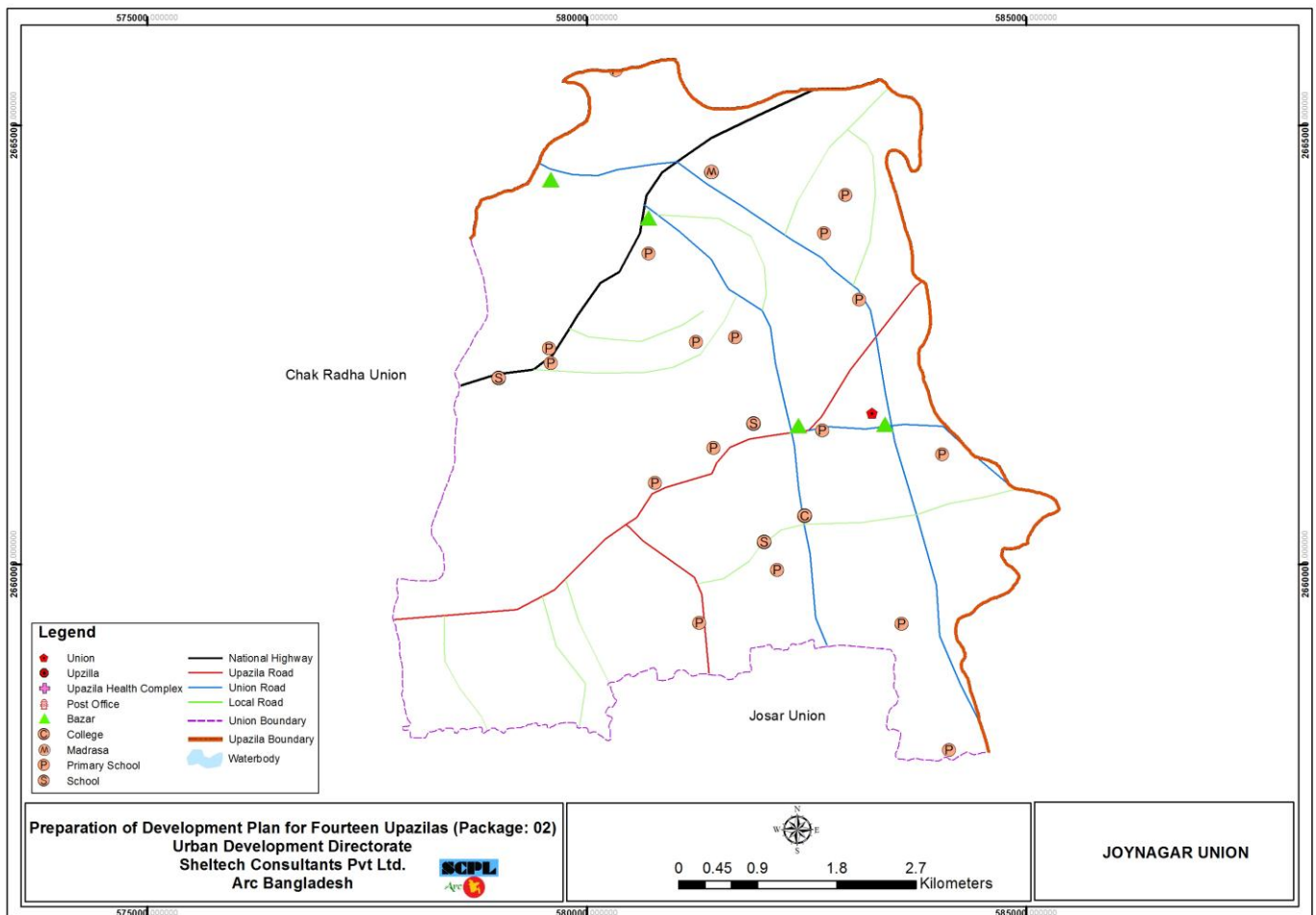
North: On the north side of the study area, Masimpur Union is situated

West: On the west side of the study area, RiverHoridua and Gojaria Union are located.

South: On the south side of the study area, Narsindi District sadar and ChinishpurUnion are located.

East: On the east side of the study area, Ayubpur Union is located

Map 5.1: Joynagar Union



5.2 Spatial Aspects

Social mapping is useful PRA tool which is helpful in knowing the Spatial Aspects of the target area that can assist of planning team in decision making for future planning. It is also helpful to identify different problems and resources in the area through map exercising that can helpful to select intervention in order to minimize or reduce the problems.

The Facilitator has selected two or three persons for preparing the social map of Joynagar Union who have vast knowledge about the area as well as good hand for drawing of map. Then the participants were asked the participants to draw all resources in the Union and have explained that “resources” are buildings, organizations, people, or services that are available to the community when they are needed. “like; roads, houses, health facilities (pharmacies, hospitals, clinics etc.), post office, schools/college/madrassa, religious buildings, graveyard, crematorium, water wells, public baths, markets, schools, factories, rivers, beel, pond, embankment, flood/hazard prone area, flood shelter, bus stand, launch ghat, agricultural land, forest, etc.



5.3 Major Problems and Potentials

5.3.a Problems Identification

Most of the participants have participated in order to identify the problems and prioritized the problems with causes, effect/impact and potentials. The following problems have identified during PRA which are as follows:

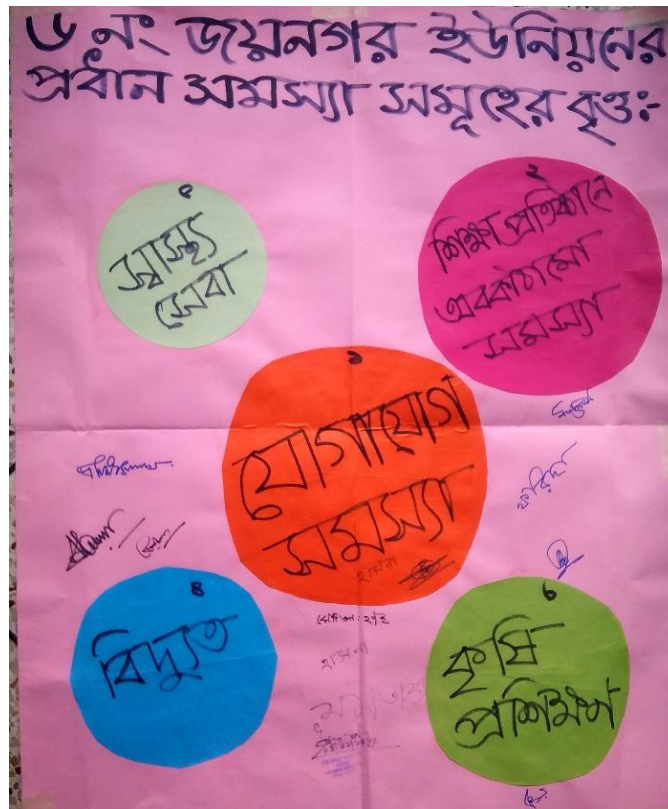
- Weak Transportation (Broken road, green road, broken bridge and culvert)
- Lack of hospital(Lack of doctor, ambulance, medicine)
- No pure drinking water
- Scarcity of tube well
- No shelter center Scarcity of sanitation

- Trouble of education system (Lack of Educational institution structure Such as scarcity of primary school, classroom, teacher and educational materials and no school boundary wall)
- Problem of agriculture, irrigation and drainage
- Lack of Electricity (Load shedding, no 100%electricity connection)
- No gas connection
- No needle machine training center
- Lack of employment
- Disease of jack fruit tree
- Lack of canal digging
- No agricultural training center

5.3.b Problems Prioritization through Venn Diagram

After long discussion, the participants have come into the consensus to identify the 5 major problems as priority basis. The five major problems are as follows;

1. Weak transportation system
2. Infrastructure problem for education
3. Lack of agricultural training center
4. Problem of electricity
5. Problem of health service

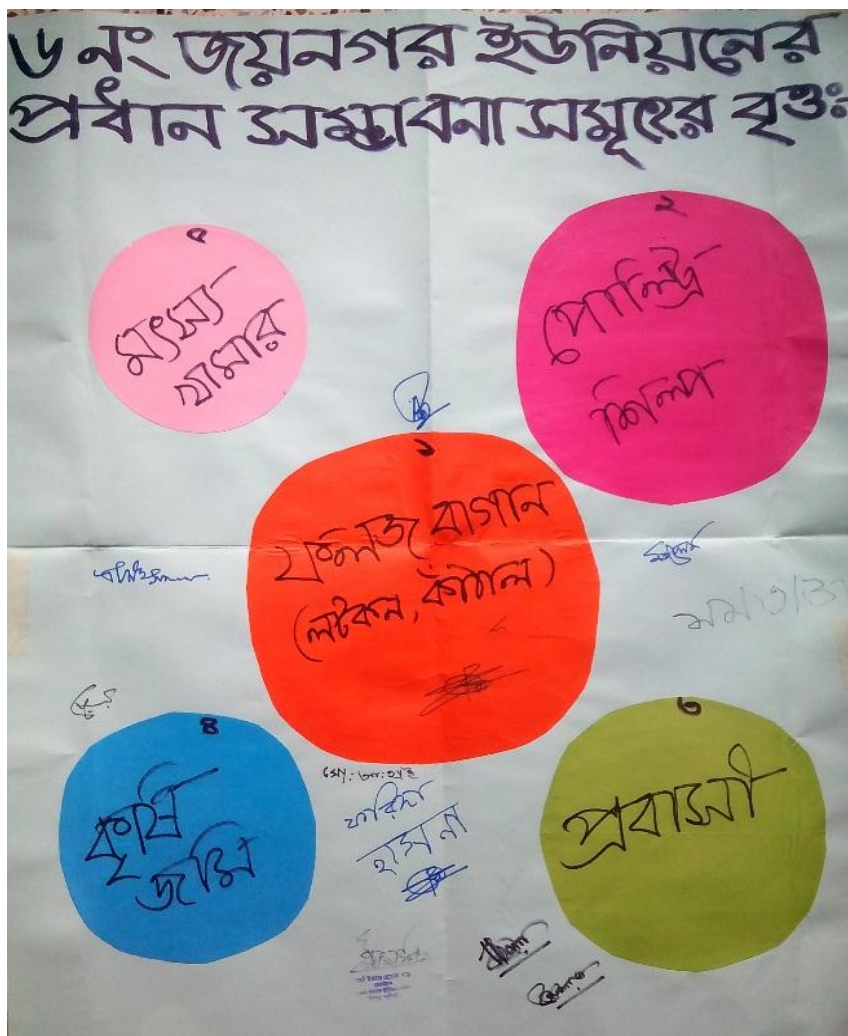


Photograph 5.3: Venn diagram of major problems

5.3.c Identification of Potentials through Venn Diagram

After identification of problems with prioritization, the next step has to identify the potentials of the respective area which might be used as resources during planning. The potentials are as follows;

- Agriculture (Paddy, Vegetables)
- Remittance
- Poultry
- Cattle rearing
- Fruit garden
- Hatchery
- Active human resource
- Market
- Industries



Photograph 5.4: Major Five Potentials

5.3.d Identification of Prioritized Problems, Cause, Impact, Potentials

After identification of the problems and potentials, the large group has engaged to identify the causes and effect/impact of problems and potentials in the area. The problems, causes, effect/impact and potentials have furnished in the following table;

Table 5.1: Problems, Impact, Potentials

Identified Problems	Causes	Impact	Potentials/Probability
1.Weak Transportati on System	<ul style="list-style-type: none"> Lack of budget Green road, broken road, bridge, culvert 	<ul style="list-style-type: none"> Financial loss Cut of communication in rainy season Problem of marketing goods 	<ul style="list-style-type: none"> Existing katcha roads may be maintained
2.Problem of education	<ul style="list-style-type: none"> Lack of new building Lack of repairing old building Lack of fan, bench, toilet 	<ul style="list-style-type: none"> Problem of teaching Students are being uninterested 	<ul style="list-style-type: none"> Exist enough educational institution Existing land and human resource
3.Trouble of agricultural training	<ul style="list-style-type: none"> Lack of budget 	<ul style="list-style-type: none"> Farmers are depriving of right consultation 	<ul style="list-style-type: none"> Existing agricultural land and fruit garden
4.Problem of electricity	<ul style="list-style-type: none"> Lack of industries 	<ul style="list-style-type: none"> Problem of study Increasing fuel cost 	<ul style="list-style-type: none"> People of the union are interested to getting electricity
5.Problem of health service	<ul style="list-style-type: none"> Lack of doctor Lack of medicine Lack of ambulance Underdeveloped union health complex Underdeveloped transportation 	<ul style="list-style-type: none"> Poor people are depriving from health treatment Delivery and pregnant women are not getting proper treatment in proper time 	<ul style="list-style-type: none"> Existing 4 community clinic

5.4 Perceived Development Priorities

The recommended development Priorities for Joynagar Union is as follows:

Table 5.2: Development Priorities for Joynagar Union

Short term	Midterm	Long term
<ul style="list-style-type: none"> • Demand of developed road communication • Demand of concrete road • Demand of ensure 100% health treatment • Demand of establishing a health complex • Demand of established new school building • Demand of a soil damping on graveyard 	<ul style="list-style-type: none"> • Demand of canal digging • Illumination of illiteracy • Demand of school • Demand of madrasah • Want gas connection 	<ul style="list-style-type: none"> • Demand of developed education system • Demand of establishing industries • Solve unemployment problem • Demand of digital union

5.5. List of Participants

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: **শিবপুর**
Union: **জয়নগর**
Venue: **উ.পি. কমপ্লেক্স**

Date: **০৪-১১-২০১৭**
Time: **১০:০০**

Sl No	Name	Designation	Address Ward/Village	Phone number	Signature
1	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
2	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
3	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
4	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
5	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
6	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
7	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
8	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
9	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
10	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
11	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
12	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
13	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
14	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
15	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
16	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
17	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
18	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: **শিবপুর**
Union: **জয়নগর**
Venue: **উ.পি. কমপ্লেক্স**

Date: **০৪-১১-২০১৭**
Time: **১০:০০**

Sl No	Name	Designation	Address Ward/Village	Phone number	Signature
19	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
20	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
21	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
22	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
23	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
24	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
25	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
26	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
27	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
28	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
29	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
30	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
31	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
32	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
33	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
34	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
35	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
36	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
37	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
38	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
39	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	
40	স্ব.শ্রী. রফিকুল হক	সহকারী	আবুদাউদ/১২	০১৭১২৭২৮১১	

6.0 Masimpur Union

6.1 Overview

Masimpur Union under the administrative jurisdiction of Shibpur Upazila in Narsingdi District has an area of 03.30 km². The boundary of the study area is stated below:

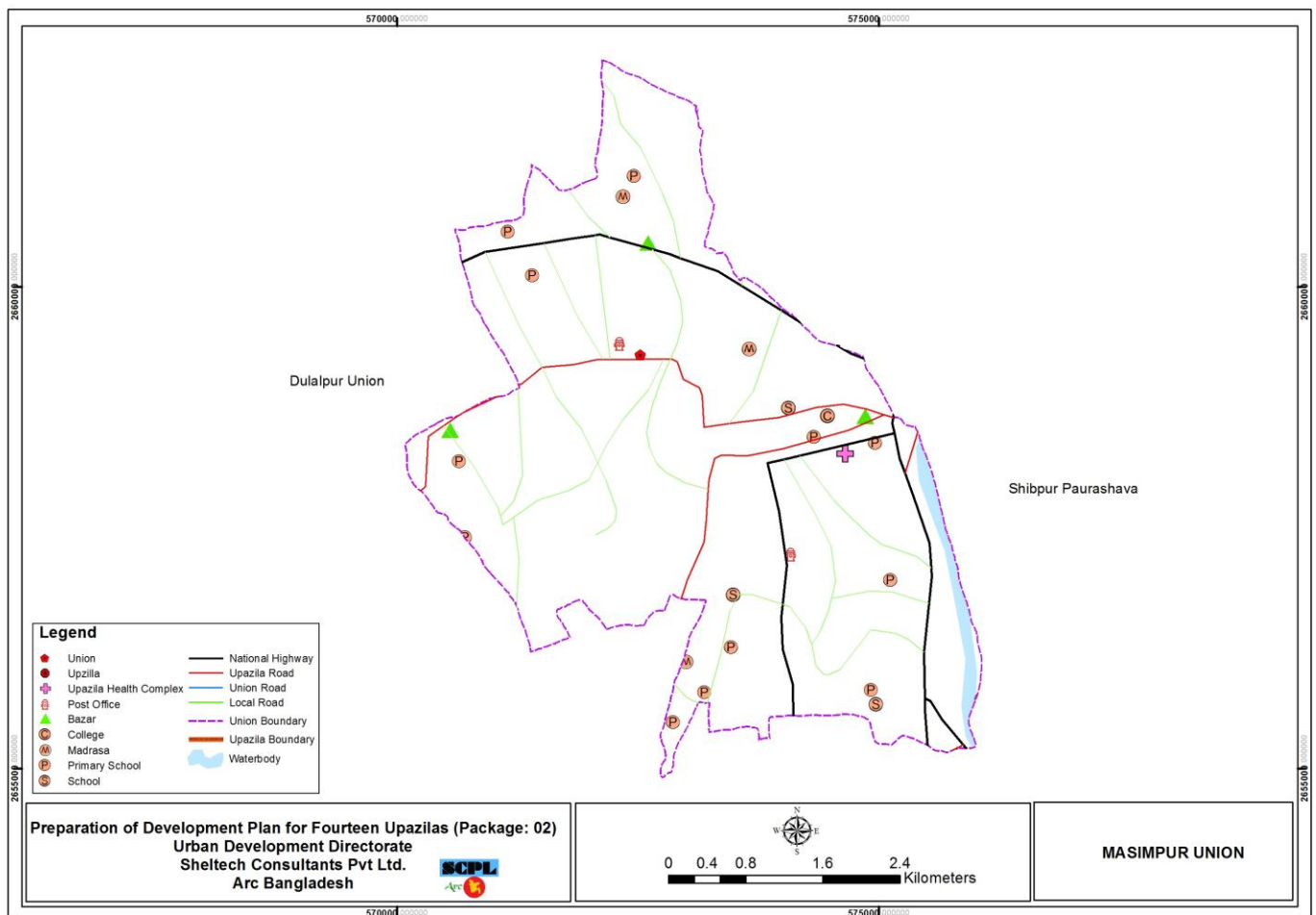
North: On the north side of the study area, Chakradha Union is situated.

West: On the west side of the study area, Dulalpur Union is located.

South: On the south side of the study area, Sadhar Char and Putia Union are located

East: On the east side of the study area, Bagabo Union is located.

Map 6.1: Masimpur Union



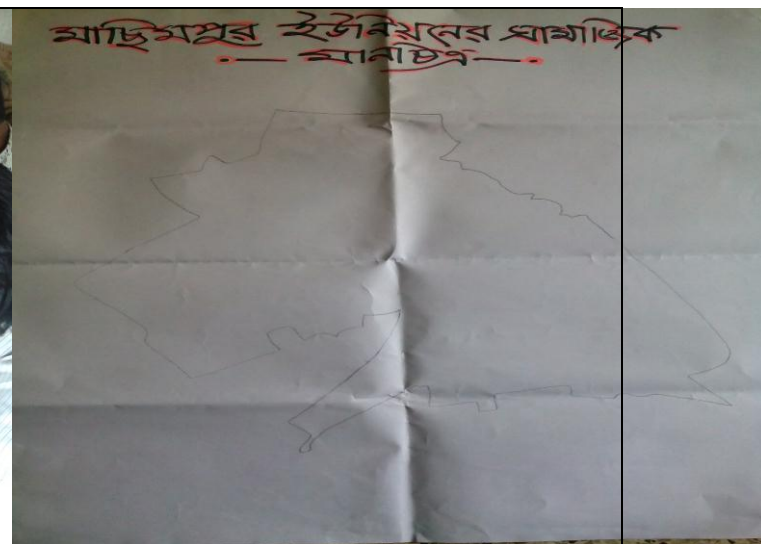
6.2 Spatial Aspects

Social mapping is useful PRA tool which is helpful in knowing the Spatial Aspects of the target area that can assist of planning team in decision making for future planning. It is also helpful to identify different problems and resources in the area through map exercising that can helpful to select intervention in order to minimize or reduce the problems.

The Facilitator has selected two or three persons for preparing the social map of Masimpur Union who have vast knowledge about the area as well as good hand for drawing of map. Then the participants were asked the participants to draw all resources in the Union and have explained that “resources” are buildings, organizations, people, or services that are available to the community when they are needed. “like; roads, houses, health facilities (pharmacies, hospitals, clinics etc.), post office, schools/college/madrassa, religious buildings, graveyard, crematorium, water wells, public baths, markets, schools, factories, rivers, beel, pond, embankment, flood/hazard prone area, flood shelter, bus stand, launch ghat, agricultural land, forest, etc.



Photograph 6.1: Preparing Social Map



Photograph 6.2: Social Map of Masimpur Union

6.3 Major Problems and Potentials

6.3.a Problems Identification

Most of the participants have participated in order to identify the problems and prioritized the problems with causes, effect/impact and potentials. The following problems have been identified during PRA which are as follows:

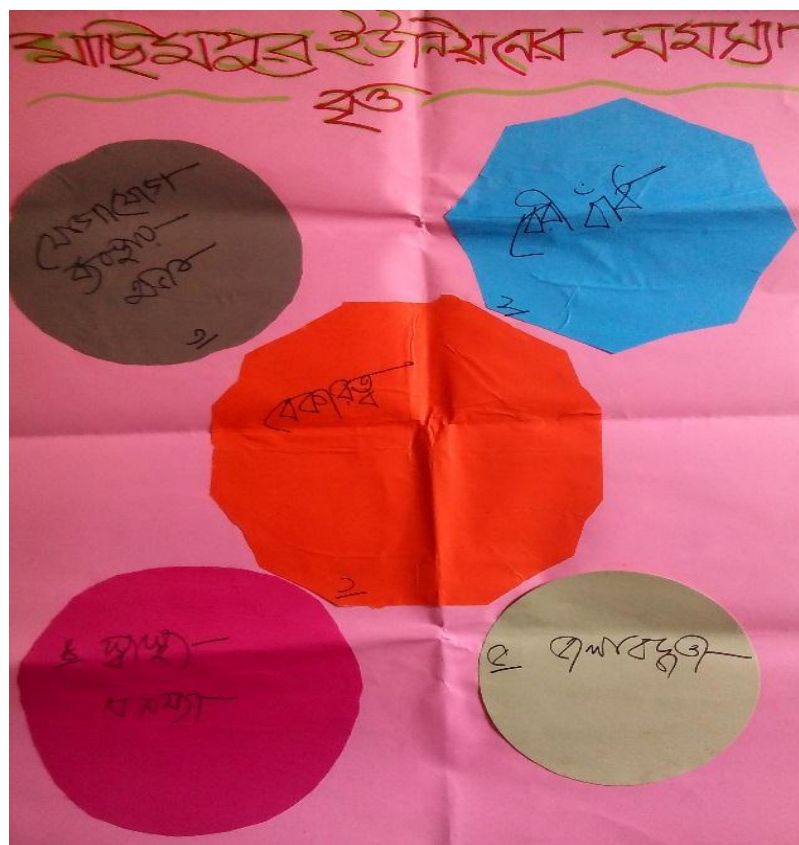
- Weak Transportation (Lack of road repair, narrow road, illegal vehicles stopping problem, lack of good communication system)
- Trouble of health service (Lack of skilled doctor, medicine, tools)
- Lack of vocational institution
- Problem of drag addiction
- Decreasing law enforcement
- Lack of employment
- Problem of ditch

- Lack of canal digging
- Problem of stealing and robbing
- Lack of religious institution structure
- Lack of agricultural training and extension
- Problem of marketing agricultural crops
- Lack of safe drinking water
- Lack of drainage
- Problem of Dak Banglo
- Evil jhut businessman

6.3.b Problems Prioritization through Venn Diagram

After a long discussion, the participants have come to the consensus to identify the 5 major problems as priority basis. The five major problems are as follows;

1. Problem of unemployment
2. Problem of beri badh
3. Problem of transportation
4. Trouble of health service
5. Problem of ditch

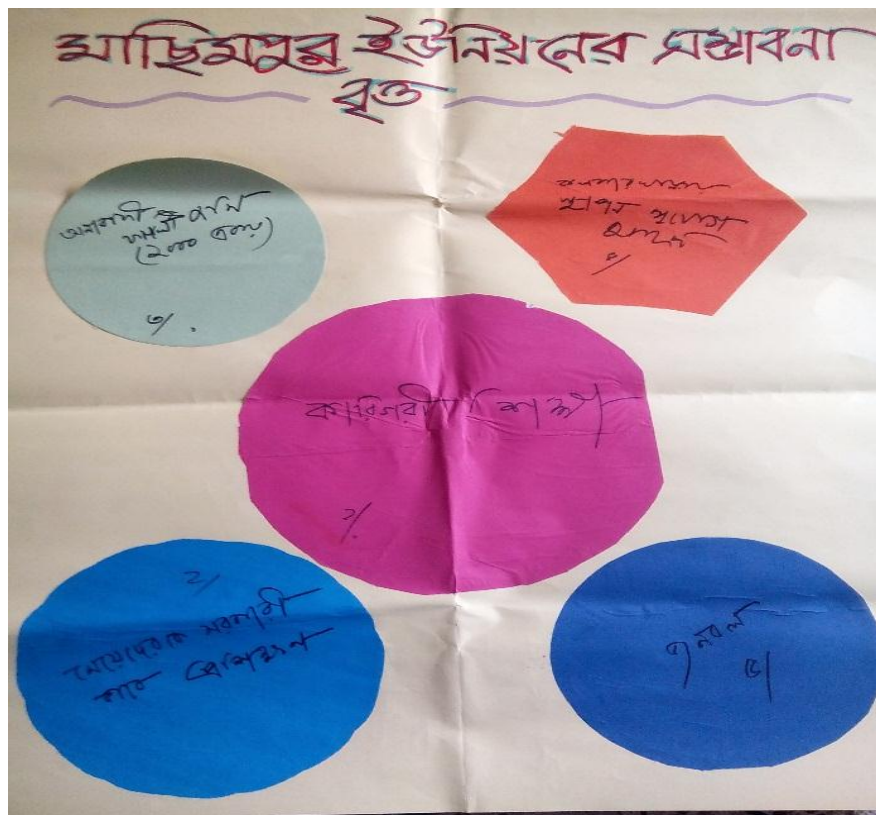


Photograph 6.3: Venn diagram of major problems

6.3.c Identification of Potentials through Venn Diagram

After identification of problems with prioritization, the next step has to identify the potentials of the respective area which may be used as resources during planning. The potentials are as follows;

- Uncultivated land (2000 acre)
- Skilled and active human resource
- Opportunity to build up industry
- Govt. training for woman
- Vocational education



Photograph 6.4: Major Five Potentials

6.3.d Identification of Prioritized Problems, Cause, Impact, Potentials

After identification of the problems and potentials, the large group has engaged to identify causes and effect/impact of problems and potentials in the area. The problems, causes, effect/impact and potentials have furnished in the following table;

Table 6.1: Problems, Cause, Impact, Potentials

Identified Problems	Causes	Impact	Potentials/Probability
1.Unemployment problem	<ul style="list-style-type: none"> No employment 	<ul style="list-style-type: none"> Drug addiction Stealing and robbing 	<ul style="list-style-type: none"> Vocational training Employment opportunity
2. Lack of beri badh	<ul style="list-style-type: none"> Lack of govt. enterprise 	<ul style="list-style-type: none"> Damaging crops No winter season crops 	<ul style="list-style-type: none"> Switch gate
3.Transportation problem	<ul style="list-style-type: none"> No repairing No enterprise higher authority 	<ul style="list-style-type: none"> Problem of communication 	<ul style="list-style-type: none"> Enterprise of the govt.
4.Trouble of health service	<ul style="list-style-type: none"> Lack of doctor Lack of medicine Lack of treatment tools 	<ul style="list-style-type: none"> People are affected in disease 	<ul style="list-style-type: none"> Existing hospital
5.Problem of ditch	<ul style="list-style-type: none"> Raising silicon No drain 	<ul style="list-style-type: none"> Transportation problem 	<ul style="list-style-type: none"> Existing canal, beel Govt. efforts

6.4 Perceived Development Priorities

The recommended development priorities for Masimpur Union are as follows:

Table 6.2: Development Priorities of Masimpur Union

Short term	Midterm	Long term
<ul style="list-style-type: none"> Demand of development of education Demand of development of health treatment service Demand of development of agriculture Demand of land survey 	<ul style="list-style-type: none"> Demand of developed drainage system 	<ul style="list-style-type: none"> Demand of industrialization Demand of development of transportation

6.5. List of Participants

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: শিবপুর Date: ২১/০১/১৮
Union: আল-হুদা Time: ২:৪৫
Venue: আল-হুদা মসজিদ

Sl No.	Name	Designation	Address: Ward/Village	Phone number	Signature
1	আবু মাহমুদ	মহাসচিব	আল-হুদা		
2	মহাসচিব	উপ	১১	০১৭২ ১৭৩০ ৬৫০	২১/০১
3	মহাসচিব	১১	১১		২১/০১
4	(উ) আল-হুদা		১১		
5	আল-হুদা		১১		
6	আল-হুদা		১১		
7	আল-হুদা		১১		
8	আল-হুদা		১১		
9	মহাসচিব	STUDENT	১১	০১৬১০০৫৫৩৭	আল-হুদা
10	মহাসচিব	STUDENT	১১	০১৬৫৭০৫৫১	আল-হুদা
11	মহাসচিব				
12	মহাসচিব	STUDENT	১১	০১৭২৭০০৫৫০	আল-হুদা
13	মহাসচিব				
14	মহাসচিব				
15	মহাসচিব				
16	মহাসচিব				
17	মহাসচিব				
18	মহাসচিব				

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: শিবপুর Date: ২১/০১/১৮
Union: আল-হুদা Time: ২:৫০
Venue: আল-হুদা মসজিদ

Sl No.	Name	Designation	Address: Ward/Village	Phone number	Signature
1	আবু মাহমুদ	মহাসচিব	আল-হুদা	০১	২১/০১
2	আবু মাহমুদ	উপ	১১	০১৭২ ১৭৩০ ৬৫০	২১/০১
3	আবু মাহমুদ				
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					

7.0 Joshar Union

7.1 Overview (Study Area)

The Joshar union is under the administrative jurisdiction of Shibpur Upazila of Narsingdi district. The boundary of the Union is as follows;

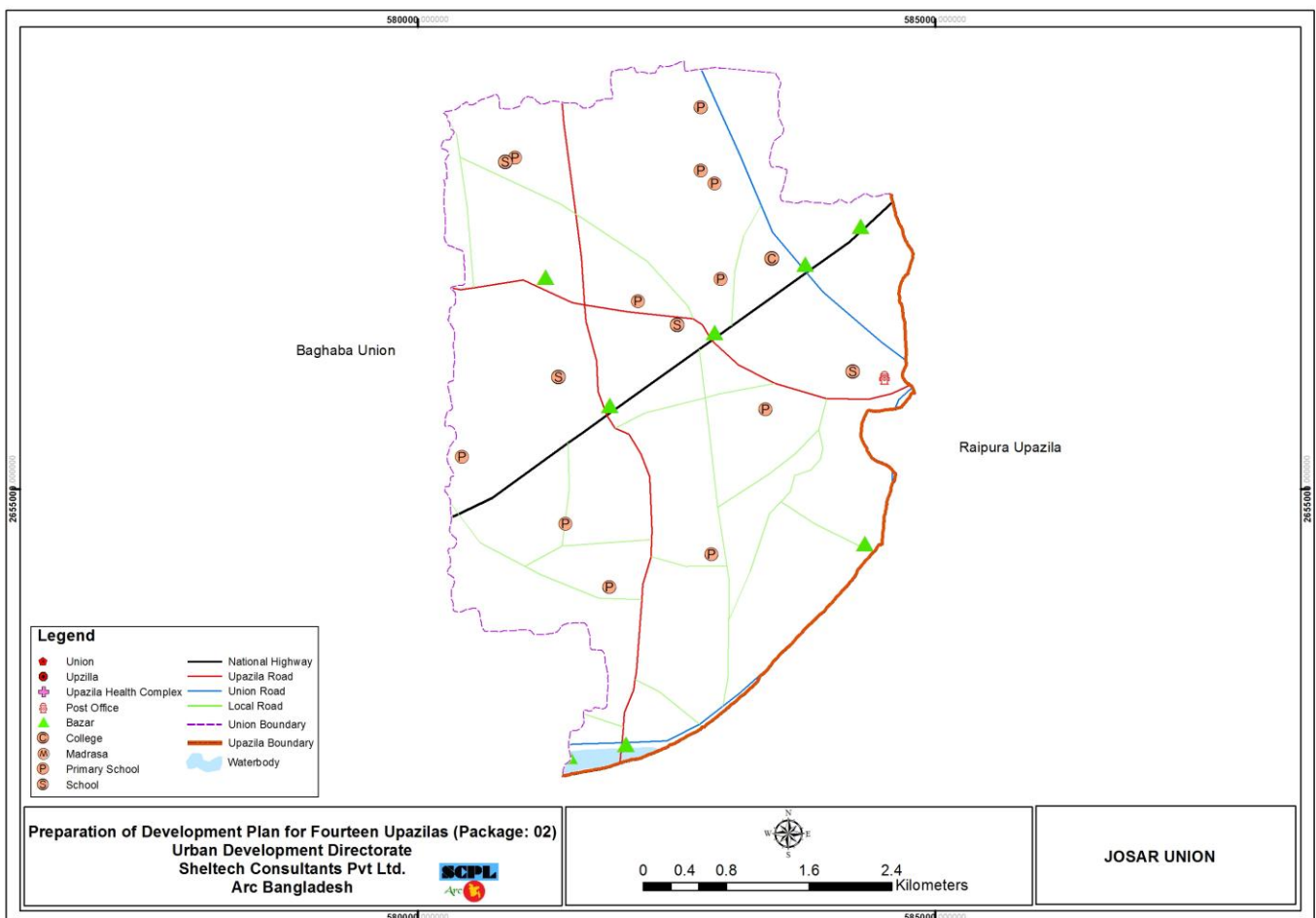
West: On the West side of the study area, Bagabo union is situated

North: On the North of the study area, Joynogor union is located

South: On the south side of the study area, Arial Kha River and Raypura upazila are located

East: On the east side of the study area, Raypura upazila is located.

Map 7.1: Joshar Union


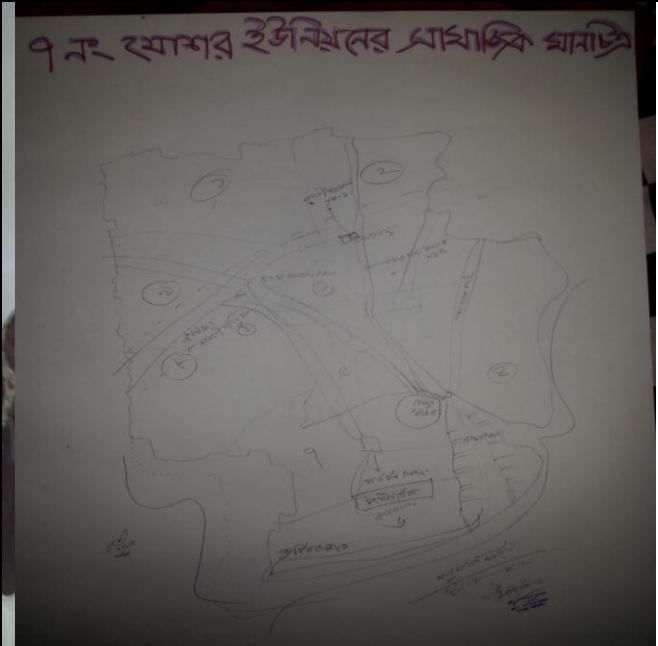


7.2 Spatial Aspects

Social mapping is useful PRA tool which is helpful in knowing the Spatial Aspects of the target area that can assist of planning team in decision making for future planning. It is also helpful to identify

different problems and resources in the area through map exercising that can help to select intervention in order to minimize or reduce the problems.

The Facilitator has selected two or three persons for preparing the social map of Joshar Union who have vast knowledge about the area as well as good hand for drawing of map. Then the participants were asked to draw all resources in the Union and have explained that “resources” are buildings, organizations, people, or services that are available to the community when they are needed. “like; roads, houses, health facilities (pharmacies, hospitals, clinics etc.), post office, schools/college/madrassa, religious buildings, graveyard, crematorium, water wells, public baths, markets, schools, factories, rivers, beel, pond, embankment, flood/hazard prone area, flood shelter, bus stand, launch ghat, agricultural land, forest, etc.

	
<p>Photograph 7.1: Preparing Social Map</p>	<p>Photograph 7.2: Social Map of Joshar Union</p>

7.3 Major Problems and Potentials

7.3.a Problems Identification

Most of the participants have participated in order to identify the problems and prioritized the problems with causes, effect/impact and potentials. The following problems have been identified during PRA which are as follows:

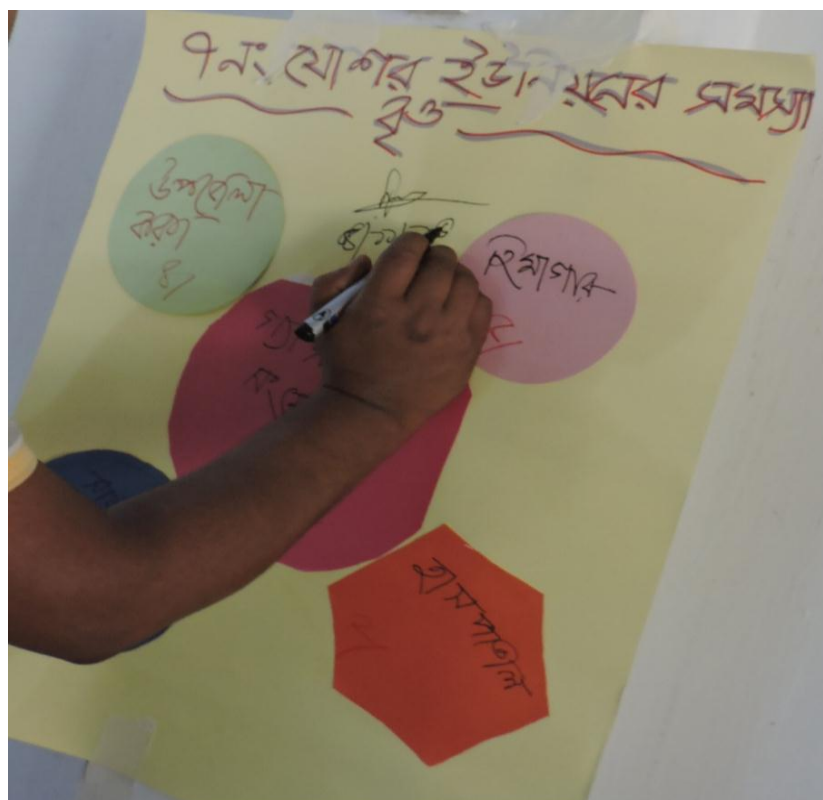
- No gas line connection
- Need cold Storage
- Health Complex and hospital
- Need Agriculture University
- Road repairing
- Problem of electricity
- Lack of educational institutions, college
- Lack of institutional infrastructure
- Drug addiction

- Lack of graveyard
- Lack of vocational training institute
- Unemployment
- Lack of security
- Deforestation
- Repairing of religious institution (temple)
- Secured sanitation system
- Lack of playground and cultural auditorium

7.3.b Problems Prioritization through Venn Diagram

After a long discussion, the participants have come to the consensus to identify the 5 (five) major problems on priority basis. The five major problems are as follows;

1. No gas connection
2. hospital (200 beds)
3. need of play ground and cultural auditorium
4. Establishing Upazila
5. Need cold Storage

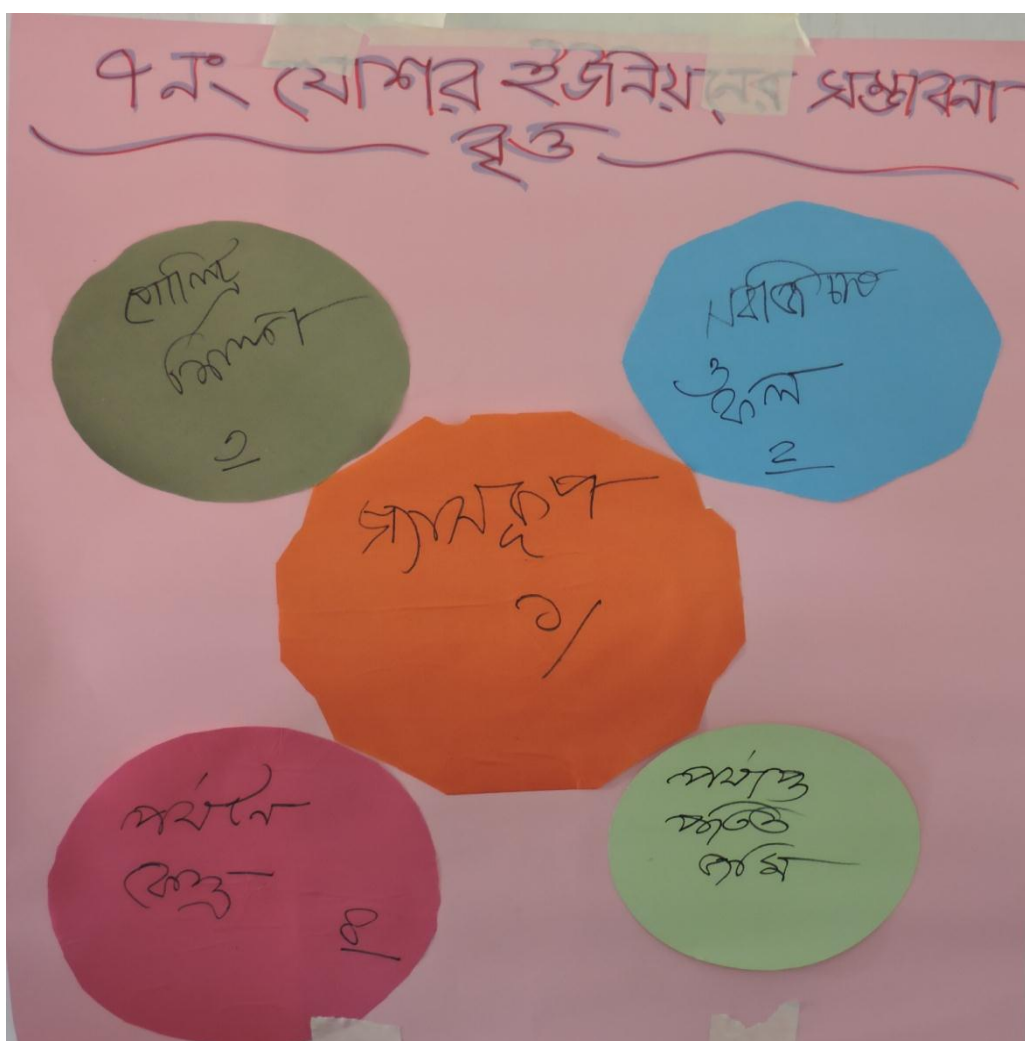


Photograph 7.3: Major Five Problems

7.3.c Identification of Potentials through Venn Diagram

After identification of problems with prioritization, the next step has to identify the potentials of the respective area which may be used as resources during planning. The potentials are as follows;

- Gas field
- Cultivation of vegetables and fruits
- Poultry farm
- Tourist spot
- Skilled human resources
- Handicraft



Photograph 7.4: Major Five Potentials

7.3.d Identification of Prioritized Problems, Cause, Impact, Potentials

After identification of the problems and potentials, the large group has engaged to identify the causes and effect/impact of problems and potentials in the area. The problems, causes, effect/impact and potentials have furnished in the following table;

Table 7.1: Problems, Cause, Impact, Potentials

Identified Problems	Causes	Impact	Potentials/Probability
1. Insufficient medical facility	<ul style="list-style-type: none"> lack of enough skilled doctors, communication problems, lack of modern medical equipment and insufficient medicine Local authority and government hasn't taken initiatives for building up a hospital. 	<ul style="list-style-type: none"> People of Chakrodha are suffering from different problems, such as- loss of time & money, deprived from services. 	<ul style="list-style-type: none"> medical facilities will be ensured for the large amount of poor people Medical cost will be less as for potentials.
2. Lack of cultural activities and play ground	<ul style="list-style-type: none"> There is no financial allotment Lack of enough and exact place of playground. 	<ul style="list-style-type: none"> The young generations are intended to drug addiction 	<ul style="list-style-type: none"> Cultural activities will help to cultural development of the young generations.
3. Establishing Upzila	<ul style="list-style-type: none"> Legal authority and government didn't take initiatives. Another reason is that the people cannot communicate with the proper authority. 	<ul style="list-style-type: none"> Distance between people and administration is increased. Lack of security and people are victim of discrimination. 	<ul style="list-style-type: none"> Job opportunity for the people. Administrative service will be reached at the door to door.
4. Cold storage	<ul style="list-style-type: none"> Lack of proper initiative and financial scope. 	<ul style="list-style-type: none"> The vegetables and fruits are got rotten and the farmers face a great financial loss Farmers don't get the reasonable price of the products 	<ul style="list-style-type: none"> Marketing will be easy; farmers will get financial benefit with reasonable price.
5. No gas line connection	<ul style="list-style-type: none"> Government has not taken any initiatives 	<ul style="list-style-type: none"> This area is not being industrialized, Increased deforestation Not creating employment facilities 	<ul style="list-style-type: none"> Significant potentiality is getting rid of unemployment

7.4 Perceived Development Priorities

The recommended development priorities for Joshar Union is as follows:

Table 7.2: Development Priorities for Joshar Union

Short term	Midterm	Long term
<ul style="list-style-type: none"> Demand of for gas connection. Need vocational training center Literacy rate to be 80% Give job opportunity to all poor people Need cold storage for preserve agro product. Reducing unemployment 	<ul style="list-style-type: none"> Want to see development of our locality Make joshor as a upazila Want administrative facility by establishing upazila 	<ul style="list-style-type: none"> Want agricultural university Education for all

7.5. List of Participants

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: শিবপুর
Union: আর জোশর ইউনিয়ন
Venue: জোশর ইউনিয়ন পরিষদ ভবন

Date: 08/02/2002
Time: ১০.০০ বারিবে

Sl No.	Name	Designation	Address: Ward/Village	Phone number	Signature
1	আবুল মজিদ	কৃষক	লিখাবাদ	01812821320	আবুল মজিদ
2	আবুল মাজিদ	কৃষক	২নং ওয়ার্ড	01718486579	আবুল মাজিদ
3	মহম্মদ হুসেইন	কৃষক	২নং ওয়ার্ড	01822614705	মহম্মদ হুসেইন
4	মহম্মদ হুসেইন	চাষাবাদী	৩নং ওয়ার্ড	01740495475	মহম্মদ হুসেইন
5	মহম্মদ হুসেইন	কৃষক	৩নং ওয়ার্ড	01718810254	মহম্মদ হুসেইন
6	আবুল হুসেইন	কৃষক	৩নং ওয়ার্ড	01779506041	আবুল হুসেইন
7	আবুল হুসেইন	কৃষক	৩নং ওয়ার্ড	0178872267	আবুল হুসেইন
8	আবুল হুসেইন	কৃষক	৩নং ওয়ার্ড	01742910086	আবুল হুসেইন
9	আবুল হুসেইন	কৃষক	৩নং ওয়ার্ড	01794185277	আবুল হুসেইন
10	আবুল হুসেইন	কৃষক	৩নং ওয়ার্ড	01722827835	আবুল হুসেইন
11	আবুল হুসেইন	কৃষক	৩নং ওয়ার্ড	01785776087	আবুল হুসেইন
12					
13					
14					
15					
16					
17					
18					

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: শিবপুর
Union: আর জোশর ইউনিয়ন
Venue: জোশর ইউনিয়ন পরিষদ ভবন

Date: 08/02/2002
Time: ১০.০০ বারিবে

Sl No.	Name	Designation	Address: Ward/Village	Phone number	Signature
1	আবুল মজিদ	কৃষক	লিখাবাদ	01812821320	আবুল মজিদ
2	আবুল মাজিদ	কৃষক	২নং ওয়ার্ড	01718486579	আবুল মাজিদ
3	মহম্মদ হুসেইন	কৃষক	২নং ওয়ার্ড	01822614705	মহম্মদ হুসেইন
4	মহম্মদ হুসেইন	চাষাবাদী	৩নং ওয়ার্ড	01740495475	মহম্মদ হুসেইন
5	মহম্মদ হুসেইন	কৃষক	৩নং ওয়ার্ড	01718810254	মহম্মদ হুসেইন
6	আবুল হুসেইন	কৃষক	৩নং ওয়ার্ড	01779506041	আবুল হুসেইন
7	আবুল হুসেইন	কৃষক	৩নং ওয়ার্ড	0178872267	আবুল হুসেইন
8	আবুল হুসেইন	কৃষক	৩নং ওয়ার্ড	01742910086	আবুল হুসেইন
9	আবুল হুসেইন	কৃষক	৩নং ওয়ার্ড	01794185277	আবুল হুসেইন
10	আবুল হুসেইন	কৃষক	৩নং ওয়ার্ড	01722827835	আবুল হুসেইন
11	আবুল হুসেইন	কৃষক	৩নং ওয়ার্ড	01785776087	আবুল হুসেইন
12					
13					
14					
15					
16					
17					
18					

8.0 Putia Union

8.1 Overview (Study Area)

Putia Union is under the administrative jurisdiction of Shibpur Upazila in Narsingdi District has an area of 22.03 km². The boundary of the study area is stated below:

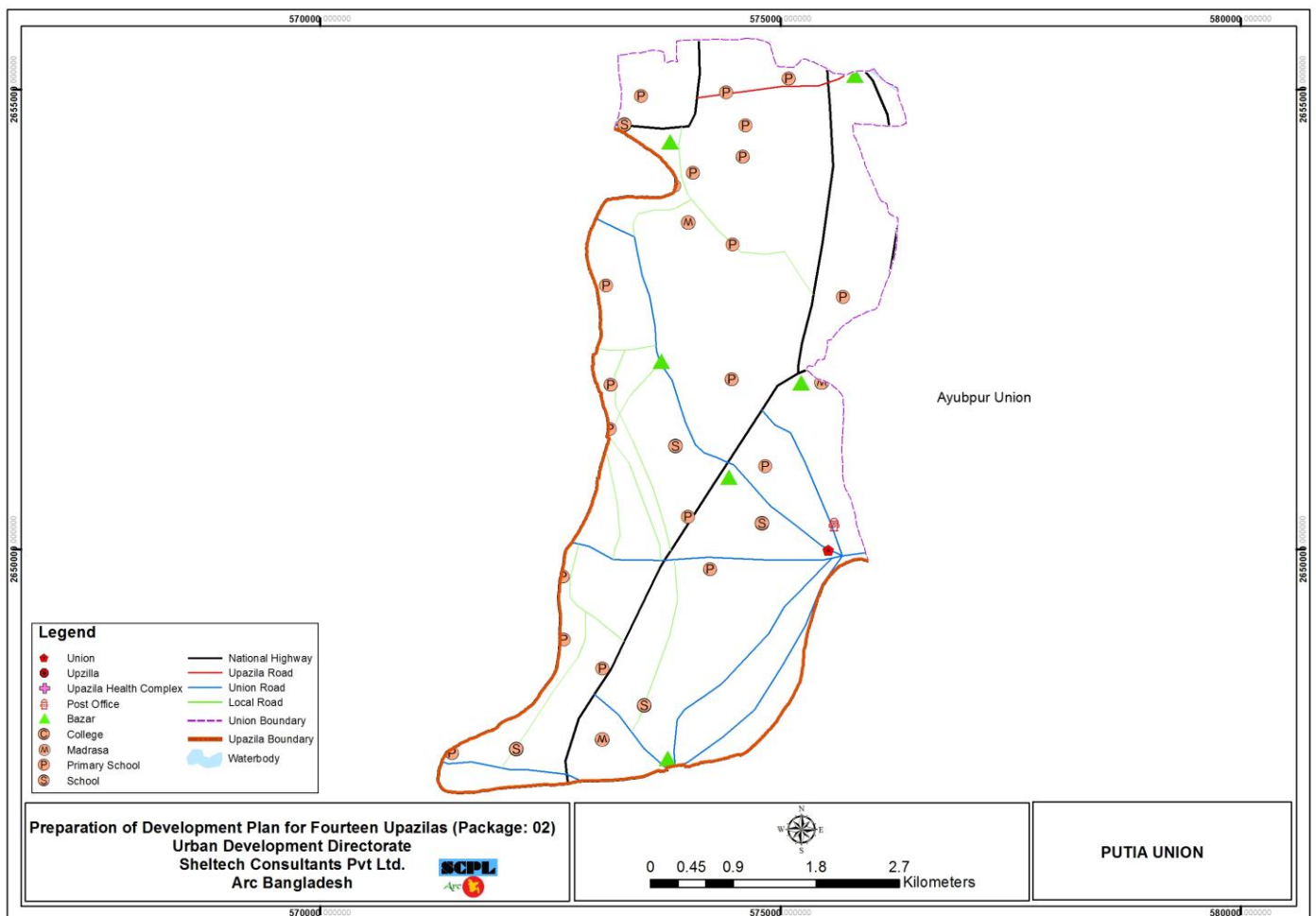
North: On the north & west side of the study area, Masimpur Union is situated.

West: On the west side of the study area, River Horidua and Gojaria Union are located.

South: On the south side of the study area, Narsindi District sadar and Chinishpur Union are located.

East: On the East side of study area, Ayubpur Union is located.


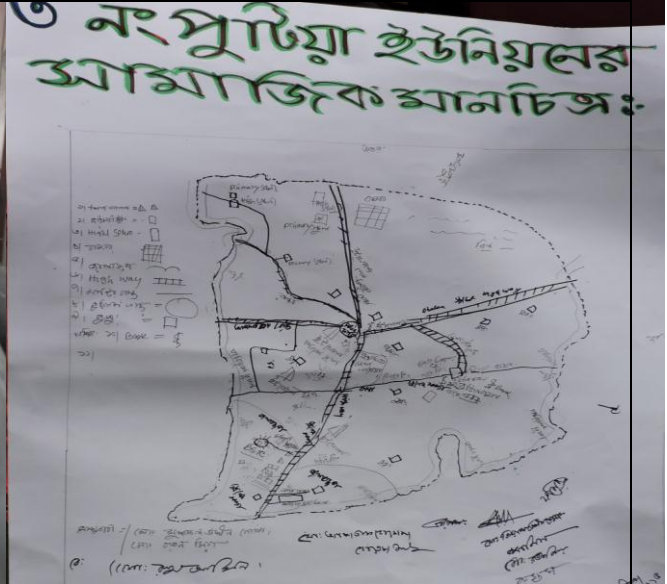
Map 8.1: Putia Union



8.2 Spatial Aspects

Social mapping is useful PRA tool which is helpful in knowing the Spatial Aspects of the target area that can assist of planning team in decision making for future planning. It is also helpful to identify different problems and resources in the area through map exercising that can helpful to select intervention in order to minimize or reduce the problems.

The Facilitator has selected two or three persons for preparing the social map of Putia Union who have vast knowledge about the area as well as good hand for drawing of map. Then the participants were asked the participants to draw all resources in the Union and have explained that “resources” are buildings, organizations, people, or services that are available to the community when they are needed. “like; roads, houses, health facilities (pharmacies, hospitals, clinics etc.), post office, schools/college/madrassa, religious buildings, graveyard, crematorium, water wells, public baths, markets, schools, factories, rivers, beel, pond, embankment, flood/hazard prone area, flood shelter, bus stand, launch ghat, agricultural land, forest, etc.

	
<p>Photograph 8.1: Preparing Social Map</p>	<p>Photograph 8.2: Social Map of Putia Union</p>

8.3 Major Problems and Potentials

8.3.a Problems Identification

Most of the participants have participated in order to identify the problems and prioritized the problems with causes, effect/impact and potentials. The following problems have been identified during PRA which are as follows:

- Problem of drainage system (Ward no 5 and 6)
- Water logging (5250 Decimal area of land damage by flash flood, rainfall and monsoon tidal force)
- Problem of Canal Dredging.
- No gas line
- Shortage structure of educational institutions (College and university)
- Lack of Emergency health services (Demand of Hospital)
- No cow hatchery center.

- Weak communication system(Ward no 8.Earthen road, broken road repair less road)
- Shortage of employment
- Problem of drug addiction.
- River dredging (Haridhoa)
- Shortage of foot over bridge(Area of Boroitala,Itakhola,Saidnagar and Shomser JuteMill)
- Shortage of pure drinking water(Arsenic, Iron and Poisonous industrial byproduct)
- No Cold storage
- Lack of speedy internet.
- Break down of law and order (Problem of harassment by law and order force.)
- Sound pollution(Digital sound box and industry)

8.3.b Problems Prioritization through Venn Diagram

After a long discussion, the participants have come to the consensus to identify the 5 major problems as priority basis. The five major problems are as follows;

1. Weak Transportation System
2. Problem of drainage system
3. Environmental pollution
4. Break down of Law and order
5. Lack of gas line



Photograph 8.3: Major five Problems

8.3.c Identification of Potentials through Venn Diagram

After identification of problems with prioritization, the next step has to identify the potentials of the respective area which may be used as resources during planning. The potentials are as follows;

- Mill industries.
- Hat bazar(Famous Putia cow hat)
- Dhaka-Sylhet Highway
- Cultivable Agricultural land(Banana, Rice ,vegetable, sugarcane and lemon)
- Foreign remittance
- Hardworking People.
- Fisheries.
- Cattle rearing
- Beel (Patuar Par, Kurer Para and Doatia)
- CNG Station
- Archeology Sites # 2(Salurdia Math and Dakshin Kararcharmat)
- Government Primary school-15,Registered primary school -4, & Madrasha-70, Primary school-1, Private High school -5, Kindergarden-13, Community primary school

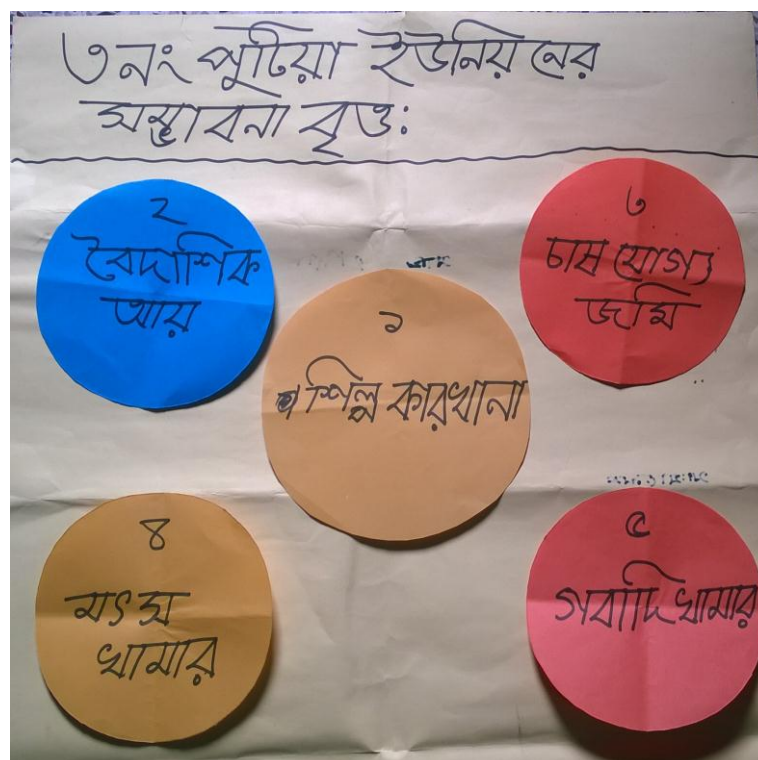


Figure 8.1: Major Five Potentials

8.3.d Identification of Prioritized Problems, Cause, Impact, Potentials

After identification of the problems and potentials, the large group has engaged to identify the causes and effect/impact of problems and potentials in the area. The problems, causes, effect/impact and potentials have furnished in the following table:

Table 8.1: Problems, Cause, Impact, Potentials

Identified Problems	Causes	Impact	Potentials/Probability
1.Weak Transportation System	<ul style="list-style-type: none"> • Broken roads (long time no repair). • Earthen road(Ward no 8) • Permission less vehicles • Bureaucratic complexity. 	<ul style="list-style-type: none"> • Difficulties of product transporting) • Marketing, transport problem 	<ul style="list-style-type: none"> • Running Brickfield in area of Putia union • Hardworking people
2. Problem of drainage system	<ul style="list-style-type: none"> • No drain for enough water passing • No drain for passing water in entire union. 	<ul style="list-style-type: none"> • Every year affected by water logging • Increase financial losses 	<ul style="list-style-type: none"> • Enough land and any development
3.Environmental pollution	<ul style="list-style-type: none"> • River water polluted by industrial wastes • More effected by Thermex group • Wastes from basic industrial area • Wastes from Abed textile 	<ul style="list-style-type: none"> • Damages cultivable agricultural land • Increase diseases to local people • No more fishes alive in river water • No agricultural crops production • No use of river water • Drinking water bad smell and disqualified for drinking 	<ul style="list-style-type: none"> • Peoples are more co-operative.
4.Broken law and order	<ul style="list-style-type: none"> • For this situation due to unemployment. • No opportunity to work in local industries for the local people. • Administration and police are self destroyed mentality 	<ul style="list-style-type: none"> • Increase terrorism ,stealing and robing • Increase social instability 	<ul style="list-style-type: none"> • Any support from local administration.
5.Gas	<ul style="list-style-type: none"> • Lack of gas • Bureaucratic complexity 	<ul style="list-style-type: none"> • Increase fuel cost. • Environment pollution • Destroying Forest and trees. 	<ul style="list-style-type: none"> • Gas pipe line is going through this union. • Gas is available at Putia bazar.

8.4 Perceived Development Priorities

The recommended development priorities for Putia Union is are follows:

Table 8.2: Development Priorities for Putia Union

Short term	Midterm	Long term
<ul style="list-style-type: none"> • Demand of development of educational system. • Demand of for employment. • Need a system of Uncultivable land should be cultivable in Putia union. • Developed Drainage system. • Demand of emergency basis gas connection • Demand of pure drinking water. • Demand of establishment of cold storage. • Demand of Mini Stadium. • Demand of development of transportation system. • Demand of development of law and order. • Prevention of environment and water pollution. 	<ul style="list-style-type: none"> • Demand of for employment. • Demand of establishment of cold storage. • Demand of Mini Stadium. • Developed Drainage system. • Prevention of environment and water pollution. • Demand of development of educational system. 	<ul style="list-style-type: none"> • Demand for job. • Demand of Mini Stadium. • Demand of establishment of cold storage.

8.5 List of Participants

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: শিবপুর
Union: ০২ পি.এন
Venue: ২৬ পি.এন

Date: ০২/১১/২০১৮
Time: ১০:০০

Sl No.	Name	Designation	Address: Ward/Village	Phone number	Signature
1	শ্রী. জাহাঙ্গীর আলী	চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
2	শ্রী. কামরুজ্জামান	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
3	শ্রী. বাচ্চু মোহা	চিকিৎসক	১২৬/১	০১৭৩১০৬০০৪	
4	শ্রী. সুকান্ত কান্ত	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
5	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
6	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
7	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
8	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
9	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
10	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
11	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
12	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
13	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
14	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
15	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
16	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
17	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
18	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: শিবপুর
Union: ০২ পি.এন
Venue: ২৬ পি.এন

Date: ০২/১১/২০১৮
Time: ১০:০০

Sl No.	Name	Designation	Address: Ward/Village	Phone number	Signature
19	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
20	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
21	শ্রী. মোহাম্মদ হোসেন	সহ চেয়ারম্যান	১২৬/১	০১৭৩১০৬৩৮	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					

9.0 Sadherchar Union

9.1 Overview

Sadherchar Union under the administrative jurisdiction of Shibpur Upazila in Narsingdi District has an area of 03.30 km². The boundary of the study area is stated below:

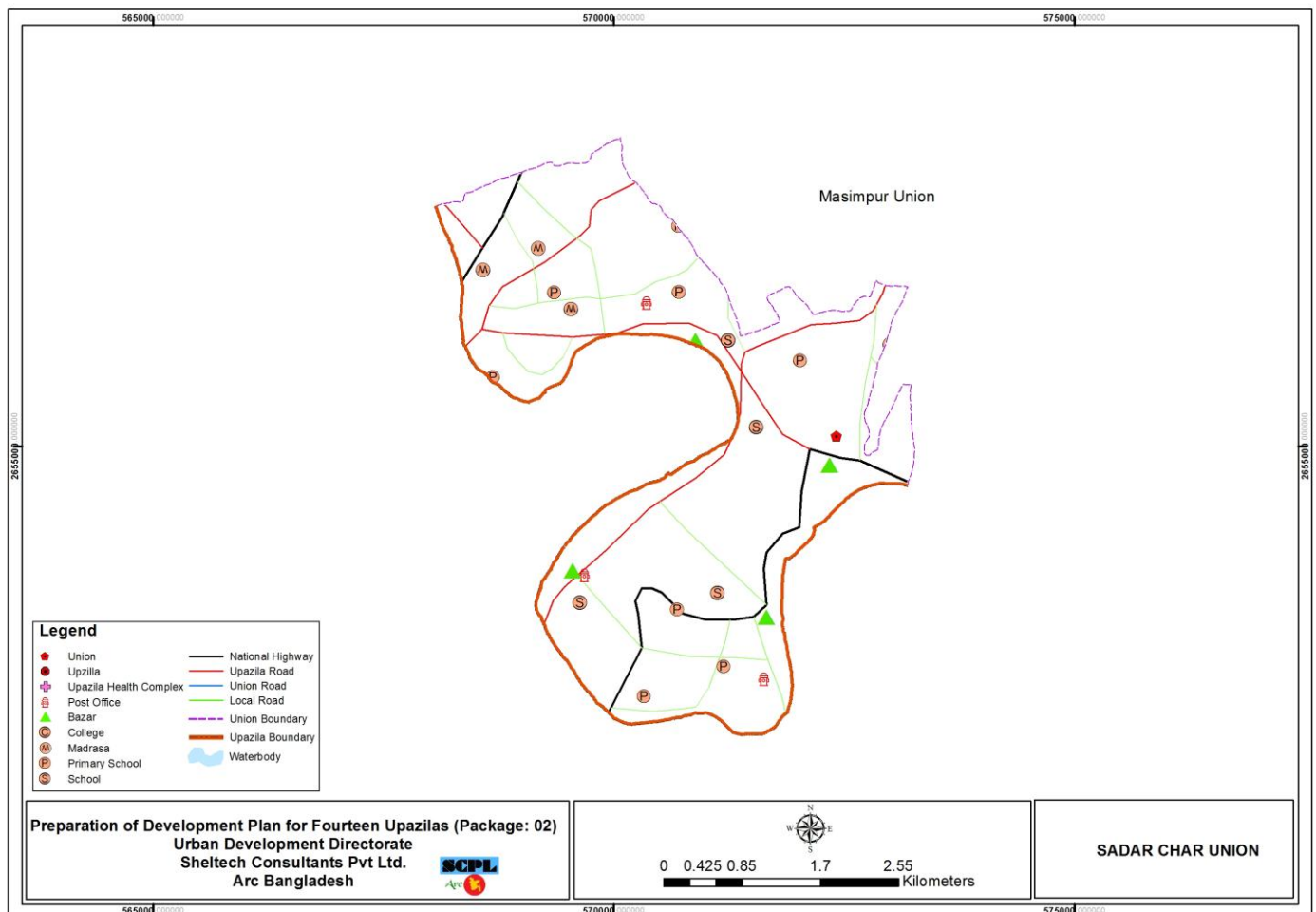
North: On the north side of the study area, Dulalpur Union is situated

West: On the west side of the study area, Charshindur Union is located

South: On the south side of the study area, Gajarya Union is located

East: On the south side of the study area, Masimpur Union is located

Map 9.1: Sadherchar union


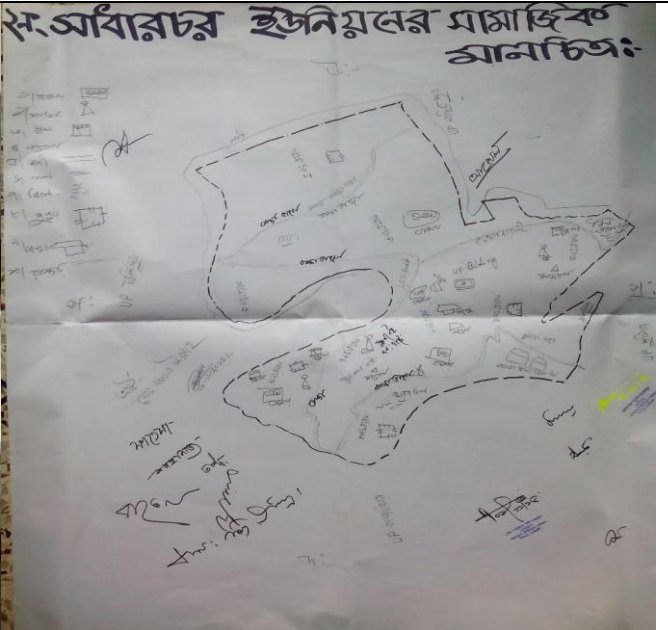


9.2 Spatial Aspects

Social mapping is useful PRA tool which is helpful in knowing the Spatial Aspects of the target area that can assist of planning team in decision making for future planning. It is also helpful to identify

different problems and resources in the area through map exercising that can help to select intervention in order to minimize or reduce the problems.

The Facilitator has selected two or three persons for preparing the social map of Sadherchar Union who have vast knowledge about the area as well as good hand for drawing of map. Then the participants were asked to draw all resources in the Union and have explained that “resources” are buildings, organizations, people, or services that are available to the community when they are needed. “like; roads, houses, health facilities (pharmacies, hospitals, clinics etc.), post office, schools/college/madrassa, religious buildings, graveyard, crematorium, water wells, public baths, markets, schools, factories, rivers, beel, pond, embankment, flood/hazard prone area, flood shelter, bus stand, launch ghat, agricultural land, forest, etc.

	
<p>Photograph 9.1: Preparing Social Map</p>	<p>Photograph 9.2: Social Map of Sadherchar Union</p>

9.3 Major Problems and Potentials

9.3.a Problems Identification

Most of the participants have participated in order to identify the problems and prioritized the problems with causes, impact and potentials. The following problems have been identified during PRA which are as follows:

- Weak Transportation (No lamp post, Broken road, green road, no culvert)
- Trouble of health service (Lack of doctor, medicine, FWC is inside the union)
- Lack of vocational institution
- Problem of drug addiction
- Poor law and order situation
- Poverty
- Lack of shelter
- Lack of employment

- Problem of ditch
- Lack of canal digging
- Problem of stealing and robbing
- Lack of religious institution structure
- Lack of agricultural training and extension
- Problem of marketing agricultural crops
- Scarcity of sanitation
- Lack of safe drinking water
- Lack of drainage
- Problem of gambling
- No information tools in U.P complex

9.3.b Problems Prioritization through Venn Diagram

After a long discussion, the participants have come to the consensus to identify the 5 major problems as priority basis. The five major problems are as follows;

1. Weak Transportation System
2. Problem of Unemployment
3. Drug addiction and stealing
4. Lack of health services
5. Lack of education

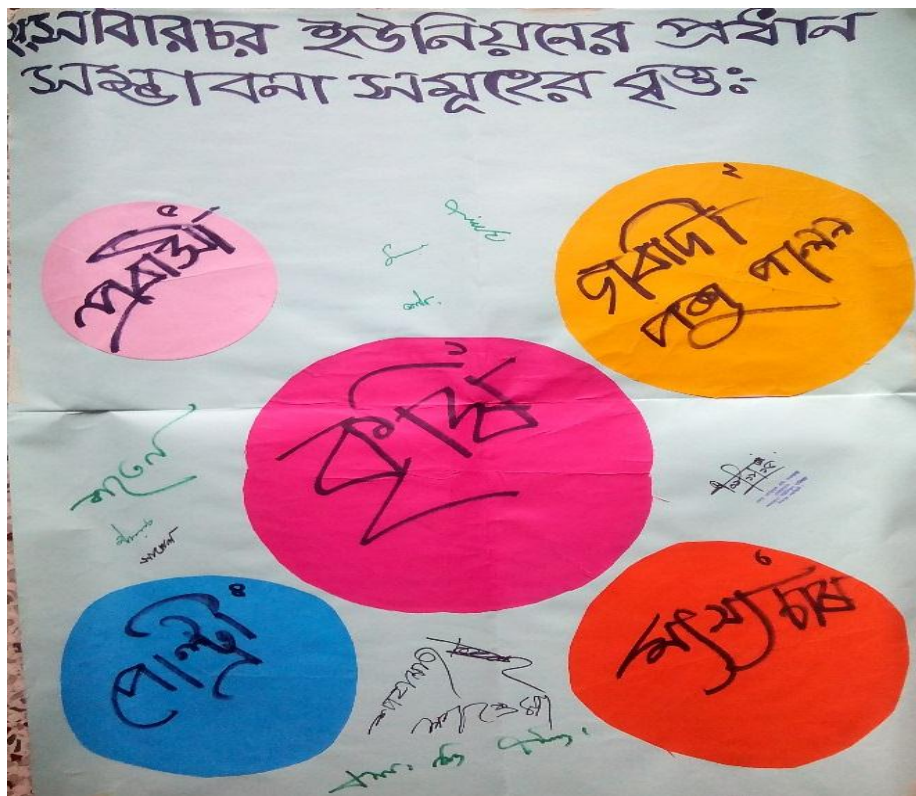


Photograph 9.3: Venn diagram

9.3.c Identification of Potentials through Venn Diagram

After identification of problems with prioritization, the next step has to identify the potentials of the respective area which may be used as resources during planning. The potentials are as follows;

- Agriculture (Paddy, vegetables)
- Fisheries
- Poultry
- Cattle rearing
- Gardening
- Spinning mill
- Foreign remittance
- Skilled and active human resource



Photograph 9.4: Major Five Potentials

9.3.d Identification of Prioritized Problems, Cause, Impact, Potentials

After identification of the problems and potentials, the large group has engaged to identify the causes and impact of problems and potentials in the area. The problems, causes, impact and potentials have furnished in the following table;

Table 9.1: Problems, Cause, Impact, Potentials

Identified Problems	Causes	Impact	Potentials/Probability
1.Weak Transportation System	<ul style="list-style-type: none"> Roads have been concreted long before Unplanned vehicles (unapproved) Corruption of conductor Lack of earth beside the roads 	<ul style="list-style-type: none"> Problem of school going students Transportation problem for patients Problem of marketing agricultural crops 	<ul style="list-style-type: none"> Existing skilled human resource Existing silicon and earth
2.Unemployment problem	<ul style="list-style-type: none"> Lack of employment No vocational institution 	<ul style="list-style-type: none"> People are being addicted in drag Increasing stealing and ribbing 	<ul style="list-style-type: none"> Exist land for building industries A garment is being built
3.Trouble of drag addiction, stealing and robbing	<ul style="list-style-type: none"> More unemployment problem Poverty 	<ul style="list-style-type: none"> Decreasing of law enforcement Social anxiety is increasing 	<ul style="list-style-type: none"> Area leaders are sincere Existing law enforcement
4.Trouble of health service	<ul style="list-style-type: none"> Communication system is bad with Sadar Upazila Lack of doctor Lack of medicine F.W.C is beside the union 	<ul style="list-style-type: none"> Union people are depriving from basic right Mother and children's immature death are increasing 	<ul style="list-style-type: none"> 3 community clinic 1 F.W.C

9.4 Perceived Development Priorities

The recommended development priorities for Sadherchar Union are as follows:

Table 9.2: Development Priorities for Sadherchar Union

Short term	Midterm	Long term
<ul style="list-style-type: none"> • Development of transportation system. • Development of agricultural system. • Demand of road lighting. • Demand of pure drinking water. • Demand of development of law and order. • Demand of Free of Drug addiction Through Stealing and robbing in Sadherchar. • Development of emergency health services. • Demand of for employment. • Demand of development of educational system. 	<ul style="list-style-type: none"> • Demand of for employment. • Development of emergency health services. • Demand of development of educational system. 	<ul style="list-style-type: none"> • Demand of social plantation.

During the top workshop it has been observed that most participants mentioned about improve communication facility, health and education facility, improve law and order situation, availability of pure drinking water, improve recreational facility and also establish employment opportunity. Another thing is huge overlapping within the problem and opportunities among the participants.

9.5. List of Participants

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: **শিবপুর**
Union: **ইউ.পি. কামদেউ**
Venue: **ইউ.পি. কামদেউ**

Date: **01/11/2015**
Time: **10:00**

Sl. No.	Name	Designation	Address Ward/Village	Phone number	Signature
1	শ্রী: আফ্রোজা হান্না	উপাচার্য	আবদুল/উড়া-০৬	০১৭১১১১১১১	
2	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১২২১০২৪০৪	
3	মুন্সজ্জমা	সংস্কৃতি	উড়া-০৬	০১২২১০২৪০৪	
4	শাহনাজ হোসেন	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	
5	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	
6	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	
7	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	
8	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	
9	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	
10	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	
11	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	
12	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	
13	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	
14	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	
15	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	
16	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	
17	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	
18	আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭৬৪৩২৫২৬	

Ministry of Housing and Public Works
Urban Development Directorate (UDD)
Preparation of Development Plan for Fourteen Upazilas, Package-02
Attendance Sheet for Conducting PRA session

Upazila: **শিবপুর**
Union: **ইউ.পি. কামদেউ**
Venue: **ইউ.পি. কামদেউ**

Date: **01/11/2015**
Time: **10:00**

Sl. No.	Name	Designation	Address Ward/Village	Phone number	Signature
19	শ্রী: আফ্রোজা	উপাচার্য	উড়া-০৬	০১৭১২১৪০১৭	
20	শ্রী: আফ্রোজা মুন্সজ্জমা	সংস্কৃতি/উড়া-০৬	উড়া-০৬	০১৭২০০৭৩১৭২	
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
13					
14					
15					
16					
17					
18					



Government of the People's Republic of Bangladesh
Ministry of Housing and Public Works
Urban Development Directorate (UDD)

Preparation of Development Plan for Fourteen Upazilas

Package-02
(Ishwarganj Upazila, Mymensingh; Raipura Upazila and Shibpur
Upazila, Narsingdi)

DRAFT SURVEY REPORT

**Participatory Rural Appraisal (PRA)
of
Ishwarganj Upazila, Mymensingh**

August, 2016

Joint Venture of

**Sheltech Consultants Pvt. Limited
And
Arc-Bangladesh Limited**



Government of the People's Republic of Bangladesh
Ministry of Housing and Public Works
Urban Development Directorate (UDD)

**Preparation of Development Plan for
Fourteen Upazilas
Package 02**

SURVEY REPORT

**Geological Survey
of
Shibpur Upazila**

August 2016

Submitted By

**Joint Venture of
SHELTECH CONSULTANTS PRIVATE LTD. (SCPL)
ARC BANGLADESH LTD. (ABL)**

JV of SCPL-ABL

Preparation of Development Plan for Fourteen Upazilas Project (Package-02)

Ref: SCPL-ABL/UDD/2016/ Geological Survey Report /Shibpur Upazila

Date:

To

The Project Director

“Preparation of Development Plan for fourteen Upazilas” Project

Urban Development Directorate

82, Segunbagicha, Dhaka, 1000.

Subject: Submission of the Final Geological Survey Report of Shibpur Upazila, Narsingdi

Dear Sir,

We are pleased to submit herewith the Final Geological Survey Report of Shibpur Upazila, Narsingdi for your kind information and further action.

Thanking you and assuring you of our best services.

Your Sincerely,

(Dr. Nurul Islam Nazem)
Team Leader, Package -2

(Mohammad Jamal Uddin)
Geological Expert, Package -2

Encl: As stated.

Copy to:

1. Project Manager, Package-2, 14 Upazila Project, UDD
2. Director, Sheltech Consultants Pvt. Limited
3. Chairman, Arc-Bangladesh limited, Dhaka

1/E/2 Paribagh (Mazar Road), Shahbagh, Dhaka-1000, Bangladesh

Phone: +880-2-9611171 Fax: +880-2-9611172

Email: scpl.mail@gmail.com

Chapter-04

Conclusion

Shibpur Upazila and its adjoining areas is mostly comprises by monotonous flood plain area except few depression. Soil quality of the project area is is varying as morphological difference, that's why geological, geotechnical and geophysical investigations has been carried out such a paatern to cover all morphological unit. In this consequences, 24 boreholes with SPT, 3 downhole seismic test and 5 MASW program has been completed in the field as a part of this survey investigation. During this survey, soil samples (disturbed and undisturbed) are also collected for further laboratory test which will give idea about the soil engineering properties. This investigation data will be analyzed and integrated in a module from which it can possible to generate geomorphologic map, sub-surface litho-logical 3D model of different layers, engineering geological mapping based on AVS30, Seismic Hazard Assessment Map (risk sensitive micro-zonation maps), soil type map, seismic intensity map, Peak Ground Acceleration (PGA) and Peak Ground Velocity (PGV) map, recommended building height maps for both high rise building and low rise building, liquefaction and Ground Failure Map etc

Above investigation and outcomes would give a clear idea about the geo-hazard status of particular landscape where newly urban developing activities or any other mega infrastructure project is going on and this mentioned investigation also gives idea about the vulnerability of existing build up infrastructure of a particular area. Based on these results, proper management techniques as well as other necessary adaptation process could be addressed before or after the development activities in the studied area. It is to be mentioned that the long-term maintenance cost will be reduced and the developed structure will withstand against the potential natural hazards if the infrastructures are built following the risk informed physical land-use plan.

References/Bibliography

- i. Anbazhagan P, Sitharam TG. Mapping of average shear wave velocity for Bangalore region: a case study. *Journal of Environmental & Engineering Geophysics* 2008;13(2):69–84.
- ii. Anbazhagan P, Sitharam TG. Seismic microzonation of Bangalore. *Journal of Earth System Science* 2008; 117(S2):833–52.
- iii. Anbazhagan P, Sitharam TG. Spatial variability of the weathered and engineering bed rock using multichannel analysis of surface wave survey. *Pure and Applied Geophysics* 2009;166(3):409–28.
- iv. Auld, B., 1977, Cross-Hole and Down-Hole Vs by Mechanical Impulse, *Journal of Geotechnical Engineering Division, ASCE*, Vol. 103, No. GT12, pp. 1381-1398
- v. Kitsunezaki. C. ,N. Goto, Y. Kobayashi., T. Ikawa, M. Horike, T. Saito, T. Kurota, K. Yamane, and K. Okuzumi, 1990, Estimation of P- and S- wave velocities in Deep Soil Deposits for Evaluating Ground Vibrations in Earthquake, *SIZEN-SAIGAI-KAGAKU*,9-3,1-17 (in Japanese).
- vi. Miller RD, Xia J, Park CB, Ivanov J. Multichannel analysis of surface waves to map bedrock. *The Leading Edge* 1999;18(12):1392–6.
- vii. Okada, H., 2003, The microtremor survey method, *Society of Exploration Geophysicist*, Tulsa
- viii. Park CB, Miller RD, Xia J. Multi-channel analysis of surface waves. *Geophysics* 1999; 64(3):800–8.

EXECUTIVE SUMMARY

Geological survey work has been carried out in the project area under the package-2 (covering Shibpur Upazila, Dist: Dhaka), project titled 'Preparation of Development Plan for Fourteen Upazilas' a initiative of Urban Development Directorate (UDD). In this development plan, subsurface geological and geotechnical information's has been considered for a durable and sustainable urban environment. This work is to determine subsurface soil condition of the project area and evaluating of natural geological and hydro-meteorological hazards such as earthquake, landslide and ground failure which integrate the consequence into the design of the infrastructure.

In this study work, following investigations and surveys have been carried out in the field which are geo-morphological survey; boreholes drilling and preparation of borehole logs; undisturbed and disturbed soil sample collection as per standard guide line; conducting standard penetration tests (SPTs); drilling of boreholes and casing by PVC pipe for conducting PS logging test; conducting down-hole seismic test and Multi-Channel Analysis of Surface Wave (MASW) test. Laboratory testing of soil samples such as Grain Size Analysis, Natural Moisture Content, Atterberg Limits, Specific Gravity, Direct Shear Test, Unconfined Compression strength, etc has been performing in the laboratory which will give more qualitative and quantitative information about the subsurface materials. To meet the above geological, geotechnical and geophysical task 24 boreholes with SPT program, five MASW and three down-hole seismic test survey programs have been conducted at Shibpur Upazila.

Field and laboratory investigation data will be analyzed and result will be integrated in a module by which it is possible to produce sub-surface litho-logical 3D model of different layers, engineering geological mapping based on AVS30, Seismic Hazard Assessment Map (risk sensitive micro-zonation maps), soil type map, seismic intensity map, Peak Ground Acceleration (PGA) and Peak Ground Velocity (PGV) map, recommended building height maps for both high rise building and low rise building, liquefaction and Ground Failure Map etc.

Above test result would give a clear idea about the geo-hazard status of particular landscape where newly urban developing activities or any other mega infrastructure project is going on and this mentioned investigation also gives idea about the vulnerability of existing build up infrastructure of a particular area. Based on these results, proper management techniques as well as other necessary adaptation process could be addressed before or after the development activities in the studied area. It is to be mentioned that the long-term maintenance cost will be reduced and the developed structure will withstand against the potential natural hazards if the infrastructures are built following the risk informed physical land-use plan.

Abbreviations

ASTM	:	American Society for Testing and Materials
AVS30	:	Average Shear Wave velocity of 30 meter
BH	:	Borehole
MASW	:	Multi-Channel Analysis of Surface Wave
N value	:	Soil resistance or compactness
PGA	:	Peak Ground Acceleration
PGV	:	Peak Ground Velocity
PS logging	:	Primary and Shear wave logging (Down-hole seismic test)
SA	:	Spectral Acceleration
SPAC	:	Spatial Autocorrelation
SPT	:	Standard Penetration Tests
UDD	:	Urban Development Directorate

Table of Contents

Letter of Transmittal	i
Executive Summary	ii
Abbreviations	iii
Chapter-01: Introduction	5
1.1. Background:.....	5
1.2. Scope of Work:	6
1.3. Brief Description of the area:.....	6
Chapter-02: Methodology.....	8
2.1. Test Details and Procedure of Down-Hole Seismic Test (Ps Logging).....	8
2.2.1. Procedure of Field Work and Analysis.....	8
2.2. Test Details and Procedure of Multi-Channel Analysis of Surface Wave (MASW). 11	
2.2.1. Analysis of MASW.....	11
2.3. Test Details and Procedure of Standard Penetration Test	13
2.3.1. Wash Boring	13
2.3.2. Soil Sampling	14
2.3.3. Standard Penetration Test (SPT)	15
Chapter-03: Survey Result at Shibpur Upazila	18
3.1. Geophysical Investigations	18
3.1.1. Down-Hole Seismic (PS Logging) Test Results.....	22
3.2. Geotechnical Investigations	28
3.2.1. Standard Penetration Test (SPT) Log	29
Chapter-04: Conclusion	51
References/Bibliography	
Photographical Representation	

List of Tables

Table 1: Data Acquisition Parameters	5
Table 2: PS logging and MASW test locations	12
Table 3: Summary of MASW Test Results	23
Table 4: Bore Hole Information Summary at Shibpur Upazila	30

List of Figures

Figure 1: Determination of the Arrival Time Of S-Wave	10
Figure 2: Calculation of the Travel Time	10
Figure 3: Main Step of the MASW Processing Technique	12
Figure 4: Wash Boring	13
Figure 5 (A) Thin-Walled (Shelby Tube) Sampler, And (B) Split-Spoon Sampler	15
Figure 6 Split-Spoon Sampler	16
Figure 7: The SPT Sampler In Place In The Boring	16

List of Maps

Map 1: Shibpur Upazila Map	2
Map 1: Locations Map of the geophysical tests at Shibpur Upazila	19
Map 2: Locations Map of the Standard Penetration tests (SPT) at Shibpur Upazila	29

List of Photographs

Plate1: Downhole Seismic Test data logger	8
Plate2: Wooden Plank as the Vibration Source	8
Plate3: Geophone	9
Plate4: Data Acquisition Unit	9
Plate5: Geophone Lowering In the Borehole	9
Plate6: Direction of Excitations	9
Plate7: MASW Data Acquisitions at Shibpur Upazila	20
Plate8: PS logging Data Acquisitions at Shibpur Upazila	22

CHAPTER-01: INTRODUCTION

1.1. Background:

Recently rapid urban expansion is the common phenomena in Bangladesh due to rapid population and economic growth with increasing life expectancy of the peoples. In this consequences, the present trend of planning practice is very much poor, mostly oriented towards planning of major cities and towns in Bangladesh but not in all other towns or growth centers which is belonging district or Upazila urban area because involves of huge amount of financial allocation/grants. Recent policy of Bangladesh Government, the upazila has been recognized as the most significant tier of administration. So that these areas are need to be planned and developed to accommodate all social, economic, administrative, infrastructure services and service facilities for the region. The current government's intention is to reflect the national policy of bringing development administrative and service facilities to the door step of rural masses and to ensure better delivery of government services to the people. Realizing the fact and importance of formulating development plans for upazilas, Urban Development Directorate has come up with a great initiative to plan those areas. At the first phase of this initiative UDD has decided to prepare development plan for 14 Upazilas all over Bangladesh into five different packages. For each package separate consultancy team has been appointed to carry out that job more fruitfully. Sheltech Consultants Private Ltd. (SCPL) in associate with Arc Bangladesh Ltd. (ABL) has been selected for package-2 (covering Ishwarganj Upazila, Dist: Mymensingh; Raipura, Dist: Narsingdi; and Shibchar Upazila, Dist: Narsingdi) by project evaluation committee of UDD.

The studies of this development plan are subsurface geological and geotechnical investigation which has been considered for a durable and sustainable urban environment. Initially this work is to determine subsurface soil condition of the project area and evaluating of natural geological and hydro-meteorological hazards such as earthquake, landslide and ground failure which integrate the consequence into the design of the infrastructure.

In this study, following investigations and surveys has been carried out in to the field which are geo-morphological survey; drilling of boreholes and preparation of borehole logs; collection of undisturbed and disturbed soil sample as per standard guide line; conducting standard penetration tests (SPTs); drilling of boreholes and casing by PVC pipe for conducting PS logging test (Down-hole seismic test); conducting PS logging test (Down-hole seismic test) and conducting Multi-Channel Analysis of Surface Wave (MASW). Geomorphologic conditions of the study area is covered by floodplain and elevated Pleistocene trace with some low or marshy land. Geologically and structurally the area is not much complex, that's why geotechnical and geophysical investigations are covered whole floodplain and elevated Pleistocene trace area except low or marshy land and almost everywhere soils are Modhupur clay and recent fluvial type of deposit which are much soft and thicker.

Soil samples such as Grain Size Analysis, Natural Moisture Content, Atterberg Limits, Specific Gravity, Direct Shear Test, Unconfined Compression strength, Triaxial test etc has been performing in the laboratory which will give more qualitative and quantitative information about the subsurface materials. These field and laboratory data will be analyzed and produce risk sensitive micro-zonation maps of the project area.

1.2. Scope of Work:

- a) Preparation of geomorphologic map
- b) Preparation of sub-surface lithological 3D model of different layers through geo-technical investigation
- c) Preparation of engineering geological mapping based on AVS30
- d) Preparation of Seismic Hazard Assessment Map
- e) Peak Ground Acceleration (PGA) and Peak Ground Velocity (PGV) map.
- f) Liquefaction and Ground Failure Map.
- g) Finally intensity map is prepared for high rise and low rise building

1.3. Brief Description of the area:

The area of Upazila is 217.71 sq. km (BBS 2011) including 1.09 sq. km river area. It is located between 23°56' and 24°07' north latitudes and between 90°38' and 90°50' east longitudes. The upazila is bounded on the north by Monohardiupazila on the east by Shibpur and Belaboupazila on the south by NarsingdiSadarupazila and on the west by Palashupazila and Kapasia and Kaliganjupazila of Gazipurzila.

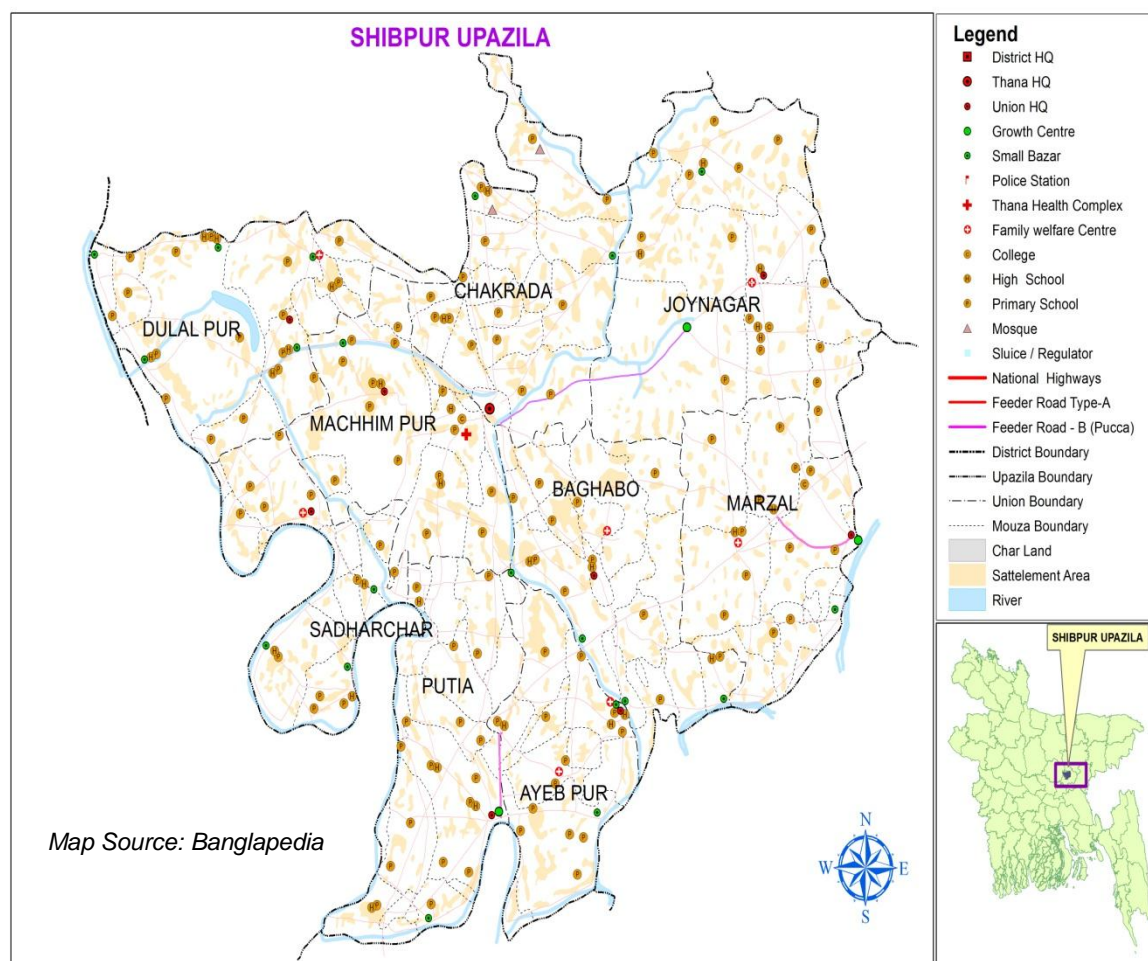
Shibpur came into existence on the 12th January 1918, with nine unions. Presently, added a 'C' class paurashava in this upazila. The upazila came under the influence of the rule of the Kharog dynasty from the middle of the 6th and 7th century A.D. There were five kings in Kharog dynasty namely king Kharogaddam, Maharaj Jatkhara, Maharaj DevKharag, Raja Rajvratra and Raja Balvratra. From this dynasty three Raja were Buddhist and after that two Raja were Shaiba Hindu. Nothing is definitely known about the origin of name of the upazila. It is generally believed that in the long past it was a centre for worship of shib. The upazila might have derived its name as Shibpur after the name of Shib a hero of Hindu Mythology. Shibpur has historical glory for long time which can be easily understood by the presence of rich heritage sites. There are many heritage sites stands in Shibpur. Among them Naimuri Pahar, Ashrafpur Gayevi Jame Mosque, Graveyard of Shahid Asad, Jamidar Mohoni Mohon Shaha's home, Lakhpur Jamindar home, Dhupirtech Bauddh Paddn Mandir, Jank hartech Purakriti, Tungirtech Pratattik Nidarshan and KumardiShaha Mansur's Masque and Dargah is mentionable.

Shibpur has a population of 303813. Males constitute 48.85% of the population, and females 51.15%. Shibpur has an average literacy rate of 55.7% (7+ years), and the national average of 51.77% literate. (Source: BBS 2011).

The economy of the project area is agro based dominated by trading of various agro-products. Rice, potato, maize are major cash crop of the area. Potato is cultivated throughout the region and has become very popular as a cash crop. Though other vegetables is taking over potato cultivation, in areas like Shibpurupazila and around vegetables is the major crop. On the other hand paddy and wheat are major cereal crops. In recent times cultivation of maize is becoming popular which generally fetches good income for the cultivators. In the rural settlements of the upazila, brinjal, green Chile and Heap are a common picture. The area has potential for production of oil seed like mustard. The main sources of income of this area are Agriculture, Small Business, Wage, Livestock and Poultry,

Fisheries, Cottage Industry and Service. Agriculture is the predominant source of income of Shibpur upazila. Most of the people depend on agriculture for their livelihood.

The city of Shibpur is served by several highways. The main road transport is Dhaka-Sylhet highway. Mainly three types of roads such as pucca, HBB/ brick soling and kutcha roads connect different parts of the Upazilla. It has 1024.50 km of pucca road, 1350 km of HBB/Soling and 497 km of kutcha road. There are 15 pucca bridges and 1037 culverts and 5 Bailey bridge within the Upazilla. (Source: Banglapedia)



Source: JV of SCPL and ABL, 2015

N.B: Based on SOB, Map

Map 1: Shibpur Upazila Map

CHAPTER-02: METHODOLOGY

The methods and materials used to carry out of these activities have been described below-

2.1. Test Details and Procedure of Down-Hole Seismic Test (Ps Logging)

Main objectives of downhole seismic test to measure the travelling time of elastic wave from the ground surface to some arbitrary depths beneath the ground. The seismic wave was generated by striking a wooden plank by a sledge hammer. The plank was placed on the ground surface at around 1 m in horizontal direction from the top of borehole. The plank was hit separately on both ends to generate shear wave energy in opposite directions and is polarized in the direction parallel to the plank.

The shear wave emanated from the plank is detected by a tri-axial geophone. The geophone was lowered to 1 m below ground surface and attached to the borehole wall by inflating an air bladder. Then, the measurements were taken at every 1 m interval until the geophone was lowered to 30 m below ground surface. For each elevation, 3 records were taken and then used to calculate the shear wave velocity.



Plate1: Downhole Seismic Test data logger

2.2.1. Procedure of Field Work and Analysis

A wooden plank with an approximate dimension of 2 ft x 1 ft x 2 ft is fixed to the ground. The wooden plank is placed about 1m from the borehole as shown in Plate 2.



Plate2: Wooden Plank as the Vibration Source

- b) Cables are wired from the geophone Plate3 and the trigger to the data acquisition unit Plate4. Signals in the vertical, radial and transverse directions are recorded by the data acquisition unit.

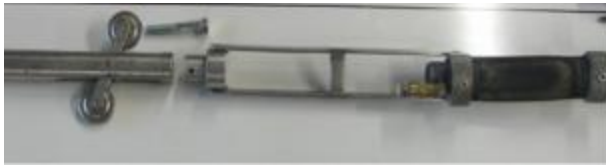


Plate3: Geophone



Plate4: Data Acquisition Unit

- c) The geophone is lowered into the borehole as shown in Plate5. Then, air is pumped into the air bag to fix the geophone to the casing (PVC pipe) at 1 m interval in depth basically.



Plate5: Geophone Lowering In the Borehole

- d) Excitations are generated by hitting the wooden plank in three directions by the hammer.



Plate6: Direction of Excitations

- e) Data is recorded in the data acquisition unit. Figure illustrates a typical dataset in obtaining the arrival time of S-wave. Hitting the wooden plank in opposite directions generates signals as shown in the figure. The time that two curves begin to separate is the arrival time of shear wave. By doing the same analysis for every depth, S-wave profiles are obtained throughout the depth of the borehole.

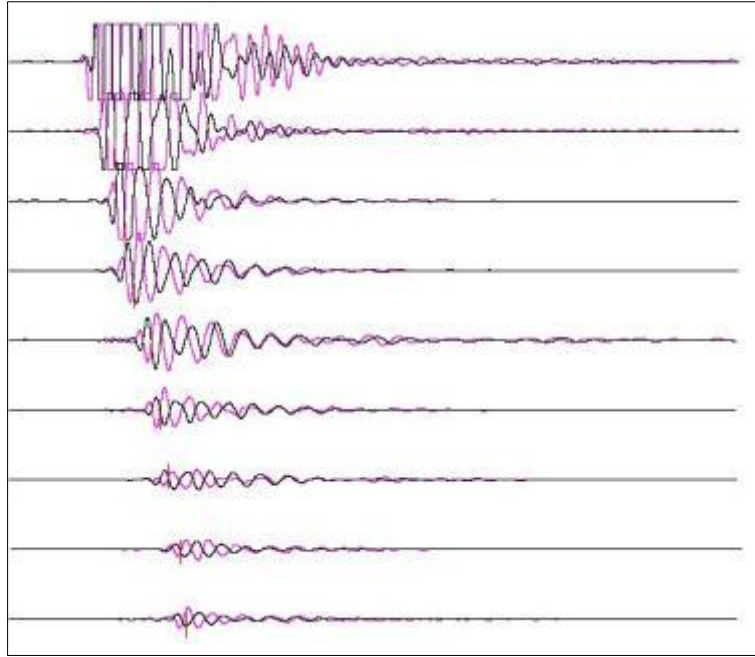
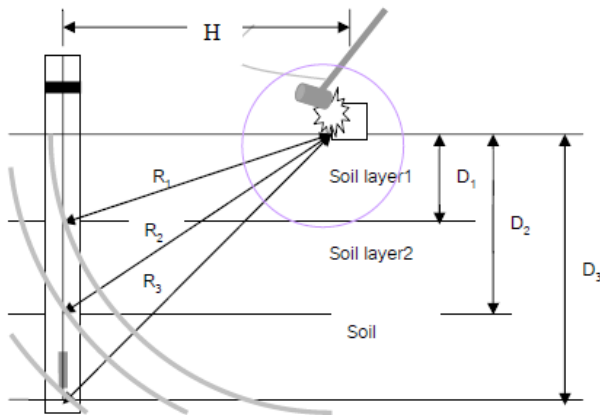


Figure 1: Determination of the Arrival Time of S-Wave

- f) Using the raw data of the test depth (D), the shortest pass (R) and the recorded arrival time of S-wave (t) in the inclined path is calculated to the travel time, t_c , in the vertical path as shown in Figure 2.



$$t_c = D \frac{t}{R}$$

Where

t_c is the corrected travel time

D is the testing depth from ground surface,

t is the first arrival time from test

R is the distance between the source and receiver

[Auld 1977]

Figure 2: Calculation of the Travel Time

- g) By plotting the corrected travel time versus depth, the velocity of every 1 m interval is calculated from (Auld 1977)

$$V_d = \frac{\Delta D}{\Delta t_c} \text{ [Auld 1977]}$$

Where, ΔD is depth interval showing similar slope and Δt_c is the corrected travel time difference of ΔD .

2.2. Test Details and Procedure of Multi-Channel Analysis of Surface Wave (MASW)

Multichannel Analysis of Surface Wave (MASW) is recent and very popular method for computation of shear wave velocity. This method is widely used for seismic microzonation. A MASW is a seismic surface method, widely used for subsurface characterization and is increasingly being applied for seismic microzonation and site response studies (Anbazhagan and Sitharam, 2008). It is also used for the geotechnical characterization of near surface materials (Park and Miller, 1999; Xia et al., 1999; Miller et al., 1999; Anbazhagan and Sitharam, 2008). MASW is used to identify the subsurface material boundaries, spatial and depth variations of weathered and engineering rocks (Anbazhagan and Sitharam, 2009). We have used the MASW system consisting of 12 channels Geode seismograph with 12 vertical geophones of 10 Hz capacity.

The measuring procedure in this project is shown as follows:

- I. To decide the measuring line
- II. To set receivers along the line at the ground surface. The intervals of each geophone are 3m.
- III. To set an acrylic board at a half interval outside the line
- IV. To shoot it vertically. Then generated elastic waves are recorded by receivers.
- V. To shift the acrylic board between second receiver and the third receiver, and shoot it vertically. Then generated elastic waves are recorded at receivers.
- VI. To iterate this procedure up to setting the acrylic boards at a half interval outside the other side of the line.

The data acquisition parameters are given in Table 1.

Table 1: MASW Data Acquisition Parameters

Seismic refraction	
Number of channels	12
Geophone spacing	3m
Array length	33m
Sampling rate	1ms
Record length	2 sec
Natural frequency of Geophone	10 Hz
Source	8 kg hammer
Shot number	13 points, 11 between geophones and 2 outside of measuring line

Source: Park and Miller, 1999; Xia et al. 1999; Miller et al. 1999; Anbazhagan and Sitharam, 2008.

2.2.1. Analysis of MASW

Data processing consists of two main steps: (i) Obtaining the dispersion curves of Rayleigh wave phase velocity from the records; (ii) Determining the V s profiles from which the Vs30 values are calculated (see figure 3). In the phase velocity analysis, SPAC (Spatial Autocorrelation) method (Okada, 2003) is employed. Okada (2003) shows Spatial Autocorrelation function $\rho(\omega, r)$ is expressed by Bessel function.

$$\rho(\omega, r) = J_0(\omega r / c(\omega)) \quad [\text{Okada, 2003}]$$

Where, r is the distance between receivers, ω is the angular frequency, c (ω) is phase velocity of waves, J_0 is the first kind of Bessel function. The phase velocity was obtained at

each frequency using equation (2). A one dimensional inversion using a non-linear least square method has been applied to the phase velocity curves. In the inversion, the following relationship between P-wave velocity (V_p) and V_s (Kitsunezaki et. al., 1990):

$$V_p = 1.29 + 1.11V_s \quad [\text{Kitsunezaki et. al., 1990}]$$

Where, V_s is S-wave velocity (km/s), V_p is P-wave velocity (km/s). In order to assume density ρ (g/cm³) from S-wave velocity, the relationship of Ludwig et al. (1970) is used.

$$\rho = 1.2475 + 0.399V_p - 0.026V_p^2 \quad [\text{Ludwig et al. (1970)}]$$

These calculations are carried out along the measuring line, and the S-wave velocity distribution section was analyzed.

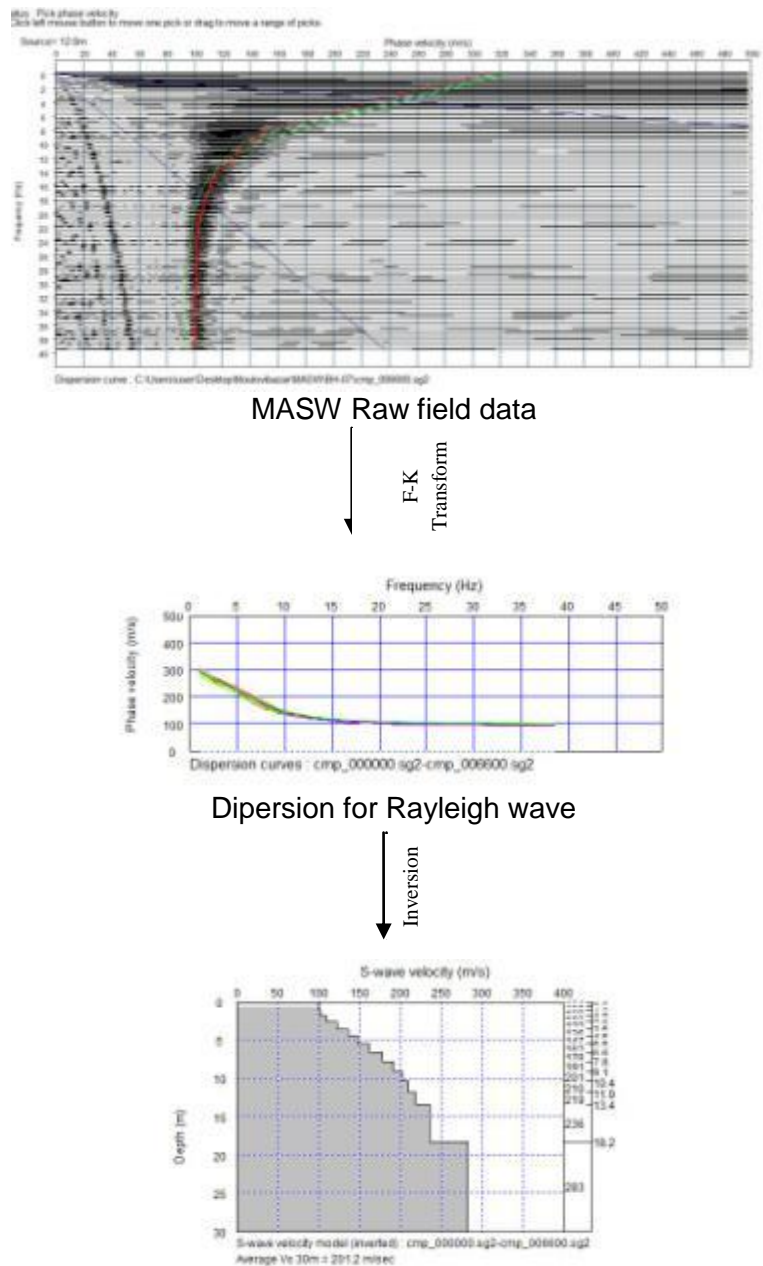


Figure 3: Main Step of the MASW Processing Technique

2.3. Test Details and Procedure of Standard Penetration Test

The geotechnical boreholes have been constructed using wash boring method. In this investigation, 24 numbers of boreholes have been prepared at Shibpur Upazila. The borehole logs are enclosed in the Appendix. The boring method has been described in the following section.

2.3.1. Wash Boring

In this method, water is pumped through a string of hollow boring rods and is released under pressure through narrow holes in a chisel attached to the lower end of the rods. The soil is loosened and broken up by the water jets and the up and down movement of the chisel. There is also provision for the manual rotation of the chisel by means of a tiller attached to the boring rods above the surface. The soil particles are washed to the surface between the rods and the side of the borehole and are allowed to settle out in a sump. The rig consists of a derrick, a winch and a water pump. The winch carries a light steel cable which passes through the sheaf of the derrick and is attached to the top of the boring rods. The string of rods is raised and dropped by means of the winch unit, producing the chopping action of the chisel. The borehole is generally cased but the method can be used in uncased holes. Drilling fluid may be used as an alternative to water in the method, eliminating the need for casing.

Wash boring can be used in most types of soil but progress becomes slow if particles of coarse gravel size and larger are present. The accurate identification of soil types is difficult due to particles being broken up by the chisel and to mixing as the material is washed to the surface: in addition, segregation of particles takes place as they settle out in the sump. However, a change in the feel of the boring tool can sometimes be detected, and there may be a change in the color of the water rising to the surface, when the boundaries between different strata are reached. The method is unacceptable as a means of obtaining soil samples. It is used only as a means of advancing a borehole to enable tube samples to be taken or in-situ tests such as Standard Penetration Test (SPT) to be carried out below the bottom of the hole. An advantage of the method is that the soil immediately below the hole remains relatively undisturbed.

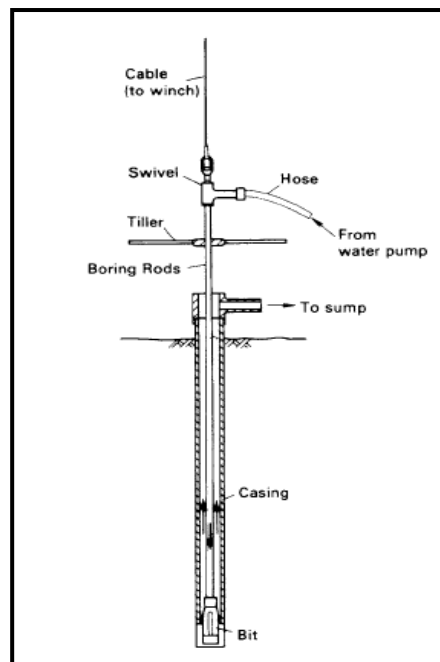


Figure 4: Wash Boring

2.3.2. Soil Sampling

Two main categories of soil samples are collected, undisturbed and disturbed. Undisturbed samples, which are required mainly for shear strength and consolidation tests, are obtained by techniques which aim at preserving the in-situ structure and water content of the soil. In boreholes, undisturbed samples can be obtained by withdrawing the boring tools (except when hollow-stem continuous-flight augers are used) and driving or pushing a sample tube into the soil at the bottom of the hole. The sampler is normally attached to a length of boring rod which can be lowered and raised by the cable of the percussion rig. When the tube is brought to the surface, some soil is removed from each end and molten wax is applied, in thin layers, to form a seal approximately 25mm thick: the ends of the tube are then covered by protective caps. Undisturbed block samples can be cut by hand from the bottom or sides of a trial pit. During cutting, the samples must be protected from water, wind and sun to avoid any change in water content: the samples should be covered with molten wax immediately they have been brought to the surface. It is impossible to obtain a sample that is completely undisturbed, no matter how elaborate or careful the ground investigation and sampling technique might be. In the case of clays, for example, swelling will take place adjacent to the bottom of a borehole due to the reduction in total stresses when soil is removed and structural disturbance may be caused by the action of the boring tools; subsequently, when a sample is removed from the ground the total stresses are reduced to zero.

Soft clays are extremely sensitive to sampling disturbance, the effects being more pronounced in clays of low plasticity than in those of high plasticity. The central core of a soft clay sample will be relatively less disturbed than the outer zone adjacent to the sampling tube. Immediately after sampling, the pore water pressure in the relatively undisturbed core will be negative due to the release of the in-situ total stresses. Swelling of the relatively undisturbed core will gradually take place due to water being drawn from the more disturbed outer zone and resulting in the dissipation of the negative excess pore water pressure: the outer zone of soil will consolidate due to the redistribution of water within the sample. The dissipation of the negative excess pore water pressure is accompanied by a corresponding reduction in effective stresses. The soil structure of the sample will thus offer less resistance to shear and will be less rigid than the in-situ soil.

A disturbed sample is one having the same particle size distribution as the in-situ soil but in which the soil structure has been significantly damaged or completely destroyed; in addition, the water content may be different from that of the in-situ soil. Disturbed samples, which are used mainly for soil classification tests, visual classification and compaction tests, can be excavated from trial pits or obtained from the tools used to advance boreholes (e.g. from augers and the clay cutter). The soil recovered from the shell in percussion boring will be deficient in fines and will be unsuitable for use as a disturbed sample. Samples in which the natural water content has been preserved should be placed in airtight, non-corrosive containers: all containers should be completely filled so that there is negligible air space above the sample.

All samples should be clearly labeled to show the project name, date, location, borehole number, depth and method of sampling; in addition, each sample should be given a serial number. Special care is required in the handling, transportation and storage of samples (particularly undisturbed samples) prior to testing. The types of tube samplers used in this study are described below.

Thin-walled Sampler

Thin-walled samplers (Figure 5a) have been used to collect undisturbed samples from boreholes. These samplers are used in soils which are sensitive to disturbance such as soft to firm clays and plastic silts. The sampler does not employ a separate cutting shoe, the

lower end of the tube itself being machined to form a cutting edge. The internal diameter may range from 35 to 100 mm. The area ratio is approximately 10% and samples of first-class quality can be obtained provided the soil has not been disturbed in advancing the borehole. In trial pits and shallow boreholes the tube can often be driven manually

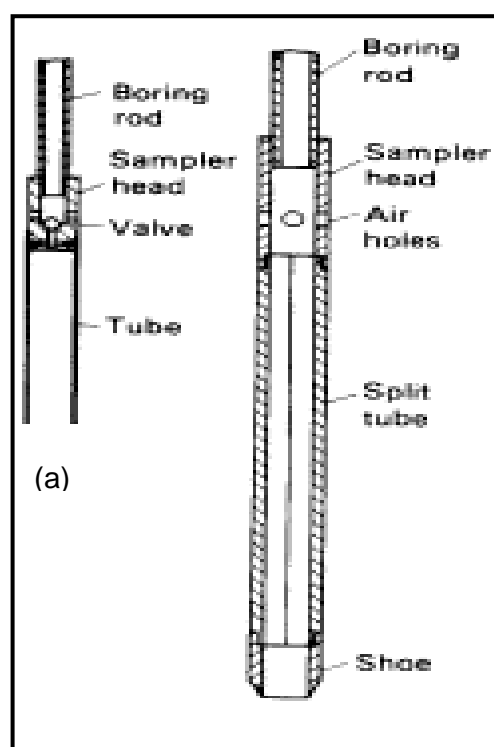


Figure 5: (A) Thin-Walled (Shelby Tube) Sampler, And (B) Split-Spoon Sampler.

Split-spoon sampler

Split-spoon samplers (Figure 5b) have been used to collect disturbed samples. It consists of a tube which is split longitudinally into two halves: a shoe and a sampler head incorporating air-release holes are screwed onto the ends. The two halves of the tube can be separated when the shoe and head are detached to allow the sample to be removed. The internal and external diameters are 35 and 50 mm, respectively, the area ratio being approximately 100%, with the result that there is considerable disturbance of the sample. This sampler is used mainly in sands, being the tool specified in the standard penetration test (SPT).

2.3.3. Standard Penetration Test (SPT)

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

Although the SPT also is plagued by many problems that affect its accuracy and reproducibility, it probably will continue to be used for the foreseeable future, primarily because of its low cost. However, it is partially being replaced by other test methods, especially on larger and more critical projects.

The ASTM standard D1586 has been followed to carry out SPT. The procedure is as follows.

1. Drill a 60-200 mm (2.5-8 in) diameter exploratory boring to the depth of the first test.
2. Insert the SPT sampler (also known as a Split-spoon Sampler) into the boring. The shape and dimensions of this sampler are shown in Figure 6. It is connected via steel rods to a 63.5 kg (140 lb) hammer, as shown in Figure 7.
3. Using either a rope and cathead arrangement (in case of wash boring used this technique in this investigation) or an automatic tripping mechanism (in case of rotary drilling used this technique in this investigation), raise the hammer a distance of 760 mm (30 in) and allow it to fall. This energy drives the sampler into the bottom of the boring. Repeat this process until the sampler has penetrated a distance of 450 mm (18 in), recording the number of hammer blows required for each 150 mm (6 in) interval. Stop the test if more than 50 blows are required for any of intervals, or if more than 100 total blows are required. Either of these events is known as refusal and is so noted on the boring log.
4. Compute the N-value by summing the blow counts for the last 300 mm (12 in) of penetration. The blow count for the first 150 mm (6 in) is retained for reference purposes, but not used to compute N because the bottom of the boring is likely to be disturbed by the drilling process and may be covered with loose soil that fell from the sides of the boring. Note that the N-value is the same regardless of whether the engineer is using English or SI units.
5. Extract the SPT sampler, then remove and save the soil sample (disturbed sample).
6. Drill the boring to the depth of the next test and repeat steps 2 through 6 as required.

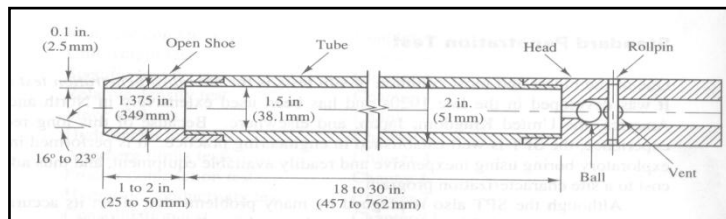


Figure 6: Split-Spoon Sampler.

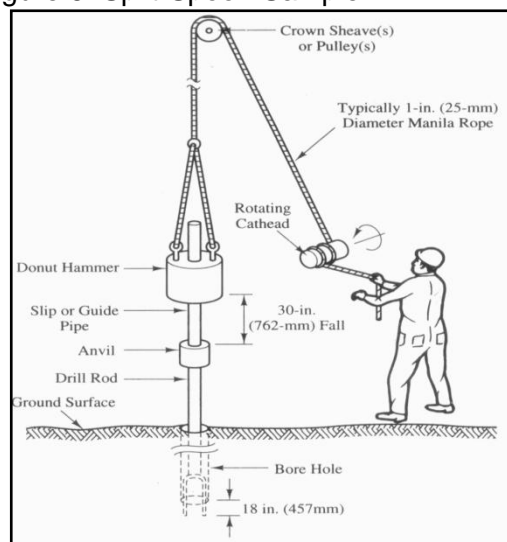


Figure 7: The SPT Sampler In Place In The Boring.

Thus, N-values may be obtained at intervals no closer than 500 mm (20 in). Typically these tests are performed at 1.5 – 5 m (5 – 15 ft) intervals (1.5 m interval in this investigation). The term consistency of the cohesive soil is generally used on the basis of the SPT values (N) in the following way.

N	...	...	0-2	...	...	Very Soft
N	...	...	2-4	...	...	Soft
N	...	...	4-8	...	...	Medium
N	...	...	8-15	...	...	Stiff
N	...	...	15-30	...	...	Very Stiff
N	...	...	30-50	...	...	Hard
N	...	...	>50	...	...	Very Hard

The term relative density for the non-cohesive soil is used on the basis of the SPT values (N) in the following way.

N	...	...	0-4	...	...	Very loose
N	...	...	4-10	...	...	Loose
N	...	...	10-30	...	...	Medium dense
N	...	...	30-50	...	...	Dense
N	...	...	>50	...	...	Very dense

Visual Soil Classification Procedure:

Soils are classified according to grain size distribution and limit tests. Size divisions for various materials are as follows:

Sieve	Soils Designations
+No 4 (4.76mm)	Gravel
No.4 to No 10(2.00mm)	Coarse sand
No. 10 to No 40 (0.42mm)	Medium Sand
No. 40 to No 200 (0.07mm)	Fine sand
-No.200	Silt or Clay

Description of the Soil Composition:

The following terms have been used in this report for description of soil composition:

Trace	1 to 10%
Little	10 to 25%
With	25 to 35%
Substantial	35 to 50%

(Source: ASTM Standard D1586)

CHAPTER-03: SURVEY RESULT AT SHIBPUR UPAZILA

3.1. Geophysical Investigations

The main objectives of these investigation to estimate local site effects against earthquakes and the task has been segregated by three-fold: 1) To determine shear wave velocity profile at various sites, 2) To classify soil conditions according to seismic design specifications and 3) To analyze soil amplifications in the area. Field measurements of shear wave velocities were conducted in Shibpur Upazila and described in below.

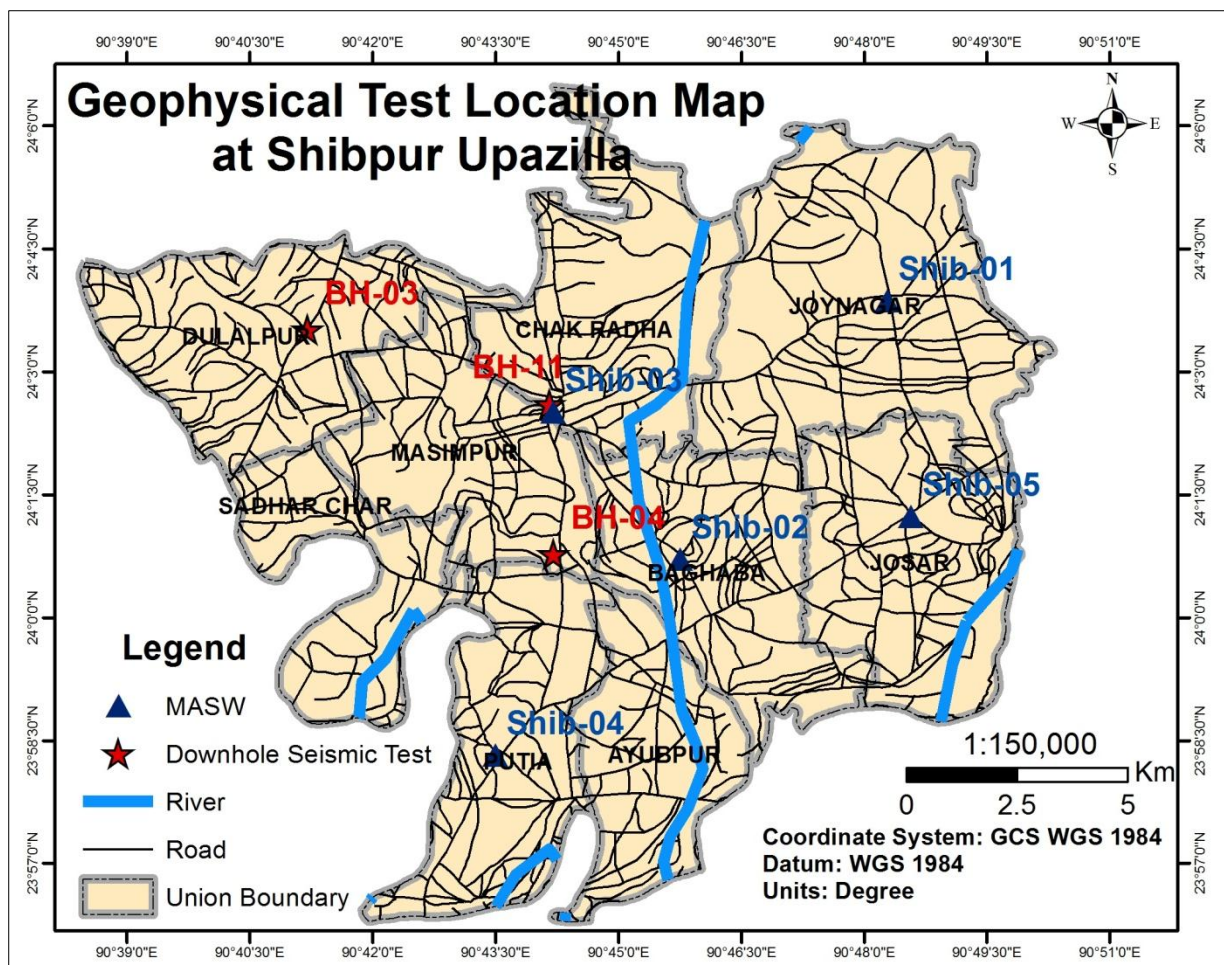
Shear wave velocity profile (Vs profile) in the field were carried out by two geophysical exploration methods namely 1) seismic downhole test and 2) Multichannel Analysis of Surface Wave (MASW).

Seismic downhole test is a direct measurement method for obtaining the shear wave velocity profile of soil stratum. However, the test requires borehole which is not time and cost effective for the project. Multichannel analysis of surface waves (MASW) is a non-invasive technique which can be used to determine the Vs profile at sites. In this project, the seismic downhole and MASW tests were performed at 3 and 5 locations respectively. Locations of seismic downhole test and MASW tests are shown in Map. The GPS coordinate of the test locations are showing in Table 2.

Table 2: PS logging and MASW test locations

Upazila Name	Test/ Survey Name	ID	Location Name	Coordinate	
				Latitude	Longitude
Shibpur	Downhole Seismic Test (PS Logging)	BH-11	Shibpur ideal school and college, Shibpur Sadar	24.04338	90.73601
		BH-04	Near Dulalpur Union porishod, Dulalpur Union	24.01284	90.73682
		BH-03	Fayaj mollah high school, Masimpur Union	24.0585	90.68671
	Multichannel analysis of surface waves (MASW)	MASW Shib 01	Joynagar Hazi Nawab Ali Balika Uchho Biddaloy, Joynagar Union	24.06443	90.8046
		MASW Shib 02	Baghaba Union Uchho Biddaloy, Baghaba Union	24.01177	90.76251
		MASW Shib 03	Shibpur Ideal school & college (Old), Shibpur Sadar	24.04173	90.73669
		MASW Shib 04	Sayed Nagar uchho Biddaloy, Putia Union	23.97198	90.72488
		MASW Shib 05	Chaitano bohumukhi uchho Biddaloy, Josar Union	24.02045	90.80951

Source: Field Survey, 2016



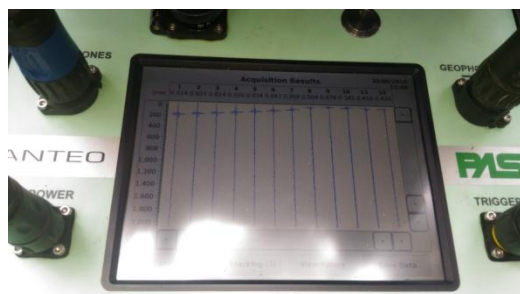
Map 2: Locations Map of the geophysical tests at Shibpur Upazila



Set receivers along the line at the ground surface and the intervals of each geophone are 3m



Vertical Geophone of 10 Hz capacity



Data Acquisition unit



shoot it vertically by 8kg hammer to generated elastic waves



MASW Sib 1, JoynagarHaziNawab Ali BalikaUchhoBiddaloy, Joynagar Union



MASW Sib 2,Baghaba Union UchhoBiddaloy, Baghaba Union



MASW Sib 3,Shibpur Ideal school & college (Old), ShibpurSadar



MASW Sib 4,Sayed Nagar uchhoBiddaloy, Putia Union



MASW Sib 5,ChaittanobohumukhiuchhoBiddaloy, Josar Union

Plate7: MASW Data Acquisitions at ShibpurUpazila



BH-11, Shibpur ideal school and college, ShibpurSadar



BH-04, Near Dulalpur Union porishod, Dulalpur Union



BH-03, Fayajmollah high school, Masimpur Union

Plate8: PS logging Data Acquisitions at Shibpur Upazila

3.1.1. Down-Hole Seismic (PS Logging) Test Results

As a fundamental parameter, shear wave velocity is required to define the dynamic properties of soils. If the soil velocity is less than 180m/s, it can be said as loose or soft soil. Estimation of shear wave velocity (V_s) / average shear wave velocity (AVS) and mapping is a way to characterize varying site conditions, and it can also be used to model earthquake-related ground shaking (e.g., Petersen and others, 1997; 1999; Wills and others, 2000). Estimation of AVS aims to generate a map of estimated shear wave velocities for the upper 30m of the subsurface. Further this map can be used for seismic site response analysis i.e., to determine peak ground acceleration (PGA) and spectral acceleration (SA) values of both bedrock and ground surface.

Downhole seismic test data acquisition has been completed at Shibpur Upazilla in three different locations on date 24th August 2016. Field raw data will be processed and interpreted very soon and result shall be included into final report.

3.1.2. MASW Survey Result

To predict subsurface shear-wave interval velocities, multi-spectral analyses of surface waves (MASW) are popularly used. Shear wave velocities can also extract additional velocity-related information such as mechanical properties of soils and rocks. In general, MASW data compare favorably to other geophysical methods for predicting interval velocities. Furthermore, comparisons to vertical seismic profiles correlate well with MASW predicted shear wave interval velocities.

MASW test has been completed at five different locations at Shibpur Upazilla by 24th August 2016 and field raw data has also been processed and interpreted. According to MASW test result, shear wave velocity of the project area is showing soft to moderate soil condition for foundation. MASW-01, MASW-04 and MASW -05 test results are showing more than 180 m/s but others two locations the average velocity is below 180m/s. The shear wave velocities at soil layer shows gradually increase from 110m/s to 230m/s. From those soil velocities, it can be saying the upper soils (depth around 15m) are soft soil and soil hardness gradually increases by increasing depth.

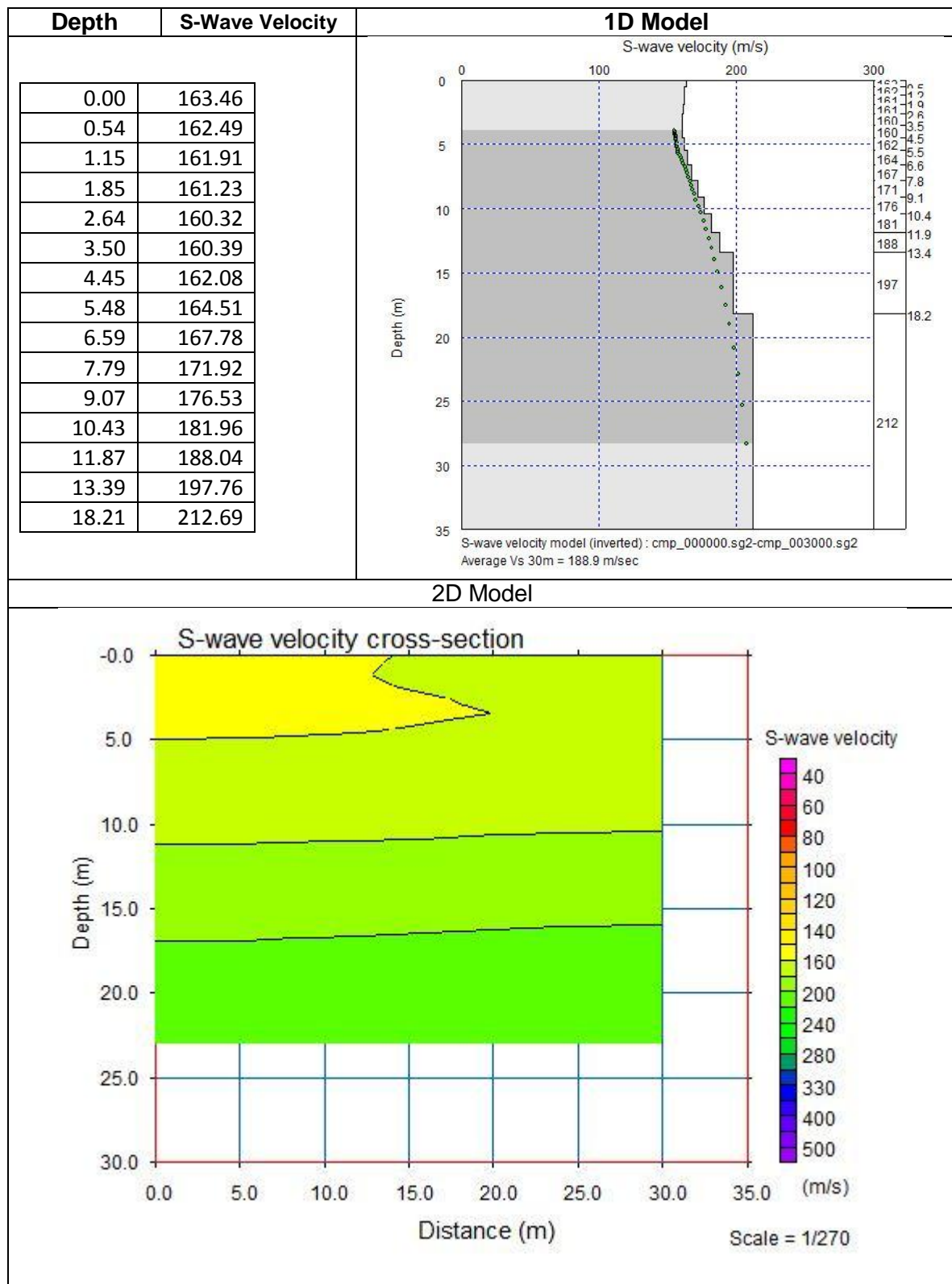
Actual subsurface soil condition will be known when all data has been integrated in a single module to produce shear wave velocity map and from which it is possible to interpret hazard condition of sub surface soil environment and seismic behavior of the project area. The MASW survey results are shown in Table 3. Details of MASW data has been shown in below Figure.

Table 3: Summary of MASW Test Results

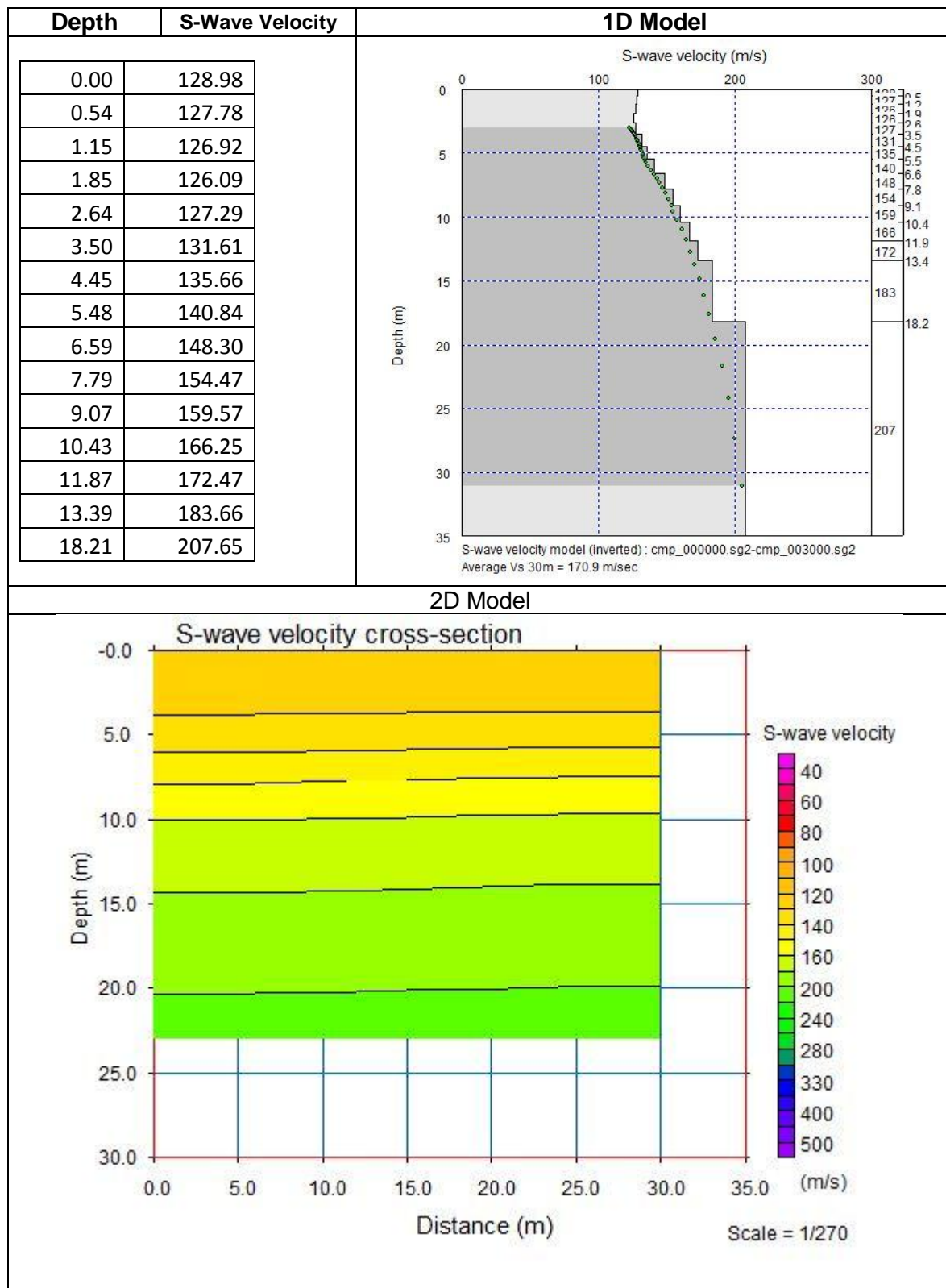
MASW ID	Average Shear Wave Velocity (Vs 30)
MASW Shib 1	188.9 m/s
MASW Shib 2	170.9 m/s
MASW Shib 3	178.4 m/s
MASW Shib 4	190.3 m/s
MASW Shib 5	205.3 m/s

Source: Field survey, 201

MASW ID:Shib-1 Date: 23.08.2016
Coordinate : Lat-24.06443 Long-90.80460
Location: Joynagar Hazi Nowab Ali Balika High School, Shibpur, Narshindhi



MASW ID: Shib-2 Date: 23.08.2016
Coordinate : Lat-24.01177 Long-90.76251
Location: Baghaba Union High School, Shibpur, Narshindhi

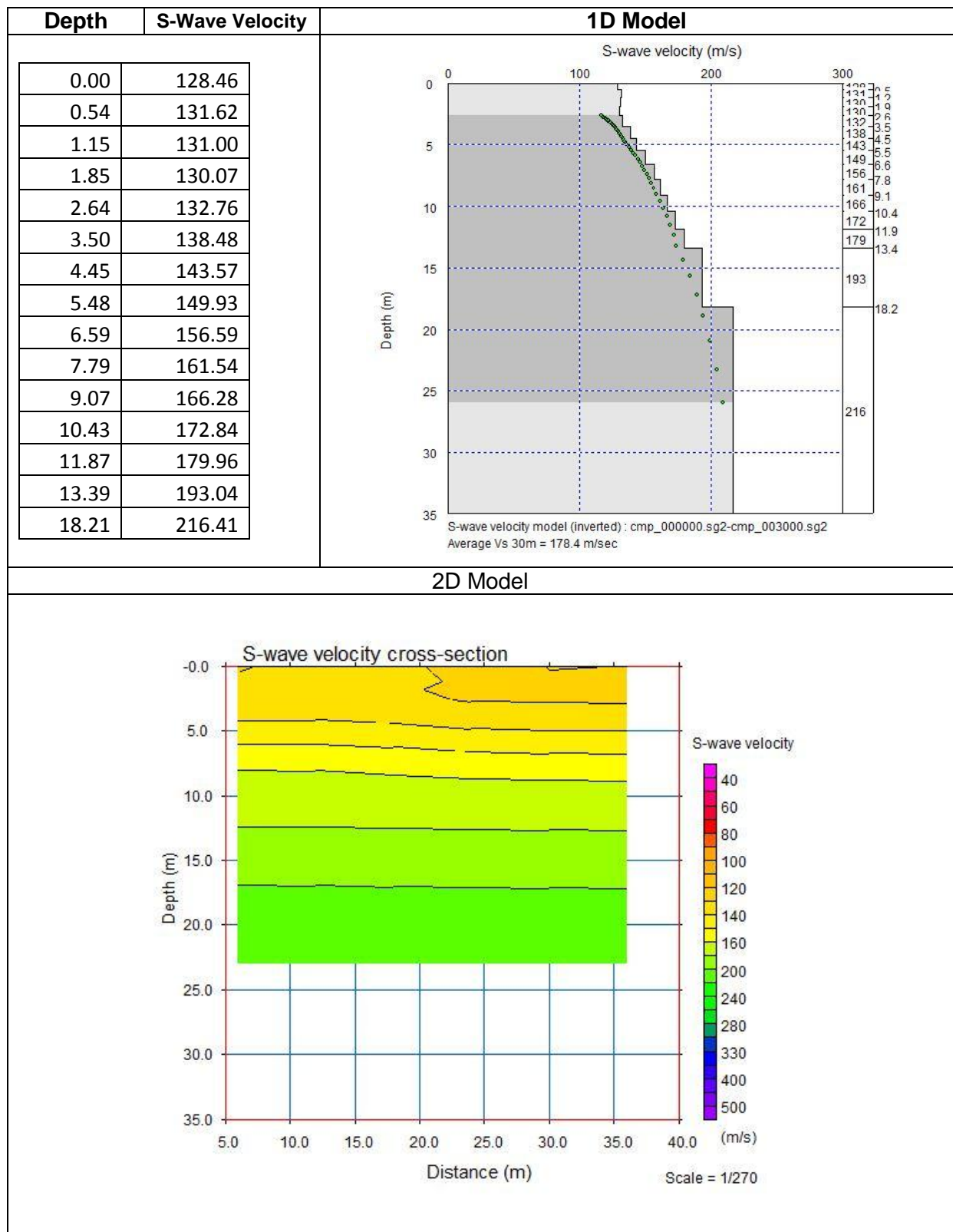


MASW ID: Shib-3 Date: 23.08.2016

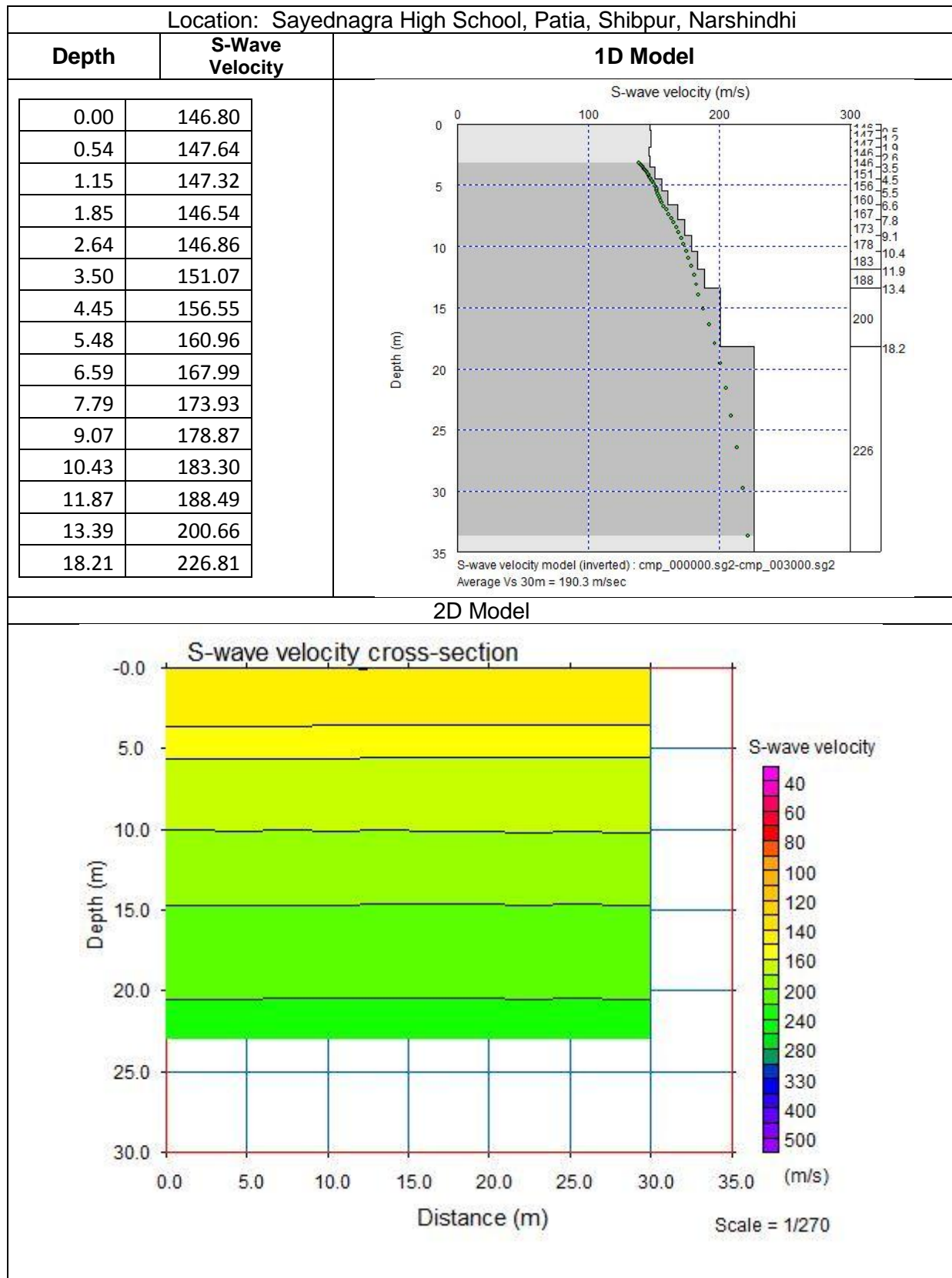
Coordinate : Lat-24.04173

Long-90.73669

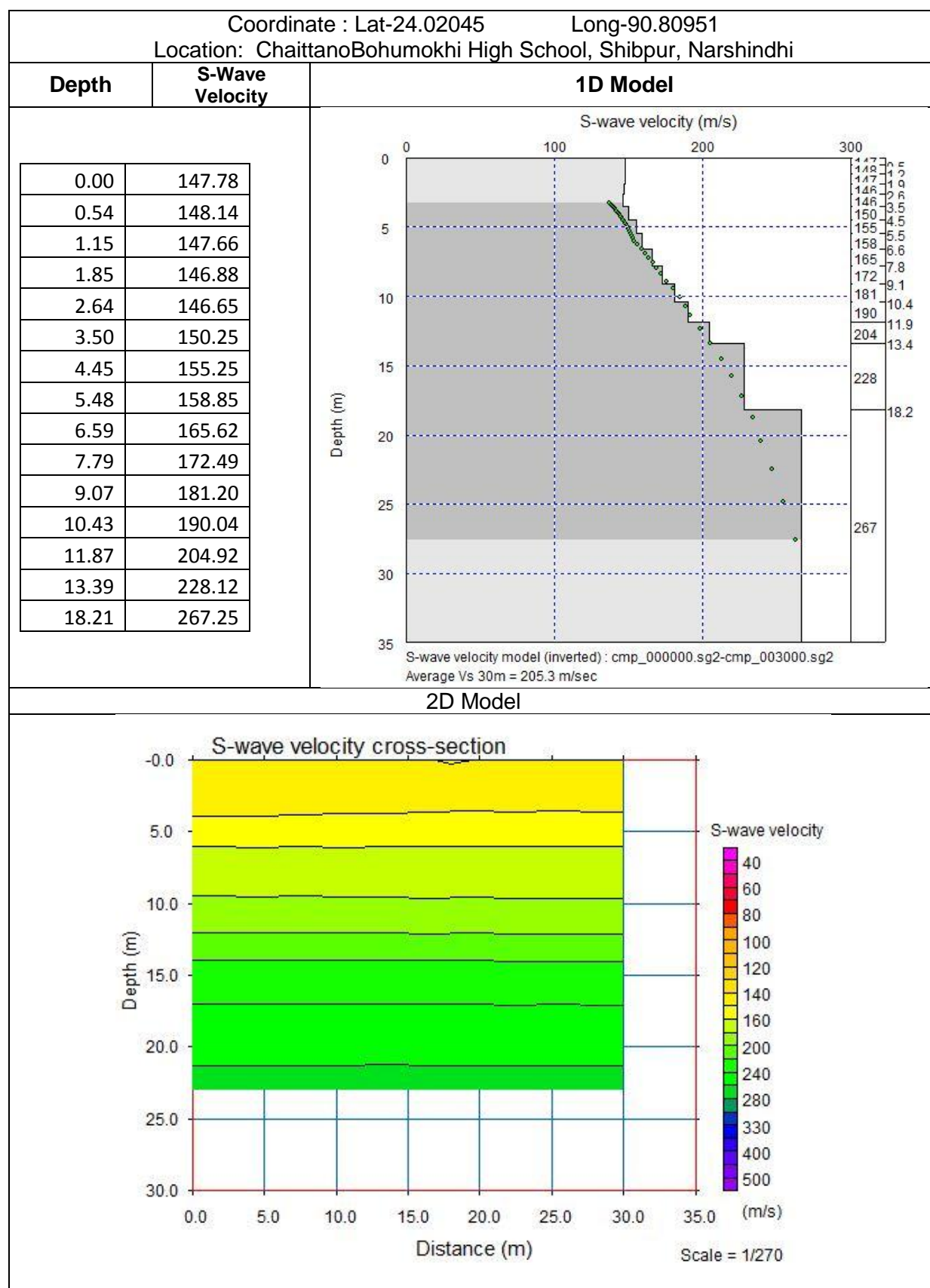
Location: Shibpur Ideal School & College, Shibpur, Narshindhi



MASW ID: Shib-4 Date: 24.08.2016
Coordinate : Lat-23.971981 Long-90.724886

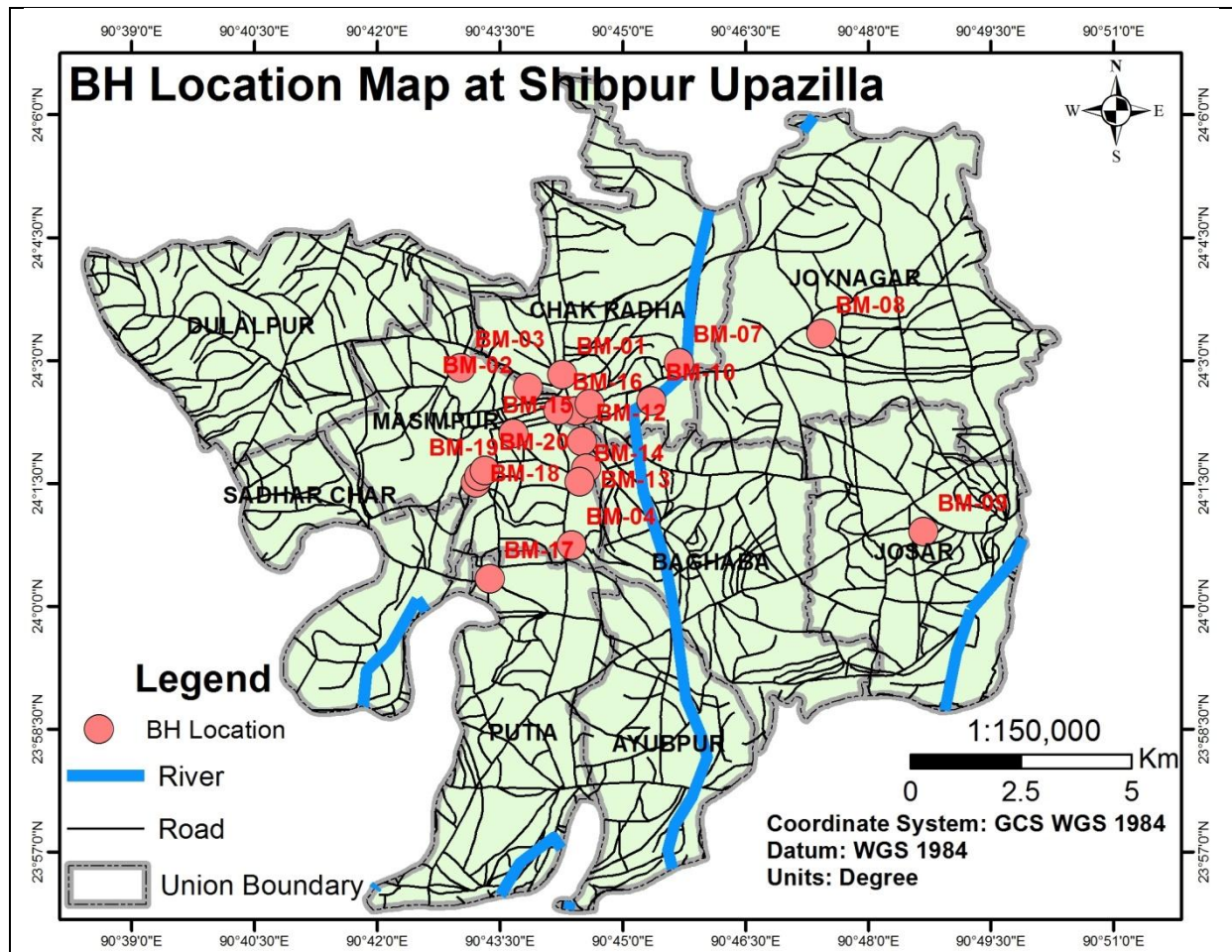


MASW ID: -5 Date: 24.08.2016



3.2. Geotechnical Investigations

To ensure safety of human beings and materials, geotechnical investigations have become an essential component of every construction, it includes a detailed investigation of soil strength, composition, water content, and other important soil characteristics. Investigation borings with standard penetration test were conducted in order to know vertical geological conditions. The borings with SPT were carried out at 24 points at Shibpur Upazila.



Map3: Locations Map of the Standard Penetration tests (SPT) at Shibpur Upazila

3.2.1. Standard Penetration Test (SPT) Log

SPT is a common in-situ testing method used to determine the geotechnical engineering properties of subsurface soils. It was developed in the late 1920s and has been used extremely in North and South America, the United Kingdom, Japan, and elsewhere. Because of this long record of experience, the SPT is well-established in engineering practice. It is performed inside exploratory boring using inexpensive and readily available equipment, and thus adds little cost to a site characterization program. Although the SPT also is plagued by many problems that affect its accuracy and reproducibility, it probably will continue to be used for the foreseeable future, primarily because of its low cost. However, it is partially being replaced by other test methods, especially on larger and more critical projects.

All the borings has to be conducted and preparation of field bore log by visual classification has to be done in the presence of the experienced technical personnel. The borehole records have to be taken that include soil type, nature of sample, soil moisture content and consistency, SPT blow counts (N Value), ground water observation and apparent origin (fill, alluvium, recent sediments, etc.) and daily field logs have been prepared. The bore locations are given in following table 4 and the geotechnical borehole log are enclosed in the below section.

Table 4: Bore Hole Information Summary at Shibpur Upazila

BH ID	Location	Lat	Long
BM-01	Sonakura Bazar	24.04717	90.73754
BM-02	Masimpur U.P	24.04451	90.73059
BM-03	Dulalpur Union Parisad	24.04857	90.71695
BM-04	Madharchar Union Digital Center	24.01248	90.73954
BM-05	Soebpur Union Parisad	24.03994	90.74217
BM-06	Putia Bazar	24.03978	90.74029
BM-07	Baghabo Union Parisad	24.04961	90.76135
BM-08	Joynagar Union Parisad	24.05552	90.79038
BM-09	Josar Union Parisad	24.01516	90.81117
BM-10	Ansar VDP Unnyan Bank	24.04178	90.75578
BM-11	Puran Bus Stand	24.04128	90.74317
BM-12	Shibpur Primary School	24.03356	90.74162
BM-13	ShibpurUpazila	24.02807	90.74254
BM-14	Shibpur R&H Office	24.02536	90.74115
BM-15	Upazila Health Complex	24.03516	90.72763
BM-16	Bandadia Primary School	24.03982	90.7368
BM-17	Upazila Livestock Office	24.00564	90.72286
BM-18	Dhanua Primary School	24.02513	90.72002
BM-19	Dhanura Primary School	24.02651	90.72073
BM-20	Shibpur Sahid Assad College	24.02765	90.72177
BM-21	Dulalpur primary school	24.02631	90.76235
BM-22	Joynagar girls school	24.03533	90.36424
BM-23	Sadar char primary school	24.02683	90.65983
BM-24	Putia bazar	24.04123	90.69325

The drilling work of 24 boreholes has been completed at Shibpur Upazila and the field raw data will be processed and interpreted very soon. Laboratory analysis of soil samples (disturbed and undisturbed) will be analyzed to prepared geotechnical logs which will include into final report.



Government of the People's Republic of Bangladesh
Ministry of Housing and Public Works
Urban Development Directorate (UDD)

Preparation of Development Plan for Fourteen Upazilas

Package-02

(Ishwarganj Upazila, Mymensing; Raipura Upazila and Shibpur
Upazila, Narsingdi)

DRAFT SURVEY REPORT

**Physical feature Survey, Land Use Survey
Topographic Survey and Photogrammetry Works
of
Shibpur Upazila, Narsingdi**

~~Joint Venture of~~
August 2016 of
Sheltech Consultants Pvt. Limited
And
Arc-Bangladesh Limited



Government of the People's Republic of Bangladesh
Ministry of Housing and Public Works
Urban Development Directorate (UDD)

Preparation of Development Plan for Fourteen Upazilas

Package-02

(Ishwarganj Upazila, Mymensing; Raipura Upazila and Shibpur Upazila, Narsingdi)

DRAFT SURVEY REPORT

**Physical feature Survey, Land Use Survey
Topographic Survey and Photogrammetry Works
of
Shibpur Upazila, Narsingdi**

Joint Venture of
Sheltech Consultants Pvt. Limited
And
Arc-Bangladesh Limited

JV of SCPL-ABL

Preparation of Development Plan for Fourteen Upazilas Project (Package-02)

Ref: SCPL-ABL/UDD/2016/ Final Survey Report/ Shibpur Upazila

Date:

To

The Project Director

“Preparation of Development Plan for fourteen Upazilas” Project

Urban Development Directorate

82, Segunbagicha, Dhaka, 1000.

Subject: Submission of the Final Physical feature, Land Use, Topographic Survey and Photogrammetry Survey Report of Shibpur Upazila, Narsingdi.

Dear Sir,

We are pleased to submit herewith the Final Physical feature, Land Use, Topographic Survey and Photogrammetry Survey Report of Shibpur Upazila, Narsingdi for your kind information and further action.

Thanking you and assuring you of our best services.

Your Sincerely,

(Dr. Nurul Islam Nazem)

Team Leader, Package -2

(Md. Shamim Hasan)

Survey Expert, Package -2

(Shahina Akhter)

Photogrammetry Expert,
Package -2

Team Leader, Package -2

Encl: As stated.

Copy to:

1. Team Leader, Package-2.
2. Director, Sheltech Consultants Pvt. Limited
3. Chairman, Arc-Bangladesh limited, Dhaka

1/E/2 Paribagh (Mazar Road), Shahbagh, Dhaka-1000, Bangladesh

Phone: +880-2-9611171 Fax: +880-2-9611172

Email: scpl.mail@gmail.com

EXECUTIVE SUMMARY

Shibpur is an Upazila of Narsingdi district in the division of Narsingdi, Bangladesh. The upazila occupies an area of 217.71 sq. km (BBS 2011) including 1.09 sq. km river area. It is bounded by Manohardi Upazila to the north, Narsingdi Sadar Upazila to the south, Belabo to the east and Palash Upazila to the west. This report contains detailed activities undertaken for Physical Feature Survey, Land Use Survey and Topographic Survey in Shibpur upazila, based on stereo satellite imagery through photogrammetric technology. High resolution ortho-rectified satellite image along with photogrammetric data are used in preparing base map for conducting the surveys.

This report contains four separate reports. These are:

1. Physical Feature Survey
2. Land Use Survey
3. Topographic Survey and
4. Photogrammetric Works

Physical Feature Survey Report covers how the features with their attribute are collected and processed for the preparation of base map for planning. Land Use Survey Report describes the methodology for acquiring and processing of land use data. Topographic Survey Report contains the acquisition and processing of topographic data by using the photogrammetric technology. The report on Photogrammetric Works contains the basic technologies of stereo satellite image processing and extraction of features.

ABBREVIATIONS AND ACRONYMS

BM	: Bench Mark
BUTM	: Bangladesh Universal Transverse Mercator
DEM	: Digital Elevation Model
DGPS	: Differential Global Positioning System
DLRS	: Directorate of Land Records & Surveys
DPI	: Dot Per Inch
DPW	: Digital Photogrammetry Workstation
DTM	: Digital Terrain Model
GCP	: Ground Control Point
GIS	: Geographic Information System
GPS	: Global Positioning System
HBB	: Herring Bone Bond
JPEG	: Joint Photographic Experts Group
Km	: Kilometer
MSL	: Mean Sea Level
PD	: Project Director
PM	: Project Manager
RL	: Reduced Level
RMS	: Root Mean Square
RS	: Revisional Survey
RTK-GPS	: Real Time Kinematic Global Positioning System
SOB	: Survey of Bangladesh
TIN	: Triangulated Irregular Network
TOR	: Terms of Reference
UDD	: Urban Development Directorate

TABLE OF CONTENTS

	Page No.
Letter of Transmittal	i
Executive Summary	ii
List of Abbreviations	iii
Table of Content	iv
 Chapter-01: Introduction	 01
1.0 Background	01
 Chapter-02: Methodology	 02
2.0 Reconnaissance Survey	02
2.1 Compilation and Preparation of Base Map	02
2.1.1 Collection of Mauza Maps	04
2.1.2 Approval of Collected Mauza Maps for Scanning and Digitization	04
2.1.3 Scanning of Mauza Maps	05
2.1.4 Preparation of Technical Specifications for GIS Database	05
2.1.5 Digitization of Mauza Maps	05
2.1.6 Edit Plot checking of the Digitized Mauza Maps	06
2.1.7 Geo-referencing of Raster Mouza Map	06
2.1.8 Geo-referencing of Vector Mouza Map	08
2.1.9 Edge Matching of Mouza Maps	08
2.1.10 Demarcation of the Project Area based on Mouza Maps	09
2.2 Establishment of Ground Control Point (GCP) / BM Pillars	11
2.2.1 Selection of Sites for BM Pillars with justification	11
2.2.2 Design of Pillars	12
2.2.3 Construction of BM Pillars	13
2.2.4 Description of Reference BM Pillars	13
2.2.5 Baseline Survey by RTK-DGPS Method	15
2.2.6 Establishment of Coordinates (X,Y,Z) for BM Pillars	15
2.2.7 Marking of BM Pillars	18
2.3 Satellite Image Processing for Data Acquisition	20
2.3.1 Physical Feature Extraction from Satellite Image	21
2.3.2 Preparation of Survey Base Map	21
2.3.3 Preparation of Log Book for Attribute Collection	24
2.4 Satellite Image Processing	24
2.4.1 Image Collection	25
2.4.2 Image Pre-Processing	26
2.4.2.1 Merge, Color Balance and Pan-Sharpen	26
2.4.2.2 Bit Rate, Pyramid and Epi-polar Correction	28
2.4.3 GPS/INS Processing	29
2.4.4 Aerial Triangulation	29
2.4.5 Digital Mapping (Feature Extraction) from Stereo Model	29
2.4.6 Generation of Ortho-rectified Image	34
 Chapter-03: Physical Feature Survey	 35
3.1 Field Level Data Acquisition	35
3.1.1 Mobilization of Survey Team	35
3.1.2 Physical Feature Survey	35

3.2	Survey Data Processing & Analysis	37
3.2.1	Processing of Spatial and Attribute Data	37
3.2.2	Development of GIS Database	41
3.2.3	Field Verification/Ground Truthing	43
Chapter-04: Land Use Survey		44
4.1	Field Level Data Acquisition	44
4.1.1	Mobilization of Survey Team	44
4.1.2	Land Use Survey	44
4.2	Survey Data Processing & Analysis	46
4.2.1	Processing of Land Use Data	46
4.2.2	Preparation of Land Use Map	46
Chapter-05: Topographic Survey		52
5.1	Field Level Data Acquisition	52
5.1.1	Mobilization of Survey Team	52
5.1.2	Topographic Survey	52
5.2	Data Processing & Analysis	53
5.2.1	Processing of Topographic Data	53
5.2.2	General Topography of Shibpur Upazila	53
5.2.3	Alignment and Crest Level of Major Roads	56
Chapter-06: Photogrammetric Works		57
6.1	Satellite Image Processing	57
6.1.1	Image Collection	58
6.1.2	Image Pre-Processing	58
6.1.2.1	Merge, Color Balance and Pan-Sharpen	58
6.1.2.2	Bit Rate, Pyramid and Epi-polar Correction	60
6.1.3	GPS/INS Processing	61
6.1.4	Aerial Triangulation	61
6.1.5	Digital Mapping (Feature Extraction) from Stereo Model	61
6.1.6	Generation of Ortho-rectified Image	66
Chapter-07: Conclusion		67
Reference		68

LIST OF TABLES

Page No.

Table-2.1: Mauza Maps Collection from DLRS	04
Table-2.2: Specifications for Scanned Mauza Maps	05
Table-2.3: Specifications of the Scanner used for Scanning of Mauza Maps	05
Table-2.4: Status of Scanning of Mauza Map	05
Table-2.5: Status of Digitizing of Mauza Map	06
Table-2.6: Location of Reference BM	14
Table-2.7: Coordinates and Descriptions of the BM Pillars	16
Table-2.8: Input-output in Aerial Triangulation	29
Table-3.1: Composition of Survey Team	34
Table-4.1: Composition of Survey Team	43
Table-4.2: Land Use Categories	47
Table-4.3: Generalize Land Use Information of the Project Area (The table below is for Shibpur Paurashava)	51
Table-5.1: Composition of Survey Team	52
Table-5.2: General Height Information	53
Table-5.3: Crest level of major roads along their alignment in Shibpur	54

LIST OF MAPS

Map-1.1: Project Area Map of Shibpur Upazila	01
Map 2.1: Mouza Map of Shibpur Upazila	10
Map-2.2: Location of BM Pillars in Shibpur Upazila	19
Map 2.3: Sample Survey Base Map comprising Satellite Image and Photogrammetric Data	23
Map 2.4: Sample Survey Base Map comprising Mauza Map and Photogrammetric Data	23
Map-3.1: Structure Use in Shibpur Town Area	39
Map-3.2: Structure Type and Use in Shibpur Town Area	40
Map-4.1: Land Use in Shibpur Town Area	47
Map-5.1: Digital Elevation Model of Shibpur Upazila	54
Map-5.2: Contour map of Shibpur Upazila (Part)	55

LIST OF FIGURES

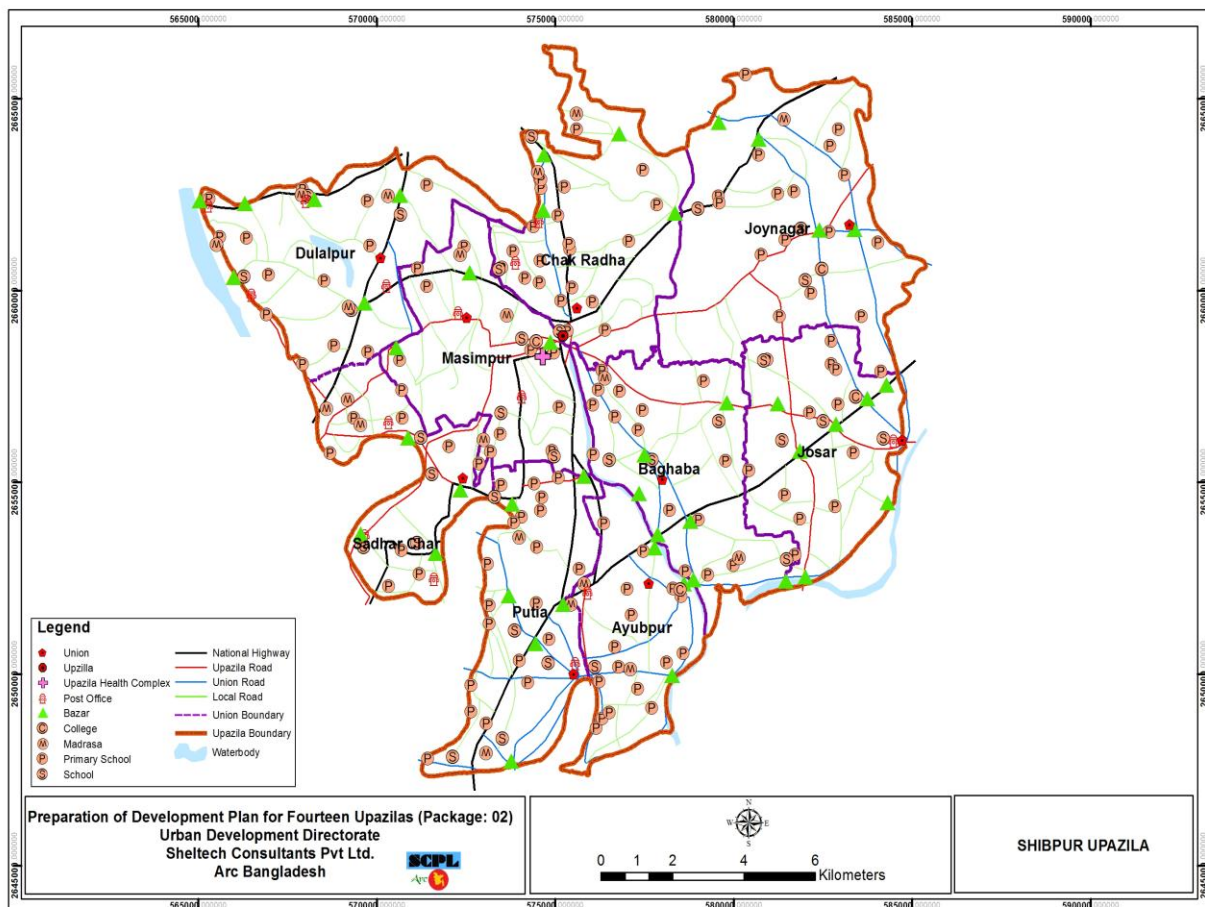
Figure 2.1	Flow Diagram for Preparation of GIS Database using RS Mauza Map	03
Figure 2.2	Sample of Scanned Mauza Map	04
Figure 2.3	On Screen Digitization and Sample Digitized Mauza Map	06
Figure 2.4	Sample Geo-referenced Raster Mauza Map Overlaid on Satellite Image	07
Figure-2.5	Sample Diagram of Edge-matching	08
Figure-2.6	Design of BM Pillar	12
Figure-2.7	Workflow of Stereo Satellite Image Processing and Data Extraction	20
Figure-2.8	Grids for Survey Base Maps of Shibpur Upazila (Dulalpur Union)	22
Figure-2.9	Survey Base Maps of Shibpur Upazila in Grids (Masimpur Union)	22
Figure-2.10	Workflow of Stereo Satellite Image Processing and Data Extraction	25
Figure-2.11	Tiles of satellite image without color and contrast balance	27
Figure-2.12	Merged satellite image with color and contrast balance	27
Figure-2.13	Satellite Image Multispectral Image 2.0 meter	28
Figure-2.14	Satellite Image Panchromatic 0.5 meter	28
Figure-2.15	Pan-sharpen Image - multispectral 0.5 meter	28
Figure-2.16	Extracted Features of Entire Shibpur Upazila by Photogrammetry	30
Figure-2.17	Enlarged Partial View of Extracted Features of Shibpur	31
Figure-2.18	Digital Elevation Map (DEM) of Shibpur Upazila (Partial)	32
Figure-2.19	Contour Lines of Shibpur Upazila (Partial)	33
Figure-2.20	Ortho-Rectified Image of Shibpur Upazila (Partial)	34
Figure-3.1	Sample Scanned Base Map for Physical Features and Land use Survey	36
Figure-3.2	Sample Log Book Page with Information Recorded in Field	37
Figure-3.3	Log Book Data Entry Interface in Microsoft Access Software	38
Figure-3.4	Tabular View of Log Book Data Entry in Microsoft Access Software	38
Figure-3.5	3D Display of Physical Features in Shibpur Town Area	39
Figure-3.6	Attribute Table of Structure Database of Shibpur Upazila	41
Figure-3.7	Attribute Table of Road Centerline of Shibpur Upazila	41
Figure-3.8	Attribute Table of Mauza Map of Shibpur Upazila	41
Figure-3.9	Catalog View of Scanned Mauza Map Files of Shibpur Upazila	42
Figure-3.10	Catalog View of Geodatabases of Digitized Mauza Maps of Shibpur Upazila	42
Figure 4.1	Color used by Color pencil for Land Use Demarcation	45

Figure 4.2	Landuse Base Map used in Shibpur Upazila	45
Figure 4.3	Legend for Existing Generalized Landuse	50
Figure 4.4	Legend for Existing Important Point Feature	51
Figure 6.1	Workflow of Stereo Satellite Image Processing and Data Extraction	57
Figure 6.2	Tiles of satellite image without color and contrast balance	59
Figure 6.3	Merged satellite image with color and contrast balance	59
Figure 6.4	Satellite Image Multispectral Image 2.0 meter	60
Figure 6.5	Satellite Image Panchromatic 0.5 meter	60
Figure 6.6	Pan-sharpen Image - multispectral 0.5 meter	60
Figure 6.7	Extracted Features of Entire Shibpur Upazila by Photogrammetry	62
Figure 6.8	Enlarged Partial View of Extracted Features of Shibpur	63
Figure 6.9	Digital Elevation Map (DEM) of Shibpur Paurashava (Partial)	64
Figure 6.10	Contour Lines of Shibpur Paurashava (Partial)	65
Figure 6.11	Ortho-Rectified Image of Shibpur Upazila (Partial)	66

Chapter-01 Introduction

1.0 Background

Shibpur is an upazila of Narsingdi district in the division of Dhaka, Bangladesh. Shibpur Upazila (Narsingdi district) area 206.98 sq km, located in between 23°56' and 24°07' north latitudes and in between 90°38' and 90°50' east longitudes. It is bounded by monohardi upazila on the north, Raipura, Narsingdi sadar and Palash upazilas on the south, Belabo and Raipura upazilas on the east, Palash and kapasia upazilas on the west.. This report contains detailed activities undertaken for Physical Feature Survey, Land Use Survey and Topographic Survey in Shibpur upazila, based on stereo satellite imagery through photogrammetric technology. High resolution ortho-rectified satellite image along with photogrammetric data are used in preparing base map for conducting the surveys. This report contains three separate reports. These are: Physical Feature Survey, Land Use Survey & Topographic Survey. Physical Feature Survey covers how the features with their attribute are collected and processed for the preparation of base map for planning. Land Use Survey portion describes the methodology for acquiring and processing of land use data. Topographic Survey contains the acquisition and processing of topographic data by using the photogrammetric technology. This report aims to give a potential view of the project 'Preparation of Development Plan for Fourteen Upazilas', for the Package-2, Shibpur Upazila. All required information for this report has been collected using the advanced technologies in the survey and data Rapid urbanization and development in an unplanned manner, tend to generate the collection process. The survey was carried out according to the methodology mentioned in the TOR. The Project Area map has been shown in **Map-1.1**.



Map-1.1: Project Area Map of Shibpur Upazila

Chapter-02

Methodology

2.0 Reconnaissance Survey

A reconnaissance survey of the study area has been conducted to identify the existing problems, development constraints and future development potentialities of the upazilas. This reconnaissance survey has given the planning team an initial overview of the area that was necessary to set on the task of preparing a Master 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 are very much essential to develop the methodological approach for required data collection.

2.1 Compilation and Preparation of Base Map

Preparation of base map is an important requirement for planning the project area. The base map will be used to depict the survey findings. Preparation of base map comprises the following item of works presented in sections.

Major task for the compilation and development of Geospatial data of mauza maps have been summarized in the flow diagram as shown in **Figure-2.1**:

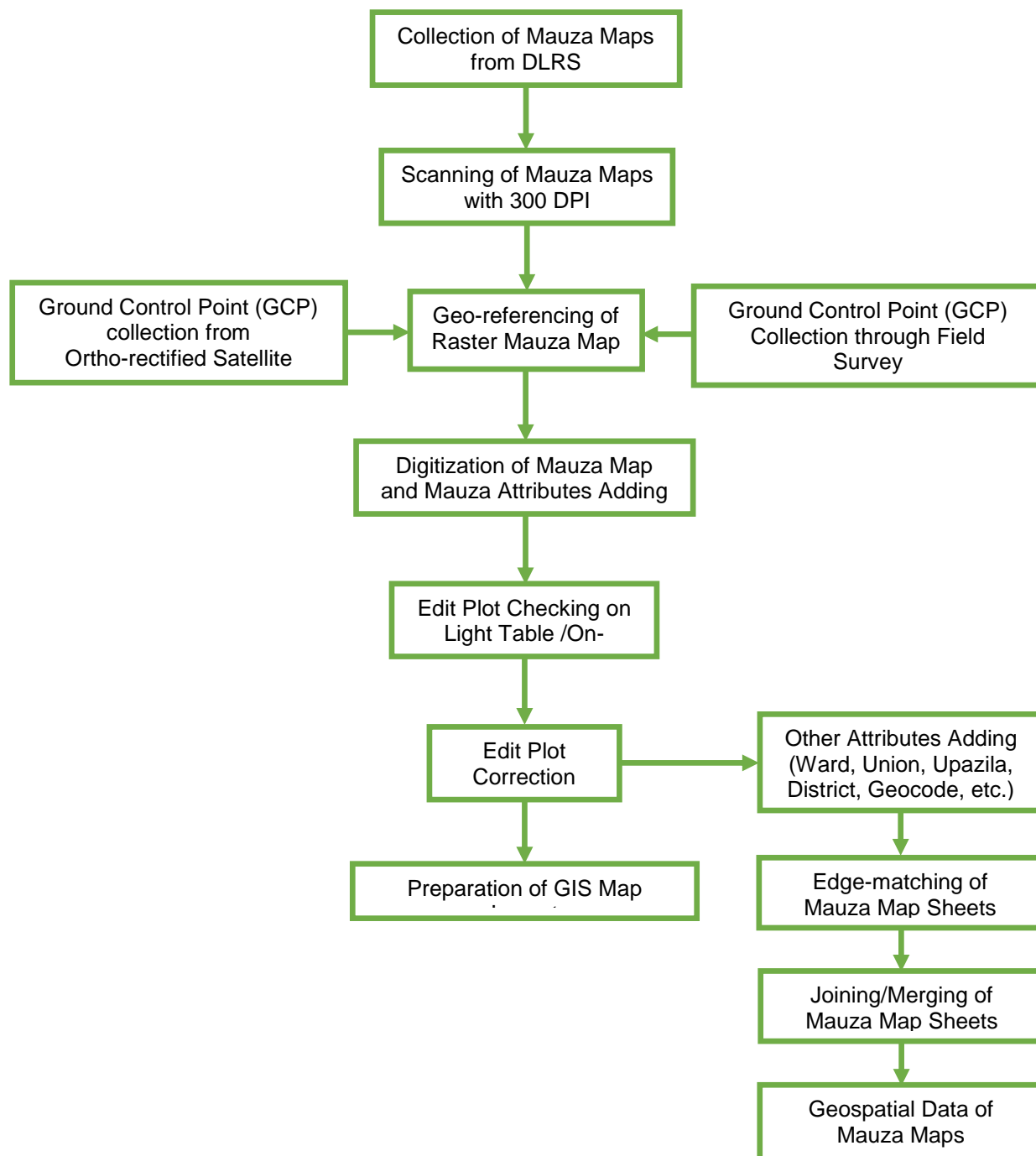


Figure-2.1: Flow Diagram for Preparation of GIS Database using RS Mauza Map

2.1.1 Collection of Mauza Maps

The Consultant has collected all the mauza maps covering the entire project area from DLRS office. The mauza sheets having distortion due to rapping or pasting cloths/tape were avoided during collection of mauza maps. The detail list of Mauza maps are provided in the **Annexure-I**.

Table-2.1: Mauza Maps Collection from DLRS

Upazila	Mauza Version	Mauza Maps		Collection Percentage
		Total No. of Sheet	No of Collected Sheet	
Shibpur	RS	171	171	100%

2.1.2 Approval of Collected Mauza Maps for Scanning and Digitization

After collection of mauza maps of Shibpur Upazila from DLRS, all sheets were submitted to PM for review and quality check before scanning and digitizing. The PM of the project has approved all the mauza maps in presence of the Consultant. A sample of approved scanned mauza map is shown in **Figure-2.2**.

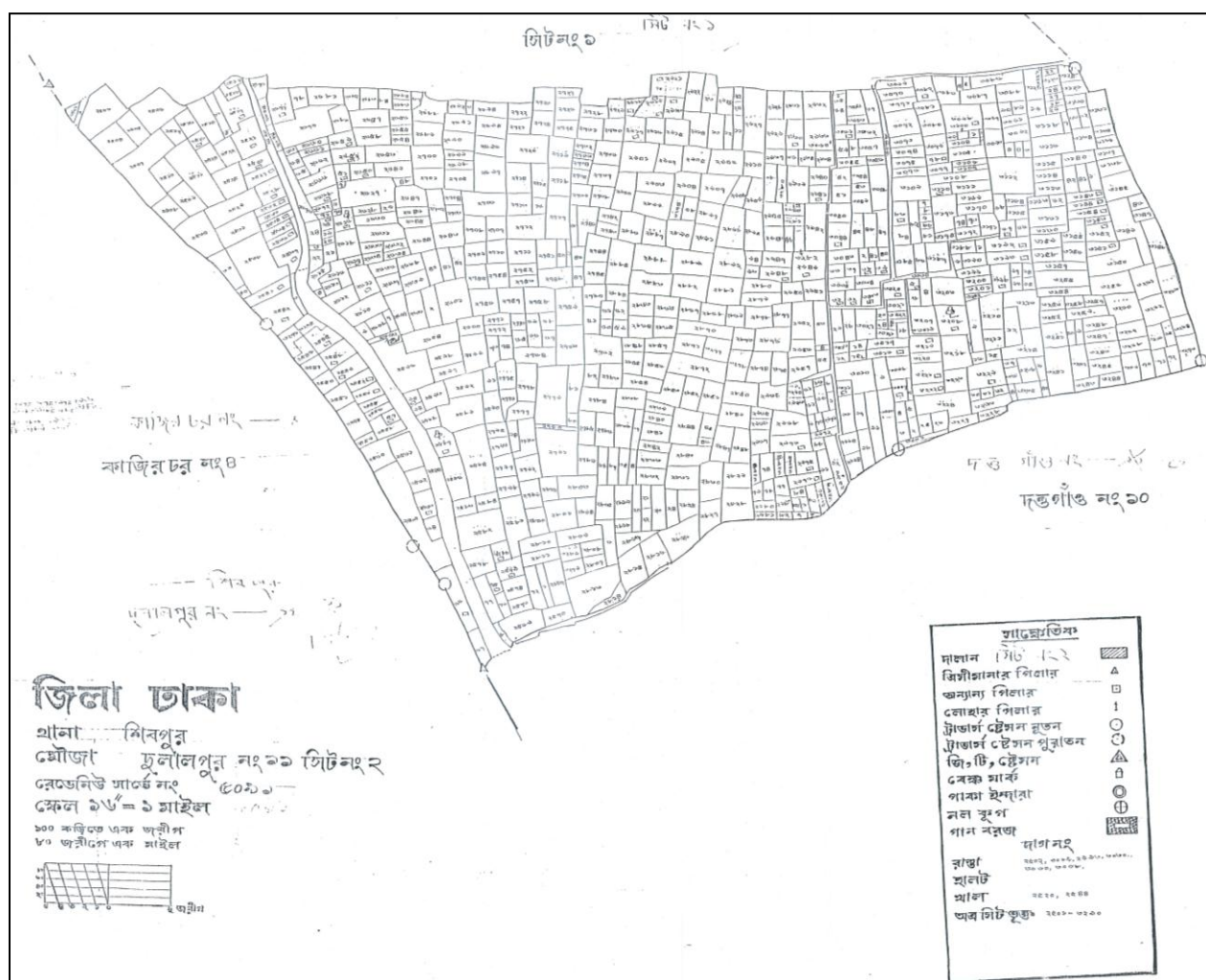


Figure-2.2: Sample of Scanned Mauza Map

2.1.3 Scanning of Mauza Maps

Scanning of all the mauza maps/sheets was started immediately after their approval by PM. As per TOR, scanning of mauza maps/sheets was carried out using drum scanner with 300 DPI to obtain good quality image and saved as JPEG format to be used later on for screen digitization. Extra care was taken during the scanning process for maintaining the proper rotation and alignment to minimize the distortion and deviation. As per TOR, the following specifications have been maintained.

Table 2.2: Specifications for Scanned Mauza Maps

Image Type	Grayscale
Image Format	JPEG
Image Resolution	300 dpi

Table 2.3: Specifications of the Scanner used for Scanning of Mauza Maps

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

Table 2.4: Status of Scanning of Mauza Map

Upazila	Mauza Maps		Scanning Percentage
	Total No. of Hard Copy Sheets	Total No of Scanned Sheets	
Shibpur	171	171	100%

2.1.4 Preparation of Technical Specifications for GIS Database

A document on technical specifications of GIS database was prepared for storing spatial and attribute database of all layers including mauza maps. Later this document was finalized in consultation with PM and GIS Experts of all the packages. This document is given in **Annexure-II**.

2.1.5 Digitization of Mauza Maps

The mauza maps have been digitized through On-screen Digitization process using ArcGIS software. In brief, this process involves adding a scanned mauza map in ArcMap, creating four empty shape files of three basic feature types (point, line, and polygon) in ArcCatalog, and using ArcMap's drawing tools and the mouse to trace features from the image into the shape files. All the features of a mauza map such as Plot boundary, Plot number, Road, Canal, Building, Mosque, Temple, Traverse Station, Iron Pillar, etc., are created and stored with attributes in four different vector layers as per the Technical Specification of GIS Database. For attaining maximum level of digitizing accuracy, the Data Frame properties have been set as Map Unit = Inch and Distance Unit = Inch to get 1:1 map scale and later zoom in to 1:30 scale during the digitization process. The **Figure-2.3** shows the on-screen digitization and a sample digitized mauza map.

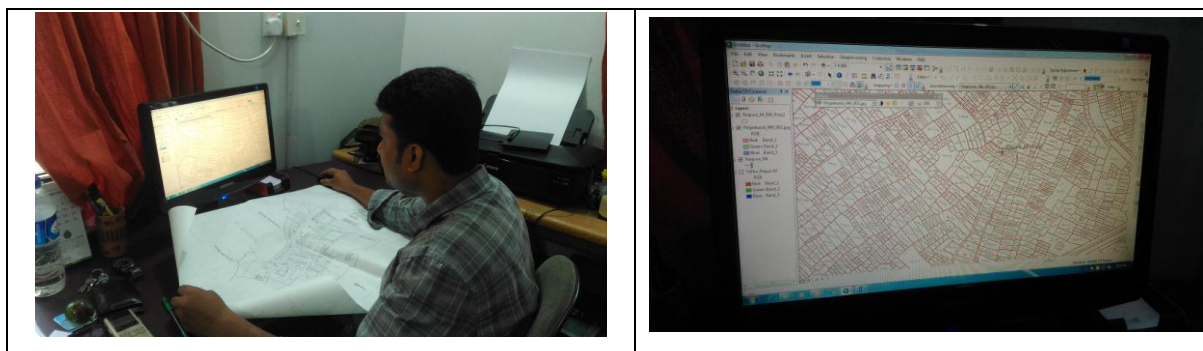


Figure 2.3: On Screen Digitization and Sample Digitized Mauza Map

Table-2.5: Status of Digitizing of Mauza Map

Upazila	Mauza Maps		Digitization Percentage
	Total No. of Mauza Sheets	Total No of Digitized Sheets	
Shibpur	171	171	100%

2.1.6 Edit Plot checking of the Digitized Mauza Maps

After digitization of mauza maps edit plots were produced containing all the features in different colors. The digitized mauza maps were checked and verified by superimposing on the original mauza maps. This checking was done with the joint team of UDD and the GIS Expert. The observed errors normally were, wrong Id of lines, plot numbers and symbols. In some sheets, few arcs have found as missing.

After completion of edit plot checking, necessary corrections have been done using ArcGIS. After correction, the Mauza maps/sheets were printed out again and were checked to ensure that corrections were made accordingly. In this way, utmost effort has been made to ensure quality of digitization. After finalization of digitization of all the mauza maps, both soft and hard copies of them have been submitted to Project Director.

2.1.7 Geo-referencing of Raster Mauza Map

Georeferencing is the process of establishing real world coordinates or geographical coordinates of certain points of the map (at least 4 points) with great accuracy while the remaining points are calculated automatically, based on transformation formulas.

In addition to GCP survey for georeferencing mauza maps, ortho-rectified satellite image of the study area has been used as a control layer. This layer contains a rich source of real world coordinates, because it is derived by aerial triangulation of stereo images in photogrammetric environment and later ortho-rectified by the generated DEM of the area. It should be noted here that a required number of GCPs were acquired through RTK-GPS/DGPS method for the process of Aerial Triangulation that is a pre-requisite for photogrammetric works.

The Coordinate System used for both GCP and ortho-rectified satellite image is the **Bangladesh Universal Transverse Mercator (BUTM2010)** which is established by the national mapping agency **Survey of Bangladesh (SOB)**. The parameters of BUTM 2010 are as below:

Spheroid : WGS 1984
Datum : WGS 1984
Unit : Meters
False Easting : 500000
False Northing : 0.0
Central Meridian : 90.0
Scale Factor : 0.9996
Latitude of Origin : 0.0

Since, we can pick real world coordinates (Easting, Northing) of any point on the ortho-rectified satellite image, geo-referencing of mauza map has been done by using this geometrically corrected satellite image as reference. The process of geo-referencing of mauza map using satellite image is actually parcel (plot) of mauza map matching with respect to the ortho-rectified satellite image. The **Figure 2.4** shows a sample geo-referenced raster mauza map which is overlaid on ortho-rectified satellite image.

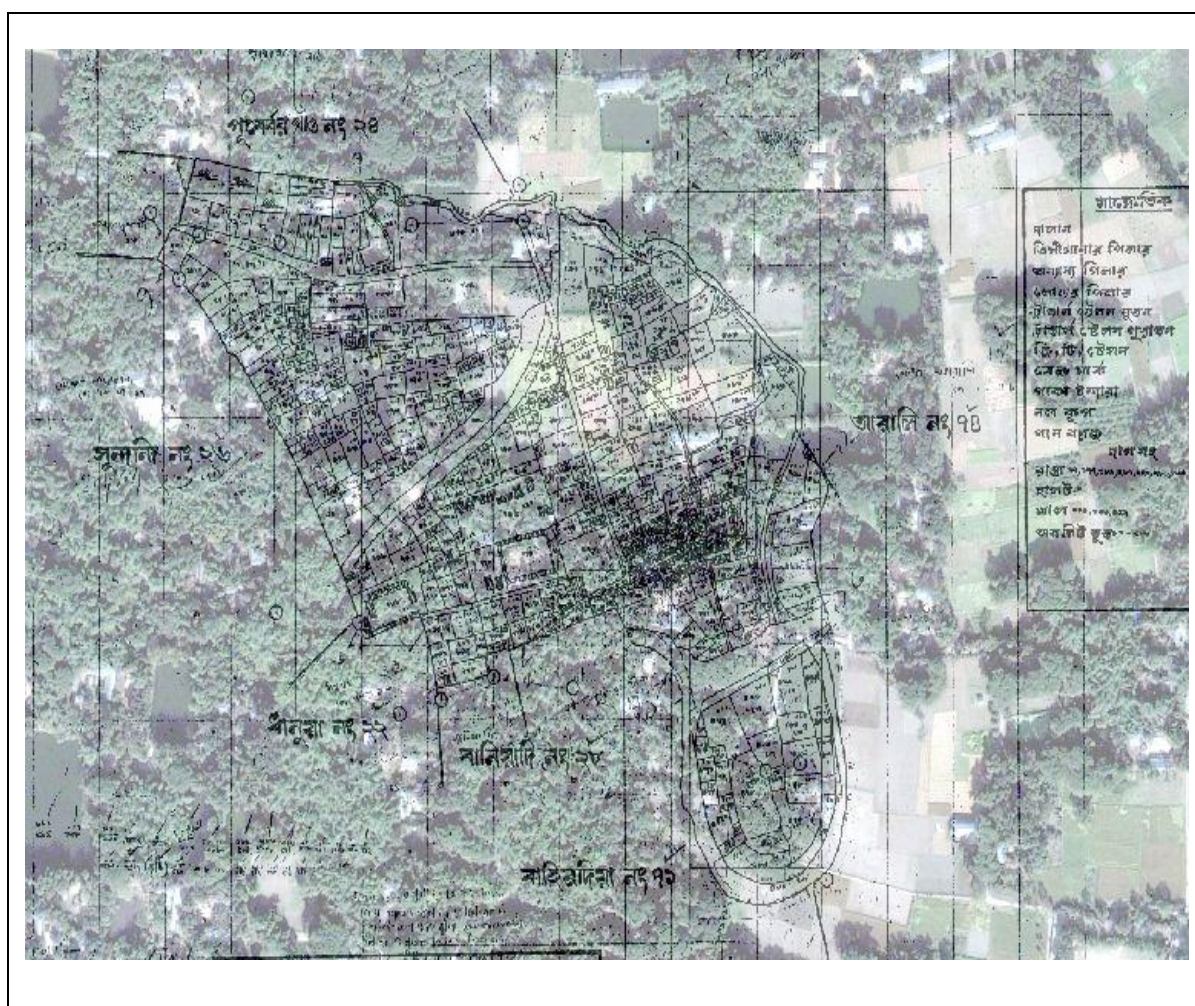


Figure-2.4: Sample Geo-referenced Raster Mauza Map Overlaid on Satellite Image

A suitable number of GCP (minimum 4), preferably plot corners and building corners, has been taken for proper geo-referencing of mauza map depending on its size and 2nd Order Polynomial Transformation was applied. Total RMS error was kept within 0.5/1.5 meter i.e. within 1 to 3 pixels of the satellite image. Thus individual sheet of the mauza maps get properly georeferenced. Finally, permanently georeferenced images of mauza maps have been created by using 'Rectify' tool of ArcMap.

2.1.8 Geo-referencing of Vector Mauza Map

After georeferencing of scanned image of mauza maps (raster mauza maps), georeferencing of vector mauza maps have been done. The vector maps i.e. the shape files of each mauza map sheet have been spatially adjusted to the respective georeferenced raster mauza map sheet. The Spatial Adjustment Tools of ArcMap have been used to do this.

2.1.9 Edge Matching of Mauza Maps

A parcel or plot based digital map of the whole project area is a pre-requisite for planning. But edge-matching is a critical component of creating such a map. The project area encompasses many mauzas each of which contains one or more than one map sheets. The adjacent mauza maps are coincident and share the same location of coordinates, boundaries, or nodes. The problem is that, in reality, the common boundaries of adjacent Mauza map sheets actually do not match exactly with each other. Hence the edge-matching problem arises. Mauza maps are especially prone to this problem.

Edge-matching is used to align features along the edges of adjacent layers. Usually, the layer with the less accurate features is adjusted, while the other layer is used as the target layer. By superimposing the vectorized mauza maps on satellite image the accuracy of the common boundaries with respect to satellite image have been investigated. Then, edge-matching of two adjacent mauza map layers have been done by comparing the accuracy of their linear features with reference to the satellite image, identifying and keeping more accurate common features from one layer and deleting the less accurate features from other layer. In case of common roads, rivers or canals, the more accurate features have been kept entirely (both edges) from a mauza map sheet and the same features which belong to other layer have been deleted. The arisen errors such as undershoots, overshoots, etc. have been fixed immediately after deleting features.



Figure-2.5: Sample Diagram of Edge-matching

2.1.10 Demarcation of the Project Area based on Mauza Maps

Mosaicing of all mauza maps belonged to the Upazila form the actual boundary of the project area. Before mosaicking, edge-matched mauza maps have been made as free of topological errors. Finally plot based mosaic mauza maps of the project area have been created by using 'Merge' tool of ArcGIS. The boundary of this merged mauza map becomes the Project Area Boundary with real world coordinates. Project Area Map of Shibpur Upazila is shown in **Map 2.1**

The consultant in cooperation with UDD officials has demarcated the actual boundary of the project in the newly formed mosaic Mauza map. Later on, the project boundary was finalized by field verification, which was considered and used for the project after duly approved by UDD.

From the mosaic mauza map of the project area, the administrative boundaries such as District boundary, Upazila boundary, Union boundary, Mauza boundary and Mauza Sheet boundary have been created by using geo-processing tools of ArcGIS such as Dissolve, Erase, Intersect, Spatial Join, etc.

2.2 Establishment of Ground Control Point (GCP) / BM Pillars

A network of permanent Bench Mark (BM)/Ground Control Point has been established having real world coordinates (Easting, Northing, and Elevation) within the study area to carry out the topographic, physical features and land use survey. 13 BM pillars have been established in Shibpur Upazila. The network establishment for the survey comprises the following item of works:

2.2.1 Selection of Sites for BM Pillars with justification

Appropriate site selection is crucial for establishing BM pillars. The consultant has considered the following points in selecting sites for ground control points:

- i. The site is suitable for RTK-GPS/DGPS observation. There exists Good Sky Visibility (15 degree cut of angle above the horizon) and far from mobile tower or high voltage electric line.
- ii. The site is located on undisturbed location due to natural or human activities.
- iii. The site is located on a corner of government own land, playground, school or beside of road.
- iv. The site is located on such a place that is suitable to set up Total Station equipment in future work.
- v. Two successive BM pillars are inter-visible and at least 100 meters apart.

2.2.2 Design of Pillars

BM pillars in the Study area have been constructed according to the design supplied by UDD. The approved design sheet appears at **Figure-2.6**.



Shibpur Upazila is covered by 13 BM pillars. The BMs are constructed as per approved design of BM pillar. The BM pillars have been installed in the field. Installation of the BM pillars has been monitored by UDD and the Consultant.



Plate-1: Sample of Constructed BM and Installed BM

2.2.4 Description of Reference BM Pillars

For the selection of reference BM, the survey team considered the BM 533, GPS 2317 and GPS 3533 of Survey of Bangladesh (SOB) as reference BM pillar in Shibpur Upazila. The information of Reference BM Pillars has been collected from Survey of Bangladesh.



Plate-2: Reference BM Pillar in Shibpur Upazila

The location and its x, y and z value are given in **Table-2.6**. On the basis of this reference BM, 14 BMs have been established as local reference control points within the Project Area.

Table-2.6: Location of Reference BM

Sl No.	Point ID	WGS-84		RL	Location of pillar
		Latitude	Longitude		
1	BM 533	24°01'12.24721''	90°48'33.95158''	9.891	The pillar is situated in the palyground of chaitannya high School on Dhaka Narsingdi road. Vill: Chaitannya, Upazila: Shibpur, Dist: Narsingdi
2	GPS 2317	24°06'29.99146''	90°50'58.58477''	7.6315	The pillar is situated in tha soudth- west of Zila parishad Dak Banglow, 2.8m south-west from tha south- west side boundary wall, 2.6m west from west side wall. Vill: Belabo, Upazila: Belabo, Dist: Narsingdi.
3	GPS 3533	23°53'02.77343''	90°58'10.38328''	6.6094	The pillar is situated in Nabingar, pilot High School ground & south side of tha field. It is about 75m West from main roid. Vill: Nabinagar, Upazila: Nabinagar, Dist: Brahmanbari

Source: Survey of Bangladesh (SOB), 2016

2.2.5 Baseline Survey by RTK-DGPS Method

The baseline survey is the instantaneous data collection in static mode at two or more fixed points using two or more dual frequency RTK-GPS receivers. The measurement network for RTK-GPS baseline survey is planned by connecting the BM points to be established and the selected reference BM (Known latitude, longitude and ellipsoidal height) near the Study Area. A line connecting two measurement points is known as baseline.

The GPS measurements consists a simultaneous static measurement with two dual frequency GPS receivers one on the known reference BM (base) and another one will be on the BM to be established (Rover). The simultaneous measurement or logging time for a session is usually 20 minutes to an hour depending on the availability of satellite and distance. During taking the measurements, the GPS receivers at the two points record the satellites information or data and the stored data is processed using software.



Plate-3: RTK-GPS Observation

The GPS Survey Team has conducted survey by RTK/DGPS methods. The Base station has been established by connecting to the Reference BM (BM 533, GPS 2317 and GPS 3533) of SOB) and 10 hours of continuous observation to get precise coordinates. After establishing the base station, the rovers are positioned on the newly installed BM Pillars one by one and observations have been made for each of the 13 BM in the project area.

2.2.6 Establishment of Coordinates (X, Y, Z) for BM Pillars

The GPS data acquired through RTK-GPS/DGPS survey has been processed by using post processing software and the co-ordinates (Northing, Easting and Elevation) of BM Pillars are achieved. Thus the coordinates of all the 13 BM pillars have been established in the Project Area along with their RL (height above MSL). The location of BM's and its x, y and z values are given with photograph of BM are given in **Table-2.7** and location of BM pillars are given in **Map-2.2**.

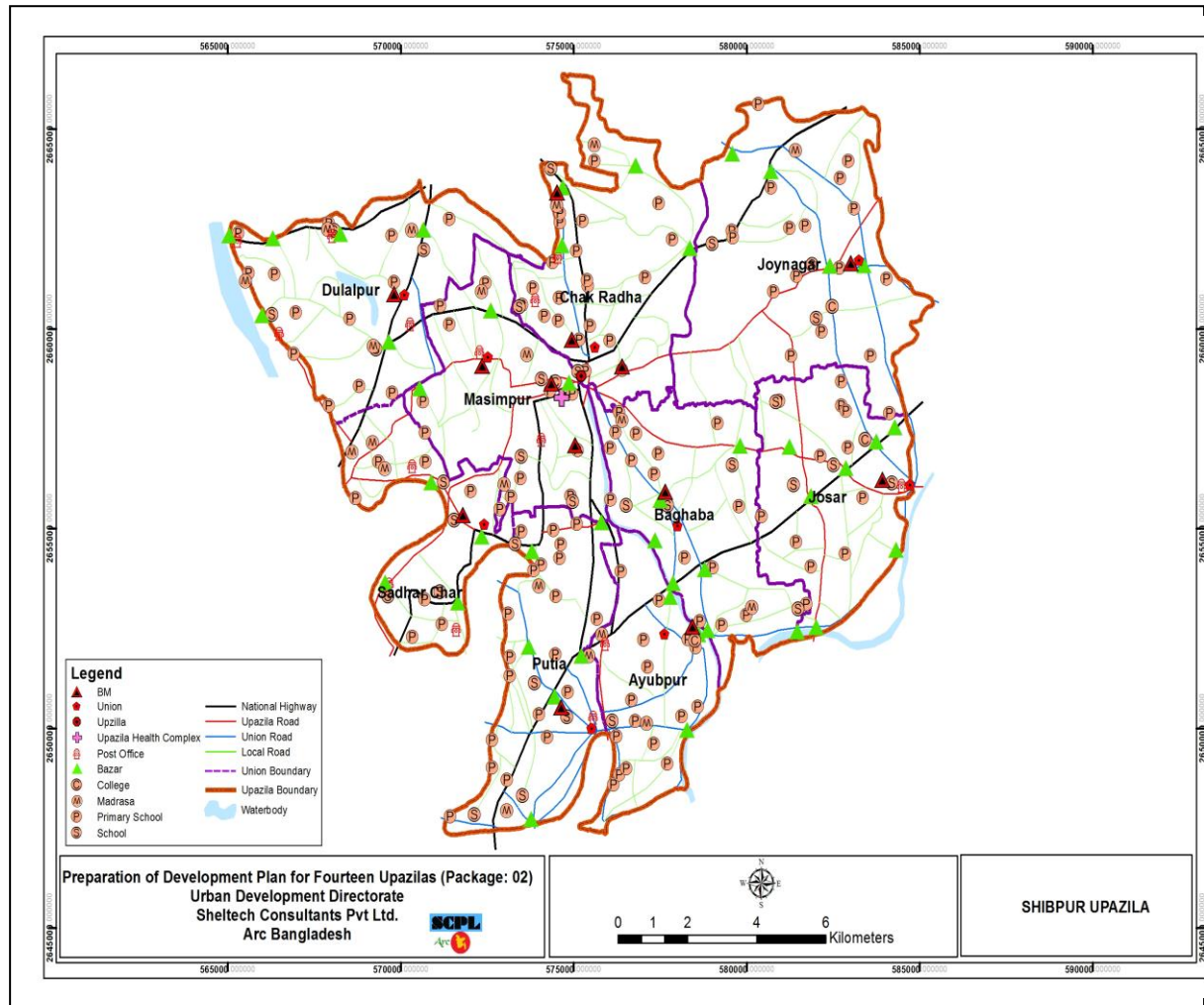
Table-2.7: Coordinates and Descriptions of the BM Pillars

BM No.	R.L (m)	Northing (dd)	Easting (dd)	Location
1	7.3477	24°02'29.84935"N	90°45'02.71778"E	Within the boundary wall of Arali School. Union: Jowarianala
2	4.429	24° 04'35.45457"N	90°44'05.63278"E	Within the boundary of Joynagar Union Parisad. Union: Joynagar
3	12.4231	24° 03'49.66408"N	90°48'40.41162"E	Within the boundary of Baghabo Union Parisad. Union: Baghabo
4	10.2658	24° 01'12.22778"N	90°48'34.05770"E	Along the road side of Jossore Union Parisad. Union: Jossore

BM No.	R.L (m)	Northing (dd)	Easting (dd)	Location
5	6.1142	24° 02'30.22935''N	90°42'43.25060''E	Within the boundary of Masimpur Union Parisad. Union: Masimpur
6	6.5594	224°02'14.90889''N	90°43'54.32976''E	Within the boundary of Dulalpur Union Parisad. Union: Dulalpur
7	5.7197	24° 2'29.939''N	90°45'3.183''E	Within the boundary of Chakradha Union Parisad. Union: Chakradha
9	4.892	23°57'52.77086''N	90°44'00.96761''E	Within the boundary of Putia Union Parisad. Union: Putia
10	7.0271	23°58'17.78376''N	90°45'18.57249''E	Left side of the playground of Shahid Asad College. Shibpur Paurashava
11	6.7797	24°02'30.35605''N	90°44'22.20511''E	Within the boundary of Ayubpur Union Parisad. Union: Ayubpur
12	19.815	24°03'30.59321''N	90°41'11.84211''E	Along with the road of the CNV Barigao Madrasha. Union: Chakradha
13	8.5722	24°00'32.38168''N	90°42'21.80228''E	Within the boundary of Sadharchar Union Parisad. Union: Sadharchar

2.2.7 Marking of BM Pillars

The number of the respective BM pillars has also been inscribed on the face of each pillar as per specification provided by UDD. The team members of the consultant firm have properly supervised the marking of Bench Mark Pillars.



Map-2.2: Location of BM Pillars in Shibpur Upazila

2.3 Satellite Image Processing for Data Acquisition

Satellite image came with a certain level of processing. However, for the purpose of features extraction, further processing is needed in a number of steps. The step by step procedures has been shown in the **Figure 2.7**.

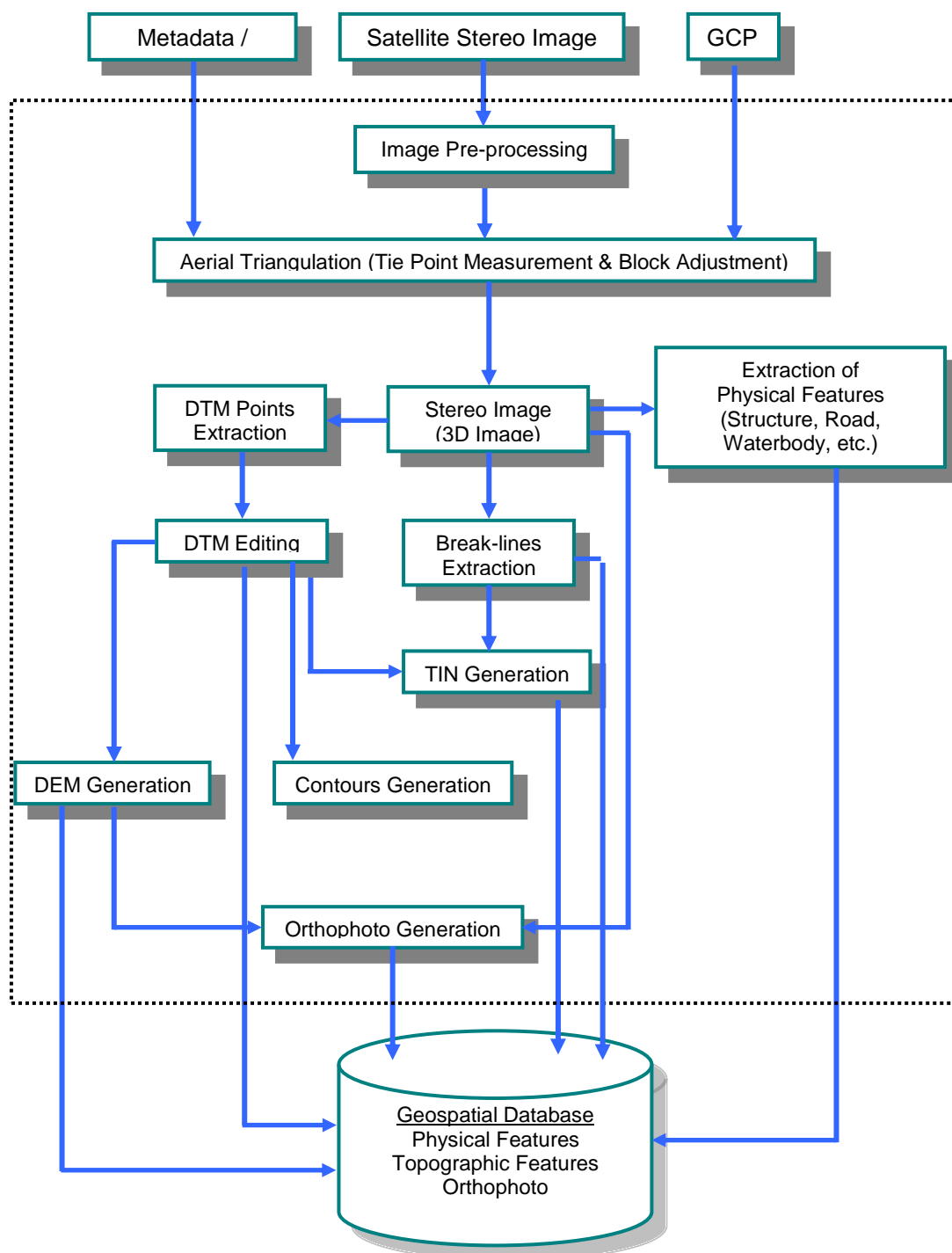


Figure-2.7: Workflow of Stereo Satellite Image Processing and Data Extraction

After collecting raw satellite imagery in stereo pairs, initial image processing has been done by performing Epi-polar Correction, Color Balance, Contrast Adjustment, Sharpening, Pyramid building and Bit Rate Setting. For geometrical correction of satellite images four reliable GCPs has been collected through RTK-GPS survey study area. Using these GCPs, Aerial Triangulation of the stereo

pairs has done and stereo model has been prepared for photogrammetric works. The detail procedure has been described in 2.4.

2.3 Data Acquisition

2.3.1 Physical Feature Extraction from Satellite Image

After initial image processing and building up of stereo models, extraction of physical features has been done by a team of skilled photogrammetrist. All type of physical features including Structures (katcha, pucca, semi-pucca, etc.), Roads, Water bodies, etc. have been extracted as 3D features. Each vertex of features contains z-value (elevation).

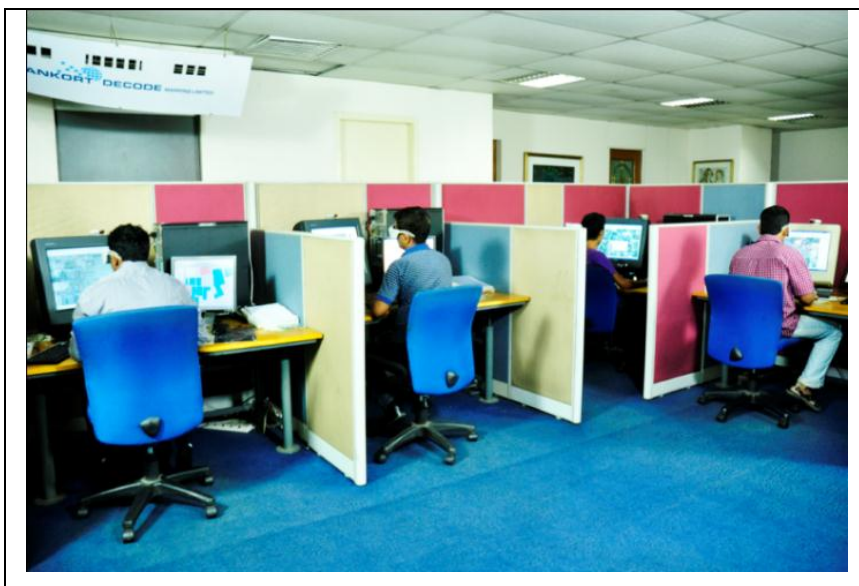


Plate-4: Digitization by Digital Photogrammetry

The Photogrammetric Expert and the GIS Expert has monitored the feature extraction works examine the data for their proper registration.

2.3.2 Preparation of Survey Base Map

The survey base map has been created by superimposing Project Area Maps derived from Mauza map and Satellite Image Processed data. This superimposition is very important to form a unique map and database comprising the data collected from satellite imagery and Mauza map data (e.g. plot no, Mauza name, JL no., sheet no.). These base maps have been used to collect attributes of the physical features and missing features which could not be extracted due to dense vegetation in the project area.

Entire Shibpur Upazila has been divided into 2362 grids and survey base maps have been prepared based on these grids. The base maps have been printed on A3 paper sheet at a scale of 1:990 to make sure that all required physical features are visible enough to carry out the survey works.

The Grids used to prepare survey base map is shown in **Figure-2.8** and Grids with photogrammetric data and satellite image is shown in **Figure-2.9**.

A sample base map comprising photogrammetric data and satellite image is shown in **Map-2.3** and photogrammetric data with mauza map is shown in **Map-2.4**.

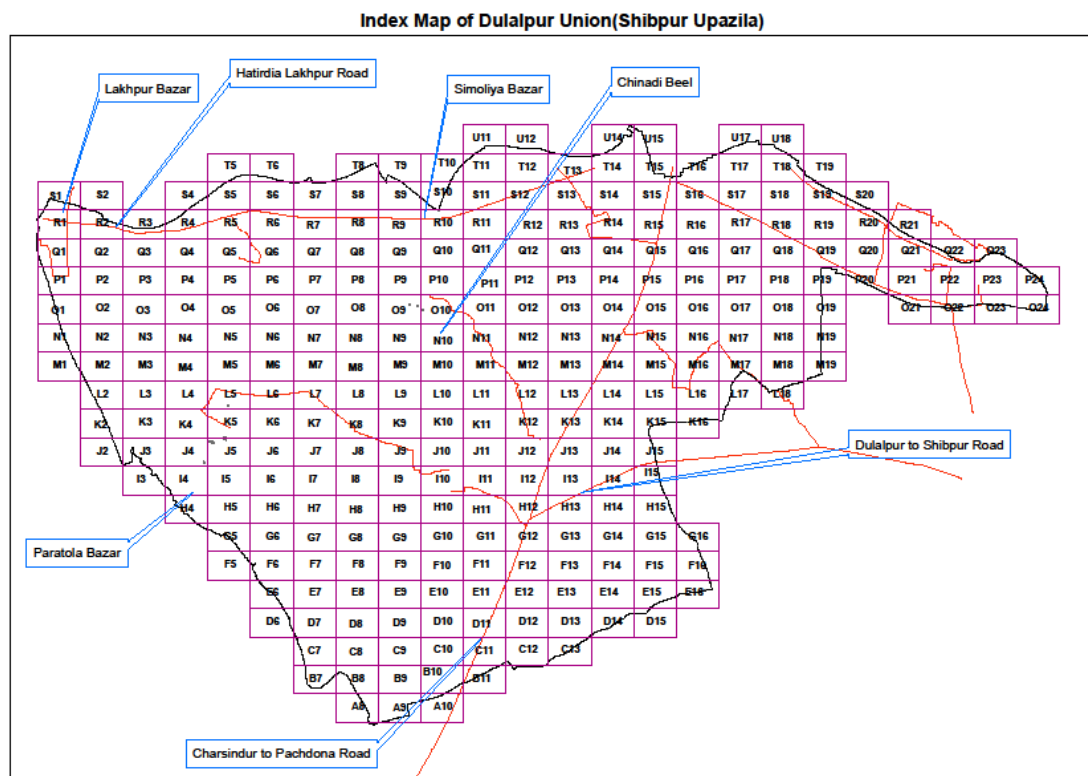


Figure-2.8: Grids for Survey Base Maps of Shibpur Upazila (Dulalpur Union)

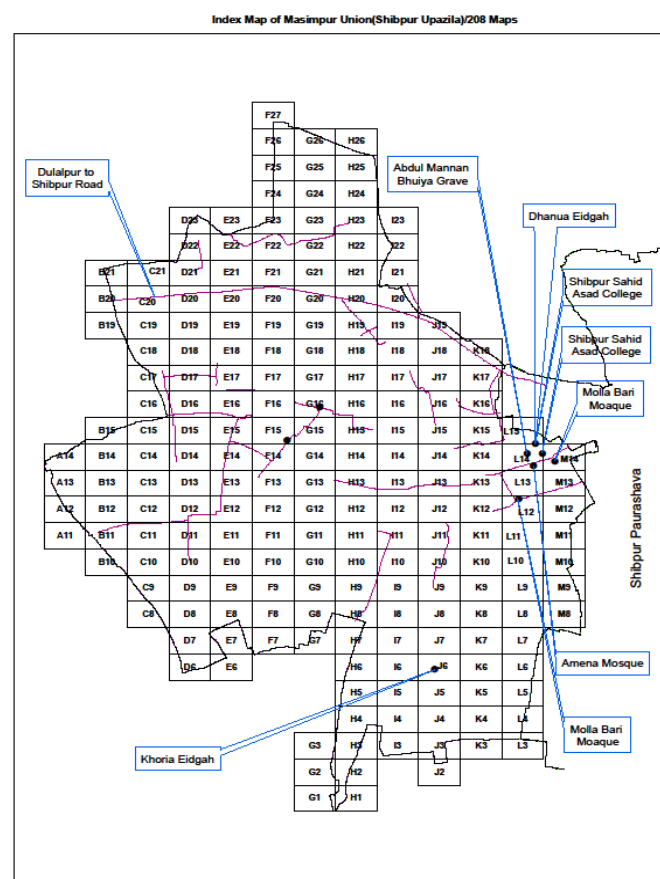
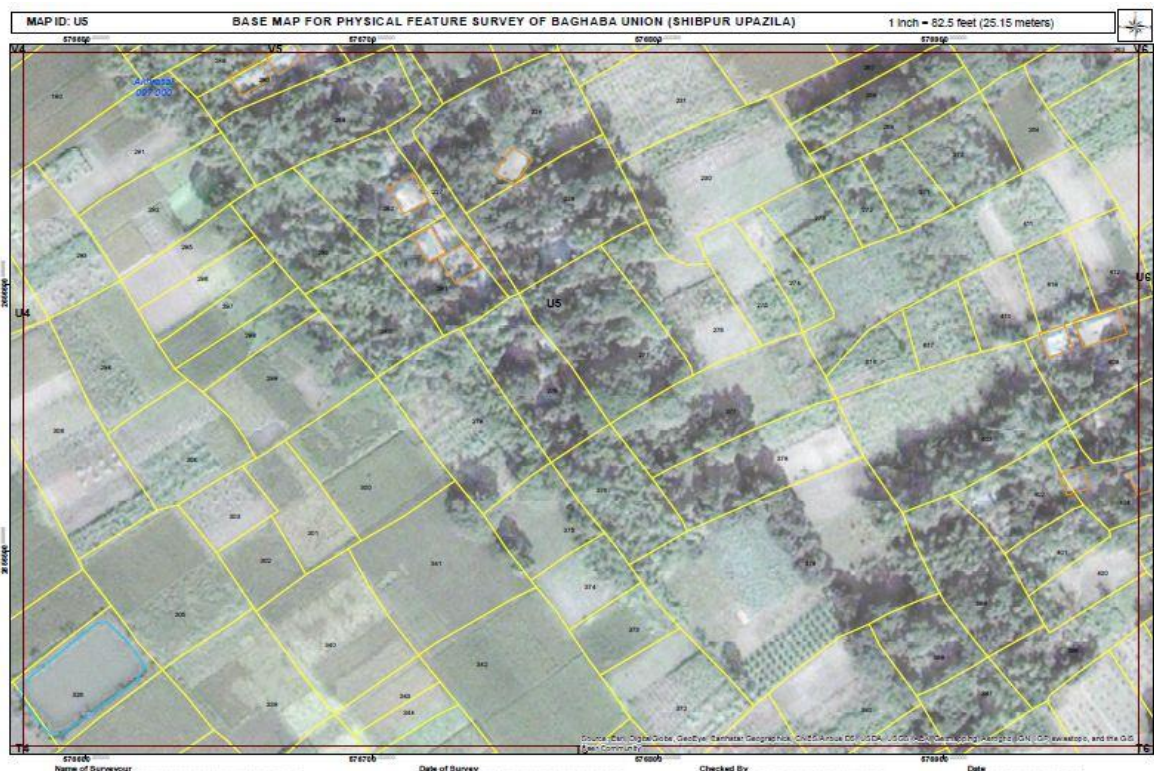


Figure-2.9: Survey Base Maps of Shibpur Upazila in Grids (Masimpur Union)



Map 2.3: Sample Survey Base Map comprising Satellite Image and Photogrammetric Data



Map 2.4: Sample Survey Base Map comprising Mauza Map and Photogrammetric Data

2.3.3 Preparation of Log Book for Attribute Collection

To collect attributes or textual information, a Log Book comprising data collection forms has been developed. A Form of the Log Book is given in **Annexure-III**. Each page of the book contains columns for collecting following information:

- Type of structure
- Use of structure
- Name of the structure, if any
- Construction year of the structure
- Owner of the structure
- Mobile no. of the owner of the structure, if possible
- Road name beside the structure, if any
- Plot no. and Mauza name belongs to the structure
- Ward/Union belongs to the structure
- Name of the location

2.4 Satellite Image Processing

Satellite image came with a certain level of processing. However, for the purpose of features extraction, further processing is needed in a number of steps. The step by step procedures has been shown in the **Figure-2.10**

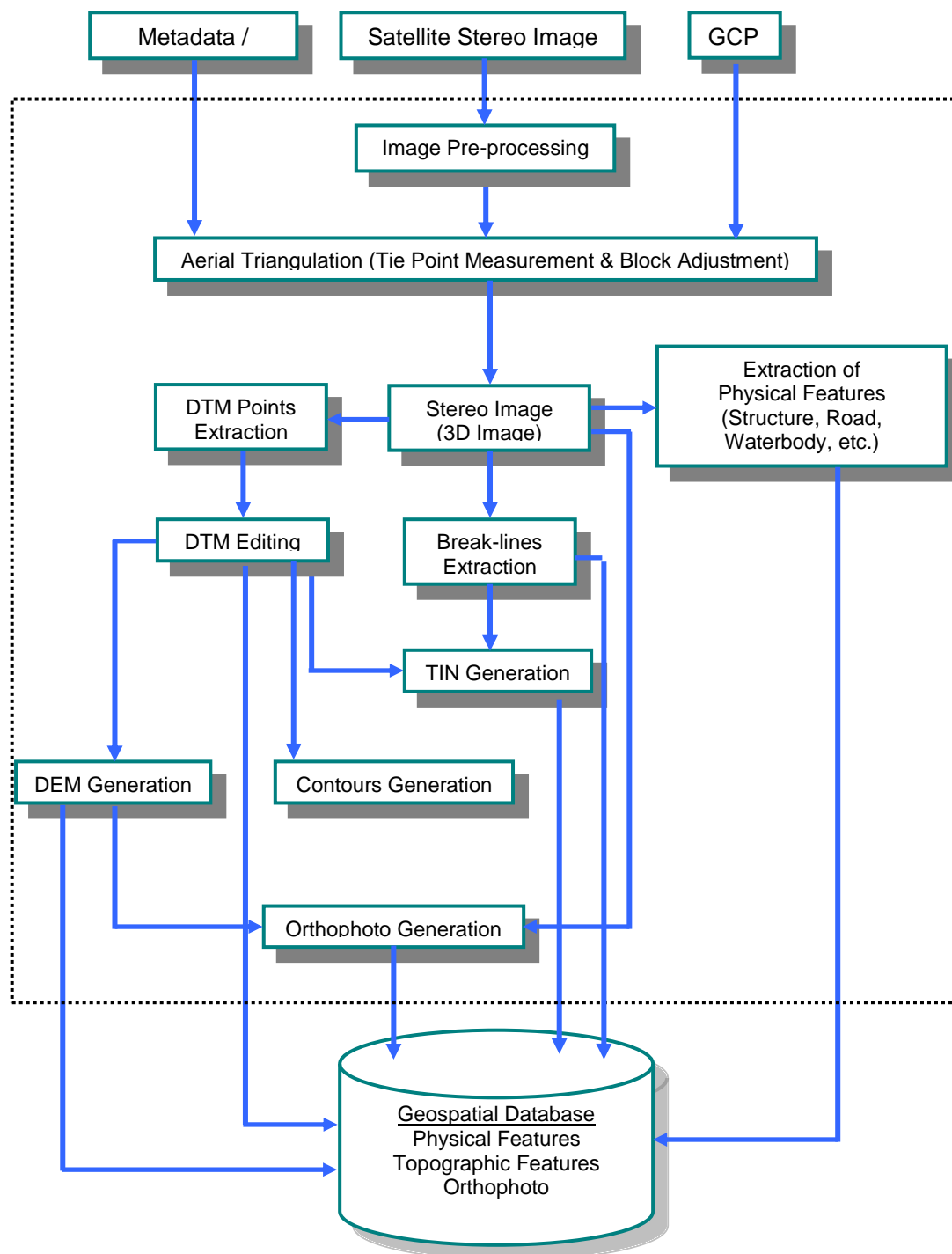


Figure-2.10: Workflow of Stereo Satellite Image Processing and Data Extraction

2.4.1 Image Collection

The satellite image was ordered to PCI India. The authorized reseller/partner of Airbus. 0.5 meter stereo pair image has been purchased by the Consultant for Shibpur. The specifications of the purchased satellite image are as below:

For **Town Area** of Shibpur Upazila:

Image Sensor : Airbus
Type : Ortho ready stereo (3D)
Resolution : 0.5m Panchromatic, 2.0 meter Multispectral
Source : New Acquisition, 10th February 2015
Total Area : 100 Sq. km.
Bit Rate : 16 Bit
Company : Airbus Defence and Space.

For **Rural Area** of ShibpurUpazila:

Image Sensor : Airbus
Type : Basic stereo (3D)
Resolution : 1.0m Panchromatic, 4.0 meter Multispectral
Source : New Acquisition, 10th February 2015
Total Area : 117.71 Sq. km.
Bit Rate : 16 Bit
Company : Airbus Defence and Space.

2.4.2 Image Pre-Processing

Satellite image came with two parts. One is multispectral band which resolution is 1.74 meter and another one is panchromatic which resolution is 0.5 meter. We need 0.5 meter multispectral image for feature extraction. After collecting raw digital images, the tasks involved in image processing are:

- Merge the image tile
- Color Balance
- Contrast Adjustment
- Pan-sharpening

2.4.2.1 Merge, Color Balance and Pan-Sharpen

Satellite image comes with lots of small segment which called image tile so that image can be sent by the provider on DVD media. To create an individual image all image tiles have been merged and thus an individual large image has been created.

Image tiles may vary in color and contrast. So during the merge process, color and contrast has been adjusted to get a color balanced image. **Figure-2.11** shows the satellite image tiles without color and contrast balance.

During the image capturing time, satellite captures two types of image, one in multispectral (RGB & NIR) image which is low resolution (2.0 meter) and another in high resolution (0.5 meter) panchromatic image. For feature extraction, 0.5 meter high resolution (0.5m) multispectral image is required. To have this 0.5 meter multispectral image, pan-sharpening tools have been used. This tool produces a 0.5 meter multispectral image by combining 2.0 meter multispectral image and 0.5 meter panchromatic image. **Figure-2.12** shows the merged satellite image with color and contrast balance.

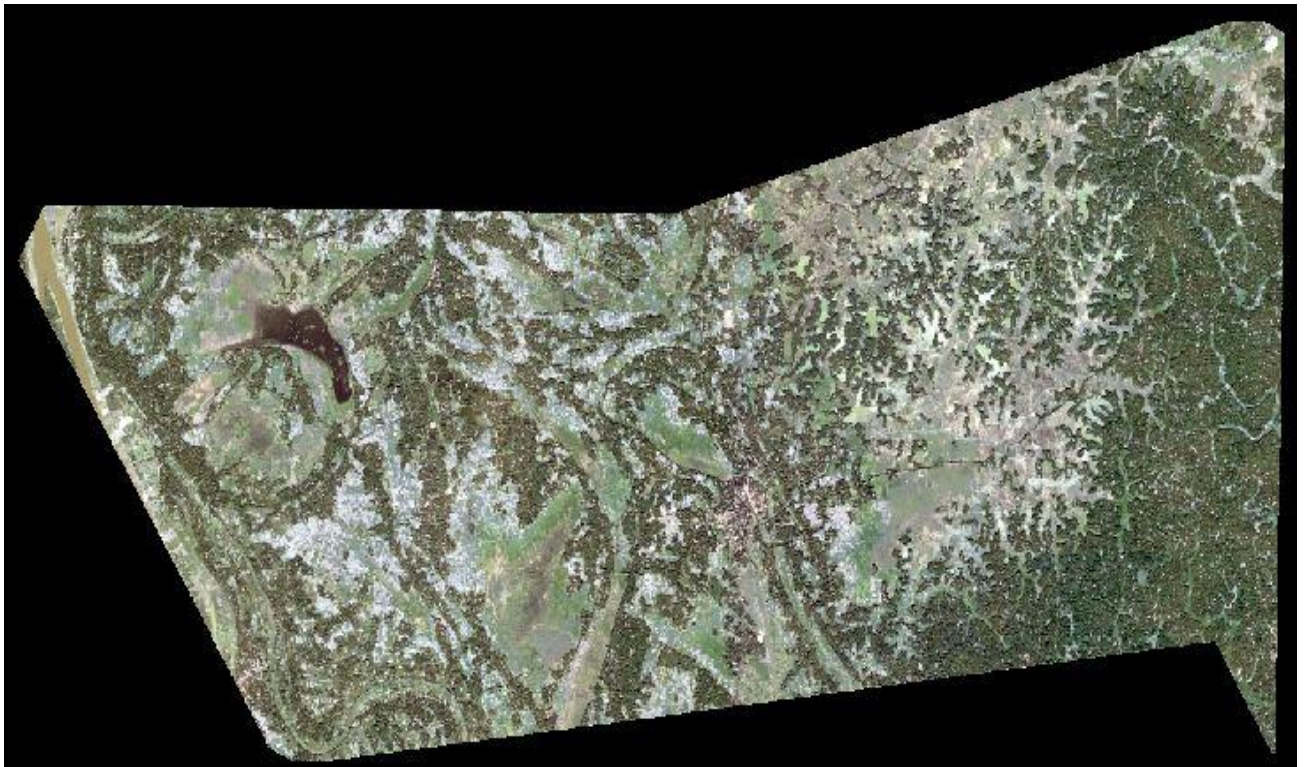


Figure-2.11: Tiles of satellite image without color and contrast balance

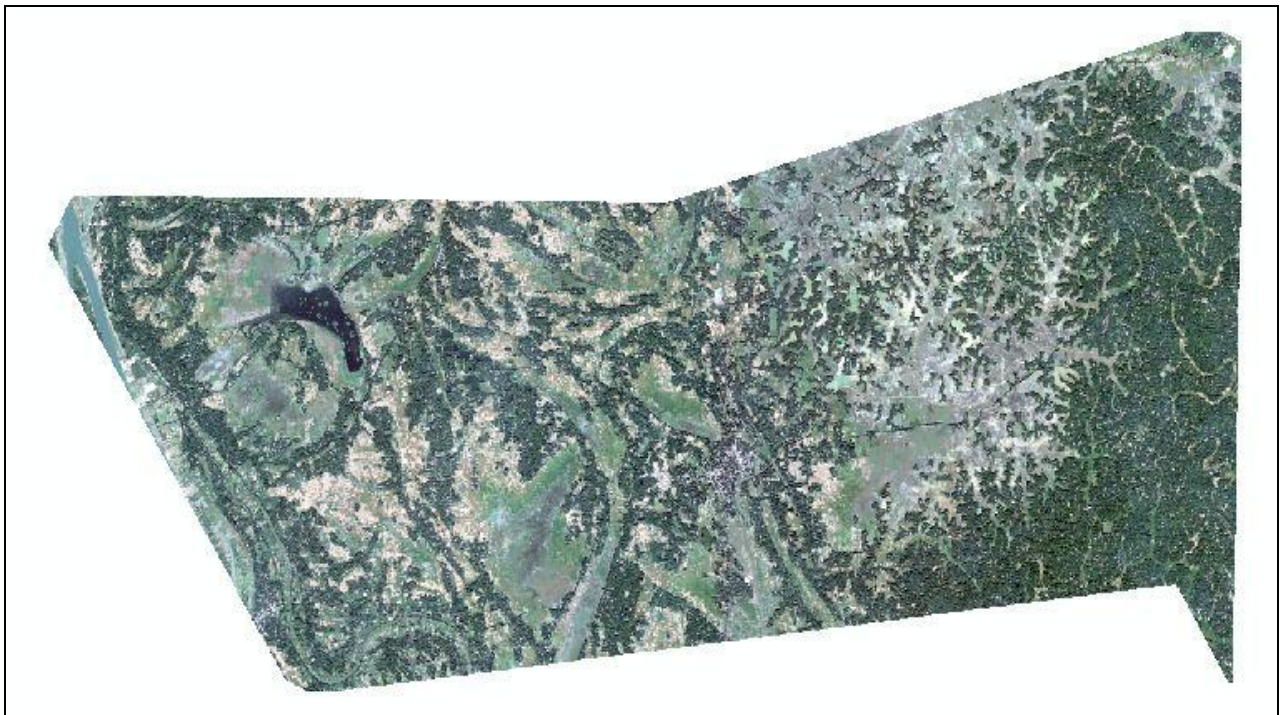


Figure-2.12: Merged satellite image with color and contrast balance



**Figure-2.13: Satellite Image Multispectral
Image 2.0 meter**



**Figure-2.14: Satellite Image Panchromatic
0.5 meter**



Figure-2.15: Pan-sharpen Image - multispectral 0.5 meter

2.4.2.2 Bit Rate, Pyramid and Epi-polar Correction

Bit Rate: In general practice 8 bit images are used. Satellite image can capture 11 bit image. Since the purchased satellite image is in 16bit, it has been changed the 16 bit to 8 bit for radio matrix adjustment and better handling the image.

Pyramid: To efficiently view and pan the image, the pyramid of the image has been built. The DATEM Summit Evolution software has been used for image interpretation.

Epi-polar Correction: Epi-polar geometry is the geometry of stereo vision. When two cameras view a 3D scene from two distinct positions, there are a number of geometric relations between the 3D points and their projections onto the 2D images that lead to constraints between the image points. The 3D models have been created by using the Summit Evolution software.

2.4.3 GPS/INS Processing

Raw IMU (GPS/INS) data of image is processed and adjusted to accomplish Aerial Triangulation. In case of satellite image the RPC file is replaced the GPS/INS file.

2.4.4 Aerial Triangulation

Aerial Triangulation is a mathematical process used to determine the position and orientation of each photograph at the moment of exposure.

Table-2.8: Input-output in Aerial Triangulation

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

The GCP and BM collected from SOB have been used for correcting the 3D satellite image coordinate using Inpho Match-AT software.

2.4.5 Digital Mapping (Feature Extraction) from Stereo Model

After the orientation of stereo models, digital mapping has been carried out. ArcGIS Geo-database model has been used for storing geo-spatial data. The Geo-database and its feature classes has been designed based on ToR.

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

Feature registration has been done considering and measuring the position of the object under its accuracy level. The Summit Evolution & Stereo Plotter of DAT/EM has been used for identifying and registration of the objects and ArcGIS 9.3 of ESRI has been used for vector data storing and editing.

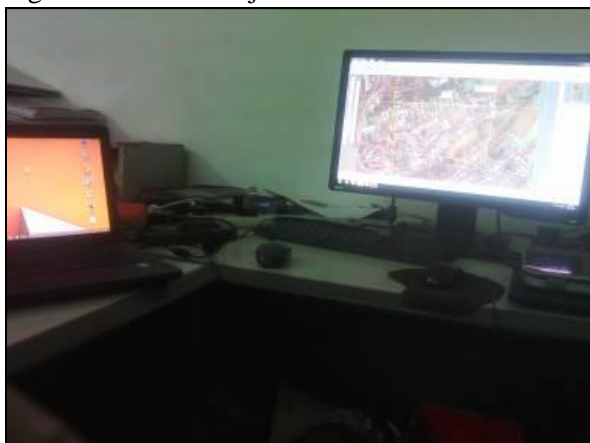


Plate-5: Digital Photogrammetric Workstation (DPW)

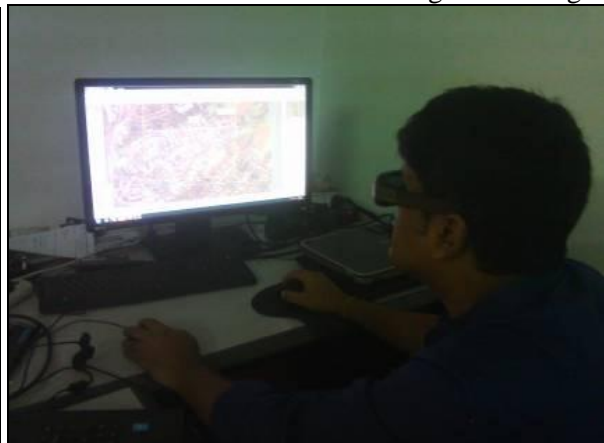


Plate-6: Photogrammetrist Extracting Features in DPW

A team of photogrammetrists has digitized Building roof with MSL height, bridge/culvert, road, khal, pond, lake, ditch, marsh/swam, river, etc. All features have been digitized in 3-dimension (X,Y,Z). **Figure-2.16** and **Figure-2.17** shows the extracted features of Shibpur Upazila at a glance.

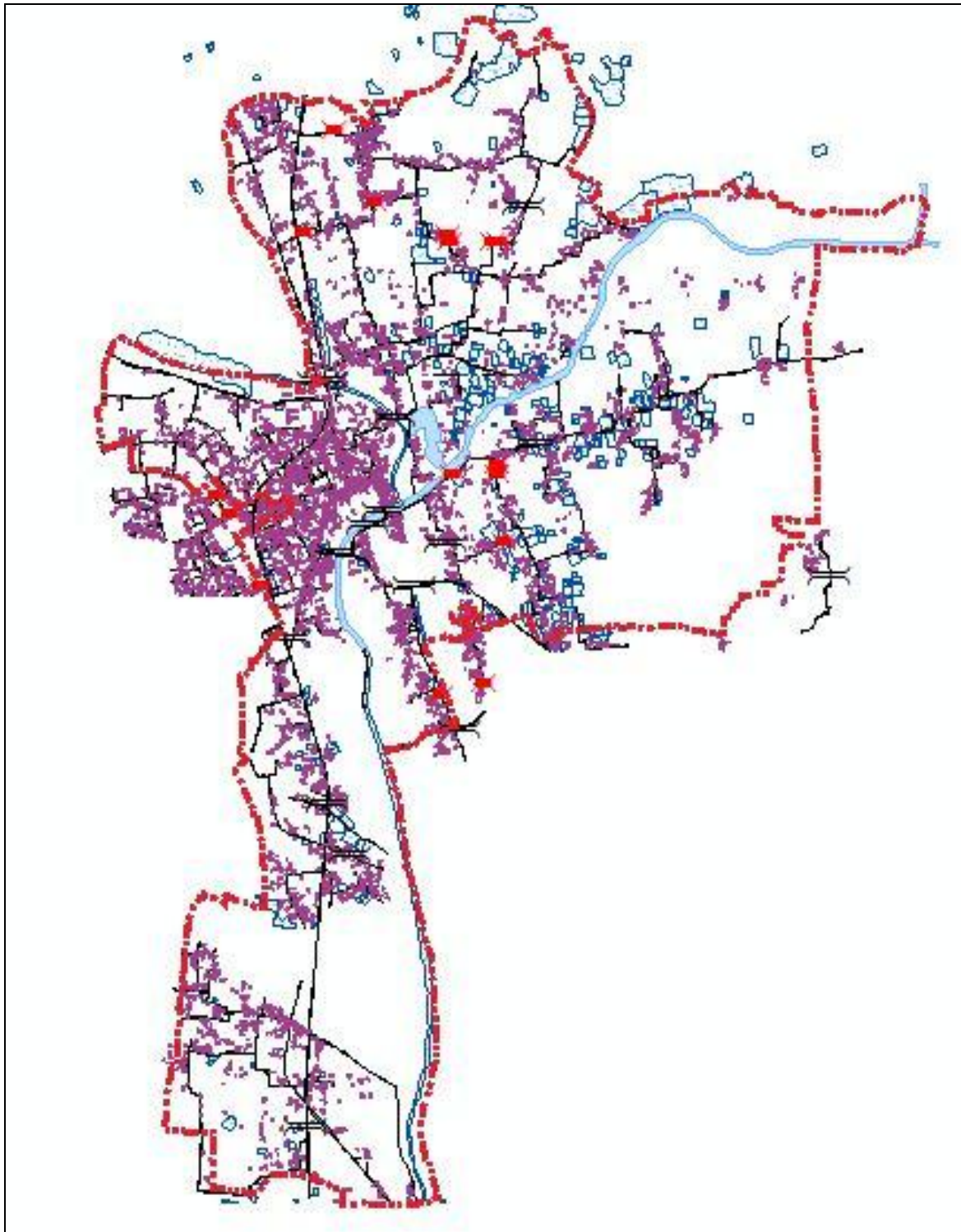


Figure-2.16: Extracted Features of Entire Shibpur Upazila by Photogrammetry

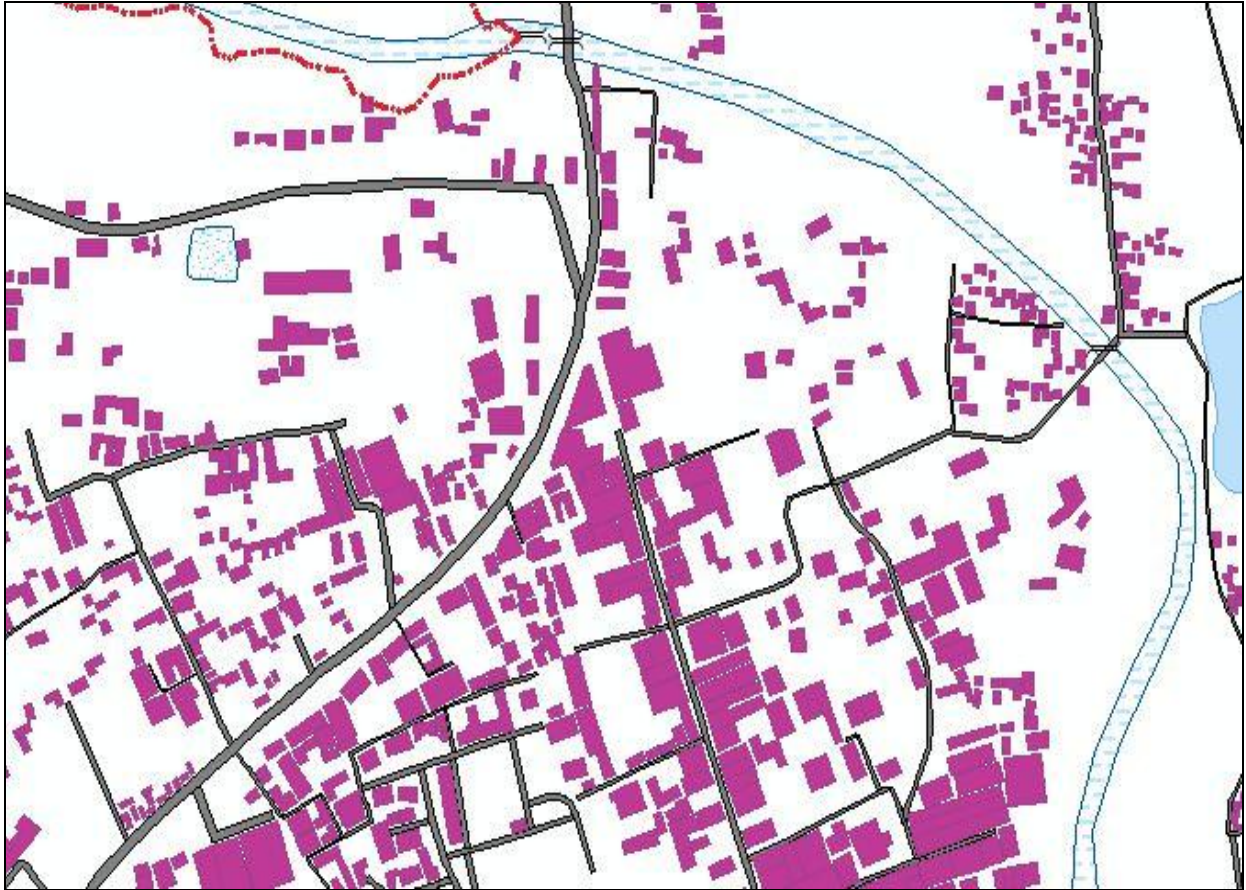


Figure 2.17: Enlarged Partial View of Extracted Features of Shibpur

For spot heights acquisition, firstly the DTM points have been generated automatically from stereo pair images by the software. Spot heights or land levels are extracted as DTM points at 10 m intervals for urban area and 20 m intervals for rural areas as described in the TOR. These automatically generated points have been then checked and edited by comparing them with stereo model in photogrammetric workstations. **Figure 2.18** shows the Digital Elevation Model of Shibpur Paurashava of Shibpur Upazila. **Figure 2.19** shows the Contour Lines partially of Shibpur paurashava of Shibpur Upazila.

The Break-lines have been created and edited after extraction of DTM Points.

The DTM Points and the Break-lines has been used later to create Triangulated Irregular Network (TIN), Digital Elevation Model (DEM) and the Contour Lines which is described in the Topographic Survey Report.

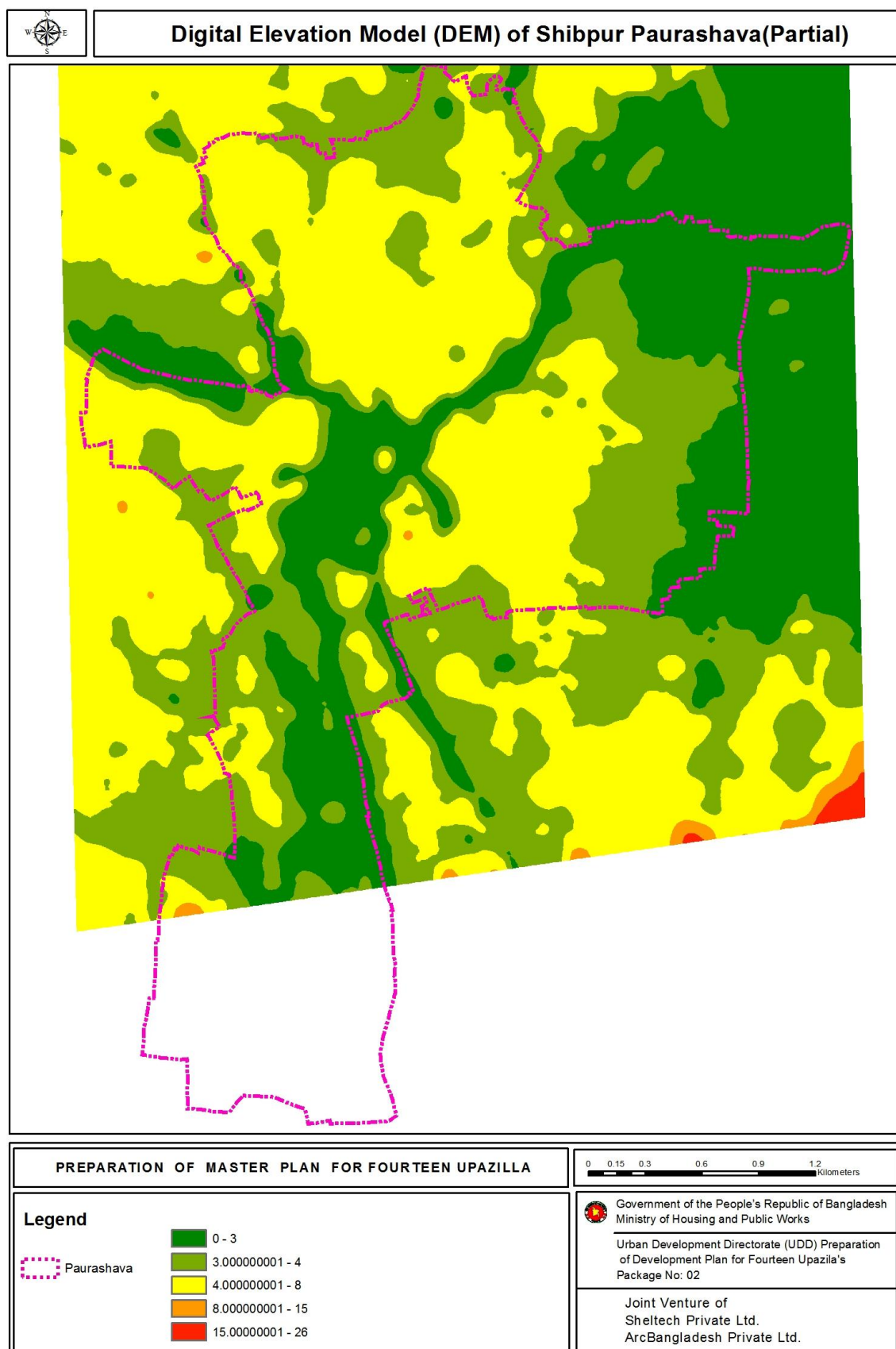


Figure-2.18: Digital Elevation Map (DEM) of Shibpur Paurashava (Partial)

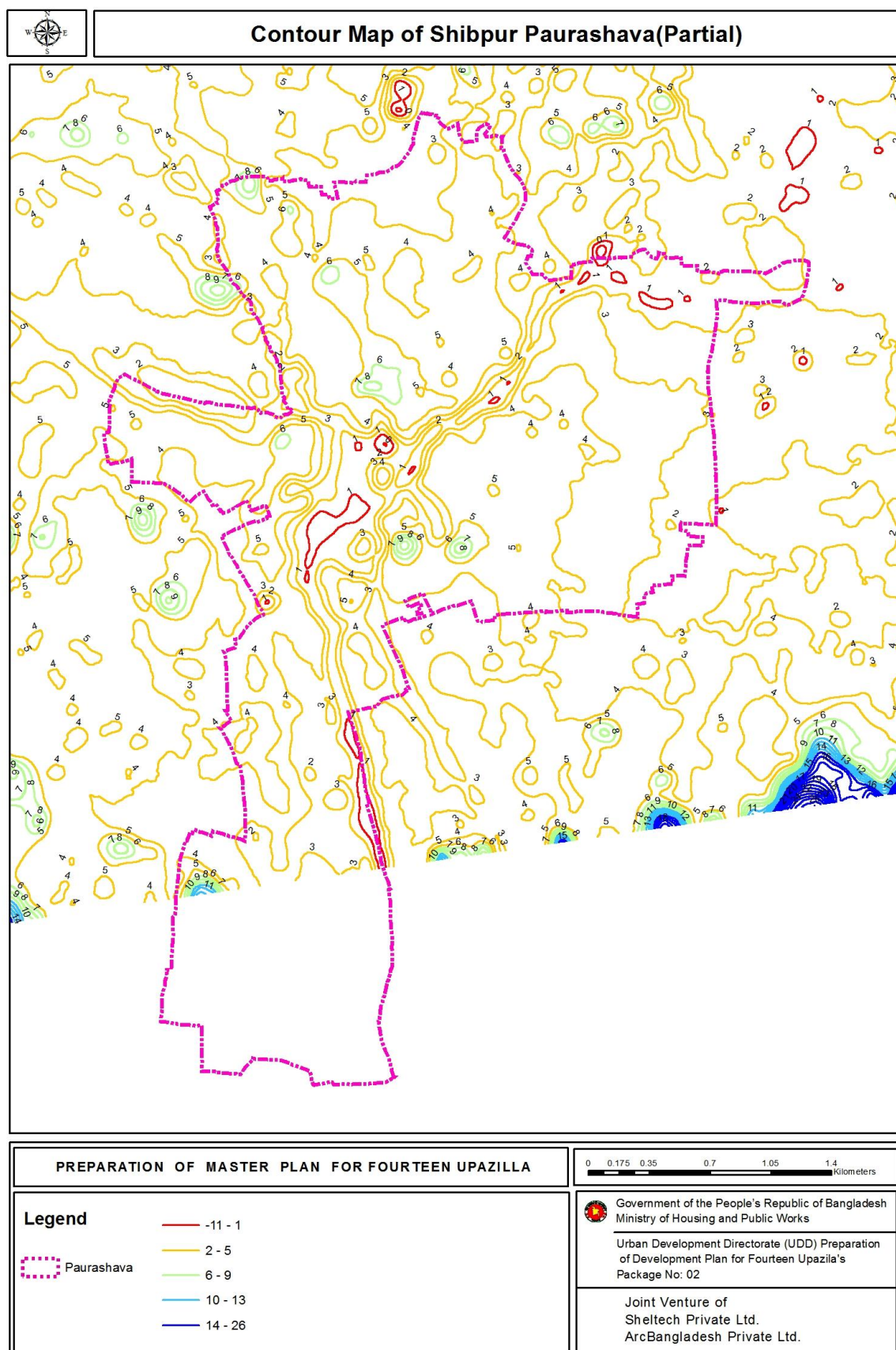


Figure-2.19: Contour Lines of Shibpur Paurashava (Partial)

2.4.6 Generation of Ortho-rectified Image

An ortho-rectified image or ortho-photo is an image which has been “corrected” for the geometric distortions (different projection, lens/sensor distortion, relief) so that it can be used as a map.

Using the DEM of the Upazila, the Ortho-rectified image has been created using photogrammetric software. Figure-2.20 shows a part ortho-rectified satellite image of Shibpur Upazila.



Figure 2.20: Ortho-Rectified Image of Shibpur Upazila (Partial)

Chapter-03

Physical Feature Survey

3.1 Field Level Data Aquisition

The portion contains the survey findings of physical feature survey consisting of all existing structures according to their floor height, structure type as well as uses like residential, commercial activities, industrial activities, educational facilities, health facilities, administrative uses, recreational facilities, religious facilities etc. Moreover it contains the findings of all types of road, bridge/culverts, dyke/embankment, drain/canal, sewer system, solid waste management, water supply system, utility services etc.

3.1.1 Mobilization of Survey Team

A dynamic and qualified survey team experienced with the GPS and Satellite Image based advance technology was mobilized to carry out physical feature survey, landuse survey and topographic survey. The composition of survey team with their qualification is given **Table-3.1**:

Table 3.1: Composition of Survey Team

Field of Expertise	Qualification	No. of Expert/ Technical Staff
Survey Expert	Bachelor of Urban & Regional Planning (BURP)	1
Survey Supervisor	Diploma in Survey/Civil Engineering	3
Surveyor	Diploma in Survey/Civil Engineering	10
Surveyor	Diploma in Survey Engineering	10

For physical survey this survey team was divided into 7 groups (each group contains two surveyors) to collect all features i.e. structures, water bodies, roads, etc. with their attributes. All these groups were supervised by the Survey Expert and the Survey Supervisor.

3.1.2 Physical Feature Survey

The Physical Feature survey in Shibpur Upazila has been carried out using the survey base maps as described in previous chapter. Survey team equipped with GPS/Smart Phone, tape, color pen, map sheet, log book, etc. have gone to field and collected required information. A sample surveyed map sheet is shown in **Figure-3.1** and a sample page of log book with collected information is shown in **Figure-3.2**.

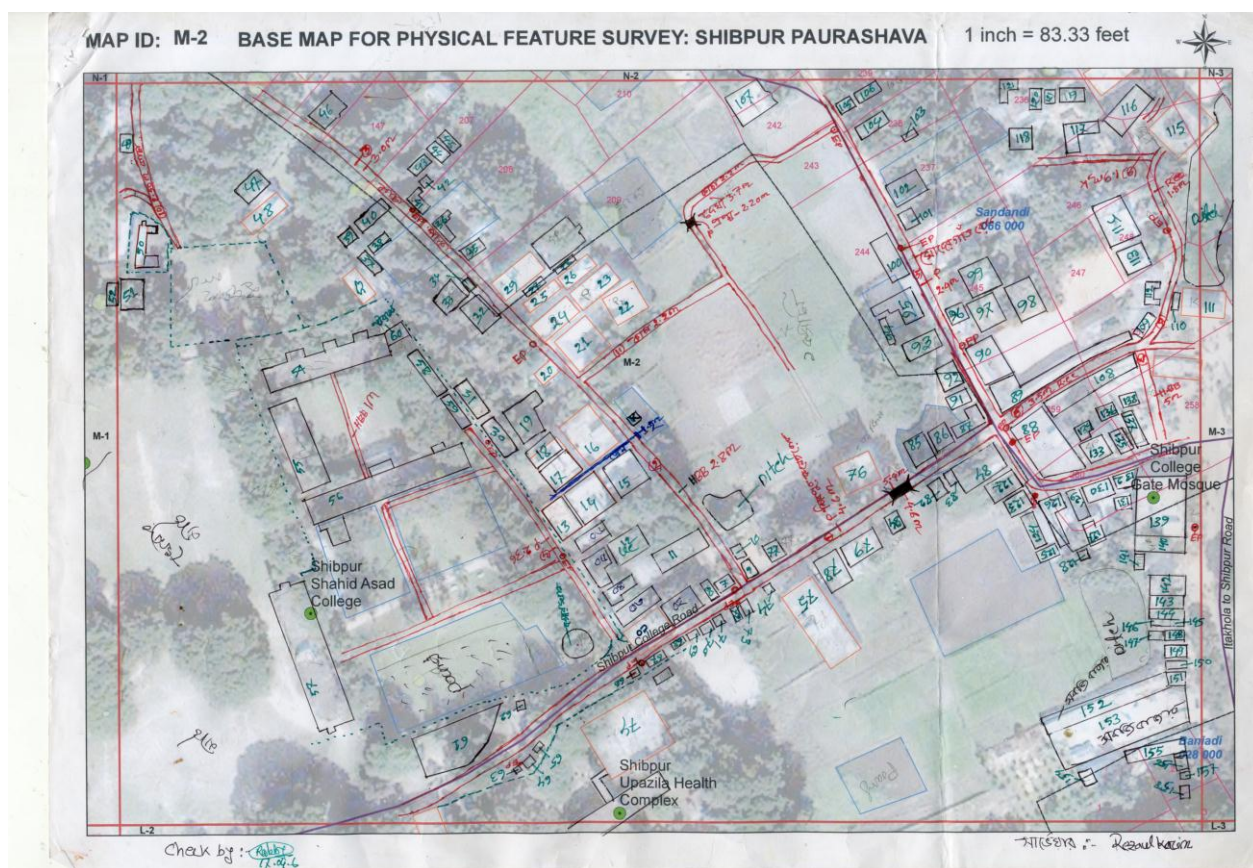


Figure-3.1: Sample Scanned Base Map for Physical Features and Land use Survey

The survey team has collected following information from field:

- Position, dimension and number of story of all structures
- Type of structures according to their construction (Pucca, semi-pucca, katcha).
- Type of structures according to their use (Residential, Commercial, Industrial, Mixed use, etc.)
- Bridge/Culverts, drain along with flow direction width and depth, location of deep tubes well, overhead water tank, electric substation, telephone exchange, Water Treatment plant, waste disposal facilities.



Plate-7: Surveyors Working on the Field in Shibpur

Upazila: শিবপুর		Preparation of Development Plan for 14 Upazilas (Package-2) Urban Development Directorate, Ministry of Housing and Public Works Physical Feature and Landuse Survey						Date: 23.03.16		Name of Supervisor:	
Ward No:	0401							Name of Surveyor:			
Serial ID:	1305							Name of Supervisor:			
Data Type:	Structure										
ID	Type	Status	Structure Use	Structure Name	Owner Name	Owner Cell No	Construction Year	Holding No	Plot No, Block Name	Road Name	Locality
133	SP	01	বাস	-	কাজিম হুসে	-	2011	200	-	কাজিম হুসে	কাজিম হুসে
134	SP	01	৷	-	জাকার হুসে	01716814173	2007	201	-	৷	৷
135	P	01	৷	-	৷	-	৷	৷	-	৷	৷
136	SP	01	৷	-	৷	-	৷	৷	-	৷	৷
137	SP	01	৷	-	কাজিম হুসে	-	2011	200	-	৷	৷
138	SP	01	৷	-	জাকার হুসে	-	2010	201	-	৷	৷
139	SP	01	৷	-	জাকার হুসে	-	2011	-	-	৷	৷
140	SP	01	৷	-	৷	-	৷	-	-	৷	৷
141	SP	01	৷	-	জাকার হুসে	0171668442	2000	202	-	৷	৷
142	SP	01	মসজিদ	মসজিদ	মসজিদ	-	1973	-	-	৷	৷
143	SP	01	চাষ	-	জাকার হুসে	-	-	-	-	৷	৷
144	SP	01	চাষ	-	জাকার হুসে	01716814173	2007	201	-	৷	৷
145	SP	01	৷	-	৷	-	৷	৷	-	৷	৷
146	SP	01	৷	-	৷	-	৷	৷	-	৷	৷
147	SP	01	৷	-	জাকার হুসে	-	-	-	-	৷	৷
148	SP	01	চাষ	-	জাকার হুসে	-	-	205	-	৷	৷

Figure-3.2: Sample Log Book Page with Information Recorded in Field

3.2 Survey Data Processing & Analysis

3.2.1 Processing of Spatial and Attribute Data

After completion of field survey, all type of spatial data is properly processed to obtain layers of physical features such as Structures, Roads, Water bodies, etc. All surveyed sheets are scanned and geo-referenced to superimpose on the satellite imagery. The surveyed features (structures, roads, water bodies, etc.) marked on the sheets were then digitized using the ArcGIS software and stored them layer by layer as per Technical Specifications on GIS Database.



Plate-8: Updating Works through GIS

After digitizing all surveyed features, editing and merging and has been done to get complete data sets of different layers of physical features.

The attribute data collected in the Log Book during the field survey have been entered in a relational database through Microsoft Access. The **Figure-3.3** shows the interface of Data Entry and **Figure-3.4** shows the tabular view of entered data in Microsoft Access.

strucID	AY24_21		
Grid No:	AY24	Wner Cell No.	
ID	21	Construction Year	2016
Type	Pacca	Holding No.	
Floor	1	Ward No.	3
Structure Use	Residential	Plot No.	ICHAMOTI,SYEDNAGAR
Structure Nme	TALUKDAR BARI	Road Name	
Owner Name	ABDUL JALIL	Locality	SYEDNAGAR PARUA

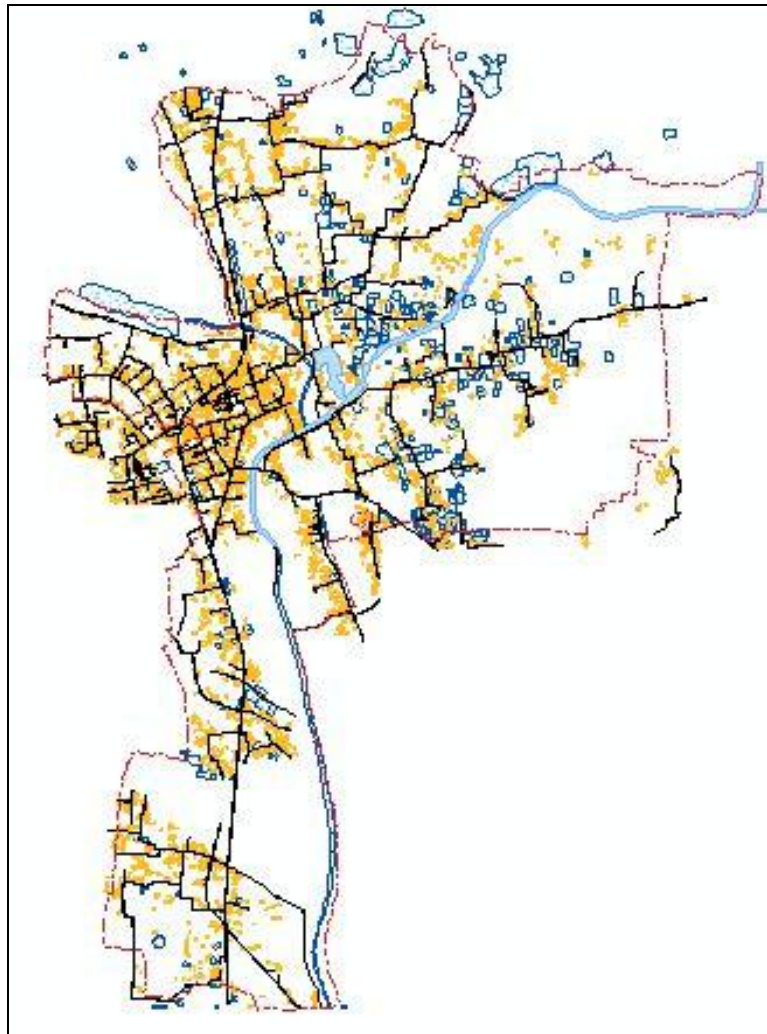
Figure-3.3: Log Book Data Entry Interface in Microsoft Access Software

strucID	GridN	SLid	struTyp	Floor	StrUse_1	StrUse	StrNam	OwnerNam	WnerCell	Conty	Holdi
BO14_44	BO14	44	Pacca	1	Mosque	Religious Area	basir mohammad jame mosq	basir mohamr		1970	
BC31_4	BC31	4	Pacca	1	TEMPLE	Religious Area	SRE SRE BOKKHO KALI MANDI			1935	
BO25_25	BO25	25	Pacca	2	Mosque	Religious Area	North Ghatcheck Shahi Jame			1994	
BK29_2	BK29	2	Semi Pacca	1	temple	Religious Area	jogonando mondir			1995	
BR15_8	BR15	8	Pacca	2	Mosque	Religious Area	Dullober Bari Jame Mosque			2000	
BP27_95	BP27	95	Pacca	1	Temple	Religious Area	Maitra Mandir	Dharmasen Ba	01815697679	2013	
BC29_4	BC29	4	Pacca	1	Mosque	Religious Area	FOKANIA MASJID	HAFIZ MAWLA	01819624739	1971	
BC29_6	BC29	6	Pacca	1	ORPHANAGE	Religious Area	FOKANIA	SHAHDAT HOS	01819624739	1971	
BG31_31	BG31	31	Semi Pacca	1	temple	Religious Area	thakur ghor	shomoronjon s			
BR17_15	BR17	15	Pacca	1	Mosque	Religious Area	Mohammadia Jame Mosque			1993	
BA28_16	BA28	16	Pacca	1	Mosque	Religious Area	MOGHOL HAT JAME MOSQUE	MOGHOL BARI		2014	
BK29_14	BK29	14	Pacca	1	Mosque	Religious Area	ali ha mosque			2006	
BL31_51	BL31	51	Pacca	1	Mosque	Religious Area	bokhotror jame mosque			2005	
BG25_61	BG25	61	Pacca	1	Mosque	Religious Area	baitul nur jam e mosque			2006	
BL31_17	BL31	17	Pacca	1	temple	Religious Area	sarbojonin			2002	
BQ21_7	BQ21	7	Katcha	1	Mosque	Religious Area	Khaza Gariber Newaz Jame M			2013	
BD24_33	BD24	33	Pacca	1	TEMPLE	Religious Area		BIRENDRALAL	01823059336	2003	
BK31_58	BK31	58	Pacca	1	Mosque	Religious Area	FORKANUA JAME MASJID			1940	
BD38_54	BD38	54	Pacca	1	Mosque	Religious Area	south nischinta pur jame mos			1970	
BQ11_43	BQ11	43	Semi Pacca	1	MAZAR	Religious Area	HAZRAT ASHRAF UDDIN SHAH	HAZRAT ASHR/		2002	
BP26_61	BP26	61	Katcha	1	MAZAR	Religious Area	SAT ANI JA MAZAR	MURADNAGAF	01868578896	1990	
BQ11_1	BQ11	1	Pacca	1	Mosque	Religious Area	ROSAIPARA JAME MOSJID	AHMED HOSAI		1970	
BN27_66	BN27	66	Semi Pacca	1	mazar	Religious Area	hazrat mustain musa oir auliv				

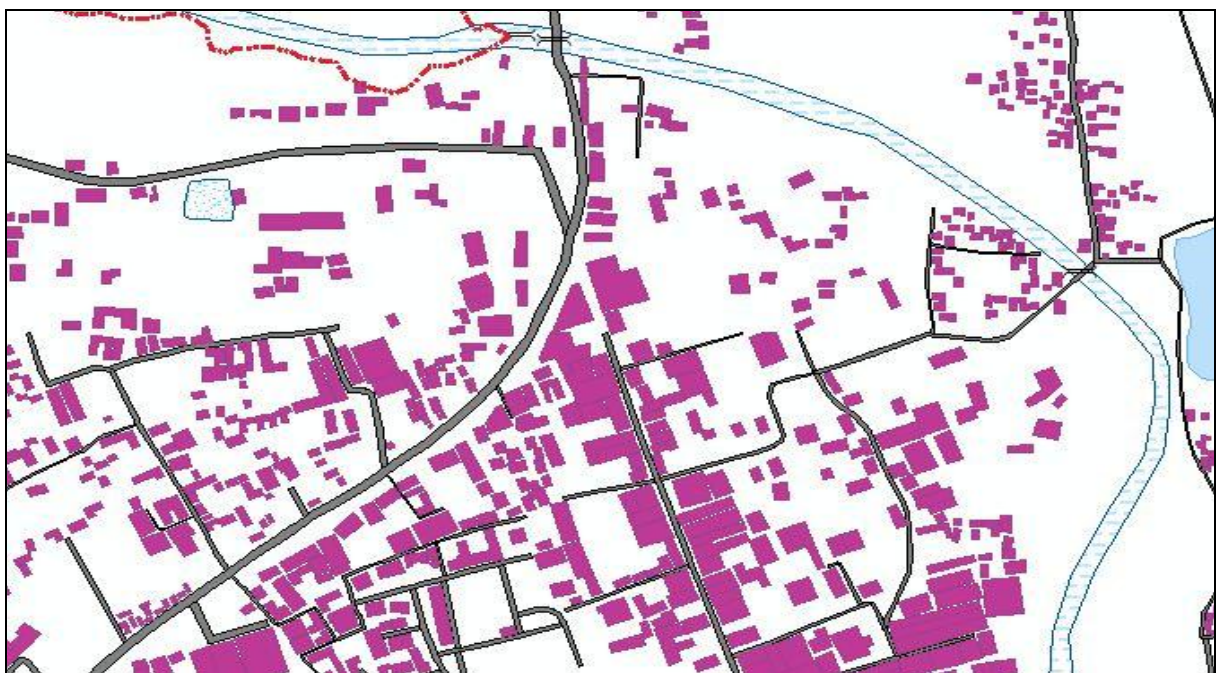
Figure-3.4: Tabular View of Log Book Data Entry in Microsoft Access Software

The data entry works have been checked and processed as usable format. These attribute data have been linked to spatial data of structures through GIS. Finally structures and all other physical data layers have been developed and finally transformed them in to Bangladesh Universal Transverse Mercator (BUTM2010) Coordinate System.

The processed data have been symbolized using different attribute to visualize the physical features of the project area. Sample processed data has been shown in **Map-3.1** and **Map-3.2**. A 3D display of physical features has been shown in **Figure-3.5**.



Map-3.1: Structure Use in Shibpur Town Area



[illegible]

JV of SCPL-ABL

3.2.2 Development of GIS Database

A GIS database has been developed for systematically organizing, storing and easy retrieving the information and data of the project area. ArcGIS File Geo-database has developed this purpose, since File Geo-database offers structural, performance and data management advantages over Personal Geo-database or shape files. The geo-database contains all the layers generated from the Mauza maps, satellite images and field survey.

Specifications of these layers has been developed to standardize GIS data structure such as layer name, layer type, attribute types and attribute values, and provided in **Annexure-II**.

The **Figure-3.6** shows partial view of attribute table of Structures of Shibpur Upazila.

OBJECTID *	Shape *	Str_ID	Struc_ID	Str_Type	Stored	Str_Uselt	Str_Uselt2	Str_name	Cons_Year	Struc_Owner	Owner_Cell	Hol
795	Polygon Z	53	BU27_53	Semi Pacca	1	OFFICE	Educational and Research	PROTEST PRIMARY	1984	GOVT	<Null>	<Null>
867	Polygon Z	56	BU26_56	Pacca	2	School	Educational and Research	RAMU PUBLIC KG & HIGH SCHOOL	2008	<Null>	<Null>	<Null>
997	Polygon Z	33	BT29_33	Pacca	2	School	Educational and Research	EVAREST TEACHING INSTITUTE	2004	<Null>	<Null>	<Null>
329	Polygon Z	122	BU28_122	Katcha	1	GARAGE	General Industry	KARNAFUL INDUSTRIES	2008	JANE ALAM	<Null>	<Null>
496	Polygon Z	23	BU28_23	Semi Pacca	1	Commercial	General Industry	MAAYER DOYA RICE FLOOR MILL	<Null>	<Null>	<Null>	<Null>
263	Polygon Z	12	BU26_12	Katcha	1	GARAGE	Mixed Use	<Null>	2015	SHOFULLAH MONSU	01812944298	<Null>
280	Polygon Z	25	BU26_25	Pacca	2	Commercial, RESIDENTIAL	Mixed Use	ORCHD HOUSE	2011	DR HARUN	0185178360	<Null>
289	Polygon Z	11	BU27_11	Katcha	1	WORKSHIP, GODOWN	Mixed Use	SARIUS SALAM COMPLEX	<Null>	ABDUS SALAM	<Null>	<Null>
290	Polygon Z	8	BU27_8	Semi Pacca	1	ABANDONED	Mixed Use	<Null>	<Null>	<Null>	<Null>	<Null>
337	Polygon Z	102	BU28_102	Pacca	5	Commercial, RESIDENTIAL	Mixed Use	<Null>	<Null>	UTPOL BARUA	<Null>	<Null>
351	Polygon Z	140	BU28_140	Pacca	2	Residential, COMMERCIAL	Mixed Use	VICTOR PLAZA	2001	UTPOL BARUA	<Null>	<Null>
373	Polygon Z	31	BU28_31	Katcha	1	ABANDONED	Mixed Use	<Null>	2008	<Null>	<Null>	<Null>
461	Polygon Z	134	BU28_134	Semi Pacca	1	GARAGE	Mixed Use	<Null>	1999	RONOS	<Null>	<Null>

Figure-3.6: Attribute Table of Structure Database of Shibpur Upazila

The **Figure-3.7** shows partial view of attribute table of Road Centerline of Shibpur Upazila.

FID	Shape *	Id	Road_Type	Road_Name	Road_Width	No_of_Lane	Rd_Owner	Road_Class	Le
73	Polyline	0	Katcha	Vandardia Paschimpara Katcha Road	8	0		Tertiary Road	
239	Polyline	3	Katcha	Uttar Para	8.25	0		Tertiary Road	
5	Polyline	0	Pucca	Upazila Road	15	0		Secondary Road	
70	Polyline	0	Pucca	Shibpur to Dulalpur Road	18	1		Secondary Road	
106	Polyline	1	Pucca	Shibpur To Bagha Road	12	1		Secondary Road	
202	Polyline	1	Pucca	Shibpur College Road	15	0		Tertiary Road	
221	Polyline	2	Pucca	Pascham Para	10	0		Secondary Road	
222	Polyline	1	Katcha	Pascham Para	12.21	0		Tertiary Road	
107	Polyline	2	Pucca	Panch Paika Road	8	1		Tertiary Road	
108	Polyline	2	Pucca	Panch Paika Road	8	1		Tertiary Road	

Figure-3.7: Attribute Table of Road Centerline of Shibpur Upazila

The **Figure-3.8** shows partial view of attribute table of Mauza Map of Shibpur Upazila.

FID	Shape *	DIVISION	DISTRICT	UPAZILA	UNION	MAUZA	JL_NO	SHEET_NO	MAUZA_JL_S	SCALE	MZ_VERSION	REVE
1360	Polyline	Dhaka	Narsingdi	Shibpur	Putia	Palpara	067	000	Palpara 067 000	16 inch = 1 mile	RS	5336
1360	Polyline	Dhaka	Narsingdi	Shibpur	Putia	Palpara	067	000	Palpara 067 000	16 inch = 1 mile	RS	5336
1360	Polyline	Dhaka	Narsingdi	Shibpur	Putia	Palpara	067	000	Palpara 067 000	16 inch = 1 mile	RS	5336
1360	Polyline	Dhaka	Narsingdi	Shibpur	Putia	Palpara	067	000	Palpara 067 000	16 inch = 1 mile	RS	5336
1359	Polyline	Dhaka	Narsingdi	Shibpur	Putia	Palpara	067	000	Palpara 067 000	16 inch = 1 mile	RS	5336
1359	Polyline	Dhaka	Narsingdi	Shibpur	Putia	Palpara	067	000	Palpara 067 000	16 inch = 1 mile	RS	5336
1359	Polyline	Dhaka	Narsingdi	Shibpur	Putia	Palpara	067	000	Palpara 067 000	16 inch = 1 mile	RS	5336
1359	Polyline	Dhaka	Narsingdi	Shibpur	Putia	Palpara	067	000	Palpara 067 000	16 inch = 1 mile	RS	5336
1359	Polyline	Dhaka	Narsingdi	Shibpur	Putia	Palpara	067	000	Palpara 067 000	16 inch = 1 mile	RS	5336
1359	Polyline	Dhaka	Narsingdi	Shibpur	Putia	Palpara	067	000	Palpara 067 000	16 inch = 1 mile	RS	5336
1359	Polyline	Dhaka	Narsingdi	Shibpur	Putia	Palpara	067	000	Palpara 067 000	16 inch = 1 mile	RS	5336
1359	Polyline	Dhaka	Narsingdi	Shibpur	Putia	Palpara	067	000	Palpara 067 000	16 inch = 1 mile	RS	5336

Figure-3.8: Attribute Table of Mauza Map of Shibpur Upazila

Adegatia_062_000.jpg	Bangsirdia_055_001.jpg	Chhutaband_092_000.jpg	Jawakandi_041_000.jpg	Kumaradi_043_001.jpg	Pahar Jaynagar_091_000.jpg
Agarpur_109_000.jpg	Bangsirdia_055_002.jpg	Dakshin Karardi Char_049_000.jpg	Josar_111_001.jpg	Kumaradi_043_002.jpg	Pahar Jaynagar_091_000.jpg
Akhrasal_097_000.jpg	Bangsirdia_055_003.jpg	Dakshin Noadia_057_001.jpg	Josar_111_002.jpg	Kunder Para_101_000.jpg	Paharpahudi_113_000.jpg
Alinagar_003_001.jpg	Baniadi_028_000.jpg	Dakshin Noadia_057_002.jpg	Josar_111_003.jpg	Lakhpur_002_000.jpg	Paikardia_021_000.jpg
Alinagar_003_002.jpg	Bara Asrafpur_077_000.jpg	Dakshin Sadhar Char_037_001.jpg	Joymangal_095_001.jpg	Lakurshichhapa_079_000.jpg	Palpara_067_000.jpg
Alinagar_003_003.jpg	Baraialgi_065_001.jpg	Dakshin Sadhar Char_037_002.jpg	Joymangal_095_002.jpg	Lampur_103_000.jpg	Panchpaika_073_000.jpg
Alinagar_003_004.jpg	Baraialgi_065_002.jpg	Dattagaon_010_001.jpg	Joymangal_095_003.jpg	Letarba_116_000.jpg	Paschim Gobindapur
Alinagar_003_005.jpg	Baraigaon_081_000.jpg	Dattagaon_010_002.jpg	Kaluarkandi_032_000.jpg	Madabdi_036_000.jpg	Peti Palashi_033_000.jpg
Arali_074_001.jpg	Bejerkandi_005_000.jpg	Dattagaon_010_003.jpg	Kamargaon_053_001.jpg	Maishadi_034_000.jpg	Purbargaon_024_000.jpg
Arali_074_002.jpg	Bharatkandi_052_000.jpg	Dattagaon_010_004.jpg	Kamargaon_053_002.jpg	Maishartek_088_000.jpg	Purundia_066_000.jpg
Asatia_019_000.jpg	Bhiti Khainkut_108_002.jpg	Dattagaon_010_005.jpg	Kamargaon_053_003.jpg	Majlispur_023_000.jpg	Ranitati_120_000.jpg
Ashtani_085_001.jpg	Bil Ichamoti_105_000.jpg	Dhanua_022_001.jpg	Kamraba_086_001.jpg	Maliara_118_000.jpg	Saiderkhola_038_000.jpg
Ashtani_085_002.jpg	Bilsaran_075_001.jpg	Dhanua_022_002.jpg	Kamraba_086_002.jpg	Manikdi_013_001.jpg	Saikar Char_121_000.jpg
Ashtani_085_003.jpg	Bilsaran_075_002.jpg	Dosardi_007_000.jpg	Kamraba_086_003.jpg	Manikdi_013_002.jpg	Salurdia_044_000.jpg
Ayerpur_054_000.jpg	Birajnagar_094_001.jpg	Dulalpur_011_001.jpg	Kamraba_086_004.jpg	Masimpur_020_000.jpg	Sankardi_040_000.jpg
Baghaba_072_000.jpg	Birajnagar_094_002.jpg	Dulalpur_011_002.jpg	Karadi_047_001.jpg	Miargaon_009_000.jpg	Sapharia_070_000.jpg
Baherkhola_017_000.jpg	Brahmandi_068_001.jpg	Ghasirdia_064_001.jpg	Karadi_047_002.jpg	Mollakanda_060_000.jpg	Saspur_061_000.jpg
Bahirdia_071_000.jpg	Brahmandi_068_002.jpg	Ghasirdia_064_002.jpg	Kaziara_114_000.jpg	Munsefer Char_045_001.jpg	Satpaika_018_001.jpg
Bailab_083_001.jpg	Brahmandi_068_003.jpg	Ghusu_076_000.jpg	Kazir Char_004_001.jpg	Munsefer Char_045_002.jpg	Satpaika_018_002.jpg
Bailab_083_002.jpg	Chandal Banda_082_000.jpg	Gilaber_089_000.jpg	Kazir Char_004_002.jpg	Nagar Maheshwardi_014_000.jpg	Satpara_080_000.jpg
Bailab_083_003.jpg	Chandandia_059_000.jpg	Gobindi_039_000.jpg	Khainkut_107_000.jpg	Nandertek_112_000.jpg	Shibpur_027_000.jpg
Bailab_083_004.jpg	Chandibardi_012_000.jpg	Gorargaon_063_000.jpg	Khaishakhali_056_000.jpg	Nandirgaon_016_000.jpg	Sikarkandi_031_000.jpg
Bandardia_029_001.jpg	Chandpasha_104_000.jpg	Gupta Para_051_000.jpg	Kharia_030_001.jpg	Naogatha_093_000.jpg	Sreephalia_100_001.jpg
Bandardia_029_002.jpg	Char Lakhpur_001_000.jpg	Hamirdia_069_000.jpg	Kharia_030_002.jpg	Nawala_098_000.jpg	Sreephalia_100_002.jpg
Bangal Satpara_078_000.jpg	Char Pitambardi_046_000.jpg	Harihardi_035_000.jpg	Khupi_006_000.jpg	Ningaon_084_000.jpg	Sreerampur_117_000.jpg
Bangpur_099_000.jpg	Chaupat_102_000.jpg	Itna_106_000.jpg	Khurda Maheshwardi_015_000.jpg	Pahar Jaynagar_091_001.jpg	Sreeshtighar_110_001.jpg

The **Figure-3.10** shows partial view of Geodatabase of Digitized Mauza Maps Files of Shibpur Upazila.

Contents	Preview	Description
Chainda_028_002.gdb		Dariar Dighi_037_004.gdb
Chainda_028_005.gdb		Dariar Dighi_037_005.gdb
Chainda_028_006.gdb		Dariar Dighi_037_006_Duplicate.gdb
Chainda_028_007.gdb		Dariar Dighi_037_007.gdb
Chakmar Kul_018_001.gdb		Dhechua Palong_036_002.gdb
Chakmar Kul_018_002.gdb		Dhechua Palong_036_003.gdb
Chakmar Kul_018_004.gdb		Dholi Chora_014_005.gdb
Dakshin Kocchopia_005_007.gdb		Dhowa Palong_034_001.gdb
Dakshin Kocchopia_005_008.gdb		Eidgor_002_008.gdb
Dakshin Kocchopia_005_010.gdb		Eidhgor_002_001.gdb
Dakshin Methachori_027_008.gdb		Eidhgor_002_002.gdb
Dakshin Methachori_027_009.gdb		Eidhgor_002_003.gdb
Dakshin Methachori_027_010.gdb		Eidhgor_002_004.gdb
Dakshin Mithachori_027_002.gdb		Eidhgor_002_005.gdb
Dakshin Mithachori_027_004.gdb		Eidhgor_002_006.gdb
Dakshin Mithachori_027_005.gdb		Eidhgor_002_007.gdb
Dakshin Mithachori_027_006.gdb		Eidhgor_002_009.gdb
Dakshin Mithachori_027_007.gdb		Eidhgor_002_010.gdb
Dakshin Mithachori_027_011.gdb		Eidhgor_002_011.gdb
Dariar Dhighi_037_006.gdb		Eidhgor_002_012.gdb
Dariar Dighi_037_002.gdb		Eidhgor_002_013.gdb
Dariar Dighi_037_003.gdb		Eidhgor_002_014.gdb
		Eidhgor_002_015.gdb
		Eidhgor_002_016.gdb
		Fotekhar Kul_022_001.gdb
		Fotekhar Kul_022_005.gdb
		Gorjonia_003_001.gdb
		Gorjonia_003_002.gdb
		Gorjonia_003_003.gdb
		Gorjonia_003_005.gdb
		Gorjonia_003_007.gdb
		Gorjonia_003_011.gdb
		Gorjonia_003_012.gdb
		Gowalia Palong_033_001.gdb
		Gowalia Palong_033_002.gdb
		Gowalia Palong_033_003.gdb
		Jangal Dariar Dighi_038_000.gdb
		Jangal Dholi Chori_013_001.gdb
		Jangal Dholi Chori_013_002.gdb
		Jangal Dholi Chori_013_003.gdb
		Jangal Dholi Chori_013_004.gdb
		Jangal Dholi Chori_013_005.gdb
		Jangal Dhowa_Palong_030_000.gdb
		Jangal Gowalia Palong_032_000.gdb
		Jowarianala_012_001.gdb
		Jowarianala_012_007.gdb
		Kauwar Kho_008_001.gdb
		Khunia Palong_035_002.gdb
		Khunia Palong_035_003.gdb
		Khunia Palong_035_005.gdb
		Kocchopia_004_001.gdb
		Kocchopia_004_003.gdb
		Kocchopia_004_007.gdb
		Kocchopia_004_008.gdb
		Kocchopia_004_009.gdb
		Lot Ukhiyar Ghona_039_001.gdb
		Lot Ukhiyar Ghona_039_002.gdb
		Lot Ukhiyar Ghona_039_003.gdb
		Lot Ukhiyar Ghona_039_004.gdb
		Lot Ukhiyar Ghona_039_005.gdb
		Lot Ukhiyar Ghona_039_006.gdb
		Lot Ukhiyar Ghona_039_007.gdb
		Moisho Koom_007_000.gdb
		Monir Jhil_006_003.gdb
		Nona Chori_017_003.gdb
		Nona Chori_017_004.gdb

Figure-3.10: Catalog View of Geodatabases of Digitized Mauza Maps of Shibpur Upazila

3.2.3 Field Verification/Ground Truthing

After developing the GIS database and preparing the field checking map the accuracy of the physical feature database is checked by the UDD and the consulting firm jointly. From 17th august, 2016 the surveyors of UDD and consulting firm are visited the shibpur upazila for field checking. Field checking is done by keeping focus on the following area:

- Dimension and shape of the features
- Accuracy of feature's attributes
- Missing objects.



Plate-9: Field Checking in Shibpur by UDD and Consulting Firm

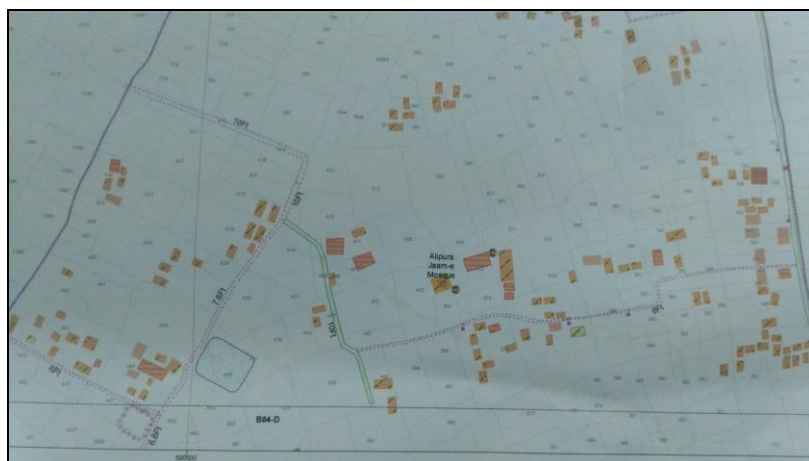


Plate-10: Physical Feature Map for Field Checking in Shibpur.

Chapter-04

Land Use Survey

Land Use Survey is a major element in any planning endeavor. Thorough detail land use survey and collection of required information of the project area are needed that helps draw up the plan in a better way.

The Land use survey was carried out by recording the current use of the land in the study area. The current use of land was classified according to the provisions given in the TOR. Land use survey, basically, records the use of land by its functional activity such as residential, industrial, commercial etc. The maps prepared for physical survey were used as base map for land use survey. Land use features were identified and classified using the recorded code and separated in different layers during data processing stage, from where category wise land use map were drawn using the identification layers of each of the land uses features.

4.0 Field Level Data Acquisition

4.1.1 Mobilization of Survey Team

A dynamic and qualified survey team experienced with the GPS and Satellite Image based advance technology was mobilized to carry out land use survey and along with physical feature survey. The composition of survey team with their qualification is given below:

Table 4.1: Composition of Survey Team

Field of Expertise	Qualification	No. of Expert/ Technical Staff
Survey Expert	Bachelor of Urban & Regional Planning (BURP)	1
Survey Supervisor	Diploma in Survey/Civil Engineering	1
Surveyor	Diploma in Survey/Civil Engineering	12
Surveyor	Diploma in Survey Engineering	10

For Land use survey, this survey team was divided into 7 groups (each group contains two surveyors) to collect land use boundary and all physical features i.e. structures, water bodies, roads, etc. with their attributes. All these groups were supervised by the Survey Expert and the Survey Supervisor.

4.1.2 Land Use Survey

The Land use survey has been carried out by recording the current use of the land in the study area. The current use of land has been classified according to provision given in the TOR. Land use survey basically records the use of land by its functional activity such as residential, industrial or commercial. The maps prepared through physical survey have been used as base map for land use survey. Land use features were identified and classified using the recorded code and drawing the boundaries using different color pencils (Figure 4.1). The following color code has been applied in field work of land use map. The Figure 4.2 shows the land use base map after survey.

Land Use Legend for Field Work	
	Education
	Industry
	Forest/Hilly Area
	Agricultural Land
	Commercial
	Water Body
	Pucca Road
	Residential
	Administrative
	Religious Area
	Grave Yard

Figure 4.1: Color used by Color pencil for Land Use Demarcation

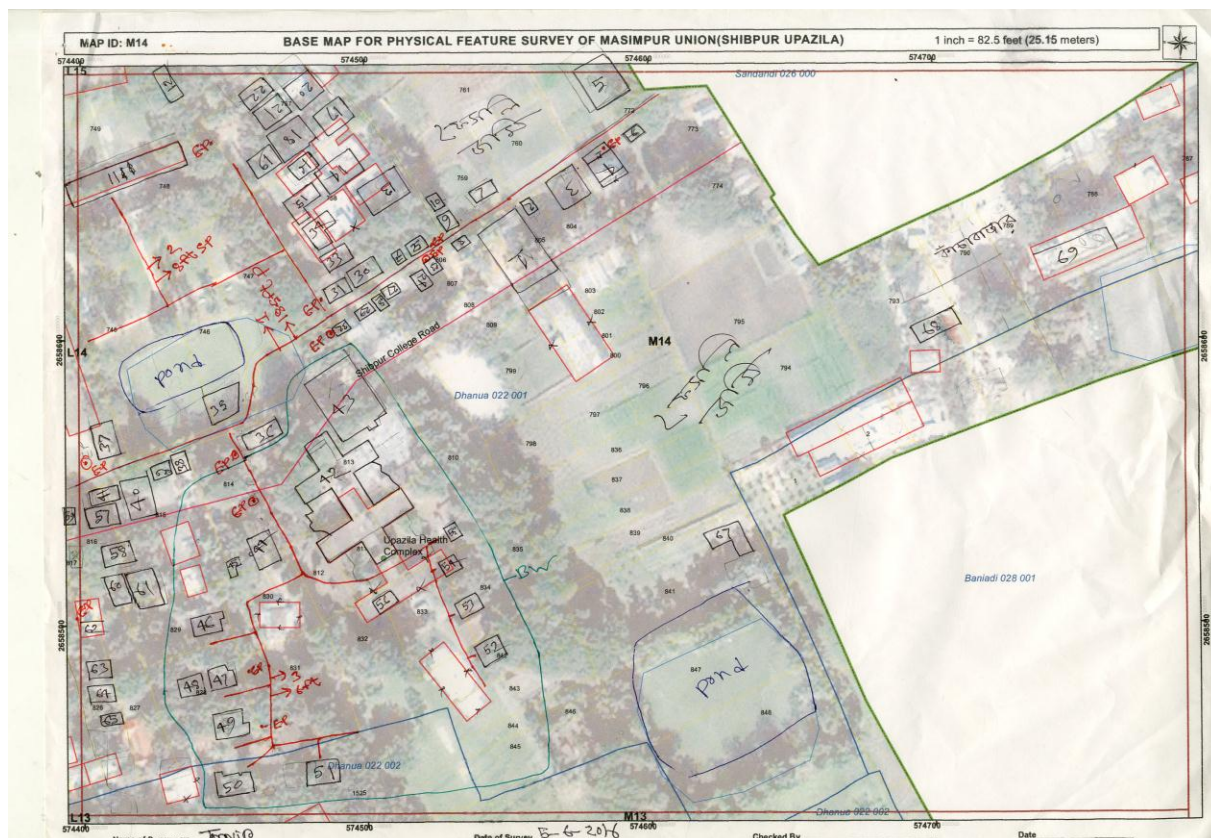


Figure 4.2: Landuse Base Map used in Shibpur Upazila

The methodology and technique followed are as follows:

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

4.2 Survey Data Processing & Analysis

4.2.1 Processing of Land Use Data

During data processing stage, all type of land use data has been properly processed to obtain the unique land uses. Firstly, survey map sheets have been scanned and geo-referenced, then land use boundary have been digitized with their attributes. On the other hand, physical feature data has been used to identify land use boundaries and categorize then into respective land use categories. The surveyed physical features (structures, roads, water bodies, etc. and land use boundaries, etc.) marked on the sheets were then digitized using the ArcGIS software.

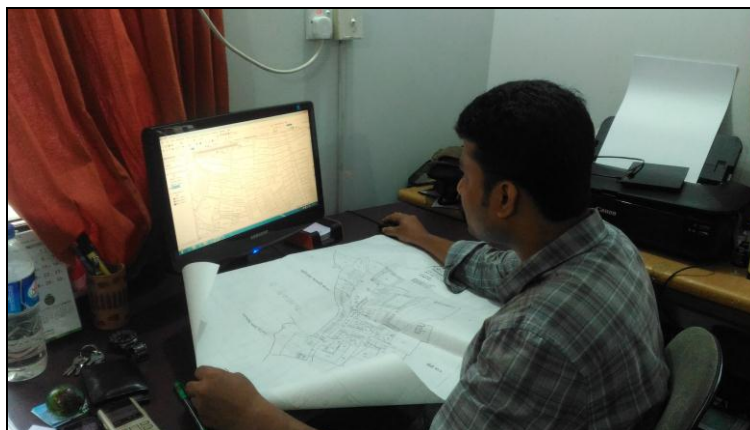


Plate-10: Updating works using Surveyed Map

4.2.2 Preparation of Land Use Map

Utilizing the land use and physical feature base map the land use maps were prepared showing the broad categories of land use. The characteristics of each land use area have fully been described in the survey report. The Land Use Maps were prepared at specified scale based on the data collected through land use survey and the information of the base map.

Details about land use have been provided in Table 4.2 and generalized land use pattern of Shibpur town area has been presented in Map-4.1.



Table 4.2: Land Use Categories

Sl. No.	Land uses	Illustrated
1.	Urban Residential Zone	Planned Residential Area, Govt. Quarters, Private Housing, Rest/Guest/Circuit House, Banglow, Mess, Orphanage/Old Home, Rural Homestead, Slum, Squatters. House type Pacca, Semi-pacca, Katcaha and Tin Shed are also enlisted at urban residential zone.
2.	Rural Settlement	Rural settlement includes the low dense residential area which is scattered and rural in nature. It may permit only low density uses. Aiming to control the growth in this zone, less service and facilities will be provided.
3.	Commercial Zone	Residential Hotel/ Hotel & Restaurant, Wholesale Rice Market, Wholesale, Vegetables Market, Wholesale Fish Market, Wholesale Paper Market, Wholesale Grocery Goods Market, Wholesale Fruit Market, Book Stall, Cloths Shop, Paper & Magazine, Stationery Shop, Shoe Shop, Bag & Leather Goods, Cosmetics, Spectacles, Electronic Goods, Audio Video Cassette, Utensils/Crockery, Sports Goods, Computer Goods, Motor Car Parts, Jewelry shops, Show Room, Furniture Shop, Department Store, Mobile Sales Center, Hardware Goods, Sweet Shop, Bakery Shop, Gift Shop, Press & Printing, Grocery Shop, Gun Shop, Iron & Steel Shops, Shopping Center/Mall, Shopping Mall, Super Market, Rubber Stamps, Phone-Fax-Photocopy, Cycle Store, Studio/Colour Lab, Drug/Pharmacy, Pottery shop, Electronics, Sports and Athletics, Kitchen Market, Katcha Bazar, Beauty Parlor/Hair dresser, Govt. Food Godown, Cold Storage, Others Godown. Growth centers, Small Bazar, Watehouses are also enlisted under commercial zone.
4.	Mixed Use Zone	Commercial – Residential, Office – Residential, Commercial – Industrial, Two or More categories.
5.	General Industrial Zone	Green and Orange, A categories as per The Environment Conservation Rules, 1997
6.	Heavy Industrial Zone	Other toxic and pollution industries (Orange B and Red categories as per the Environment Conservation Rules, 1997)
7.	Government Services/ Administrative	Deputy Commissioner's Office, Zila Parishad Office, SP Office/Police Headquarter, Civil Surgeon Office, LGED Office, Upazila Headquarter, Paurashava Office, Union Parishad Office, Settlement Office, Post office, Bank, Public Works Department Office, R&H Office, DPHE Office, Police Station, Ansar Camp, Jailkhana, Statistical Bureau Office, PDB Office, BWDB Office, DoE Office, All types of Government Office, Private Bank/ Insurance Company, Mercantile & Cooperatives, Money Exchange Center, Private company/Different types of NGO/CBO/Club, Construction Office, Commercial Group Office, Trading Corporation Office, Security Service Office, Law Chamber, Doctor's Chamber, Political Party Office, Professional's Association, Labor Union. Upazila Headquarter, AC (Land) office can also mark as government services.
8.	Non Government Services	Other office/service area which are not included in government services.

Sl. No.	Land uses	Illustrated
9.	Educational and Research Zone	Kindergarten and Nursery, Primary School, High School, College, Public University, Private University, Public Medical College, Private Medical College, Homeopathic Medical College, Engineering College/University, Law College, Social Research, Health Research, Economic Research, Vocational Training Institute, Physical Training Institute, Nursing Training Institute, Teachers Training College, Computer Training Institute, Dakhil Madrasa, Alim Madrasa, Fazil Madrasa, Kamil Madrasa, Hafezia Madrasa, Tutorial/ Coaching Center, Government Training Institute, Library, Museum, Social Welfare Institution, Kindergarten, University and Madrasas.
10.	Agricultural Zone	Single crop land, Double crop land, Triple crop land, Barren land, Mangogarden/Litchi/Jackfruit/Banana/Lemon/others, fruits garden etc., Different types of flower garden, Tree cultivation, Hatchery/Gher, Livestock / Poultry Farm / Dairy Farm, Agricultural Research Area.
11.	Water body	Equal or more than 0.25 acre and justification by the consultant and well land will merge with water body. Pond, Beels/Marshlands, /Lake/Ditch, Lakes, River, Khals, Streams, Drain.
12.	Open Space	Playground, Park, Botanical Garden, Stadium, Zoo etc. (Facilities without or with minimum building structure)
13.	Vacant Land	Barren Land, Char Land, Gravel Pits, Low Laying Area, Sand Quarries.
14.	Recreational Facilities	Facilities other than those mentioned to Open Space and indoor based facilities with designated building structure such as: Cinema Hall, Theater Hall, Museum & Art gallery, Auditorium /Community Center/Town Hall, Park/Playground/Amusement Park/Theme Park, Stadium/ Gymnasium/Swimming Pool, Tennis Complex.
15.	Circular Network	All areas covered by the roads and rail ways (Broad/Meter Gauge) network. Bridge, Culvert, Foot over Bridge, Railway Bridge.
16.	Transport Facilities and Communication	Under transport and communication land use, both transport and communication services are considered. This category includes Roads, Airport, Helicopter Station, Rail Station, Bus/Truck Terminal/Stand, Boat/Ferry Ghat, Refueling Filing Station, Garage, Launch Terminals, Passenger Shed, Telephone Exchange, Ticket counter, Road Island, Footpath, Transport office, post office/Post Box, River Port, Traffic Signal Port etc.
17.	Utility Services	Utility services include Overhead Tank, Power Office/Control Room, Public Toilet, Sewerage Office, Waste Disposal, Water Pump House, Water Reservoir, Drainage and Sewerage System, Water/Sewerage Supply Line, Water Treatment Plant etc.
18.	Health Services/ Facilities	Govt. Hospital / Pvt Hospital / Mental Hospital/ Maternity/ Children Hospital / Clinic/ Diagnostic Center, Clinic, Community Hospital and Veterinary Hospital.

Sl. No.	Land uses	Illustrated
19.	Community Facilities/ Services	Community Center, Social Club, Slaughter House, Monument, Graveyard, Crematorium, Cemetery, Eidgah, Shahid Minar etc. which will provide service to the community.
20.	Religious Area/ Facilities	Mosque, Eidgah/Mazar/Dargha, Madrasha, Temple, Church, Pagoda, Graveyard, Cemetery, Cremation place.
21.	Historical and Heritage Site	The entire mentionable historical and heritage site.
22.	Restricted Area/ Facilities	A Restricted Area is an area where no one but certain people can enter. Here, the areas which are not accessible for the general public except some high ranked personnel are considered as restricted area. Cantonment/BDR/Navy, Reserved Forest, TV Station, Radio Station, T&T Board, Power Supply Station.
23.	Forest/ Groups of Trees	Designated Forest area or Forest land.
24.	Beach	Sea Beach
25.	Hilly Area/ Hillock	Designated Hilly Area with Tilla.
26.	Miscellaneous	Any other categories which are not related to above categories. EPZ, BM, Growth Centre, Fire Service, Garland, Brick Field, Drainage Outfall, Embankment, River cum embankment, Char, Coastline, Flood Wall, Slum.

The Legend for Existing Generalized Land use is shown in Figure-4.3.

LEGEND



























Land Use	
	Urban Residential Zone
	Commercial Zone
	Heavy Industrial Zone
	Administrative/Government Services
	Agricultural Zone
	Water Body
	Vacant Land
	Circular Network
	Utility Services
	Community Service
	Historical and Heritage Site
	Forest Area
	Beach
	Rural Settlement
	Mixed Use
	General Industrial Zone
	Non-Government Services
	Educational & Research
	Open Space
	Recreational Facilities
	Transportation Facilities and Communication
	Health Facilities
	Religious Area
	Restricted Area
	Hill / Hillock
	Miscellaneous

Figure-4.3: Legend for Existing Generalized Landuse

	Growth Center		Telephone Pole
	Small Bazar		Light Post
	Kindergarten		High-Volt Electric Tower
	Primary School		Tele-Communication Tower
	School (Secondary/NGO/Others)		Market/Shopping Complex
	College		Dustbin
	University		Post Office/Post Box
	Madrassa		Shallow or Deep Tube-Well/ Water Pump House
	Museum		Passenger shade
	Cinema Hall/Auditorium/ Theater Hall		Bridge
	Monument/Shahid Miner		Culvert
	Mosque/Mazar/Dargah		Foot-over Bridge
	Temple/Church/Pagoda		Railway Bridge
	Historic Sites		Railway Over Bridge
	Electric Pole		Sluice Gate
	Bench Mark (BM)		Refueling Station
	District Headquarter (DC Office)		Power Plant/ Electric Sub-Station
	Upazila Headquarter		Fire Service
	Pourashava Office		Public Library
	Union Parishad Office		Police Box
	Godown		Industry
	Bank		Boat Ghat
	Brickfield		Ferry Ghat/Landing/ Launch Terminal/River Port
	Drainage Outfall		Bus/Truck Terminal
	Railway Station		
	Helipad		

Figure-4.4: Legend for Existing Important Point Feature

Table- 4.3: Generalize Land Use Information of the Project Area (The table below is for Shibpur Paurashava)

SI	LANDUSE	Area (Acre)
1	Administrative	8.917
2	Agricultural Area	1749.25
3	Commercial Area	26.69
4	Community Service	2.64
5	Educational & Research	14.12
6	Graveyard	2.02
7	Health Facilities	2.873
8	Industrial Area	4.63
9	Miscellaneous	8.52
10	Mixed Use	6.72
11	Recreational	0.20
12	Religious Area	5.57
13	Residential Area	493.67
14	Transportation and Communication	45.88
15	Water Body	163.79

Chapter-05 Topographic Survey

Topography is the study of the shape and features of the surface of the Earth and other observable objects. The topography of an area could refer to the surface shapes and features themselves or a description, specially their depiction in maps. Topographic surveys are carried out to identify and map the contours of the ground and features on the surface or slightly above or below the surface of the earth. Contours are imaginary lines that connect locations of similar elevation. A topographic map is a detailed and accurate two-dimensional representation of natural and human-made features on the Earth's surface. These maps are used for a number of applications like land use planning, resource management, , urban planning etc.

Topographic survey is a very important survey as it shows the suitable land for future development. Topographic Survey means measuring the surface of the earth of any area with standard known coordinates of X, Y, and Z value.

5.1 Field Level Data Acquisition

5.1.1 Mobilization of Survey Team

A dynamic and qualified survey team experienced with the GPS and Satellite Image based advance technology was mobilized to carry out land use survey and along with physical feature survey. The composition of survey team with their qualification is given below:

Table 5.1: Composition of Survey Team

Field of Expertise	Qualification	No. of Expert/ Technical Staff
Survey Expert	Bachelor of Urban & Regional Planning (BURP)	1
Survey Supervisor	Diploma in Survey/Civil Engineering	3
Surveyor	Diploma in Survey/Civil Engineering	10
Surveyor	Diploma in Survey Engineering	10

For Topographic survey, the survey team was divided into 7 groups (each group contains two surveyors) to collect topographic features which could not be collected through photogrammetry due to dense vegetation, clouds, etc. All these groups were supervised by the Survey Expert and the Survey Supervisor

5.1.2 Topographic Survey

The topographic survey of whole project area is inconvenient for direct ground surveying using RTK-GPS and Total Stations within a survey season. Hence, the Consultant adopted the photogrammetric surveying by which topographic data have been extracted from the 3D imagery (stereo imagery) of the project area.

In Photogrammetric Surveying, all topographic features are recorded in three dimensions (x, y, z coordinates) and topography is described by using mass points (spot levels) and break-lines (to describe a change of slope). Spot heights or land levels are extracted as DTM points at 10 m intervals for urban area and 20 m intervals for rural areas as described in the TOR. This data, together with 3D features (road edges, bank of river and other water bodies, etc), are used as break-lines to make Digital Terrain Models (DTMs), Digital Elevation Model (DEM), Triangulated Irregular Network (TIN), and the Contours..

In the densely vegetated area and clouded area RTK-GPS and Total Stations are used mainly to obtain 3-D data (X,Y, Z value) for enriching the photogrammetric data of roads, flood embankments and other drainage divides, drainage and irrigation channels. The Survey team carried out the survey to

collect topographic features as much as possible using survey equipment and the satellite image based map sheets. The surveyors collected the following features from the field:

- Alignment of rivers, lake, canal and drainage channels etc. showing depth and direction of flow.
- Alignment of roads, embankments, dykes and other drainage divides.
- Outline of bazaars, water body, swamps, barren land, low land, borrow pits, forest, open space, restricted area, etc.

5.2 Data Processing & Analysis

5.2.1 Processing of Topographic Data

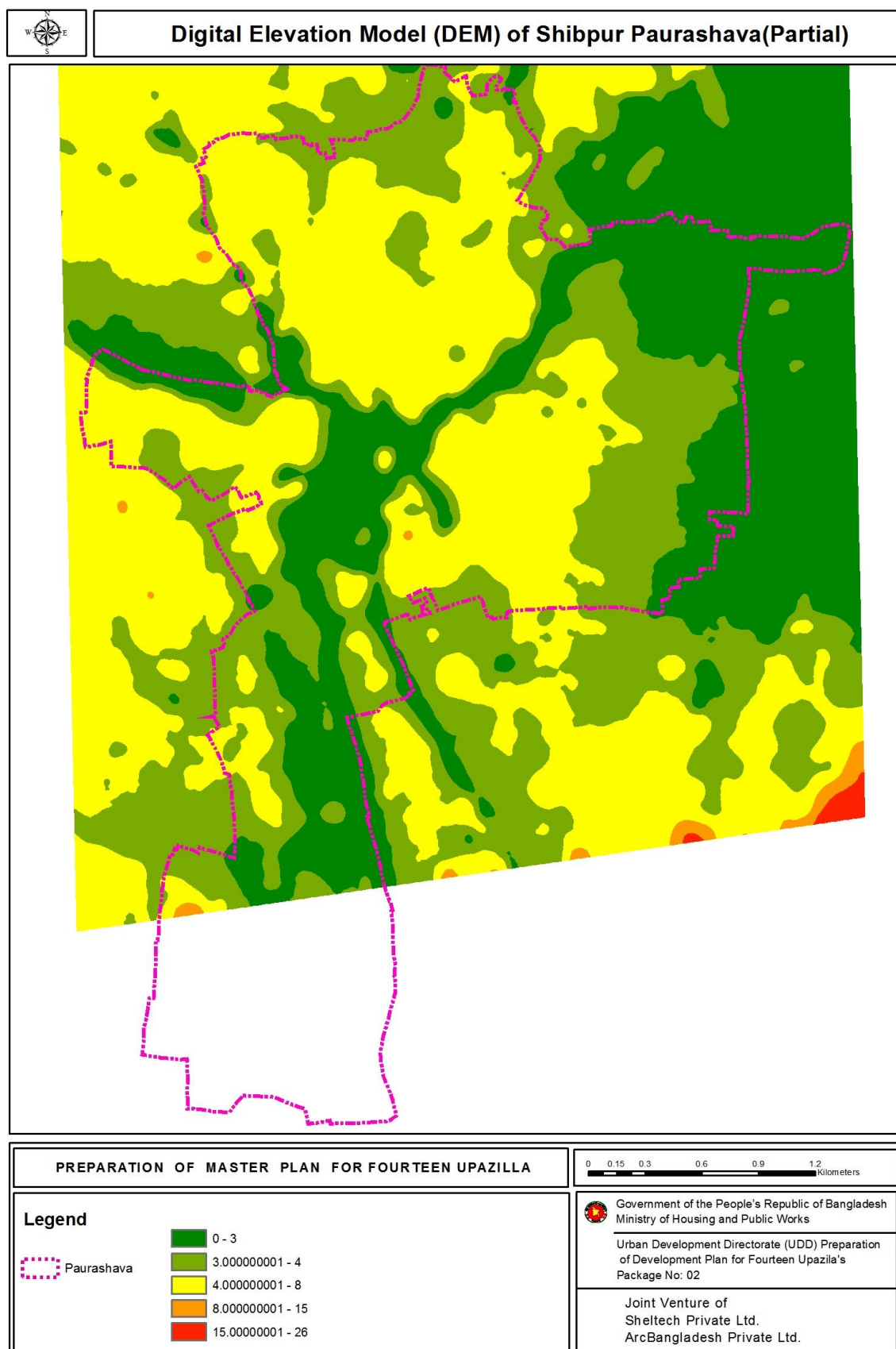
Using the photogrammetric data of DTM Points and the Break-lines Triangulated Irregular Network (TIN) and the Digital Elevation Model (DEM) has been generated. From these derived data the contour lines have been generated with 0.3 meter interval using ArcGIS software. **Map-5.1** shows the DEM of of Shibpur paurashava of Shibpur Upazila and the **Map-5.2** shows the Contour Lines partially of Shibpur Paurashava of Shibpur Upazila.

5.2.2 General Topography of Shibpur Upazila

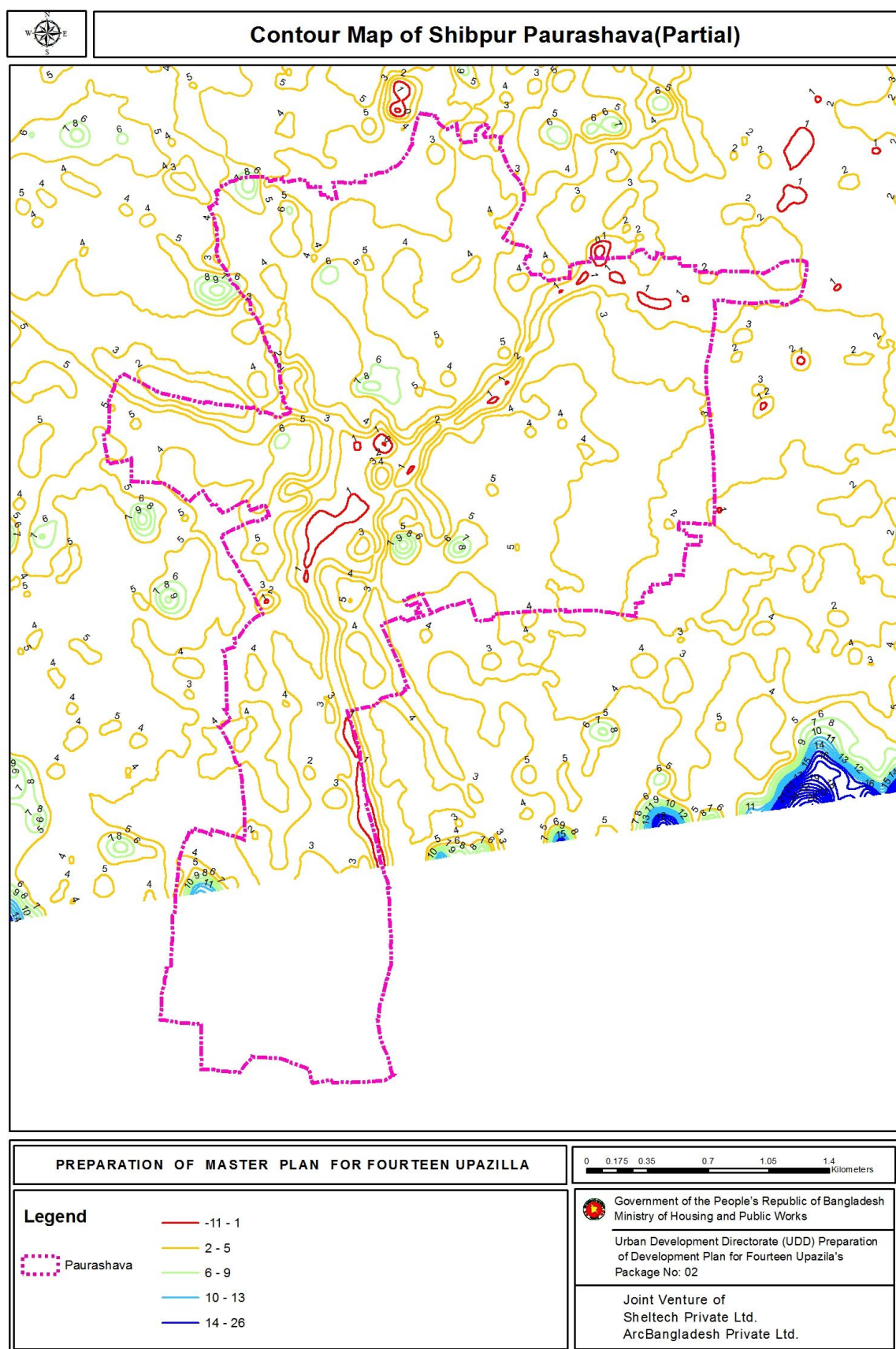
Almost the whole of the Narsingdi with exception of hilly area and a number of small rivers and channels is uniform level. The general topography of the study area is ranges from -11 to 26 meter MSL. The hilly land in jossore union area mainly high comparatively than the other part of the Upazila.

Table 5.2: General Height Information

Total Project Area	Maximum Height (Meter)	Average Height (Meter)	Minimum Height (Meter)
217.71 sq.km	26	6.72	-11



Map-5.1: Digital Elevation Model of Shibpur Upazila



Map-5.2: Contour map of Shibpur Paurashava (Partial)

5.2.3 Alignment and Crest Level of Major Roads

The alignment is the route of the road and crest level is the top surface of road, usually known as carriageway.

Geographically, most of the study area lies above flood level and as a result road is the prime means of movement. In Shibpur, two major highways pass through the study area neighboring area like Kishorganj, Bhairab, Narayanganj etc. Besides, the study area is also well connected by number of arterial roads with all parts of the study area.

Table 5.3: Crest level of major roads along their alignment in Shibpur

Name of the road	Height of crest level from MSL, in meter		
	Minimum	Maximum	Average
Shibpur to Dulalpur Road	2.05	5.25	3.65
Itakhola to Shibpur Road	3.35	6.13	4.62
Nagar Chakrada Road	2.43	7.5	4.95

Source: Topographic survey, 2016

Chapter-06 Photogrammetric Works

6.1 Satellite Image Processing

Satellite image came with a certain level of processing. However, for the purpose of features extraction, further processing is needed in a number of steps. The step by step procedures has been shown in the **Figure-6.1**

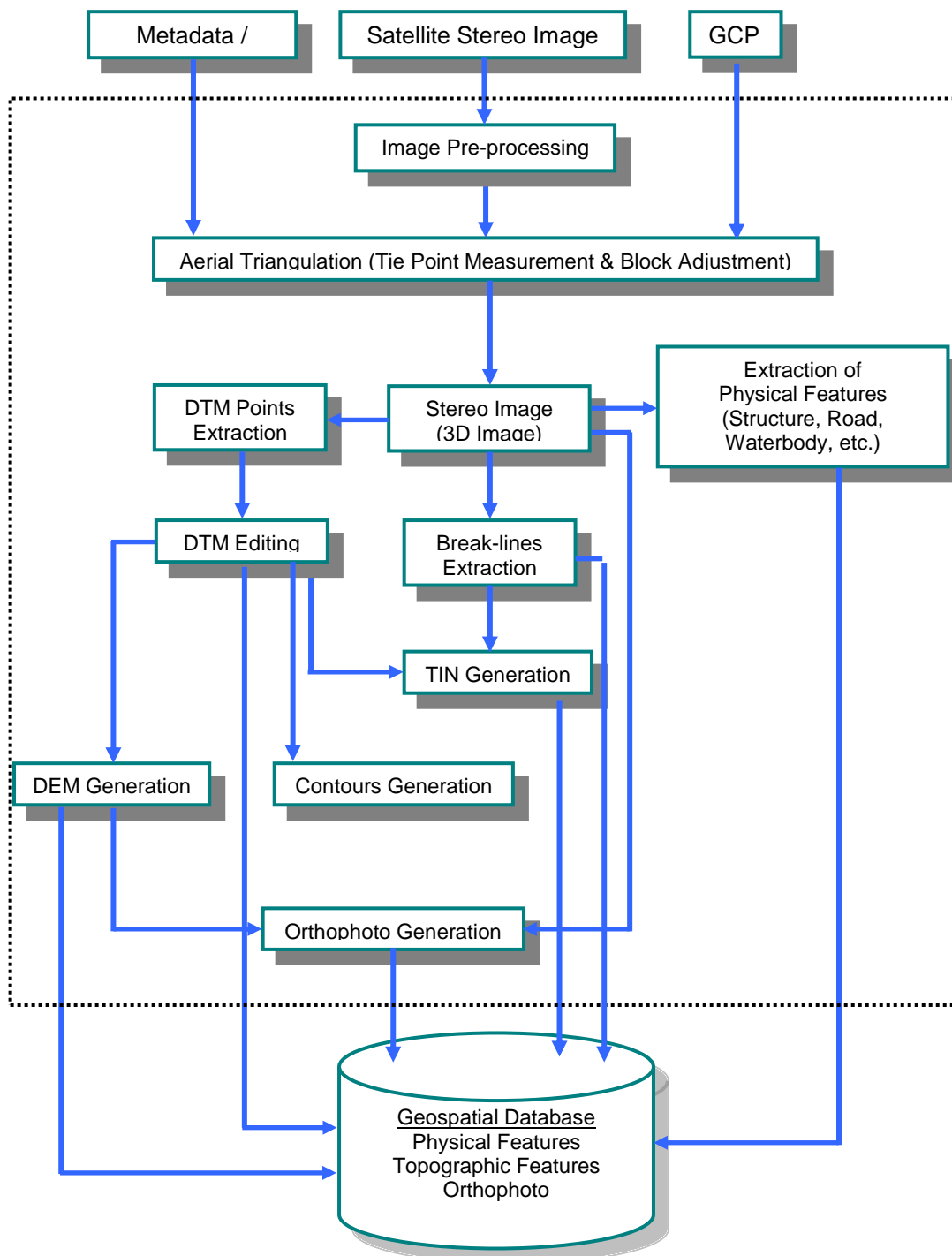


Figure-6.1: Workflow of Stereo Satellite Image Processing and Data Extraction

6.1.1 Image Collection

The satellite image was ordered to PCI India. The authorized reseller/partner of Airbus. 0.5 meter stereo pair image has been purchased by the Consultant for Shibpur. The specifications of the purchased satellite image are as below:

For **Town Area** of Shibpur Upazila:

Image Sensor : Airbus
Type : Ortho ready stereo (3D)
Resolution : 0.5m Panchromatic, 2.0 meter Multispectral
Source : New Acquisition, 10th February 2015
Total Area : 100 Sq. km.
Bit Rate : 16 Bit
Company : Airbus Defence and Space.

For **Rural Area** of Shibpur Upazila:

Image Sensor : Airbus
Type : Basic stereo (3D)
Resolution : 1.0m Panchromatic, 4.0 meter Multispectral
Source : New Acquisition, 10th February 2015
Total Area : 117.71 Sq. km.
Bit Rate : 16 Bit
Company : Airbus Defence and Space.

6.1.2 Image Pre-Processing

Satellite image came with two parts. One is multispectral band which resolution is 1.74 meter and another one is panchromatic which resolution is 0.5 meter. We need 0.5 meter multispectral image for feature extraction. After collecting raw digital images, the tasks involved in image processing are:

- Merge the image tile
- Color Balance
- Contrast Adjustment
- Pan-sharpening

6.1.2.1 Merge, Color Balance and Pan-Sharpen

Satellite image comes with lots of small segment which called image tile so that image can be sent by the provider on DVD media. To create an individual image all image tiles have been merged and thus an individual large image has been created.

Image tiles may vary in color and contrast. So during the merge process, color and contrast has been adjusted to get a color balanced image. **Figure-6.2** shows the satellite image tiles without color and contrast balance.

During the image capturing time, satellite captures two types of image, one in multispectral (RGB & NIR) image which is low resolution (2.0 meter) and another in high resolution (0.5 meter) panchromatic image. For feature extraction, 0.5 meter high resolution (0.5m) multispectral image is required. To have this 0.5 meter multispectral image, pan-sharpening tools have been used. This tool

produces a 0.5 meter multispectral image by combining 2.0 meter multispectral image and 0.5 meter panchromatic image. **Figure-6.3** shows the merged satellite image with color and contrast balance.

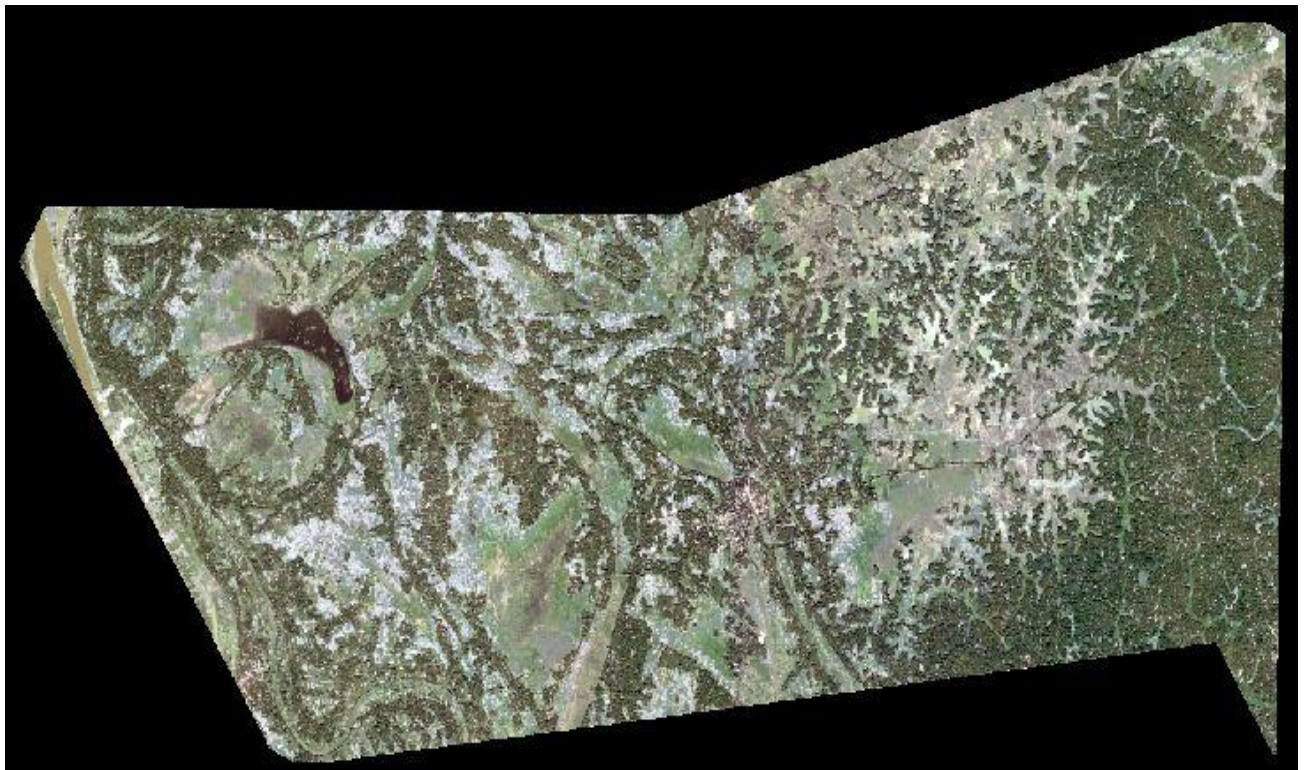


Figure-6.2: Tiles of satellite image without color and contrast balance

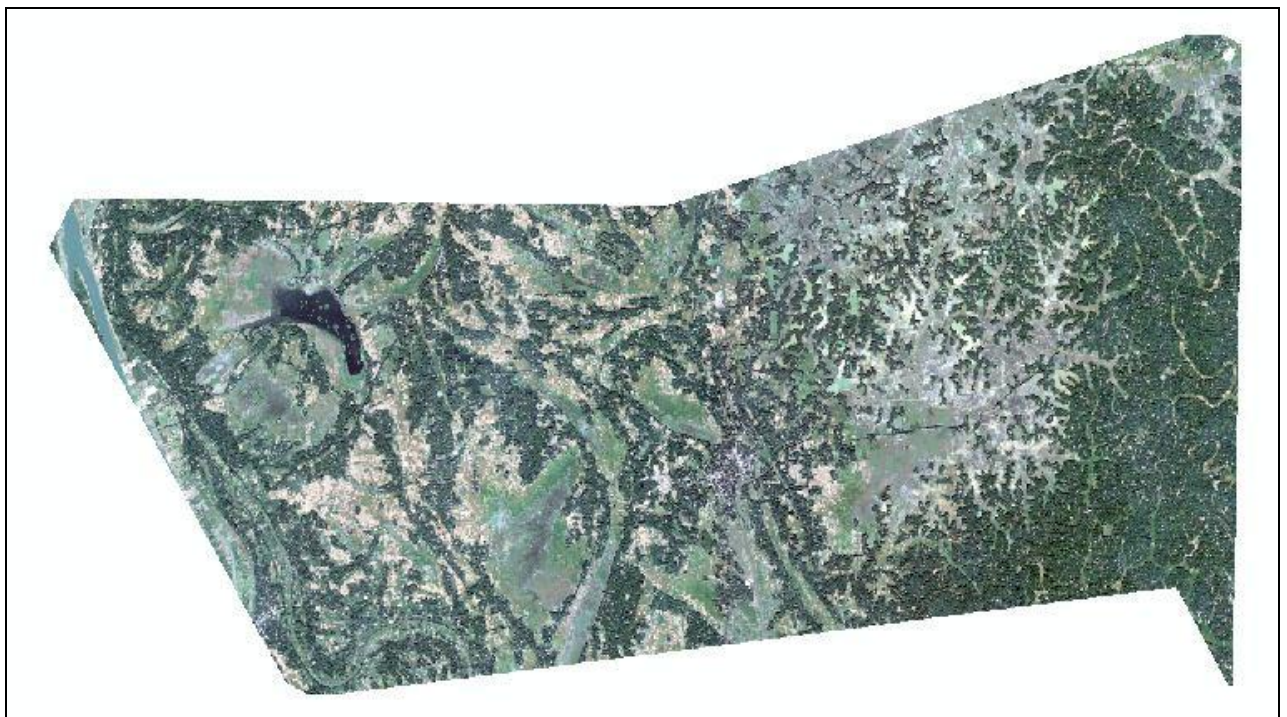


Figure-6.3: Merged satellite image with color and contrast balance



Figure-6.4: Satellite Image Multispectral Image 2.0 meter



Figure-6.5: Satellite Image Panchromatic 0.5 meter



Figure-6.6: Pan-sharpen Image - multispectral 0.5 meter

6.1.2.2 Bit Rate, Pyramid and Epi-polar Correction

Bit Rate: In general practice 8 bit images are used. Satellite image can capture 11 bit image. Since the purchased satellite image is in 16bit, it has been changed the 16 bit to 8 bit for radio matrix adjustment and better handling the image.

Pyramid: To efficiently view and pan the image, the pyramid of the image has been built. The DATEM Summit Evolution software has been used for image interpretation.

Epi-polar Correction: Epi-polar geometry is the geometry of stereo vision. When two cameras view a 3D scene from two distinct positions, there are a number of geometric relations between the 3D points and their projections onto the 2D images that lead to constraints between the image points. The 3D models have been created by using the Summit Evolution software.

6.1.3 GPS/INS Processing

Raw IMU (GPS/INS) data of image is processed and adjusted to accomplish Aerial Triangulation. In case of satellite image the RPC file is replaced the GPS/INS file.

6.1.4 Aerial Triangulation

Aerial Triangulation is a mathematical process used to determine the position and orientation of each photograph at the moment of exposure.

Table-6.1: Input-output in Aerial Triangulation

Input for AT		Output of AT
(6)	IMU data	Geo-referenced Stereo Model
(7)	GPS (on board)	
(8)	GCP (collected from field)	
(9)	Image	
(10)	RPC file	

The GCP and BM collected from SOB have been used for correcting the 3D satellite image coordinate using Inpho Match-AT software.

6.1.5 Digital Mapping (Feature Extraction) from Stereo Model

After the orientation of stereo models, digital mapping has been carried out. ArcGIS Geo-database model has been used for storing geo-spatial data. The Geo-database and its feature classes has been designed based on ToR.

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

Feature registration has been done considering and measuring the position of the object under its accuracy level. The Summit Evolution & Stereo Plotter of DAT/EM has been used for identifying and registration of the objects and ArcGIS 9.3 of ESRI has been used for vector data storing and editing.

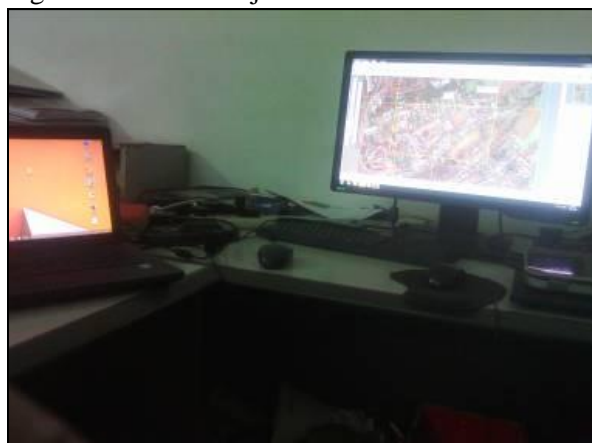


Plate-11: Digital Photogrammetric Workstation (DPW)

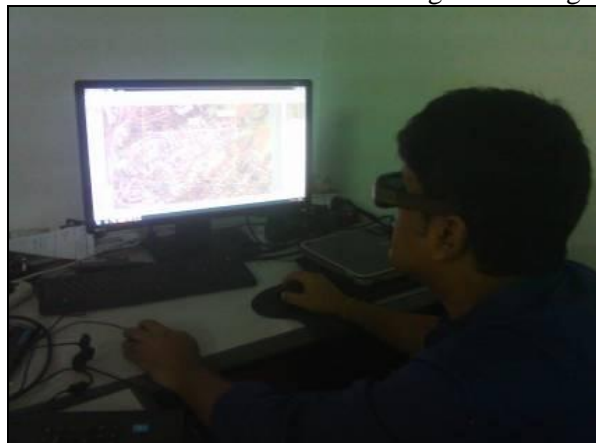


Plate-12: Photogrammetrist Extracting Features in DPW

A team of photogrammetrists has digitized Building roof with MSL height, bridge/culvert, road, khal, pond, lake, ditch, marsh/swam, river, etc. All features have been digitized in 3-dimension (X,Y,Z).

Figure-6.7 and **Figure-6.8** shows the extracted features of Shibpur Upazila at a glance.

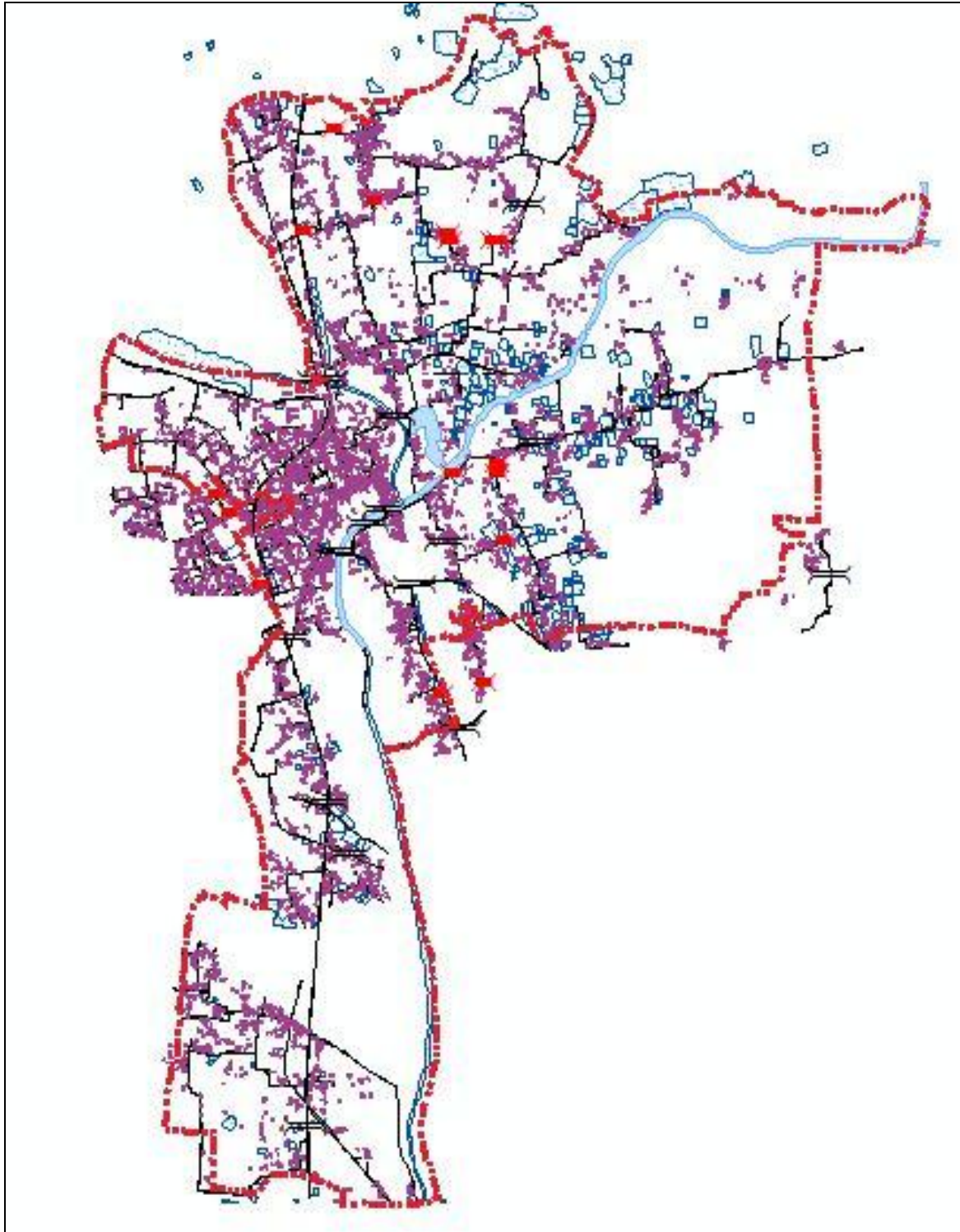


Figure-6.7: Extracted Features of Entire Shibpur Upazila by Photogrammetry

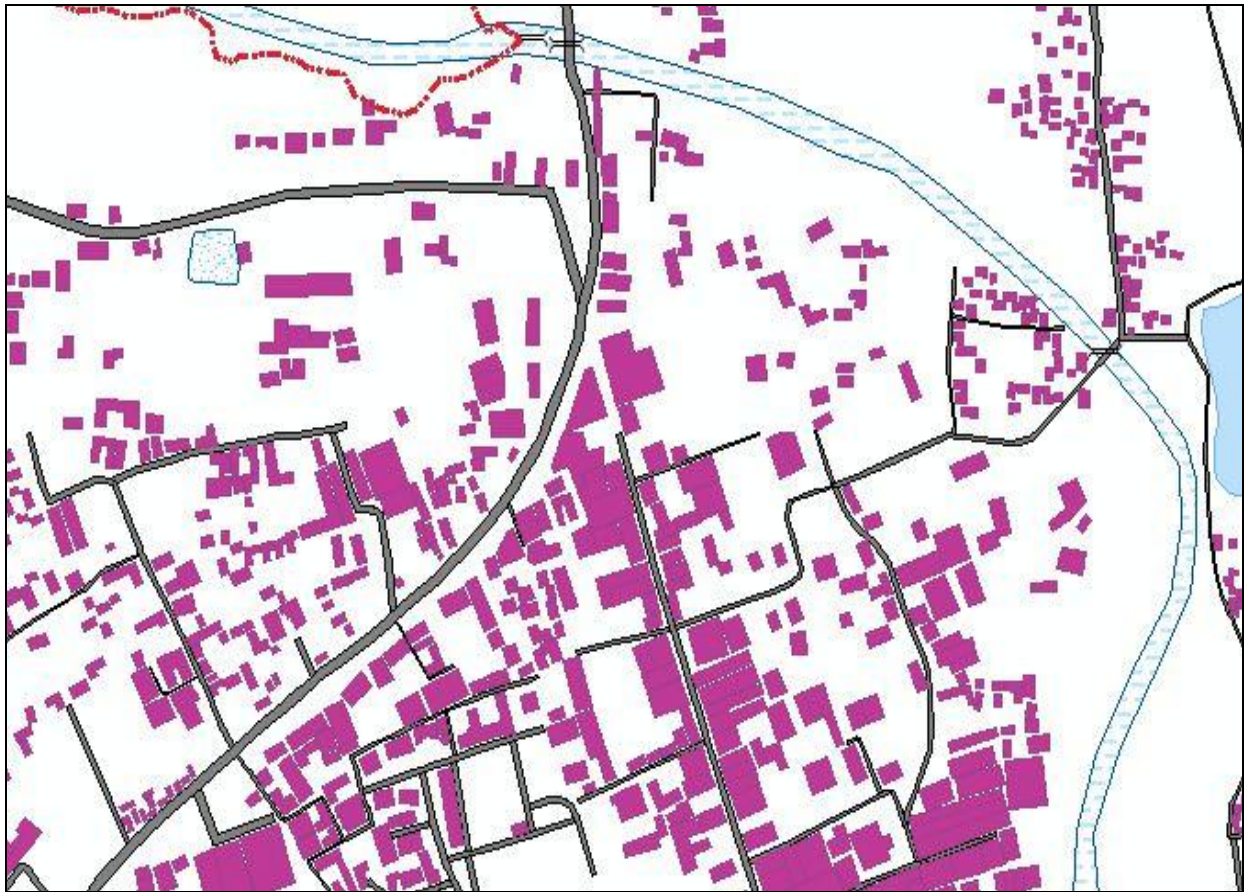


Figure-6.8: Enlarged Partial View of Extracted Features of Shibpur

For spot heights acquisition, firstly the DTM points have been generated automatically from stereo pair images by the software. Spot heights or land levels are extracted as DTM points at 10 m intervals for urban area and 20 m intervals for rural areas as described in the TOR. These automatically generated points have been then checked and edited by comparing them with stereo model in photogrammetric workstations. **Figure 6.9** shows the Digital Elevation Model of Shibpur Paurashava of Shibpur Upazila. **Figure 6.10** shows the Contour Lines partially of Shibpur paurashava of Shibpur Upazila.

The Break-lines have been created and edited after extraction of DTM Points.

The DTM Points and the Break-lines has been used later to create Triangulated Irregular Network (TIN), Digital Elevation Model (DEM) and the Contour Lines which is described in the Topographic Survey Report.

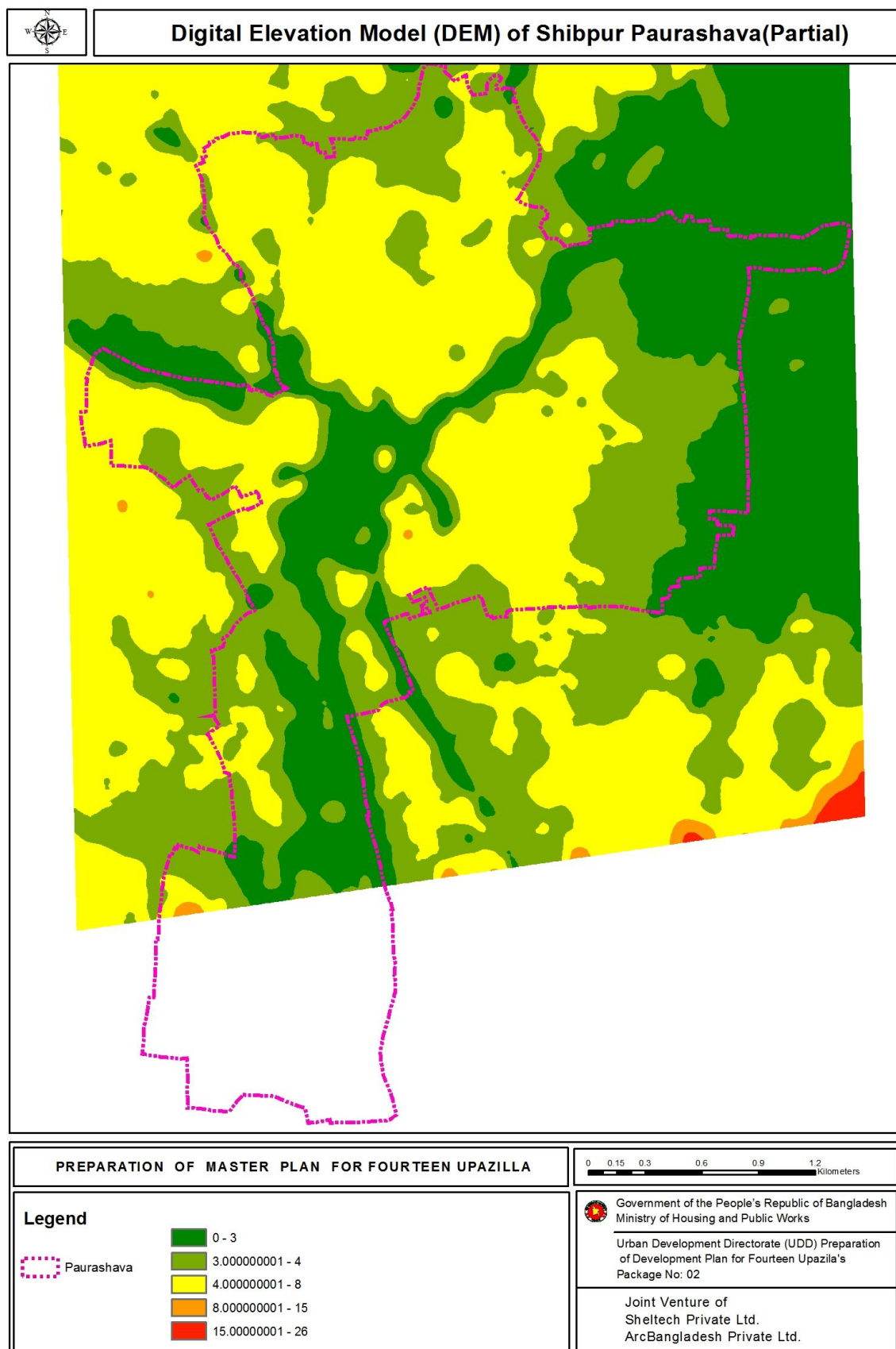


Figure-6.9: Digital Elevation Map (DEM) of Shibpur Paurashava (Partial)

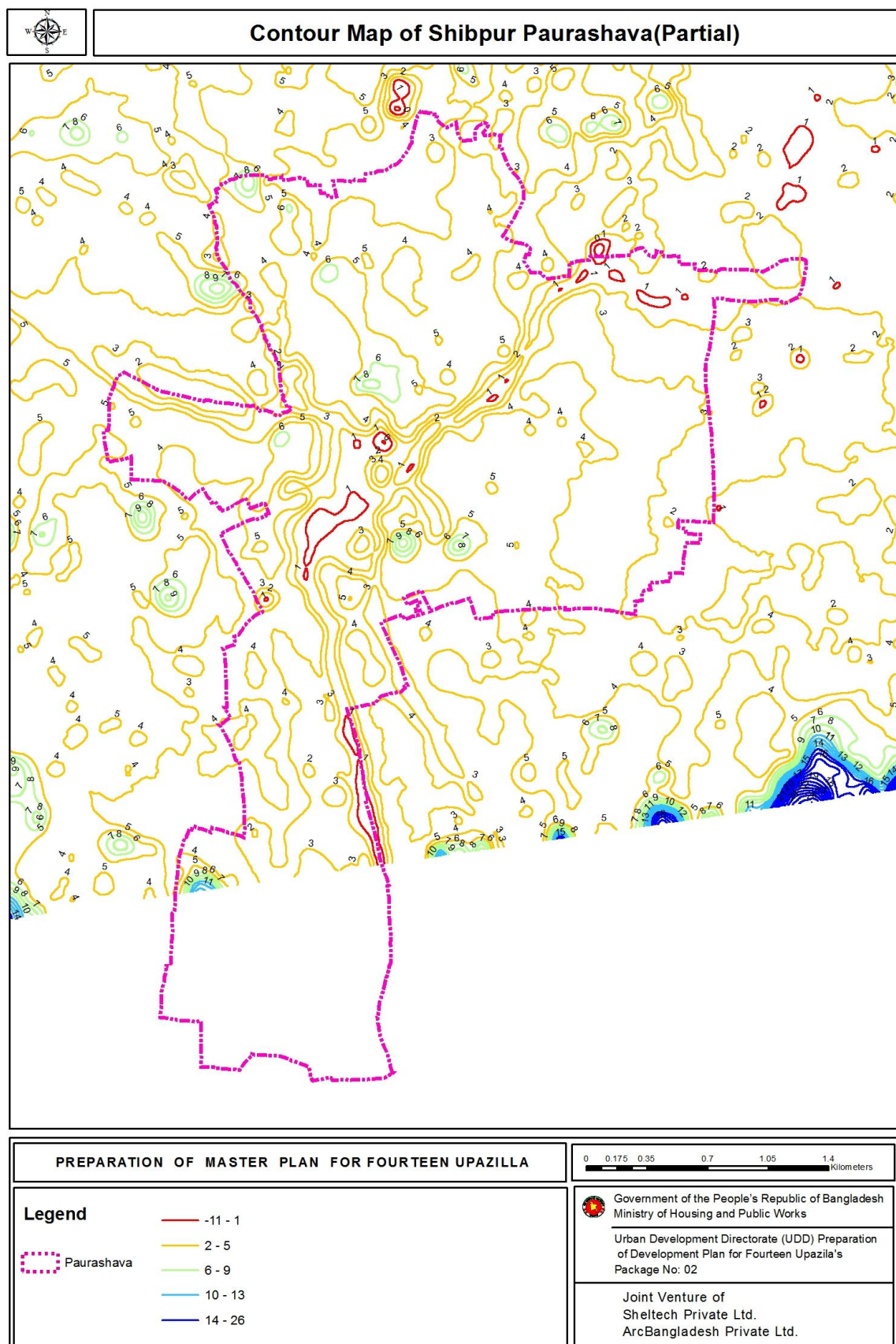


Figure-6.10: Contour Lines of Shibpur Paurashava (Partial)

6.1.6 Generation of Ortho-rectified Image

An ortho-rectified image or ortho-photo is an image which has been “corrected” for the geometric distortions (different projection, lens/sensor distortion, relief) so that it can be used as a map.

Using the DEM of the Upazila, the Ortho-rectified image has been created using photogrammetric software. Figure-2.20 shows a part ortho-rectified satellite image of Shibpur Upazila.



Figure-6.11: Ortho-Rectified Image of Shibpur Upazila (Partial)

Chapter-07

Conclusion

The land use features of Shibpur Upazila have been acquired through field survey based on high resolution stereo satellite imagery and RTK-GPS. The existing land use data acquired through land use survey and photogrammetry can play vital role for preparation of development plans of Shibpur Upazila. By using these data in planning phase, decisions can be made where different socioeconomic activities such as agriculture, housing, industry, recreation, and commerce should take place and which areas should be protected from development due to environmental, cultural, historical, or similar reasons.

The topographic features of Shibpur Upazila have been acquired mainly through photogrammetric method by using high resolution stereo satellite imagery. These data may be updated and fine-tuned by RTK-GPS based Total Station survey especially in the vegetated and clouded area.

Topographic surveyed data and the derived data such as DEM, Contours, TIN, etc. can play important roles in hydrological analysis (watershed, stream network analysis and flood analysis, etc.), erosion and land slide analysis. Thus topographic survey data can be used to find out the suitable attributes for future developmental activities in the study area.

ANNEXURES

ANNEXURE-I

RS Mouza List: Shibpur Upazila

ANNEXURE-I

RS Mouza List: Shibpur Upazila

District	Upazila	Mouza Name	JL No.	Sheet No.
Narsingdi	Shibpur	Char Lakhpur	1	1
		Lakhpur	2	1
		Alinagar	3	1
			3	2
			3	3
			3	4
		Alinagar	3	5
		Kazir Char	4	1
			4	2
		Brajerkandi	5	1
		Khupi	6	1
		Dosardi	7	1
		Uttar Sadhar Char	8	1
			8	2
		Miargaon	9	1
		Dattagaon	10	1
			10	2
			10	3
			10	4
			10	5
		Dulalpur	11	1
			11	2
		Chandibardi	12	1
		Manikdi	13	1
			13	2
		Nagar Maheshwardi	14	1
		Khurda Maheshwardi	15	1
		Nandirgaon	16	1
		Baherkhola	17	1
		Satpaika	18	1
			18	2
		Asatia	19	1
		Masimpur	20	1
		Paikardia	21	1
		Dhanua	22	1
			22	2
		Majlispur	23	1
		Purbergaon	24	1
		Abdul Khana	25	
		Sunandi (Saidargaon)	26	1

		Shibpur	27	1
		Baniadi	28	1
		Bandardia	29	1
			29	2
		Kharia	30	1
			30	2
		Sirarkanda	31	1
		Kaluarkandi	32	1
		Peti Palashi	33	1
		Maishadi	34	1
		Harihardi	35	1
		Madabdi	36	1
		Dakshin Sadhar Char	37	1
			37	2
		Saiderkhola	38	1
		Gobindi	39	1
		Sankardi	40	1
		Jawakandi	41	1
		Telia	42	1
		Kumaradi	43	1
			43	2
		Salurdia	44	1
		Munsefer Char	45	1
			45	2
		Char Pitambardi	46	1
		Karardi	47	1
			47	2
			47	3
		Uttar Karardi Char	48	
		Dakshin Karai Char	49	1
		Sujapur Char	50	1
		Gupta Para	51	1
		Bharaterkandi	52	1
		Kamargaon	53	1
			53	2
			53	3
		Ayerpur	54	1
		Bangsirdia	55	1
			55	2
			55	3
		Khaishakhali	56	1
		Dakshin Noadia	57	1
			57	2
		Trisha	58	1

		Chandandia	59	1
		Mollakanda	60	1
		Saspor	61	1
		Adgatia	62	1
		Gorargaon	63	1
		Ghasirdia	64	1
			64	2
		Baraialgi	65	1
			65	2
		Purundia	66	1
		Palpara	67	1
		Brahmandi	68	1
			68	2
			68	3
		Hamirdia	69	1
		Sapharia	70	1
		Bahirdia	71	1
		Baghaba	72	1
		Panchpaika	73	1
		Arali	74	1
			74	2
		Bilsaran	75	1
			75	2
		Ghusu	76	1
		Bara Asrafpur	77	1
		Bangal Satpara	78	1
		Lakurshichhapa	79	1
		Satpara	80	1
		Baraigaon	81	1
		Chandal Banda (Sonakora)	82	
		Bailaba	83	1
			83	2
			83	3
			83	4
		Ningaon	84	1
		Ashtani	85	1
		Astani	85	2
			85	3
		Kamraba	86	1
			86	2
			86	3
			86	4
		Sujatpur	87	1
			87	2

		Maishartek	88	1
		Gilaber	89	1
		Ajkitala	90	1
		Pahar Jaynagar	91	1
			91	2
			91	3
		Chhutaband	92	1
		Naoghata	93	1
		Birajnagar	94	1
			94	2
		Joymangal	95	1
			95	2
			95	3
		Paschim Gobindapur	96	1
		Akhrasal	97	1
		Nawala	98	1
		Bangpur	99	1
		Sreephalia	100	1
			100	2
		Kunder Para	101	1
		Chaupat	102	1
		Lampur	103	1
		Chandpasha	104	1
		Bil Ichhamati	105	1
		Itna	106	1
		Khainkut	107	1
		Bhiti Khainkut	108	2
		Agarpur	109	1
		Sreeshtighar	110	1
			110	2
		Josar	111	1
			111	2
			111	3
		Nandertek	112	1
		Paharfuldi	113	1
		Kaziara	114	1
		Machhimnagar	115	
		Letarba	116	1
		Sreerampur	117	1
		Maliara	118	1
		Kamalpur	119	
		Ranitani	120	1
		Saikarchar	121	1

ANNEXURE- II
Technical Specifications of GIS Data

ANNEXURE-II

TECHNICAL SPECIFICATIONS OF GIS DATA

This document contains the technical specifications for the development of GIS database. It has two sections: Section-A and Section-B. Specifications for mauza map scanning and digitization have been provided in Section-A and specifications of GIS layers for preparing Survey and Plan Maps have been provided in Section-B.

Section-A: Specifications for Mauza Map Scanning & Digitization

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

A.1.0 Specifications for Mauza Map Scanning

The scanning specification of mauza maps specifies Image Type, Image Format and Image Resolution and Image scale as follows:

Image Type	Color or Grayscale
Image Format	JPEG
Image Resolution	300 dpi

A.1.1 Directory Structure for Storing Scanned Mauza Maps

Directory Structure for systematically storing scanned image files of the Mauza maps may be as follows:

Directory Structure	<p>D:\GIS_Data\Project name & Package \ Division name\District name\Upazila name(Data Type)\Union name or Ward No</p> <p>Where,</p> <ul style="list-style-type: none"> - D:\GIS_Data is the root folder of the UDD's GIS database. - \Project name is the abbreviated name of the Project such as Pkg-2_14Upazila may be the abbreviated name of the project "Preparation of the Development Plan for Fourteen Upazila – Package-02". - \Division name is the name of the Division in which the project area located. - \District name is the name of the District in which the project area located. - \Upazila name is the name of the Upazila in which the project area located. - \Data_Type is the type of GIS data such as Scanned Mauza Maps, Georeferenced Raster Mauza Maps, Survey Data, Proposed Plan Data, etc. - \Union_name is the different name of the Unions of the respective Upazila or Ward number of the Paurashava. <p>Example</p> <p>D:\GIS_Data_UDD\Pkg-2_14Upazila\Dhaka.div\Narsingdi.dis\Shibpur.upz\Scanned_Mauza\.uni\Masimpur_Union is the directory to store the scanned Mauza maps of Masimpur_Union of Shibpur Upazila.</p>
---------------------	--

A.1.2 File Naming Convention for Scanned Mauza Maps

A systematic naming convention must be followed to name the files of the scanned images of the mauza maps.

File Name: **Mauza Name+_+JL no+_+Sheet No.jpg**

Where,

- **Mauza Name** is the name of the Mauza. No space or special character is allowed, underscore must be used in case of more than one word in the name.
- **JL no** is the Jurisdiction Line/List number (JL no) of the Mauza. It must be as 3 digit number
- **Sheet No** is the particular sheet number of the Mauza. It must be as 3 digit number

Example:

Mauza Name	JL No	Sheet No	File Name
Dulalpur	3	5	Dulalpur_011_001.jpg

A.2.0 Specifications for Mauza Maps Digitization

The specifications for digitization of mauza maps specifies the settings for map and display unit, scale or zoom level and vertex spacing during the process of on-screen digitization.

Map Unit	Inch
Display Unit	Inch
Scale (zoom level)	1: 15 to 30
No of vertices on linear or polygon feature	<ul style="list-style-type: none"> - Only 2 vertices along a straight line (or a straight segment of the feature) - Extra vertices are not allowed between Start and End point. - Sufficiently dense vertices must be used for curved/complex linear feature. - Vertex must be inserted at the junction of plot boundaries.
Coordinate System	Unknown (produced by scanning process)

A.2.1 Vector Layers for Mauza Map Digitization

Digitization of Mauza map must be done in five vector layers as the format of Shapefile, Coverage or Geodatabase Featureclass. The Geodatabase is preferable.

Features of the Mauza Map	Type of Layer	Name of Layer (as Shapefile/Covergae/Featureclass)
All line features, such as plot boundary, road, waterbody, building, etc.	Polyline	ML_XXX_XXX Where, - ML represents Mauza map's Line features. - XXX represents the JL number of the Mauza map (3 digit). - XXX represents the Sheet number of the Mauza map (3 digit).
Dag number (Plot no)	Point	PN_XXX_XXX Where, - PN represents Plot Number of the Mauza map. - XXX represents the JL number of the Mauza map (3 digit). - XXX represents the Sheet number of the Mauza map (3 digit).
Plot area	Polygon	MP_XXX_XXX Where, - MP represents Mauza map as Polygon (area) features. - XXX represents the JL number of the Mauza map (3 digit). - XXX represents the Sheet number of the Mauza map (3 digit).
Point features (except plot no)	Point	PF_XXX_XXX Where, - PF represents Point Features of the Mauza map except plot numbers. - XXX represents the JL number of the Mauza map (3 digit). - XXX represents the Sheet number of the Mauza map (3 digit).
Other area features	Polygon	AF_XXX_XXX Where, - AF represents other Area Features of the Mauza map - XXX represents the JL number of the Mauza map (3 digit). - XXX represents the Sheet number of the Mauza map (3 digit).

A.2.2 Attribute Structure of the Mauza Map Layers

Attribute structure of the above four layers must be as follows:

1) Layer name: **PN_XXX_XXX**

Feature Type: **Point**

This Layer will contain dag number (plot number) of the Mauza maps as point features. It must contain the fields as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Division	String	25	To contain name of the current Division.
District	String	25	To contain name of the current District.
Upazila	String	25	To contain name of the current Upazila.
Union	String	25	To contain name of the current Union.
Mauza	String	100	To contain name of the Mauza name
JL_No	String	6	To contain JL Number of the Mauza
Sheet_No	String	6	To contain sheet no the Mauza
Mauza_JL_S	String	100	To contain Mauza name+single space+JLno(3-digits)+single space+sheet no(3-digits)
Plot_No	Long Integer	10	To contain <i>dag</i> number (plot number)
Plot_Type	String	20	To contain following plot types <ul style="list-style-type: none"> - "Plot" - "Katcha Road" - "Semi-Pucca Road" - "Pucca Road" - "Halot" - "Pond" - "Canal" - "River"
Scale	String	20	To contain scale of the Mauza sheet; e.g. "16 inch = 1 mile" or "32 inch = 1 mile", etc.
MZ_Version	String	20	To contain survey version of the Mauza map; e.g. CS, RS, BS, etc.
Revenue_No	String	100	To contain revenue number of the Mauza map.
SV_Period	String	20	To contain survey period of the Mauza map; e.g 1973-85
M_Geocode	String	9	To contain 9-digit BBS Geocode of Mauza as District code+Thana code+Union/Ward code+Mauza code.
UW_Geocode	String	6	To contain 6-digit BBS Geocode of Union or Ward as District code+Thana code+Union/Ward code
Remarks	String	100	To contain remarks, if any.

2) Layer name: **ML_XXX_XXX**
Feature Type: **Polyline**

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

Field Name	Field Type	Width of the field	Purpose of the field
Division	String	25	To contain name of the current Division.
District	String	25	To contain name of the current District.
Upazila	String	25	To contain name of the current Upazila.
Union	String	25	To contain name of the current Union.
Mauza	String	100	To contain name of the Mauza name
JL_No	String	6	To contain JL Number of the Mauza
Sheet_No	String	6	To contain sheet no the Mauza
Mauza_JL_S	String	100	To contain Mauza name+single space+JLno(3-digits)+single space+sheet no(3-digits)
Scale	String	20	To contain scale of the Mauza sheet; e.g. "16 inch = 1 mile" or "32 inch = 1 mile", etc.
MZ_Version	String	20	To contain survey version of the Mauza map; e.g. CS, RS, BS, etc.
Revenue_No	String	100	To contain revenue number of the Mauza map
SV_Period	String	20	To contain survey period of the Mauza map; e.g 1973-85
Line_Code	Short Integer	10	To contain feature code or unique ID of different line feature. For example 11, 12 and 14 are the codes for Mauza boundary, Sheet boundary and Plot boundary respectively.
Line_Desc	String	30	To contain the type of plot boundaries and other line features such as <ul style="list-style-type: none"> - "Mauza boundary" - "Sheet boundary" - "Plot boundary" - "Katcha Road" - "Semi-Pucca Road" - "Pucca Road" - "Halot" - "Khal" - "Thoka/ Position mark of adjacent sheet" - "North line" - "Other line"
Remarks	String	100	To contain remarks, if any.

3) Layername: **MP_XXX_XXX**

Feature Type: **Polygon**

This Layer will contain all the plots of the Mauza maps as area or polygon features. It must contain the fields as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Division	String	25	To contain name of the current Division.
District	String	25	To contain name of the current District.
Upazila	String	25	To contain name of the current Upazila.
Union	String	25	To contain name of the current Union.
Mauza	String	100	To contain name of the Mauza name
JL_No	String	6	To contain JL Number of the Mauza
Sheet_No	String	6	To contain sheet no the Mauza
Mauza_JL_S	String	100	To contain Mauza name+single space+JLno(3-digits)+single space+sheet no(3-digits)
Plot_No	Long Integer	10	To contain <i>dag</i> number (plot number)
Plot_Type	String	20	To contain following plot types <ul style="list-style-type: none"> - “Plot” - “Katcha Road” - “Semi-Pucca Road” - “Pucca Road” - “Halot” - “Pond” - “Canal” - “River”
Scale	String	20	To contain scale of the Mauza sheet; e.g. “16 inch = 1 mile” or “32 inch = 1 mile”, etc.
MZ_Version	String	20	To contain survey version of the Mauza map; e.g. CS, RS, BS, etc.
Revenue_No	String	100	To contain revenue number of the Mauza map.
SV_Period	String	20	To contain survey period of the Mauza map; e.g 1973-85
M_Geocode	String	9	To contain 9-digit BBS Geocode of Mauza as District code+Thana code+Union/Ward code+Mauza code.
UW_Geocode	String	6	To contain 6-digit BBS Geocode of Union or Ward as District code+Thana code+Union/Ward code
Remarks	String	100	To contain remarks, if any.

4) Layer name: PF_XXX_XXX

Feature Type: **Point**

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

Field Name	Field Type	Width of the field	Purpose of the field
Division	String	25	To contain name of the current Division.
District	String	25	To contain name of the current District.
Upazila	String	25	To contain name of the current Upazila.
Union	String	25	To contain name of the current Union.
Mauza	String	100	To contain name of the Mauza name
JL_No	String	6	To contain JL Number of the Mauza
Sheet_No	String	6	To contain sheet no the Mauza
Mauza_JL_S	String	100	To contain Mauza name+single space+JLno(3-digits)+single space+sheet no(3-digits)
Scale	String	20	To contain scale of the Mauza sheet; e.g. “16 inch = 1 mile” or “32 inch = 1 mile”, etc.
MZ_Version	String	20	To contain survey version of the Mauza map; e.g. CS, RS, BS, etc.
Revenue_No	String	100	To contain revenue number of the Mauza map.
SV_Period	String	20	To contain survey period of the Mauza map; e.g 1973-85
Point_Code	String	6	To contain the user ID of different point features. For example: 45 is the ID of Traverse Station (New)
Point_Desc	String	50	To contain Point description of point features such as - “Traverse Station [Old]” - “Traverse Station [New]” - GT Station, etc. And also to contain texts of label features of adjacent mauza map such as “Sheet No. 2”, “Shaktola No. 101”, etc.
Remarks	String	100	To contain remarks, if any.

5) Layername: AF_XXX_XXX

Feature Type: **Polygon**

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

Field Name	Field Type	Field Width	Purpose of the field
Division	String	25	To contain name of the current Division.
District	String	25	To contain name of the current District.
Upazila	String	25	To contain name of the current Upazila.
Union	String	25	To contain name of the current Union.
Mauza	String	100	To contain name of the Mauza name
JL_No	String	6	To contain JL Number of the Mauza
Sheet_No	String	6	To contain sheet no the Mauza
Mauza_JL_S	String	100	To contain Mauza name+single space+JLno(3-digits)+single space+sheet no(3-digits)
Scale	String	20	To contain scale of the Mauza sheet; e.g. “16 inch = 1 mile” or “32 inch = 1 mile”, etc.
MZ_Version	String	20	To contain survey version of the Mauza map; e.g. CS, RS, BS, etc.
Revenue_No	String	100	To contain revenue number of the Mauza map.
SV_Period	String	20	To contain survey period of the Mauza map; e.g 1973-85
AF_Code	Long Integer	6	To contain the user ID of different polygon features. For example: 31 is the ID of Permanent Structure (Dalan), 32 is for Tinshed Structure, etc.
AF_Desc	String	50	To contain type of features such as - “Permanent Structure [Dalan]” - “Tinshed Structure” - “Other Structure” - “Pond/Waterbody” - “Pan Baraz” - “Graveyard”
Remarks	String	100	To contain remarks, if any.

A.2.3 Feature Codes for Mauza Map Digitization

The following feature codes (Unique ID) must be assigned in appropriate fields for digitization of different features of the mauza maps.

Feature Type/Item	Layer Name	Feature Code (ID)
International Boundary	ML_XXX_XXX	10
Division Boundary		11
District Boundary		12
Upazila Boundary		13
Union Boundary		14
Mauza Boundary		15
Sheet Boundary		16
Plot Boundary		17
Thoka/Adjacent\Match Line		18
Embankment		19
Hill		20
Road		21
Halot		22
Khal (Canal)		23
River		24
Rail Line		25
Slope		26
North Line		27
Pucca Road		28
Semi-Pucca Road		29
Katcha Road		30
Unknown Line		99
Permanent Structure [Dalan]	AF_XXX_XXX	31
Tin Shed Structure		32
Other Structure		33
Pan Baraz		34
Pond/Water Body		35
Graveyard		36
Missing or not readable plot number	PN_XXX_XXX	99999
Boundary Pillar	PF_XXX_XXX	41
Bench Mark		42
Iron Pillar		43
Traverse Station(Old)		44
Traverse Station (New)		45
GT Station		46
Other Pillars		47
Pucca Well		51
Tube Well		52
Mosque		53
Temple		54
Adjacent Mauza/Sheet		61
Otier Info		62
Demarcation Pillar		71
Settlement Pillar		72

Feature Type/Item	Layer Name	Feature Code (ID)
Stone		73
Station		74
Pucca Pillar		75
Municipality Pillar		76
CS Iron Pillar		77
Other Point Feature		88
Plot Boundary	ML_XXX_XXX	14
Katcha Road		30
Semi-Pucca Road		29
Pucca Road		28
Halot		22
Pond		14
Canal		23
River		24

Section-B: Specifications for the Layers of Survey and Plan Maps

This section contains the specifications of all physical features, topographical features and proposed plan features. It specifies the name of the spatial layers and the structure of their attribute tables.

B.1.0 File Naming Convention for GIS Layers

A systematic naming convention must be followed to name the layers of the physical, topographical plan features. The name is defined by abbreviated name of the layer with the geocode of the Division+District+upazila (UDD Upazila Master Plan 14 Upazila's) in the following tables:

Sl. No.	Division Name	Division Code	District Name	District Code	Upazila Name	Upazila Code
1	Dhaka	30	Dhaka	26	Nawabganj	62
2	Dhaka		Dhaka	26	Dohar	18
3	Chittagon g	20	Chittagong	15	Rangunia	70
4	Chittagon g	20	Cox bazar	22	Ramu	66
5	Rajshahi	50	Rajshahi	81	Bagmara	12
6	Dhaka	30	Faridpur	29	Faridpur Sadar	47
7	Dhaka		Mymensingh	61	Ishwarganj	31
8	Dhaka		Madaripur	54	Shibchar	87
9	Dhaka		Narsingdi	68	Shibpur	76
10	Dhaka		Narsingdi	68	Raipura	64
11	Rajshahi	50	Bogra	10	Sariakandi	81
12	Rajshahi		Bogra	10	Sonatala	95
13	Rangpur	55	Gaibanda	32	Saghata	88
14	Khulna	40	Meherpur	57	Gangni	47

File Name: **Layer Name+Division+District+Upazila Geocode will be added with Layer Name such as ADBL306864.**

Where,

- **Layer Name** is the abbreviated name of the layer. No space or special character is allowed.
- **Division Geocode** is the 2-digit BBS Geocode of the Division; eg. Geocode of Dhaka is 30.
- **District Geocode** is the 2-digit BBS Geocode of the Dhaka; eg. Geocode of Narsingdi is 68.
- **Upazila Geocode** is the 2-digit BBS Geocode of the upazila; eg. Geocode of Raipura Upazila is 64.

Example:

Layer Description	Layer name
Administrative Boundary as line features	ADBL306864
Plots of Merged Mauza maps as polygon features	MMP306864
Plots of Merged Mauza maps as polyline features	MML306864
Plot Numbers of Merged Mauza maps as polyline features	MMN306864
Structures within the project area	STR306864
Existing Roads of the project area as polygon features	RDP306864
Existing Roads of the project area as polyline features	RDL306864
Centerlines of Existing Roads as polyline features	RDCL306864
Footpaths in the project area as polygon features	RDFP306864
Road Islands in the project area as polygon features	RDIL306864
Waterbodies in the project area as polygon features	WBD306864
Embankments in the project area as polygon features	EMB306864
DTM points (Spot Heights) on the project area as point features	DTM306864
BM pillars established in the project area as point features	BM306864

Contour lines of the project area as polyline features	CON306864
Existing Land use of the project area as polygon features	ELU306864
Rural Homestead areas of the project area as polygon features	HOM306864
Bridge, Culvert, etc. of the project area as polygon features	BRG306864
Bridge, Culvert, etc. of the project area as polyline features	BRGL306864
Bridge, Culvert, etc. of the project area as point features	BRGP306864
Existing Drains of the project area as polyline features	DRN306864
Boundary of the project area as polyline features	BW306864
Water Supply pipe lines of the project area as polyline features	WSL306864
Overhead Tanks in the project area as point features	OHT306864
High voltage Electric Supply Lines in the project area as polyline features	ESL306864
Utilities in the project area as point features	UTL306864
Sewerage network lines in the project area as polyline features	SEW306864
Other Polygon features of the project area as polygon features	OP306864
All other Point features of the project area as point features	AP306864
Important names of locations or structures of the project area as point features	NAM306864
Important Road Names in the project area as Annotation/Polyline features	RN306864
Centerlines of Proposed Roads in the project area as polyline features	PRL306864
Union/Ward derived by dissolving merged mauza for Population mapping	POP306864
Proposed policy (Structure Plan) of the project area as polygon features	STP306864

B.1.1 Attribute Structure of the Layers

Attribute structure of the above layers must be as follows:

1) Layer name: **ADBL306864**

Feature Type: **Polyline**

This Layer will contain administrative boundaries of project area. It must contain the fields as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Line_Code	Long Integer	10	To Contain Polyline ID
Type	String	100	To contain the following administrative boundaries “International Boundary” “Division Boundary” “District Boundary” “Upazila Boundary” “Paurashava Boundary” “Union Boundary” “Ward Boundary” “Mauza Boundary” “Sheet Boundary” “Plot Boundary” “Katcha Road” “Semi-Pucca Road” “Pucca Road” “Halot” “Pond” “Canal” “River”

2) Layer name: **MMP306864**

Feature Type: **Polygon**

This Layer will contain plots of edge-matched and merged Mauza maps of project area as polygon features. It must contain the fields as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Division	String	25	To contain name of the current Division.
District	String	25	To contain name of the current District.
Upazila	String	25	To contain name of the current Upazila.
Paurashava	String	25	To contain name of the Paurashava.
Union_Ward	String	25	To contain name of the current Union or Ward No.
Mauza	String	100	To contain name of the Mauza name
JL_No	String	6	To contain JL Number of the Mauza
Sheet_No	String	6	To contain sheet no the Mauza
Mauza_JL_S	String	100	To contain Mauza name+single space+JLno(3-digits)+single space+sheet no(3-digits)
Plot_No	Long Integer	10	To contain <i>dag</i> number (plot number)
Plot_Type	String	20	To contain following plot types <ul style="list-style-type: none"> - “Plot” - “Katcha Road” - “Semi-Pucca Road” - “Pucca Road” - “Halot” - “Pond” - “Canal” - “River”
Scale	String	20	To contain scale of the Mauza sheet; e.g. “16 inch = 1 mile” or “32 inch = 1 mile”, etc.
MZ_Version	String	20	To contain survey version of the Mauza map; e.g. CS, RS, BS, etc.
Revenue_No	String	100	To contain revenue number of the Mauza map.
SV_Period	String	20	To contain survey period of the Mauza map; e.g 1973-85
M_Geocode	String	9	To contain 9-digit BBS Geocode of Mauza as District code+Thana code+Union/Ward code+Mauza code.
UW_Geocode	String	6	To contain 6-digit BBS Geocode of Union or Ward as District code+Thana code+Union/Ward code
Land_use	string	50	To contain existing land use as <ul style="list-style-type: none"> - “Administrative” - “Agriculture” - “Commercial” - “Circulation Network” - “Institutional” - “Flood Flow Zone” - “Industrial” - “Mixed Use” - “Recreational” - “Restricted / Special Use” - “Socio-Cultural” - “Transport & Communication”

Field Name	Field Type	Width of the field	Purpose of the field
			<ul style="list-style-type: none"> - "Urban Residential" - "Urban Services" - "Vacant Land" - "Water Body"
Single_Crop	string	50	To contain the single crop land
Double_Crop	string	50	To contain the double crop land
Triple_Crop	string	50	To contain triple crop land
Remarks	String	100	To contain remarks, if any.

3) Layer name: **MML306864**

Feature Type: **Polyline**

This Layer will contain line features of edge-matched and merged Mauza maps of project area as polyline features. It must contain the fields as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
ID	Long Integer	16	To Contain Mauza polyline ID.
Type	String	20	<ul style="list-style-type: none"> "Plot Boundary" "Sheet Boundary" "Mauza Boundary" "Katcha Road" "Semi-Pucca Road" "Pucca Road" "Halot" "Pond" "Canal" "River"
Remarks	String	100	To contain remarks, if any.

4) Layer name: MMN306864

Feature Type: **Point**

This layer will contain Plot numbers of edge-matched and merged Mauza maps of project area as point features. It must contain the fields as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Division	String	25	To contain name of the current Division.
District	String	25	To contain name of the current District.
Upazila	String	25	To contain name of the current Upazila.
Paurashava	String	25	To contain name of the Paurashava.
Union_Ward	String	25	To contain name of the current Union or Ward No.
Mauza	String	100	To contain name of the Mauza name
JL_No	String	6	To contain JL Number of the Mauza
Sheet_No	String	6	To contain sheet no the Mauza
Mauza_JL_S	String	100	To contain Mauza name+single space+JLno(3-digits)+single space+sheet no(3-digits)
Plot_No	Long Integer	10	To contain <i>dag</i> number (plot number)
Plot_Type	String	20	To contain following plot types <ul style="list-style-type: none"> - “Plot” - “Katcha Road” - “Semi-Pucca Road” - “Pucca Road” - “Halot” - “Pond” - “Canal” - “River”
Scale	String	20	To contain scale of the Mauza sheet; e.g. “16 inch = 1 mile” or “32 inch = 1 mile”, etc.
MZ_Version	String	20	To contain survey version of the Mauza map; e.g. CS, RS, BS, etc.
Revenue_No	String	100	To contain revenue number of the Mauza map.
SV_Period	String	20	To contain survey period of the Mauza map; e.g 1973-85
M_Geocode	String	9	To contain 9-digit BBS Geocode of Mauza as District code+Thana code+Union/Ward code+Mauza code.
UW_Geocode	String	6	To contain 6-digit BBS Geocode of Union or Ward as District code+Thana code+Union/Ward code
Remarks	String	100	To contain remarks, if any.

5) Layer name: STR306864
Feature Type: Polygon

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

Field Name	Field Type	Width of the field	Purpose of the field
Division	String	25	To contain name of the current Division.
District	String	25	To contain name of the current District.
Upazila	String	25	To contain name of the current Upazila
Pourashava			To contain name of Paurashava.
Union_Ward	String	25	To contain name of the current Union\Ward.
ID	Long Integer	16	To Contain Structure ID.
Plot_No	Long Integer	10	To Contain the plot No.
Area_Sqft	Double	0	To Contain Structure area in square feet.
Str_Type	String	20	To contain the type of the structure as follows - “Pucca” - “Semi-pucca” - “Katcha”
Storied	Short Integer	-	To contain the number of floors of the structure.
Str_Use1t	String	100	1. To contain the use (1 st) of the structure. 2. The attributes should be according to the given “Existing_Landuse” categories.
Str_Use2t	String	100	To contain the use (2 nd) of the structure.
Str_Use3t	String	100	To contain the use (3 rd) of the structure.
Str_name	String	100	To contain the name of the structure.
Cons_Year	Short Integer	-	To contain the year of construction.
Undercons	String	3	To contain the information if it was being under construction during the feature survey. - Yes/No ; True/False ; 1/0
Struc_Owner	String	100	To contain the owner name of the structure.
Owner_Cell	String	100	To contain the owner Cell No. of the structure.
Struc_Use	String	100	To contain the structure use of the Government or private and so on.
Hyperlink	String	100	To contain the picture of the structure.
Holding_no	String	50	To contain Holding number of the structure.
Road_ID	String	50	To contain adjacent road number, It must be follow of the Road Categories.
Road_name	String	100	To contain the name of the nearby road
Locality	String	50	To contain the name of the location.

6) Layer name: RDP306864

Feature Type: **Polygon**

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

Field Name	Field Type	Width of the field	Purpose of the field
Road_name	string	100	To contain the name of the road, if any
Road_ID	string	20	To contain the ID of Road
Road_type	string	20	To contain the physical type of the road as follows - "Pucca" - "HBB" - "Katcha"
Road_Class	string	100	To contain the Class of road according to RHD & LGED in the followings: RHD Road Class - "National Highways" - "Regional Highways" - "District/Zila Road" LGED Road Class - "Upazila Road(Pucca)" - "Upazila Road(Katcha)" - "Union Road(Pucca)" - "Union Road(Katcha)" - "Village Road A (Pucca)" - "Village Road A (Katcha)" - "Village Road B (Pucca)" - "Village Road B (Katcha)"

7) Layer name: **RDL306864**

Feature Type: **Polyline**

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

Field Name	Field Type	Width of the field	Purpose of the field			
Road_name	string	100	To contain the name of the road, if any			
Road_ID	string	20	To contain the ID of Road			
Road_Type	string	20	To contain the physical type of the road as follows - “Pucca” - “WBM” - “HBB” - “Katcha”			
Road_Class	string	100	To contain the Class of road according to RHD & LGED in the followings: RHD Road Class - “National Highways ” - “Regional Highways” - “District/Zila Road” LGED Road Class - “Upazila Road(Pucca” - “Upazila Road(Katcha)” - “Union Road(Pucca)” - “Union Road(Katcha)” - “Village Road A (Pucca)” - “Village Road A (Katcha)” - “Village Road B (Pucca)” - “Village Road B (Katcha)”			
Remarks	To prepare the inventory of road, Electricity, Telephone, drainage, Sewerage, pipe line and etc. The inventory will help for the present status of features. Please follow the example right side of the Data Table.	Chainage in Meters		Road_Condition	Type	Additional +Field
		From	To			
		0	500	Pucca	Pucca	To add more field as per Required.
		500	504	Culvert	Culvert	To add more field as per Required.
		504	1000	Katcha	Katcha	To add more field as per Required.
		1000	1012	Bridge	Bridge	To add more field as per Required.

8) Layer name: RDCL306864
Feature Type: Polyline

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

Field Name	Field Type	Width of the field	Purpose of the field
Road_name	string	100	To contain the name of the road, if any
Road_no	string	20	To contain road number, if any
Road_ID	string	20	To contain the ID of Road
Road_type	string	20	To contain the physical type of the road as follows - "Pucca" - "WBM" - "HBB" - "Katcha"
Road_Class	string	100	To contain the Class of road according to RHD & LGED in the followings: RHD Road Class - "National Highways" - "Regional Highways" - "District/Zila Road" LGED Road Class - "Upazila Road(Pucca)" - "Upazila Road(Katcha)" - "Union Road(Pucca)" - "Union Road(Katcha)" - "Village Road A (Pucca)" - "Village Road A (Katcha)" - "Village Road B (Pucca)" - "Village Road B (Katcha)"
Road_width	numeric		To contain average width of the road segment in meter
Road_length	numeric		To contain calculated length of the road segment in meter
Num_Lanes	numeric		To contain number of lanes on the road segment such as 1, 2, etc.
Road_own	string	100	To contain the name of the department or organization to which the road segment belongs.
METERS	Double	-	To contain length of the road in meters
FT_MINUTES	Float	-	To contain the time duration needed to travel the arc from the start node unto the end node, measured in minutes.
TF_MINUTES	Float	-	To contain the time duration needed to travel the arc from the end node unto the start node of the arc, measured in minutes,
Oneway	string	2	To contain the value to represent the possible directions to travel an arc
Hierarchy	Long		To contain order or rank assigned to road network elements.

9) Layer name: RDFP306864

Feature Type: **Polygon**

This Layer will contain footpath of project area. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Road_name	string	50	To contain road name
Road_ID	string	20	To contain the adjacent Road ID
Width	numeric		To contain width of Footpath
Status	string	50	To contain footpath conditions.

10) Layer name: RDIL306864

Feature Type: **Polygon**

This Layer will contain road islands of the project area. It must contain the fields as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Road_name	string	50	To contain road name
Road_No	string	20	To contain road number if any
Road_ID	string	20	To contain the adjacent Road ID
Width	Long integer	20	To contain width of Island
Type	string	50	To contain footpath conditions.

11) Layer name: WBD306864

Feature Type: **Polygon**

This shape file will contain water bodies of project area. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
WBD_ID	Long integer	20	To contain Water body ID.
Type	string	50	To contain following type of water bodies - "River" - "Khal" - "Irrigation Canal" - "Swamp" - "Pond" - "Ditch" - "Borrow Pits"
Type	string	50	To contain the use of water body such as Private or Public use

12) Layer name: EMB306864

Feature Type: **Polyline**

This Layer will contain embankment features of project area. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Emb_name	string	100	To contain the name of the road, if any
Emb_ID	string	20	To contain the ID of Road
Emb_Type	string	20	To contain the physical type of the Embankment to follow the road preparing method.
Emb_Class	string	100	To contain the Class of the Embankment -“Road cum Embankment” -“Embankment”
Emb_width	numeric		To contain average width of the road segment in meter
Emb_width	numeric		To contain average width of the embankment segment in meter
Emb_length	numeric		To contain calculated length of the road segment in meter
Num_Lanes	numeric		To contain number of lanes on the road segment such as 1, 2, etc.
Owner	string	100	To contain the name of the department or organization to which the embankment segment belongs.
Remarks			To follow the Road preparing Methods.

13) Layer name: DTM306864

Feature Type: **Point**

This shape file will contain spot heights as 3D points at regular interval (10m x 10m OR 20m x 20m or as specified) in project area. It must contain four fields as described in the following table:

Field Name	Field Type	Width of the field	No. of Decimal Places	Purpose of the field
ID	Sort Integer	10		To contain the ID
RL	Double	-	-	To contain Reduced Level (RL) of a point in meter as referenced with PWD
Easting	Double	-	-	To contain X-coordinate of the point
Northing	Double	-	-	To contain Y-coordinate of the point

14) Layer name: BM306864
Feature Type: **Point**

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

Field Name	Field Type	Width of the field	Purpose of the field
RL	Double	-	To contain Reduced Level (RL) of a point in meter as referenced with PWD
Easting	Double	-	To contain X-coordinate of the point
Northing	Double	-	To contain Y-coordinate of the point
Organization	String	100	To contain name of the organization
Cons_Year		10	To contain the year of construction
Remarks	String	100	To contain remarks, if any.

15) Layer name: CON306864
Feature Type: **Polyline**

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

Field Name	Field Type	Width of the field	Purpose of the field
Contour	Double	-	To contain the value (RL) of the contours up to three decimal places.
Label	Double	-	To contain the value of contour up to one decimal place. This can be used to label the contours in map.
Type	String	7	To contain the value of this field as follows: <ul style="list-style-type: none"> - "Index" - "Intermediate" The purpose of this field is to symbolize and label the contours only. (The values must be calculated in such way that after successive 4 thin (Regular) contours there should be one thick (Index) contour in map. That is if 0.00 is a thick (Index) contour then 0.3, 0.6, 0.9, and 1.2 will be (Regular) contours and 1.5 will be thick contour.

16) Layer name: ELU306864

Feature Type: **Polygon**

This shape file will contain existing land use of project area which will be prepared on the basis of physical feature and land use survey. It may contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Land_use	string	50	To contain existing land use as - “Administrative” - “Agriculture” - “Commercial” - “Circulation Network” - “Institutional” - “Flood Flow Zone” - “Industrial” - “Mixed Use” - “Recreational” - “Restricted / Special Use” - “Socio-Cultural” - “Transport & Communication” - “Urban Residential” - “Urban Services” - “Vacant Land” - “Water Body”
Single_Crop	string	50	To contain the single crop land
Double_Crop	string	50	To contain the double crop land
Triple_Crop	string	50	To contain triple crop land
Remarks	string	100	To contain remarks, if any.

17) Layer name: HOM306864

Feature Type: **Polygon**

This shape file will contain rural homestead areas in project area as polyline features. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Location	String	20	To contain the name of Mauza (Mauza_JL_Sheet) or the locality in which homestead areas lies.
Type			To contain the type of homestead area (Accordingly structures) - Urban - Rural

18) Layer name: BRG306864
Feature Type: Polygon

This shape file will contain Bridge/Culvert/Box culvert/Over bridge/Railway Bridge etc as polygon features in project area. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Length	Double	0	To contain the length of the bridge/culvert
Width	Double	0	To contain the width of the bridge/culvert
Abutment	Long integer	20	To contain the number of abutment
Span	Double	0	To contain the span of the bridge/culvert
Location	String	30	To contain the area name (Mauza_JL_Sheet or locality)
Remarks	String	254	To contain comments about the bridge such as conditions of abutment, deck, wing wall, etc. *** To follow the road map preparing methods.

19) Layer name: BRGL306864
Feature Type: Polyline

This shape file will contain Bridge/Culvert/Box culvert/Over bridge/Railway Bridge etc as polyline features in project area. Each feature must be a multipart feature. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Length	Double	-	To contain the length of the bridge/culvert
Width	Double	-	To contain the width of the bridge/culvert
Abutment	Double	-	To contain the number of abutment
Span	Double	-	To contain the span of the bridge/culvert
Location	String	20	To contain the area name (locality)
Remarks	String	254	To contain comments about the bridge such as conditions of abutment, deck, wing wall, etc. *** To follow the road map preparing methods.

20) Layer name: BRGP306864
Feature Type: Polygon

This shape file will contain Bridge/Culvert/Box culvert/Over bridge/Railway Bridge etc as point features in project area. It is expected that this shape file will be generated/produced from converting the Bridge_CL.shp file into centroids. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Length	Double	-	To contain the length of the bridge/culvert
Angle			To contain the Geographic angle of the bridge/culvert
Width	Double	-	To contain the width of the bridge/culvert
Abutment	numeric	20	To contain the number of abutment
Span	Double	-	To contain the span of the bridge/culvert
Location	String	20	To contain the area name (Mauza_JL_Sheet or locality)
Remarks	String	254	To contain comments about the bridge such as conditions of abutment, deck, wing wall, etc. *** To follow the road map preparing methods.

21) Layer name: DRN306864
Feature Type: Polyline

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

Field Name	Field Type	Width of the field	Purpose of the field
Type	string	20	To contain the (construction) type of the drain. The value of the field may be any of the following two - Surface (Katcha) - Surface (Uncovered) - Surface (Covered) - Pipe
Drain_width	Double	0	To contain the width of the drain
Drain_depth	Double	0	To contain the depth of the drain
Drain_radius	Double	0	To contain the radios of the drain
Road_ID	string	20	To contain the adjacent Road ID
Remarks	String	254	*** To follow the road map preparing methods.

22) Layer name: BW306864
Feature Type: **Polyline**

This shape file will contain boundary walls as line features of project area. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Type	string	50	To contain line features such as Boundary wall.

23) Layer name: WSL306864
Feature Type: **Polyline**

This shape file will contain water distribution pipe network as line features in project area. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Type	string	20	To contain type of pipe (Steel, PVC, etc)
Dia	Double	0	Diameter of pipe in mm
Remarks	String	254	*** To follow the road map preparing methods.

24) Layer name: OHT306864
Feature Type: **Point**

This shape file will contain overhead water tanks as point features in project area. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Capacity	Double	-	To contain the capacity of the overhead tank.
Catchment	Double	-	To contain the catchment area in sq. meter
Owner	String	100	Contains the owner name

25) Layer name: ESL306864
Feature Type: **Polyline**

This shape file will contain High Voltage Electric Lines as line features in project area. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
capacity	string	20	Contains the capacity of each line as 11KV, 33 KV etc.
Owner	string	20	Contains the name of Organization
Remarks	String	254	*** To follow the road map preparing methods.

26) Layer name: UTL306864
Feature Type: **Point**

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

Field Name	Field Type	Width of the field	Purpose of the field
Type	string	20	To contain - “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”
Owner			Contains the name of the owner
Remarks	String	100	*** To follow the road map preparing methods.

27) Layer name: SEW306864

Feature Type: **Polyline**

This shape file will contain sewerage network as line features in [project area. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Size	string	20	To contain pipe diameter of sewerage line
Type	string	25	Contains type of waste water carried by the sewerage line such as storm sewerage or household sewerage line etc.
Location	string	20	Contains location of sewerage line
Owner			Contains the name of the owner
Remarks	String	100	

28) Layer name: OP306864

Feature Type: **Polygon**

This shape file will contain various polygon features of project area. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Type	string	50	To contain boundary of following features - “Graveyard” - “Crematorium” - “Cemetery” - “Eidgah” - “Restricted Area” - “Airport” - “Brick Field” - “Rikshaw Garage” - “Automobile Garage” - “Slum” - “Monument” - “Open Space” - “Parks” - “Playground” - “Stadium” - “Golf Course” - “Botanical Garden” - “Zoological Park” - “Power Plant/Station” - “Bus Terminal” - “Truck Terminal” - “Water Treatment Plant” - “Sewerage Treatment Plant” - “Waste Disposal Plant” - “Railway Station” - “Bazaar Boundary” - “Forest Land” - “Sand Fill” - “Swimming Pool” - - <i>Other if necessary</i>
Owner			Contains the name of the owner

29) Layer name: AP306864

Feature Type: **Point**

This shape file will contain point features of project area. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Type	string	50	<ul style="list-style-type: none"> - "Airport" - "Bazar" - "Government Bank" - "Private Bank" - "Brickfield" - "Bridge" - "Bus Terminal" - "Cemetery" - "Church" - "Cinema Hall" - "College" - "Crematorium" - "Deep tube well" - "Dustbin" - "Filling Station" - "Graveyard" - "Growth Center" - "Hand tube well" - "Historic site" - "Government High School" - "Registered High School" - "Non-Registered High School" - "Hospital/Clinic" - "Madrasa" - "Registered Madrasa" - "Non-Registered Madrasa" - "Mazar/Dargah" - "Monument" - "Mosque" - "Museum" - "Oil Reservoir/Depot" - "Over Bridge" - "Pagoda" - "Police Box" - "Police Station" - "Post Office" - "River Port"

Field Name	Field Type	Width of the field	Purpose of the field
			<ul style="list-style-type: none"> - “Government Primary School” - “Registered Primary School” - “Non-Registered Primary School” - “Sluice gate” - “Temple” - “Theater Hall” - “Truck Terminal” - “Under Pass” - “University” - “Private University” - “Well” - “Culvert” - <i>Other if necessary</i>
Name	string	50	To contain name of the feature, if any
PF_ID	Long integer	6	To contain the point feature ID.
PointType	string	50	To contain short name “GPS” of the feature, e.g. Government Primary School (GPS)
Owner			Contains the name of the owner
Remark	string		Contains Further Explanation

30) Layer name: NAM306864

Feature Type: **Point**

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

Field Name	Field Type	Width of the field	Purpose of the field
Name	String	100	To contain - Name of locality, market, bazaar, important structure, historic site, university, play ground, poultry farm, river, khal, lake, pond, etc.

31) Layer name: RN306864

Feature Type: **Annotation/Polyline**

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

Field Name	Field Type	Width of the field	Purpose of the field
Name	String	100	To contain the name of road segment.

32) Layer name: PRL306864

Feature Type: **Polyline**

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

Field Name	Field Type	Width of the field	Purpose of the field
Width_m	Double	-	To contain width of the proposed road in meter
Width_ft	Double	-	To contain width of the proposed road in foot
From_To	String	100	To contain the names (of road/place) from where the road starts and to where the road ends.
Prop_type	String	20	To contain any of the two - "New" - "Widening"
Type	String	20	To contain any of the following - "Underground" - "Ground" - "Flyover" - "Viaduct"
Remarks	String	254	*** To follow the road map preparing methods.

33) Layer name: POP306864

Feature Type: **Polygon**

This shape file will contain polygon features of unions/wards derived from dissolved Mauzas of the project area. It must contain the field as described in the following table:

Field Name	Field Type	Width of the field	Purpose of the field
Union_Ward	String	50	To contain name of the Mauza
Area_BBS	Double	-	To contain area from BBS records
Area_GIS	Double	-	To contain area calculated by GIS software
Pop_2001	Long Integer	-	To contain Population in the year 2001
Pop_2011	Long Integer	-	To contain Population in the year 2011
Pop_2021	Long Integer	-	To contain Population in the year 2021
Pop_2035	Long Integer	-	To contain Population in the year 2035
Pop_den_2011	Double	-	To contain population density
Division	String	25	To contain name of Division
District	String	25	To contain name of District
Upazila	String	25	To contain name of Upazila
Union_Ward	String	25	To contain name of Union/Ward
Geocode	String	11	To contain BBS geocode of the Union
Remarks	String	254	Remarks, if any.

34) Layer name: STP306864

Feature Type: **Polygon**

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

Field Name	Field Type	Width of the field	Purpose of the field
Policy_Zone	String	50	To contain proposed policy on the plots.
Remarks	String	100	To contain remark, if any.

B.1.2 Point Feature Codes

The following feature codes (Unique ID) must be assigned in appropriate fields of the layers.

The following Point feature codes (Unique ID) will be used as follows.

Point Feature Categories	Unique ID
- "Airport"	255
- "Bazar"	260
- "Government Bank"	265
- "Private Bank"	270
- "Brickfield"	275
- "Bridge"	280
- "Bus Terminal"	285
- "Bus Stand"	290
- "Cemetery"	295
- "Church"	300
- "Cinema Hall"	305
- "Government Medical College"	245
- "Private Medical College"	250
- "Government College"	145
- "Government Woman College"	150
- "Registered College"	155
- "Non-Registered College"	160
Government Poly Technical Institute	165
Private Poly Technical Institute	170
Vocational Institute	175
Jubo Unnayan Kendra	310
Government Teacher's Training College	235
Private Teacher's Training College	240
- "Crematorium"	315
- "Deep tube well"	320
- "Dustbin"	325
- "Filling Station"	330
- "Graveyard"	335
"Growth Center"	340
- "Hand tube well"	345
- "Arsenic Hand tube well"	350
- "Tara Pump"	355
- "Historic site"	360
- "Government High School"	125
- "Government Girl's High School"	130

Point Feature Categories	Unique ID
“Registered High School”	135
“Non-Registered High School”	140
- “Hospital/Clinic”	365
- “Government Kamel Madrasa”	180
- “Registered Kamel Madrasa”	185
- “Government Fazel Madrasa”	190
- “Registered Fazel Madrasa”	195
- “Government Alem Madrasa”	200
- “Registered Alem Madrasa”	205
- “Government Eftedayee Madrasa”	210
- “Registered Eftedayee Madrasa”	215
- “Non-Registered Madrasa”	220
- “Mazar/Dargah”	370
- “Monument”	375
- “Mosque”	380
- “Museum”	385
- “ASA NGO”	390
- “BRAC NGO”	395
- “Proshikha NGO”	400
- “TMSS NGO”	405
- “Other’s NGO”	410
- “Insurance Company”	415
- “Life Insurance Company”	420
- “Oil Reservoir/Depot”	425
- “Over Bridge”	430
- “Pagoda”	435
- “Police Box”	440
- “Police Station”	445
- “Post Office”	450
- “River Port”	455
- “Government Primary School”	100
- “Registered Primary School”	105
- “Non-Registered Primary School”	110
- “K.G. School”	115
- “Kindergarten School”	120
- “Sluice gate”	460
- “Temple”	465
- “Theater Hall”	470
- “Truck Terminal”	475
- “Under Pass”	480
- “Government University”	225
- “Private University”	230
- “Well”	485
- “Culvert”	490
- <i>Other if necessary</i>	To put or add the Unique ID accordingly 5 interval

ANNEXURE-III
Structure Attribute Collection Form

Structure Attribute Collection Form

Structure Attribute Collection Form

[illegible]

PHYSICAL FEATURE SURVEY

LAND USE SURVEY

TOPOGRAPHIC SURVEY

PHOTOGRAMMETRIC WORKS

REFERENCE/BIBLIOGRAPHY

BBS (2011) Population Census-2011, Bangladesh Bureau of Statistics

ICA Bangladesh. (2015). www.ica-bangladesh.org. Dhaka: ICA Bangladesh.

ToP Network. (2015). www.top-network.org retrieved December 2, 2015.

UDD. (2015). TOR. Dhaka: Urban Development Directorate.



Government of the People's Republic of Bangladesh
Ministry of Housing and Public Works
Urban Development Directorate (UDD)

Preparation of Development Plan for Fourteen Upazilas

Package-02
(Ishwarganj Upazila, Mymensingh; Raipura Upazila and Shibpur
Upazila, Narsingdi)

DRAFT SURVEY REPORT

**Formal-Informal Economic Survey
of
Shibpur Upazila, Narsingdi**

August, 2016

Joint Venture of

**Sheltech Consultants Pvt. Limited
And
Arc-Bangladesh Limited**

JV of SCPL-ABL

Preparation of Development Plan for Fourteen Upazilas Project (Package-02)

Ref: SCPL-ABL/UDD/2016/ Formal-Informal Economic Survey/Shibpur Upazila

Date:

To

The Project Director

“Preparation of Development Plan for fourteen Upazilas” Project

Urban Development Directorate

82, Segunbagicha, Dhaka, 1000.

Subject: Submission of the Formal-Informal Economic Survey Report (Final) of Shibpur Upazila, Narsingdi.

Dear Sir,

We are pleased to submit herewith the Formal-Informal Economic Survey Report (Final) of Shibpur Upazila, Narsingdi for your kind information and further action.

Thanking you and assuring you of our best services.

Your Sincere

(Dr. Nurul Islam Nazem)
Team Leader, Package -2

(Dr. Gulam Murtaza)
Urban Economist

Encl: As stated.

Copy to:

1. Team Leader, Package-2.
2. Director, Sheltech Consultants Pvt. Limited
3. Chairman, Arc-Bangladesh limited, Dhaka

1/E/2 Paribagh (Mazar Road), Shahbagh, Dhaka-1000, Bangladesh

Phone: +880-2-9611171 Fax: +880-2-9611172

Email: scpl.mail@gmail.com

Executive Summary

Economy of an area is one the major notions of the upazila's development condition. It also reveals, which sectors of economy has been flourished here, and which sectors of economy is favorable for this area. Thus, the report aims to explore the existing economic condition of this upazila by categorizing the economic sectors into broad categories named Formal and Informal. Shibpur Upazila is a densely industrial area, and is home to many textile mills. There are about 50 textile mills located here. Among them, some of are only exported oriented. On an average, about half total products of textile mills are being exported yearly. Besides, it also has 776 poultry farms and 104 dairy farms. It also possess some of large scale brick fields. On the other hand, here it has been found that the upazila needs skilled labor but female is totally segregated from both of formal and informal sectors of economy. Thus government could take necessary steps to build the young people of this area into working skilled labor by establishing new training centers and also encouraging women to enter into the economy by taking some appropriate steps. In addition, infrastructure development (road) along with provision of loan in low interest also were preferred by most of the industries. Moreover, one of the major economic success of this area is the local markets are capable of meeting the need for most of the economic units of this area. And, the products are going beyond the upazila boundary which is favorable for flourishing economy of a region. Thus the government could take necessary steps by shifting the informal sectors into formal sectors, and thus the informal sectors could be one of the major sources of government's revenue. In addition, the management committee of the economic units both of formal and informal area enough conscious about their laborer's health security, though there are small consciousness among them about waste management and their surrounding environment. Thus awareness building programs could be taken regarding this problem.

Abbreviation/Acronyms

ABL	Arc Bangladesh Limited
BDT	Bangladesh Taka
BBS	Bangladesh Bureau of Statistics
BEZA	Bangladesh Economic Zone Authority
BDT	Bangladeshi Taka
CBOs	Community Based Organizations
EIA	Environmental Impact Assessment
FY	Fiscal Year
GDP	Gross Domestic Product
GoB	Government of Bangladesh
JV	Joint Venture
LGED	Local Government Engineering Department
MDGs	Millennium Development Goals
NGO	Non-Government Organization
NSSS	National Social Security Strategy
PRSP	Poverty Reduction Strategy Paper
SDG	Sustainable Development Goal
SPSS	Statistical Packages for the Social Sciences
SCPL	Sheltech Consultants Pvt. Ltd.
SRS	Simple Random Sampling
SME	Small and Medium Enterprises
SFYP	Seventh Five Year Plan
TIN	Tax Identification Number
ToR	Terms of Reference
TL	Team Leader
UDD	Urban Development Directorate

TABLE OF CONTENTS

	Page No.
Letter of Transmittal	i
Executive Summary	ii
List of Abbreviation/Acronyms	iii
Table of Contents	iv
List of Tables	v
List of Figures	vii
List of Maps	viii
 CHAPTER ONE: INTRODUCTION	
1.1 Background	1
1.2 Understanding Formal-Informal Economic Survey	1
1.3 Upazila Profile	2
 CHAPTER TWO: APPROACH AND METHODOLOGY	
2.1 Introduction	3
2.2 Sample Selection	3
2.3 Tools Development	4
2.3.1 Preparation of Questionnaire	4
2.3.2 Pre-testing	4
2.3.3 Training of Enumerators and Survey Supervisors	4
2..3.4 Survey Team Mobilization	4
2.4 Quality Control Measures	4
2.5 Database Preparation and Processing	5

CHAPTER THREE: REVIEW OF PLAN AND POLICIES

3.1	Introduction	6
3.2	Sustainable Development Goals (SDGs)	6
3.3	Development Goals of Bangladesh: Vision 2021 and 2041	8
3.4	Perspective Plan (2010 – 2021)	8
3.5	Seventh Five Year Plan (SFYP)	8
3.6	National Social Security Strategy (NSSS) of Bangladesh	9
3.7	Other National Policies	9
3.8	Private Sector Developments	10
3.9	Linkage of Policies, Plans and Acts/Rules Related to Economic Development of Shibpur	10

CHAPTER FOUR: FORMAL ECONOMIC SURVEY

4.1	Introduction	11
4.2	Ownership Pattern	11
4.3	Area Occupied	12
4.4	Number of Employees	12
4.5	Male-Female Ratio in Different Types of Industries	13
4.6	Raw Materials	14
4.6.1	Major Raw Materials	14
4.6.2	Minor Raw Materials	14
4.6.3	Other Raw Materials	15
4.7	Products and Their Market	15
4.8	Production amount and their yearly price	16
4.9	Mode of Transportation of Raw Materials	16
4.10	Solid Waste, Management and Environment	17
a.	Waste Disposal Site	17

b.	Availability of waste treatment system	17
c.	Environmental clearance of the industry	17
d.	Measures taken against pollution	18
4.11	Health Security of the Worker	19
4.12	Problems in the Industries	20
4.13	Suggestions to Solve the Industrial Problems	20

CHAPTER FIVE: INFORMAL ECONOMIC SURVEY

5.1	Introduction	22
5.2	Ownership Pattern	22
5.3	Area Occupied	23
5.4	Number of Employees	24
5.5	Number of Labors	24
5.6	Male-Female Ratio in Different Types of Industries	24
5.7	Raw Materials	25
5.7.1	Major Raw Materials	25
5.7.2	Minor Raw Materials	25
5.8	Products and their Market	25
5.9	Mode of Transport of Raw Materials	26
5.10	Solid Waste, Management and Environment	27
5.11	Health Security of the Worker	29
5.12	Problems in the Industries	29
5.13	Suggestion to Solve the Problem	30

CHAPTER SIX: CONCLUSIONS

REFERENCE/BIBLIOGRAPHY

APPENDICES

Appendix-I:	Sample of Formal-Informal Economic Survey Questionnaire	33
Appendix II:	List of Surveyor	39
Appendix III	List of Photographs	40

LIST OF TABLES

	Page No.
Table-4.1 Type of Industries with Location	10
Table-4.2 Distribution of no. of employees (in percentage) by types of industries	12
Table-4.3 Distribution of no. of labors (in percentage) by types of industrieS	12
Table-4.4 Major raw materials (in percentage)	13
Table-4.5 Minor raw materials (in percentage)	14
Table-4.6 Other raw materials	14
Table-4.7 Products and Their Market	15
Table-4.8 Production amount and their yearly price	15
Table-5.1 Type of Industries with Location	22
Table-5.2 Distribution of no. of employees (in percentage) by types of industries	24
Table-5.3 Distribution of no. of labors (in percentage) by types of industries	24
Table 5.4 Major raw materials	25
Table 5.5 Products and Their Market	26
Table 5.6 Production amount and their yearly price	26

LIST OF FIGURES

Figure 4.1	Ownership patterns of formal economic units	11
Figure 4.2	Area occupied by formal economic units in acre	11
Figure 4.3	Male-Female Ratio in Different Types of Industries	13
Figure 4.4	Mode of transportation of raw materials	16
Figure 4.5	Waste disposal site	16
Figure 4.6	Availability of waste treatment system	17

Figure 4.7	Environmental clearance of the industry	17
Figure 4.8	Measures taken against pollution	18
Figure 4.9	Health security of the worker	18
Figure 4.10	Problems in the industry	18
Figure 4.11	Suggestions to solve industrial problems	20
Figure 5.1	Ownership patterns of formal economic units	23
Figure 5.2	Area occupied by formal economic units in acre	23
Figure 5.3	Male-Female Ratio in Different Types of Industries	25
Figure 5.4	Mode of transportation of raw materials	27
Figure 5.5	Waste disposal site	27
Figure 5.6	Availability of waste treatment system	28
Figure 5.7	Measures taken against pollution	28
Figure 5.8	Health security of the worker	29
Figure 5.9	Problems in the industry	30
Figure 5.10	Suggestions to solve industrial problems	30

LIST OF MAP

Map 1.1	Upazila Map, Shibpur, Narsingdi	2
---------	---------------------------------	---

CHAPTER ONE: INTRODUCTION

1.1 Background

Economy of an area is one the major notions of the upazila's development condition. It also reveals, which sectors of economy has been flourished here, and which sectors of economy is favorable for this area. It also notifies the level of development that the area needs and required. Thus formal-informal economic survey plays a vital role in development planning and others level of development. Basis on the previous discussion, this report aims to explore the existing economic condition of this upazila by categorizing the economic sectors into broad categories named Formal and Informal.

In the context of Bangladesh, formal-informal sectors constitute the dominant economic activities in Bangladesh and its contribution to GDP and employment is unending fact. Empirical Studies indicate around 80% of labor force in Bangladesh works in the informal economy and that the contribution of the informal sector of the GDP is around 64%. The major informal sector in Bangladesh is agriculture, and a large number of Small and Medium Enterprises (SMEs) and Micro-enterprises fall into the category of informal sector. The major driving forces behind the growth in informal sector, is the rise of Household demand for informal sector goods and services as well as the rise in demand for intermediate inputs. In fact, informal sector covers a significant part of the economy and plays an important role in employment creation and Production. Therefore, informal sector is very important for the Bangladesh Economy, as its various channels have major impacts on both the formal economy as well as the overall economy of the country.

1.2 Understanding Formal-Informal Economic Survey

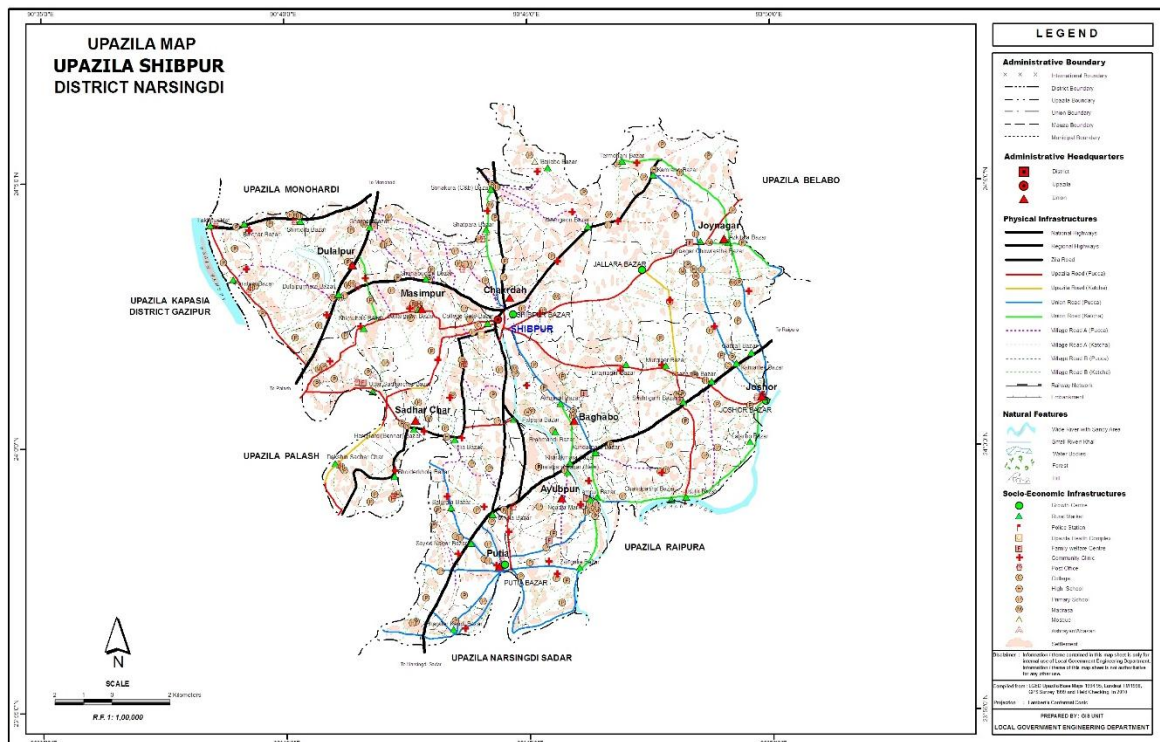
In this context the components of formal economies are, the economic units which have government approval, as they are registered, possess Taxpayer Identification Number (TIN) and give tax to the government. Industries, bank, insurance, NGO, CBOs etc. are the example of formal economic units. On the other hand, informal economies include agricultural day laborers, small traders, urban foot path vendors, paid domestic workers and home produced cloths, handicrafts, household based agriculture, vendors, hawkers, and small scale service providers like cobblers, tailors etc. are the major components of informal economy. Informal jobs mainly fall outside the domain of the Governments labor market regulation. Moreover, informal workers do not function with the types of legal protection connecting the number of working hours, health and safety or within the types mandated benefits that would be normally feature of formal employment opportunities in large ongoing private sector firms or in public sector.

1.3 Upazila Profile

Shibpur Upazila (Narsingdi district) is located in between 23°56' and 24°07' north latitudes and in between 90°38' and 90°50' east longitudes. Its area is area 206.89 sq. km. It has 9 Wards, 132 Mouzas and Mahallas, and 194 villages (BBS, 2011). It is bounded by monohardi upazila on the north, raipura, narsingdi sadar and palash upazilas on the south, belabo and

raipura upazilas on the east, Palash and kapasia upazilas on the west. It is formed as Thana on 12 January 1918 (Banglapedia, 2016). It is a densely industrial area, and is home to many textile mills. Narsingdi gas field is located in the Shibpur upazila under Narsingdi district adjacent to the Dhaka-Sylhet highway about 45 km away of northern most east direction from capital city of Bangladesh, Dhaka. This field is discovered by Petrobangla in 1990. Total recoverable gas reserves of this field re-estimated by Hydrocarbon Unit is 215 billion cubic feet (6.1×10^9 m³). Commercial gas production is started in 1996 and till 31 August 2006 total 66.304 billion cubic feet (1.8775×10^9 m³) or 30.84 percent of gas reserves has been recovered. Apart from these there are some historical tourist places like Sona Muri Pahari, Archaeological heritage and relics like Three Domed Mosque (Ashrafpur, 1524), Single Domed Mosque (Kumardi), tomb of Shah Mansur, two copperplate inscriptions (seventeenth century) discovered at village Ashrafpur, a gold coin (Gupta period) discovered at village Baghaba. There are also the graveyard of Shaheed Asad, (the Hero of 1969) at Dhanua (Banglapedia, 2016).

Map 1.1: Upazila Map, Shibpur, Narsingdi. Source: LGED, 2016



Shibpur upazila of Narsingdi District is generally functioning as a large agro-economic zone where many people are engaged with agriculture based economic activities. It also contains large employment centre at urban areas, thus the people got attracted from different parts of rural areas. The location and linkages of the city of Shibpur with the regional growth centers makes it one of the most important cities in this region. According to BBS (2011), the upazila has 4 growth centres, 31 hat/bazars, 776 poultry farms, 104 dairy farms and 18 nurseries. It also has 27 government offices, 4 nationalized bank branches, 12 private bank branches and 11 NGOs. The upazila's famous crop is paddy. It possesses 37,669 total farm holding.

According to Census Report 2011, total 32 rice mills and 135 small scale husking crafts mill have been set up at this upazila. Total 50 textile mill establishments are also found because of textile mill industrial development at Shibpur. Total 204 bamboo and cane industry has been found here. Moreover, total 120 pottery industry, 612 wooden furniture based industries, 62 saw mills and 5 oil mills are found here. In addition, 4 bakeries are also located in Shibpur. 1 printing presses, 166 tailoring shops and 12 plastic industries are also found here.

CHAPTER TWO: APPROACH AND METHODOLOGY

2.1 Introduction

First of all, the consultants reviewed different national policies and plans. Then, they developed a general survey methodology for conducting formal informal economic survey. Then appropriate personnel of formal and informal economic units were being interviewed with the approved questionnaire (Please see Annexure-I). The following reports are the general elaboration of the followed methodology of the survey. The consultants used convenient survey technique under non-probability sampling technique to collect questionnaire based primary data for formal informal economic analysis.

2.2 Sample Selection

Three criteria usually will need to be specified to determine the appropriate sample size: the level of precision, the level of confidence or risk, and the degree of variability. The determination of sample size for this project is concerned with the following issues under the assumption that the characteristic of the population to different homogenous group.

- The definition of the population;
- The creation of sampling frame;
- The choice of Probability versus Non-probability sampling;
- The calculation of sample size.

The definition of the population: Different types of formal and informal economic units are being considered as the population for this formal-informal economic survey (BBS, 2011).

The creation of sampling frame: The standard rule for sampling frame has been followed based on SRS (Simple Random Sampling).

The choice of Probability versus Non-probability sampling: Probability sampling has been followed.

The calculation of sample size: To determine the minimum sample size the following

formula has been followed: $n = \frac{z^2}{d^2} pq$

Where,

n = Sample size ,

z = Statistical certainty chosen ,

p = Coverage rate/estimated prevalence ,

$q = 1 - p$ and

$d = \text{precision desired} : 0.05$

Then, they used stratified sampling technique under probability sampling technique to collect questionnaire based primary data for formal-informal economy analysis. The stratified sampling technique is further used for collecting samples from all the sub zones such as industries, hawkers etc. of this Upazila. For each types then random sampling technique is used to select the industries for survey using Microsoft excel.

2.3 Tools Development

The Survey tool was developed following the below steps. (1) Review of National Policies and Plans (2) Collection of Upazila Map (3) Find out sectors, indicators and variables (4) Preliminary questionnaire develop and share with Team leader as well as Project Management Office (5) Pretesting at field level (6) Questionnaire Finalization.

2.3.1 Preparation of Questionnaire

In order to conduct the survey, a compact and extensive pre-coded structured questionnaire (please see Annexure-01) has been prepared for all the packages and it has been approved by the authority of Urban Development Directorate (UDD). The questionnaire has intended to capture information according to the provided format in the TOR.

2.3.2 Pre-testing

The questionnaires were pretested with formal and informal economic units with participation of survey team (Survey supervisors, Enumerators) and members of Project management team. Then the survey team discussed about the field level problem with the economic expert, Team leader and Project Management team for finalization of Questionnaire format.

2.3.3 Training of Enumerators and Survey Supervisors

JV of SCPL-ABL considered the experience of working in similar types of survey functions and educational qualifications for selection in the formal-informal economic survey team. Considering these issues, a survey team of 21 members were selected for carrying out the survey work at Shibpur Upazila (see Annexure-II). An arrangement has also been made to provide orientation and training to the survey team by the Team Leader (TL). After orientation and training at the headquarters of JV of SCPL-ABL, the survey team has been sent to the field.

2.3.4 Survey Team Mobilization

The survey started in 12.08.2015 and the total survey is taken about 30 days from that date.

2.4 Quality Control Measures

To ensure quality of data, a number of validation checks were conducted during data collection period:

- (a) The survey supervisor went back to the respondent as well as talked over mobile phone number for validate or accurate the collected data by enumerator.
- (b) After data collection had been completed, some economic units were randomly chosen, and then the supervisors went to the field for further investigation. If any inconsistencies were found, then the supervisors discussed the issue with the enumerators.
- (c) Project Manager from Project Management Office as well as formal-informal economic expert had been checked randomly for quality of collected data.

2.5 Database Preparation and Processing

After completing the survey works in the field (Annexure-II), a detail database has been prepared to follow the survey questionnaire. The database has prepared by using SPSS 20 software. To make the data input process easier, coding system has been used in the necessary field. Few data have been stored in MS Excel software. 3 micro computers are exclusively used for data entry. SPSS 20 software is used for all data management that has been collected from the field. In this chapter socioeconomic survey data have been presented into three forms/styles viz. tabular form, geographical and textual/report form.

CHAPTER THREE: REVIEW OF PLAN AND POLICIES

3.1 Introduction

Bangladesh's planning model is dominated by a central planning system where the central governments set out relevant plans and policies and implement the goal and objectives of those on sectoral basis. Either a central government body or a local institution of a particular sector under a central ministry initiates the planning process with directives from that higher authority. It can be mentioned here that both the orientation and the process of development planning have been entirely top-down approach. However, this type of plan decision making system is to be followed in undertaking even any planning initiatives at the smaller urban centre levels.

In recent times there appears to be some understanding at the national levels about the importance of physical planning which has been voiced in various national plans and policies viz. Plans - the Five Year Plans, later Poverty Reduction Strategy Paper (PRSP), Vision 2021; Vision 2021-2041; and Policies – land use policy, agriculture policy, water policy, environmental policy, industrial policy, health policy, education policy, disaster policy, transport policy, etc. These documents would be of paramount importance in the process of preparing development plans for Shibpur Upazila. It is vitally needed to consider the spatial aspects of these national plans' and policies' goal and objectives so that these are harmonized as well as reflected in the Strategy Plans, the Structure Plans, the Urban Area Plans and the Detailed Area Plans of the above mentioned Upazilas in the context of respective local circumstances.

In this section, penitent national plans and policies have been critically reviewed to provide guidance to prepare an appropriate and sustainable economic development plan for the Upazila in line with the TOR of the consultancy services.

3.2 Sustainable Development Goals (SDGs)

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

1. End poverty in all its forms every where
2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
3. Ensure healthy lives and promote well-being for all at all ages
4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
5. Achieve gender equity and empower all women and girls
6. Ensure availability and sustainable management of water and sanitation for all.
7. Ensure access to all affordable, reliable, sustainable and modern energy for all
8. Promote sustainable, inclusive and sustainable economic growth, full and decent work for all;
9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation;
10. Reduce inequality within and among countries;

11. Make cities and human settlements inclusive, safe, resilient and sustainable;
12. Ensure sustainable consumption and production pattern;
13. Take urgent action to combat climate change and its impacts
14. Conserve and sustainably use the oceans, sea and marine resources for sustainable development;
15. Protect, restore and promote, sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and biodiversity loss;
16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels;
17. Strengthen the means of implementation and revitalize the global partnership for sustainable development;

In illustration of these goals, some targets have proposed to meet the goals of SDG. Some relevant targets to meet up the goals related to the formal informal economic sector are mentioned below:

Goal 1: Poverty Elevation

Target 1.3: Ensure all men and women in poor and vulnerable, have equal rights to economic resource and access to basic services, ownership and control over land and other forms of property, inheritance, natural resource appropriate new technology and financial services including microfinance.

Target 1.5: Build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.

Goal 5: Gender Equality

Target 5.1: End all forms of discrimination against all women and girls everywhere.

Target 5.3: Eliminate all forms of violations against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation.

Goal 9: Sustainable Infrastructure and Industrialization

Target 9.2: Promote inclusive and sustainable industrialization by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries.

Target 9.4: Upgrade infrastructure and retrofit industries to make them sustainable, with increase resource-use efficiency and greater adaptation to clean and environmentally sound technologies and industrial processes.

Goal 12: Sustainable Consumption and Production Patterns

Target 12.6: Encourage companies, especially large and transnational companies, to adopt sustainable practices to integrate sustainable information at reporting cycle.

Issues like environmental sustainability, eradication of poverty and hunger, quality education, sustainable industrialization and health related matters are directly related to plan preparation process. In the preparation of Shibpur 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, industry and health facilities. The plan will be directed to reduce urban and rural deprivation through appropriate proposal for strengthening urban and rural economy and adequate provision of utility services.

3.3 Development Goals of Bangladesh: Vision 2021 and 2041

Vision 2021 was the political manifesto of the Bangladesh Awami League party before winning the National Elections of 2008. It stands as a political vision of Bangladesh for the year 2021, the golden jubilee of the nation. The policy has been criticized as a policy emblematic of technological optimism in the context of Bangladesh and the state repression of media, low internet penetration, inadequate electricity generation. The Vision 2021 is an articulation of where this nation needs to be in 2021 – the year which marks the 50th anniversary of Bangladesh’s independence.

The main goal is for Bangladesh to become a middle income country where poverty will be completely eradicated. Economic development & initiatives identified are:

- a. Meeting basic needs
- b. Population and labor force
- c. Alleviation of poverty
- d. Food & nutrition
- e. Health care center
- f. Education
- g. Industry
- h. Energy security
- i. Infrastructural development
- j. Housing
- k. Environment
- l. Water resources

3.4 Perspective Plan (2010 – 2021)

A nation without vision is a nation gone astray. Such is not the case for Bangladesh whose independence in 1971 was the culmination of a people’s struggle, as much for political freedom as it was for their economic emancipation. In keeping with those aspirations, the Government’s Vision 2021 is an articulation of where this nation needs to be in 2021 – the year which marks the 50th anniversary of Bangladesh’s independence. That milestone, ten years away from 2011, will be a high point in Bangladesh’s war against chronic poverty and the struggle to attain middle income country status, from its beginning as a low income country. This “Perspective Plan of Bangladesh (2010-2021): Making Vision 2021 a Reality” is a strategic articulation of the development vision, mission, and goals of the Government in achieving a prosperous Bangladesh grounded in political and economic freedoms a reality in 2021.

Vision 2021 stipulates middle income status for Bangladesh by 2021, reaching annual GDP growth rate of 10% by that year and averaging 9.2% for the period 2011-21. Fulfillment of this vision requires superior double digit performance for manufacturing taking its share in GDP to 27 percent by 2021, and that of industry to 37 percent. Accelerated pace of industrialization will be necessary to address the increasingly diminishing capacity of agriculture to absorb the incremental labour force, strengthen backward and forward linkages with agriculture and services sectors, cater to the growing domestic demand for industrial goods, and take advantage of emerging opportunities in the global market.

3.5 Seventh Five Year Plan (SFYP)

The Government’s Vision 2021 defines several economic and social outcomes for Bangladesh to achieve by 2021. To convert this Vision into long-term development targets, a Perspective Plan 2010-2021 was prepared. The targets of Vision 2021 and the associated Perspective Plan 2010-2021 were to be achieved through the implementation of two five-year plans, the Sixth Five Year Plan (2011-15) and the Seventh

Five Year Plan (2016-2020). The 6th FYP made solid progress in increasing per capita income and reducing poverty through a strategy of pro-poor economic growth. The Seventh Five Year Plan has targets for economic growth, employment, poverty reduction, human resources development, gender balance and environmental protection. If the targets are achieved, the socio-economic environment of the country will transform it from a low-income economy to the first stages of middle-income country. Goals and Targets of 7th FYP are:

A. Income and poverty

- Attaining average real GDP growth of 7.4% per year over the Plan period.
- Reduction in the head-count poverty ratio by 6.2 percentage point.
- Reduction in extreme poverty by about 4.0 percentage point.
- Creating good jobs for the large pool of under- employed and new labor force entrants by increasing the share of employment in the manufacturing sector from 15 percent to 20 percent.

B. Sector Development

- Increase the contribution of the manufacturing sector to 21% of GDP by FY20.
- Substantial improvement of export to \$54.1 billion by FY20. Achieving a Trade & GDP ratio of 50% by FY20.

C. Urban Development

- Access to improved water source will be ensured for all urban dwellers.
- Coverage of drainage system to be expanded to 80%
- Ensure sustainable urban development that supports increased productivity, investment and employment.

3.6 National Social Security Strategy (NSSS) of Bangladesh

The Government's Social Security Strategy is a part of policies and programs that comprises the Social Development Framework. This forms a wider umbrella incorporating the Government's poverty reduction strategy and strategies on education, health, nutrition, population, sanitation and water supply, financial inclusion, women and gender empowerment, social inclusion of ethnic and religious minorities, environmental protection, climate change management, disaster management and social security. The aim of this framework is to have a comprehensive and consistent set of policies that can help Bangladesh achieve better equity and social justice in the context of its development effort.

3.7 Other National Policies

The following national policies have also been studied:

- National Agriculture Policy, 2004
- National Land Use Policy, 2001
- National Fisheries Policy, 1998
- Forestry Policy, 1994
- National Water Policy, 1999
- National Environment Policy, 1992
- Health Policy, 2000
- Population Policy, 2004
- Housing Policy, 2004
- Industrial Policy, 2005
- National Tourism Policy, 1992
- National Policy for Safe Water Supply & Sanitation, 1998
- Urban Management Policy Statement, 1999
- Proposed National Urban Sector Policy

- National Plan for Disaster Management 2008-2015
- Disaster Management Act 2012 and Disaster Management Policy 2015

3.8 Private Sector Developments

During the reconnaissance & economic survey period, it has been noticed that a number of structures and establishments have been recently constructed haphazardly along the road sides through the private sector initiatives in various places of Shibpur Upazila. And these are used as weaving factories, dyeing industries, markets and hats, schools, colleges, fish firms, poultry firms, electric sub-stations, and so on. The overall implications of such developments have also been studied.

3.9 Linkage of Policies, Plans and Acts/Rules Related to Economic Development of Shibpur

The above mentioned vision, plan, policies and strategies will be prepared considered for preparation of development plan Shibpur upazila. The sectoral policies will also be reflected in the final plan preparation

CHAPTER FOUR: FORMAL ECONOMIC SURVEY

4.1 Introduction

The major formal types of economic activities in Shibpur are: 1) Brick Field 2) Handicrafts 3) Ice cream factory 4) Rice mill 5) Workshop 6) Yarn and Fabrics industry 7) Building materials 8) Cottage 9) Cottage and Handicrafts and 10) Flour mill. The locations of interviewed economic unit's personnel are given below:

Table 4.1 Type of Industries with Location

	Brick Field	Handicrafts	Ice cream factory	Rice mill	Workshop	Yarn and Fabrics	Building materials	Cottage	Cottage and Handicrafts	Flour mill	Food processing	Total
Ayubpur	1	0	0	0	0	0	0	0	0	0	0	1
Chakradha	1	1	0	0	0	0	2	1	2	0	0	7
Masimpur	0	0	0	2	2	0	1	0	0	0	0	5
Putia	2	0	0	0	0	4	0	0	0	0	0	6
Sadharchor	0	0	1	1	1	0	0	0	0	0	0	3
Shibpur	0	0	0	0	0	0	0	0	0	1	1	2

Source: Field survey 2015

There are 4 brick fields in this Upazila. One is located at Ayubpur and Chakradha. Rest of twos are located at Putia. These two brick fields are contributing to develop the local household and infrastructure development functions. Chakradha union contains the highest number (7) of industries interviewed. Along with brick field, it also has 1 handicraft, 1cottage, 2 building materials and 2 cottage & handicraft industries. Cottage industries play vital role to supply local cotton based products. Putia Union contains the second largest (6) number. Along with brick field, it also possesses 4 yarn and fabrics industries. Masimpur union has 2 rice mill, 2 workshop and 1 building materials industries. In Sadharchor union 1 ice cream factory, 1 rice mill and 1 workshop are interviewed. On the other hand, Shibpur union contains 1 flour mill, and 1 food processing industries. Those are employing few people at food processing unit. It has been seen that there are various types of industries are located varying from brickfields to small workshops in Shibpur upazila.

4.2 Ownership Pattern

Most of the formal economic units (about 87%) ownership pattern is private. Rest of them is owned by limited companies. Thus, most of the employments of this upazila are from private sectors. Moreover, it has also been seen that, there are no government owned company is working here (Please see figure 4.1).

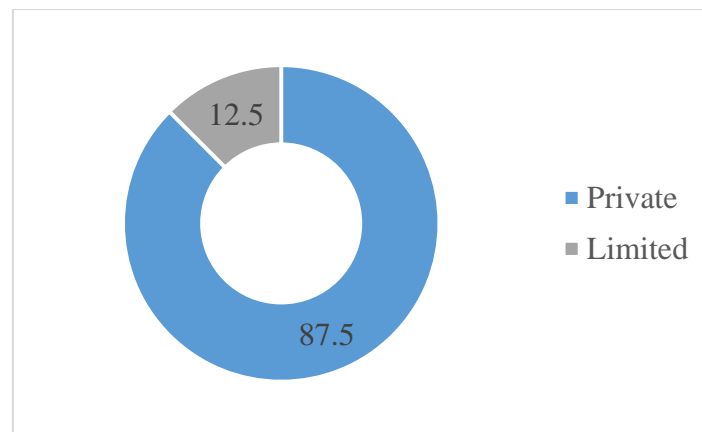


Figure 4.1: Ownership patterns of formal economic units (Source: Field Survey, 2015)

4.3 Area Occupied

It has been found that about half of total formal economic units needs area less than 0.1 acre. About one third of total also need more than 0.1 but less than 1 acres. In addition, the brick fields mainly need more land (more than 10 acre) than others (Please see figure 4.2).

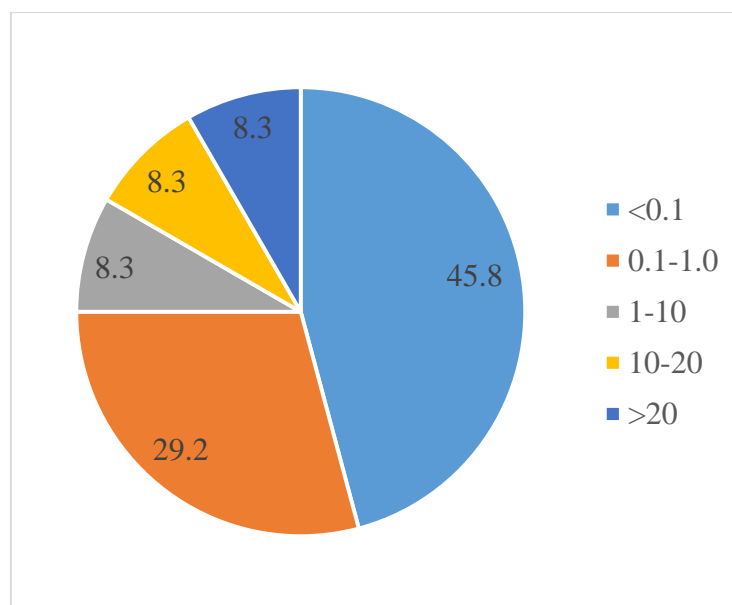


Figure 4.2: Area occupied by formal economic units in acre (Source: Field Survey, 2015)

4.4 Number of Employees

It has been found that two third of total brick fields need more than 100 people. Rest of them need less than 100 but more than 10 people. On the other hand, almost all of the handicrafts, ice cream factories, workshops and cottage industries need less than 10 people. About two third of total rice mills and almost all of the yarn & fabrics industries need more than 10 and less than 150 people. Thus, in this upazila comparatively brick fields employ more people than others.

Table 4.2: Distribution of no. of employees (in percentage) by types of industries

	<10	10-100	100-150	>150
Brick Field		25.0	50.0	25.0
Handicrafts	100.0			
Ice cream factory	100.0			
Rice mill	33.3	66.7		
Workshop	100.0			
Yarn and Fabrics industry		50.0	50.0	
Building materials	66.7	33.3		
Cottage	100.0			
Cottage and Handicrafts	50.0	50.0		
Flour mill	100.0			
Food processing	100.0			

Source: Field Survey, 2015

4.5 Male-Female Ratio in Different Types of Industries

It has been found that, most of the industries have little or no participation of female in their industries. In cottage & handicraft industries highest number of female participation has observed. In that particular types of industries about two third of total employees are female. Rice mills employed the second highest (about one third) female employees. In brick fields also about 17% of total employees are found female.

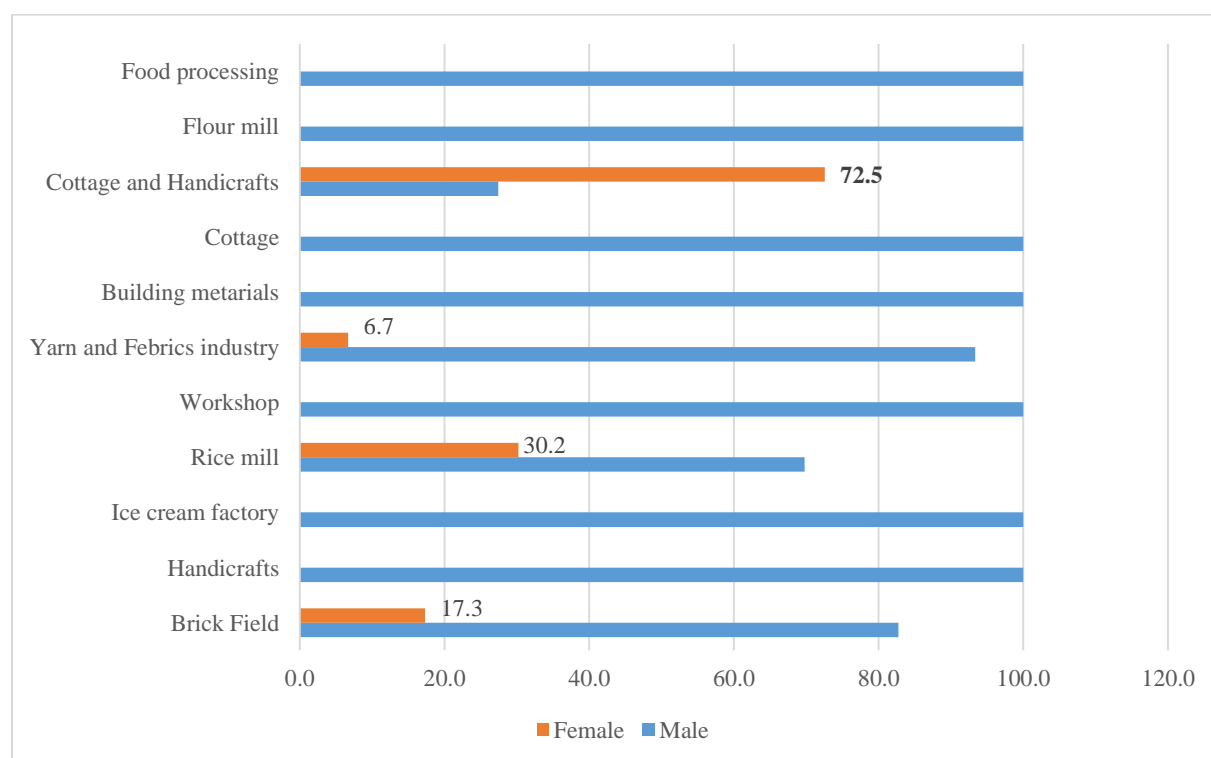


Figure 4.3: Male-Female Ratio in Different Types of Industries (Source: Field Survey, 2015)

4.6 Raw Materials

4.6.1 Major Raw Materials

Major raw materials vary by different types of industries. For instance, major raw material for brick field is soil, whereas bamboo is the major raw material of cottage industries and handicraft industries. Again sugar is mentioned as one of the major raw materials for ice cream factories. Iron and rod are the major raw materials for workshop. Moreover, flour is the major raw materials for food processing industries, whereas paddy is for rice and turmeric is for flour mill. Though major raw materials vary from industries to industries, except yarn and fabrics industries, almost all of the industries' major raw materials' sources are local market. Thus, the upazila is self-sufficient in the perspective of supply of major raw materials for most of the industries.

Table 4.4: Major raw materials (in percentage)

Industries	Major raw materials
Brick Field	Soil
Handicrafts	Bamboo
Ice cream factory	Sugar
Rice mill	Paddy
Workshop	Iron (66.67), Rod (33.33)
Yarn and Fabrics industry	Yarn
Building materials	Brick or broken bricks (66.67), Iron (33.33)
Cottage	Bamboo
Cottage and Handicrafts	Bamboo
Flour mill	Turmeric
Food processing	Flour

Source: Field Survey, 2015

4.6.2 Minor Raw Materials

Apart from the major raw materials, the industries also used some minor raw materials. For example, brick fields also used coal, sand and diesel in their industries. And almost all of the coal's source is other regions. Apart from these, most of the industries' (except yarn and fabrics) minor raw materials' source is local market. Moreover, food processing industries used sugar, and ice cream factories used flour as their minor raw materials. Again flour mills used chilly in their industries. Workshops also used Plain Sheet as their minor raw materials.

Table 4.5: Minor raw materials (in percentage)

Industries	Minor raw materials
Brick Field	Sand, Coal, Diesel (33.33% each)
Handicrafts	Guna
Ice cream factory	Flour
Workshop	Plain sheet
Yarn and Fabrics industry	Parts (66.67), Diesel (33.33)
Building materials	Sand (66.67), Sheet (33.33)
Cottage	Plastic
Cottage and Handicrafts	Cloths

Flour mill	Chilly
Food processing	Sugar

Source: Field Survey, 2015

4.6.3 Other Raw Materials

Building Materials industries also mentioned as cement, rod and GP sheets are the other raw materials they used. Whereas, food grade color is another raw material used in food processing. Ice cream factory also used milk as their raw materials in their industries. As most of the workshop works have been done by electricity, the industries also mentioned it along with steel and color sheet as their raw materials. In addition, almost all of the raw materials have been collected from local markets. Thus, the economy of this upazila is strong enough to support its own production.

Table 4.6: Other raw materials

Industries	Other raw materials
Ice cream factory	Milk
Workshop	Color sheet (50), Steel (50)
Yarn and Fabrics industry	Needle
Building materials	Cement, Rod, GP sheet (33.33% each)
Cottage and Handicrafts	Yarn
Flour mill	Chilly
Food processing	Color

Source: Field Survey, 2015

4.7 Products and Their Market

It has been seen that brick fields, yarn and fabrics industries along with cottage and handicrafts industries exported their products in other markets. Whereas cottage and handicrafts industries export most of their products (about 95%). Apart from these, most of the industries' product only supports the local needs.

Table 4.7: Products and Their Market

Industries	Product	Local (%)
Brick Field	80	20
Handicrafts	100	0
Ice cream factory	100	0
Rice mill	100	0
Workshop	100	0
Yarn and Fabrics industry	55	45
Building materials	100	0
Cottage	100	0
Cottage and Handicrafts	5	95
Flour mill	100	0
Food processing	100	0

Source: Field Survey, 2015

4.8 Production Amount and Their Yearly Price

It can be seen in Table 4.8 that production of different products in this upazila and their yearly price has been given. Here, brick fields produced average 4712500 pcs of brick per year which yearly price is highest (about BDT 3,56,75,000) among other products. Rice mills positioned in second (BDT 1,16,00,000) in the perspective of yearly price of production. On the other hand, food processing industries produce about 87.6 tons' products yearly which yearly production price is the next highest (BDT 87,60,000).

Table 4.8: Production amount and their yearly price

Industries	Amount of Production	Unit	Avg. Price in BDT
Brick Field	4712500	pcs in year	3,56,75,000
Ice cream factory	54000	pcs in year	6,48,000
Workshop	252	pcs in year	8,30,000
Building materials	5630	pcs in year	24,90,000
Cottage	9125	pcs in year	36,500
Cottage and Handicrafts	27500	pcs in year	2,87,500
Rice mill	998	tons per year	1,16,00,000
Workshop	13	tons per year	8,30,000
Yarn and Fabrics industry	3.5	tons per year	8,88,333
Flour mill	10.95	tons per year	2,19,000
Food processing	87.6	tons per year	87,60,000
Handicrafts	750	gauge/meter per year	45,000
Yarn and Fabrics industry	48250	gauge/meter per year	8,88,333

Source: Field Survey, 2015

4.9 Mode of Transportation of Raw Materials

About one-third total industries use Van/Rickshaw as their primary mode of transportation for raw materials. This is because, as discussed earlier the major source of raw materials and products produced are the local markets. Moreover, about more than one-fourth of total industries also used tempo/nosimon as their primary mode of transportation. In addition, about more than one third (37%) of total industries also used truck and pickup as their primary mode of communication.

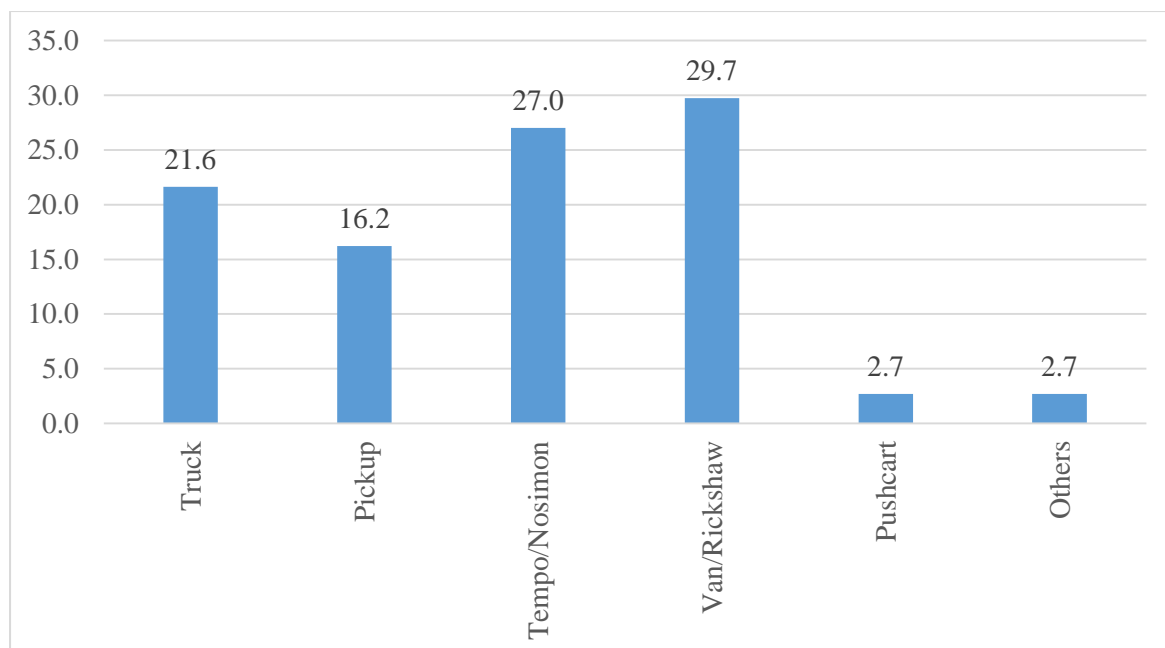


Figure 4.4: Mode of transportation of raw materials (Source: Field Survey, 2015)

4.10 Solid Waste, Management and Environment

a. Waste disposal site

From the survey it has been found that brick fields make highest amount (62.5 tons) of solid waste whereas cottage handicraft industries make about 1.5 tons of solid waste. And rest of the types of industries produce less than one tons of solid waste. About more than half of them dispose the waste into roadside. About 200% of total industries try to use the waste as poultry & dairy food and to sell. But the alarming is that about one fourth of total industries also use agricultural land as waste disposal site (please see figure 4.5). Whereas, about 28% of total waste is non-refined.

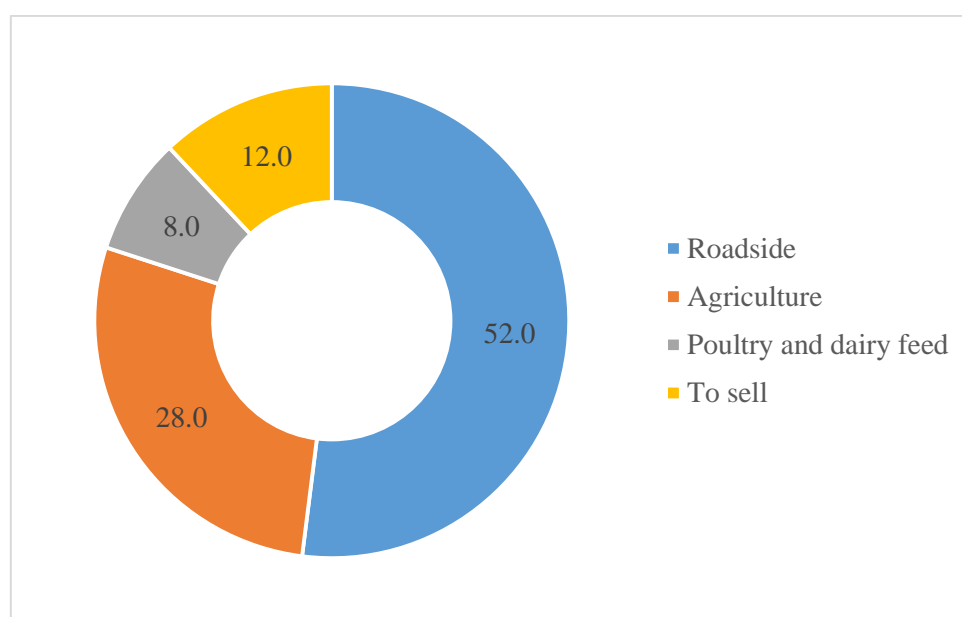


Figure 4.5: Waste disposal site (Source: Field Survey, 2015)

b. Availability of waste treatment system

Moreover, approximately more than two third of total industries said they do not have any waste treatment system (please see figure 4.6). Thus, the waste disposal condition of the industries of this upazila is unhealthy and unplanned. Necessary steps should be taken regarding these.

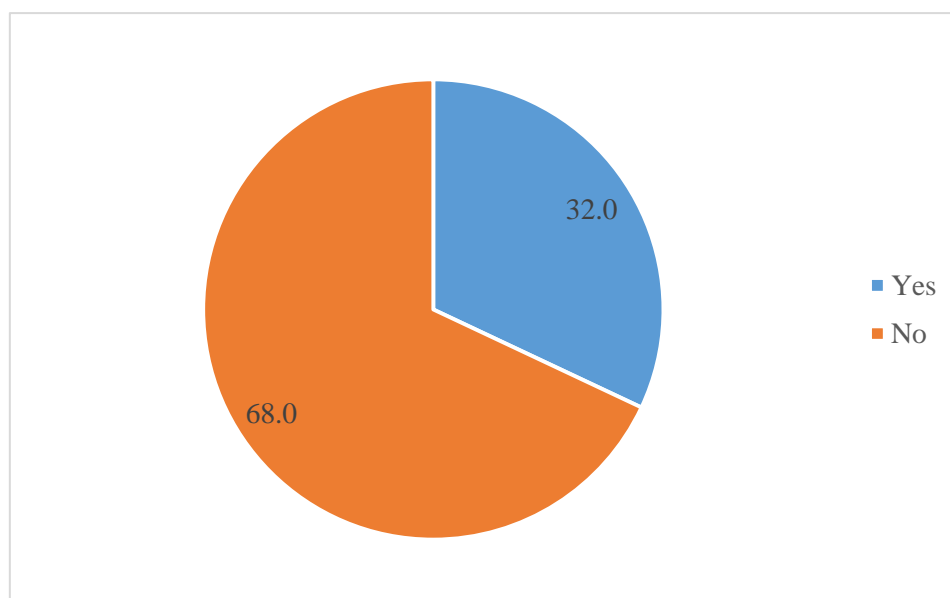


Figure 4.6: Availability of waste treatment system (Source: Field Survey, 2015)

c. Measures taken against pollution

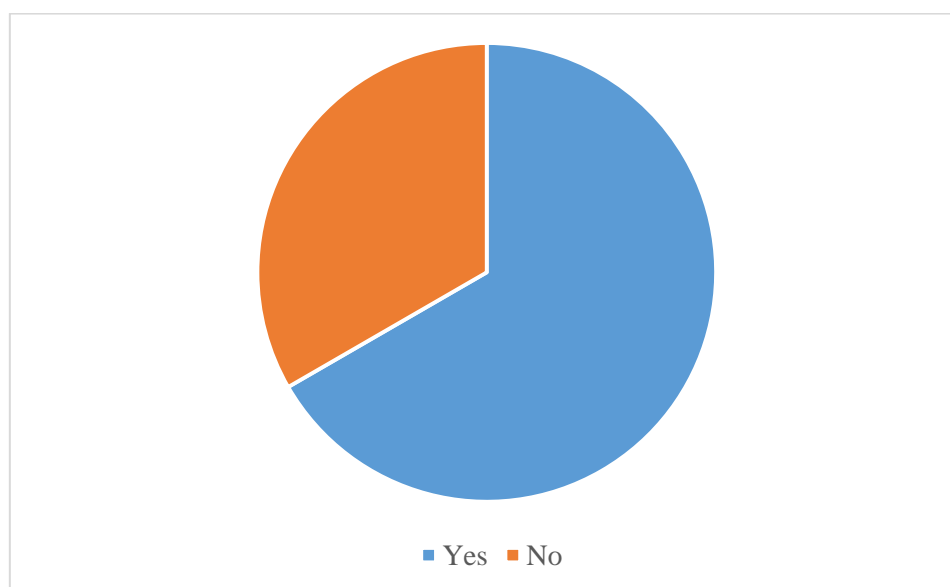


Figure 4.7: Availability of environmental clearance (Source: Field Survey, 2015)

In addition, alarming is that, about more than 90% of total industries mentioned that they do not take any measurements regarding against pollution (please see figure 4.8). In addition, not a single industries completed their Environmental Impact Assessment (EIA) report but about two third of total industries mentioned that they have environmental clearance of the industry (please see figure 4.7).

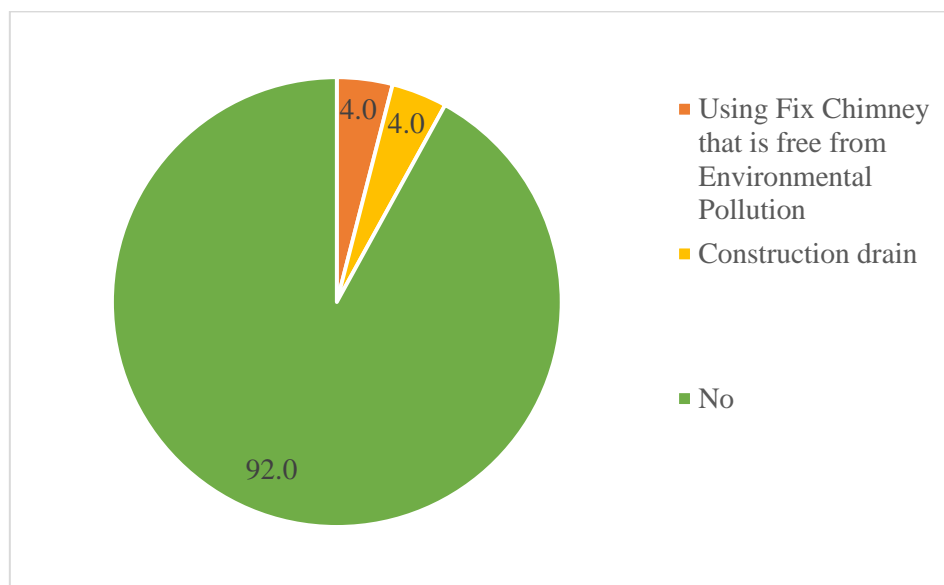


Figure 4.8: Measures taken against pollution (Source: Field Survey, 2015)

4.11 Health Security of the Worker

In approximately 8% of total industries, workers have no health security. But most of the workers of industries (about three fourth of total) opinioned that owner pays on health security of the workers. Thus, in this case, workers get their rights of treatment in most of the time.

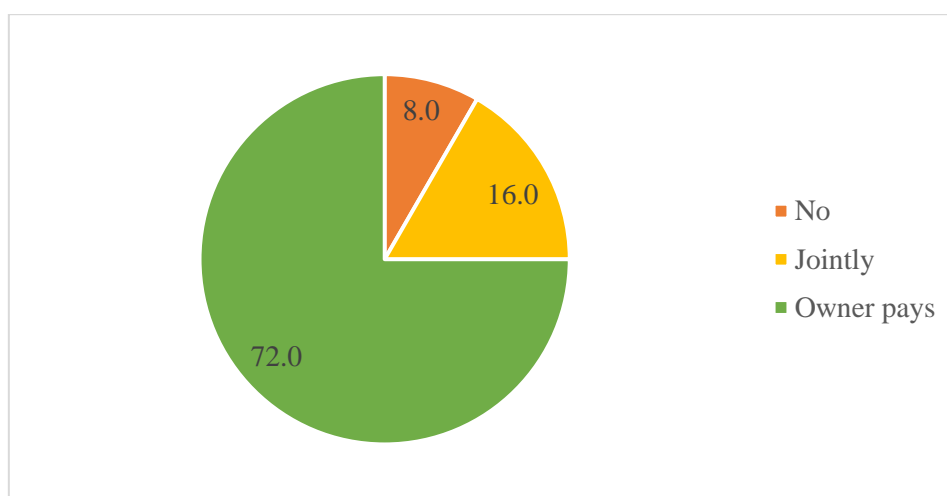
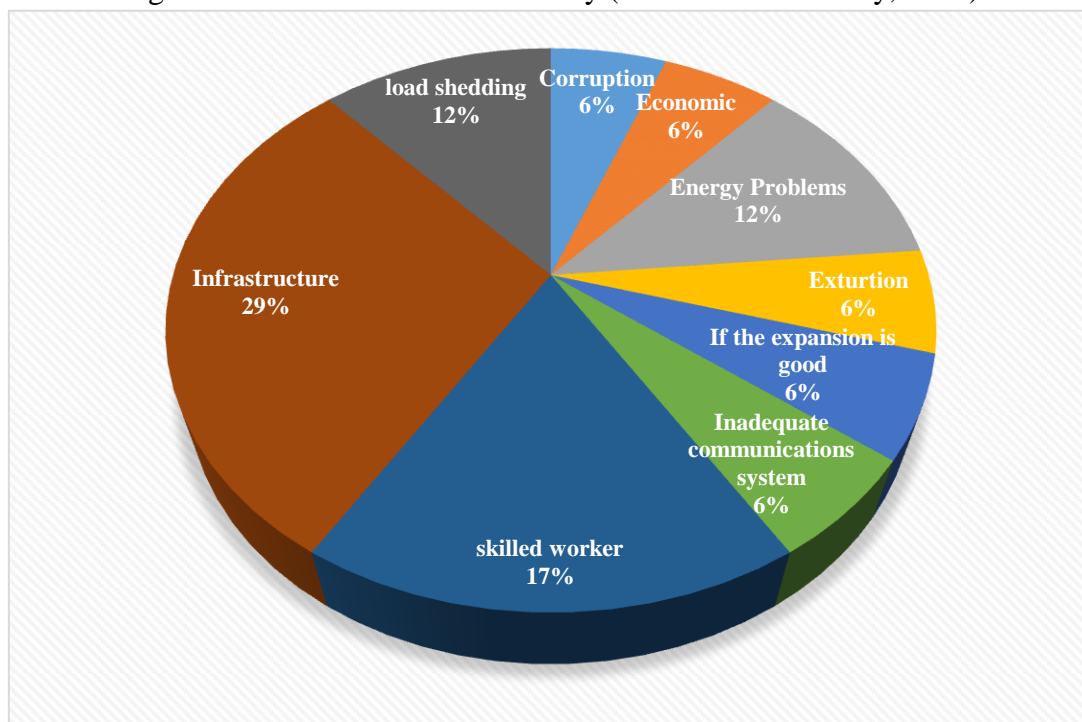


Figure 4.9: Health security of the worker (Source: Field Survey, 2015)

4.12 Problems in the Industries

About 30% (highest) of total industries said that infrastructure is their major problems. Moreover, about one fourth of total industries mentioned that their next major problem is lack of energy (electricity etc.). About 17% of total industries also said that, lack of skilled labor is their major problem. Thus lack of enough infrastructure in this upazila which is mentioned strongly by the industries.

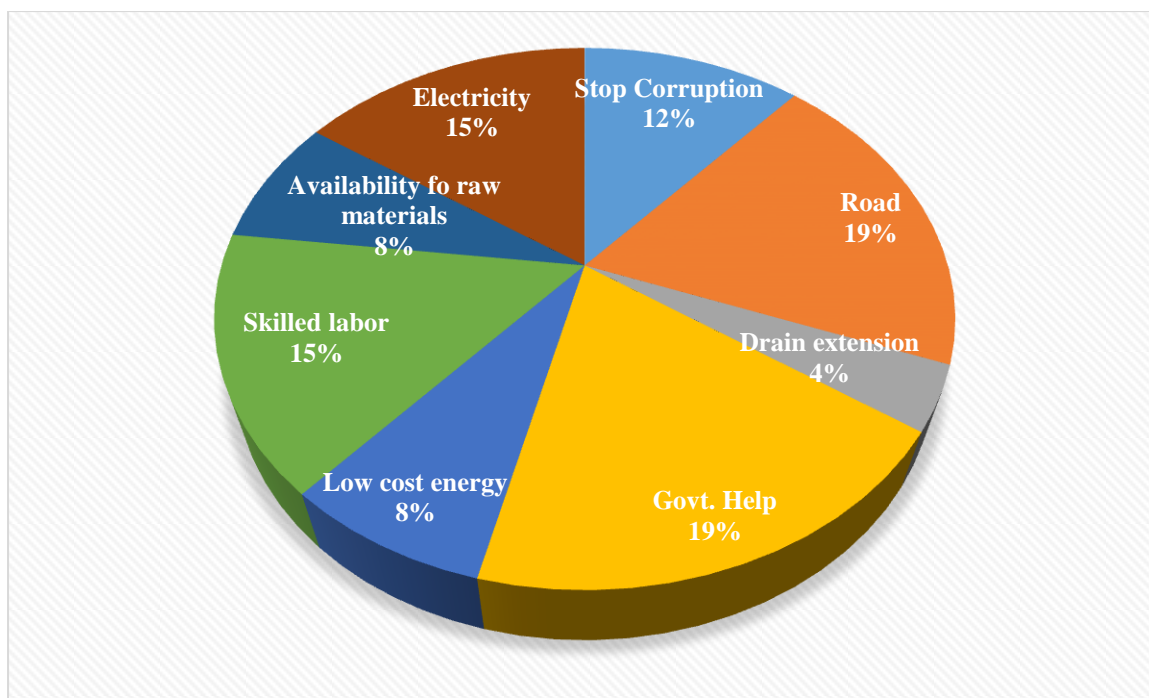
Figure 4.10: Problems in the industry (Source: Field Survey, 2015)



4.13 Suggestions to Solve the Industrial Problems

About one third of total industries notified that the solution of problems like infrastructure problem (road) and electricity problem would be solved by the government's intervention. About 12% also said that increasing the law and order condition, by lessening the occurrence of corruption could also be a significant solution (Please see figure 4.11).

Figure 4.11: Suggestions to solve industrial problems (Source: Field Survey, 2015)



CHAPTER FIVE: INFORMAL ECONOMIC SURVEY

5.1 Introduction

The major informal types of economic activities in Shibpur are: (1) Poultry; (2) Saw mills; (3) Dairy farms; (4) Fisheries ;(5) Furniture making. The locations of interviewed informal economic units are given below:

Table 5.1 Type of Industries with Location

	Poultry	Saw mill	Dairy farm	Fisheries	Furniture making	Total
Baghaba	3	0	0	0	0	3
Chakradha	1	3	1	1	0	6
Dulalpur	0	1	0	4	0	5
Masimpur	0	2	0	0	0	2
Sadharchor	0	1	0	0	0	1
Shibpur	0	0	0	0	3	3

Source: Field survey 2015

Among 5 fish farms, 4 are in Dulalpur, the rest of one in Chakradha union. It supplies fish based food demand in this upazila. 3 furniture making economic unit is located at Shibpur. There are also two saw mills are found in Masimpur, 1 of each in Dulalpur and Sadharchor union, and 3 in Chakradha union. Those play vital role to develop wood based household and other infrastructure development in Shibpur. Total 3 poultry farms found at Baghaba and 1 in Chakradha that plays vital role to meet the meat supply demand at the area. Apart from these 1 dairy farm is located at Chakradha union. This union contain highest number (6) of informal economic units in this upazila.

5.2 Ownership Pattern

Most of the informal economic units (about 85%) ownership pattern is private. Rest of them are owned by shareholders. Thus, most of the employments of this upazila are from private sectors. (Please see figure 4.1).

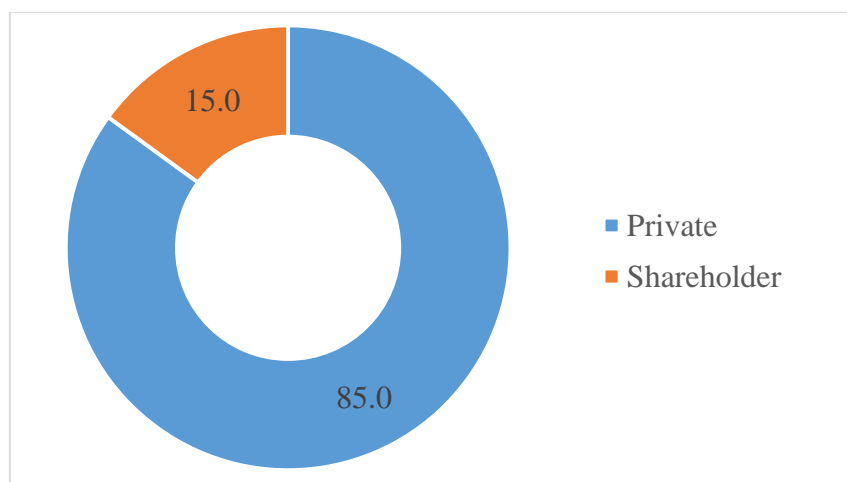


Figure 5.1: Ownership patterns of formal economic units (Source: Field Survey, 2015)

5.3 Area Occupied

It has been found that about same percentage (35%) of total informal economic units needs area more than 0.1 acre but less than 10 acres. This types of economic units are mainly the poultry, dairy, fisheries and saw mills. Among them, the fisheries and some of saw mills mainly need more land (more than 1 acre) than others. About 30% of them needs less than 0.1 acres of land. (Please see figure 4.2)

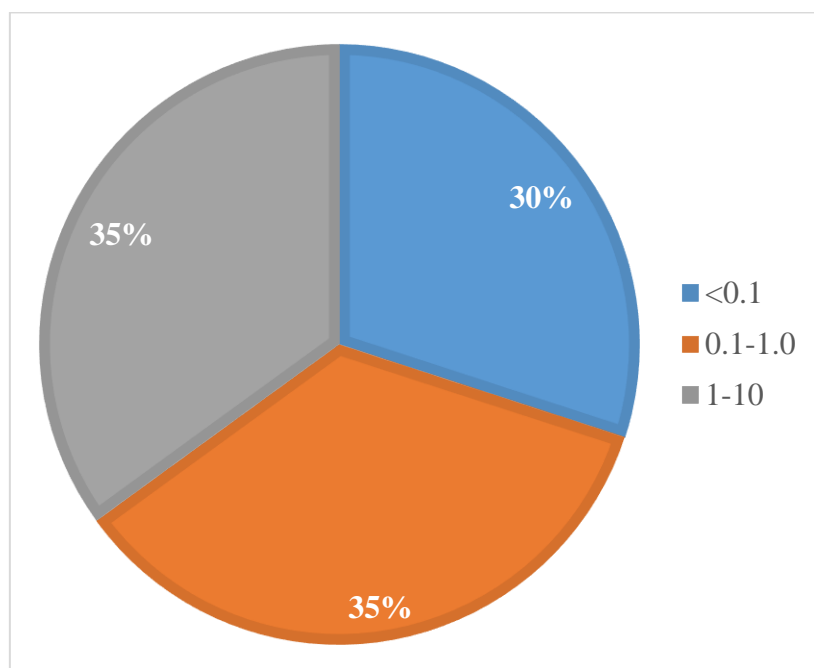


Figure 5.2: Area occupied by formal economic units in acre (Source: Field Survey, 2015)

5.4 Number of Employees

It has been found that except furniture making economic units, almost all of the informal economic units can manage their business with less than 10 people. saw mills need employees between 4 to 6. On the other hand, for furniture making more than 10 people is required.

Table 5.2: Distribution of no. of employees (in percentage) by types of industries

	<10 persons	10-100 persons
Poultry	100.0	
Saw mill	100.0	
Dairy farm	100.0	
Fisheries	100.0	
Furniture making	66.7	33.3

Source: Field Survey, 2015

5.5 Male-Female Ratio in Different Types of Industries

It has been found that, in informal economy also there are significantly low or no participation of women. In poultry and dairy farm, only about one fourth female employees have been found. In rest of the informal economic types, inconsiderable percentage of women is present. Thus awareness program or other appropriate steps should be taken regarding these.

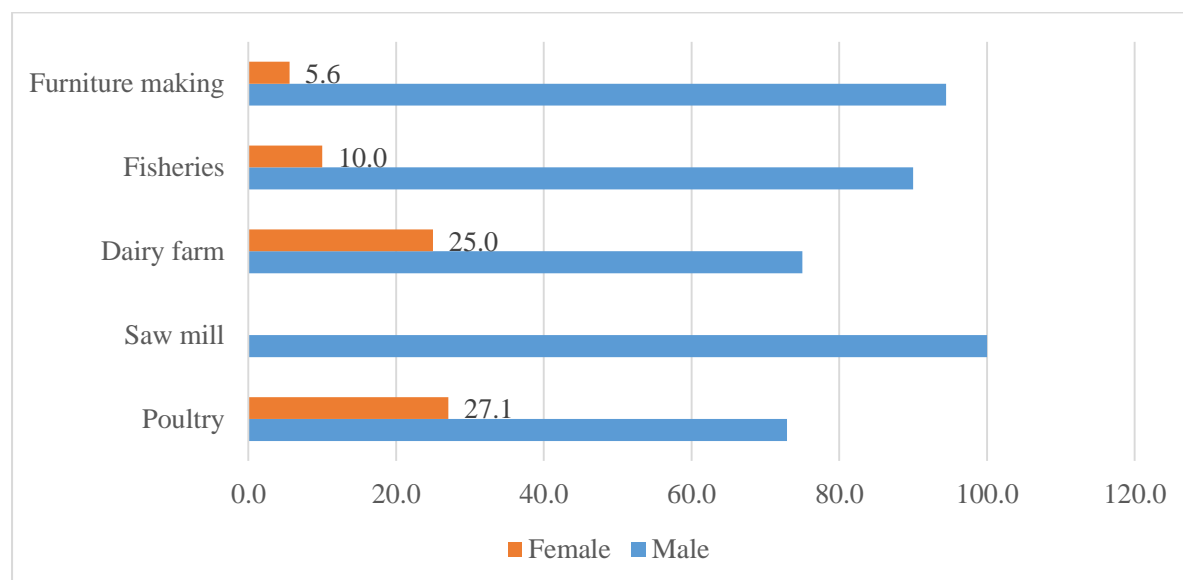


Figure 5.3: Male-Female Ratio in Different Types of Industries (Source: Field Survey, 2015)

5.6 Raw Materials

Major Raw Materials

Major raw materials vary by different types of informal industries. For instance, major raw materials for saw mills is tree, wood and wood powder, whereas Tush, Maize, Soya bean, Kura, Jhinuk, Protein, Medicine and salt, Poultry feed, Maize are the major raw materials for poultry. Again cow is one of the major raw materials for dairy farm. And except saw mills, source of all kinds of raw materials are local market. Thus local markets are sufficient enough to supply the demands for these informal economies. Saw mills about half of their raw materials import from other regions.

Table 5.4: Major raw materials

	Major raw materials
Poultry	<i>Tush</i> , Maize, Soya bean, Kura, <i>Jhinuk</i> , Protein, Medicine and salt, Poultry feed, Maize
Saw mill	Wood, Tree, Tree Powder
Dairy farm	Cow
Fisheries	Fry, Fish, Fish feed
Furniture making	Wood, Tree, Tree Powder

Source: Field Survey, 2015

Minor Raw Materials

Apart from the major raw materials, poultry farms need some minor raw materials. They need Pituitary Gland Medicine for their farms. In addition, they also mentioned that *tush* another important raw material. Dairy farms said *bhushi* as their minor raw materials. Moreover, fisheries said, Maize, Soyabean, Oilcake and Bhusi as their minor raw materials. Furniture making informal industries mentioned burnish colors and road as their minor raw materials.

Other Raw Materials

Some of the dairy farms mentioned straw and some of the furniture making economic units mentioned board as their less important raw materials needed for their business.

5.7 Products and Their Market

Products of some Poultry farms are going outside the upazila area to sell their products after meeting demands of the area. Poultry farms exported about 13% of their products outside the upazila. Apart from these, saw mills, dairy farms, fisheries and furniture making economic units' product only support the local needs.

Industries	Local	Others
Poultry	87.5	12.5
Saw mill	100	0
Dairy farm	100	0
Fisheries	100	0
Furniture making	100	0

Table 5.5: Products and Their Market

Source: Field Survey, 2015

In below table production of different informal economic units in this upazila and their yearly price has been given. Here, fisheries produced about 5.5 tons of their product per year which yearly price is highest (about BDT 76,00,000) among other products. Home appliances by furniture makers positioned in second (BDT 37,80,000) in the perspective of yearly price of production. Dairy farms produced about 14.6 tons of their product yearly, which yearly production price is the lowest (6,57,000).

Table 5.6: Average production amount and their yearly price

	Production	Units	Yearly price of products in BDT
Poultry	105600.0	Pcs per year	16,15,000
Saw mill	11350.0	gauge/meter per year	11,98,143
Dairy farm	14.6	tons per year	6,57,000
Fisheries	5.5	tons per year	76,00,000
Furniture making	193.0	Pcs per year	37,80,000

Source: Field Survey, 2015

5.8 Mode of Transportation of Raw Materials

About one third of total informal economic units use Van/Rickshaw as their primary mode of transportation for raw materials. This is because, as discussed earlier the major source of raw materials are the local markets. Moreover, about one-fourth of total informal economic units also used tempo/nosimon as their primary mode of transportation. In addition, about the same percentage (25%) of informal economic units also used truck as their primary mode of communication.

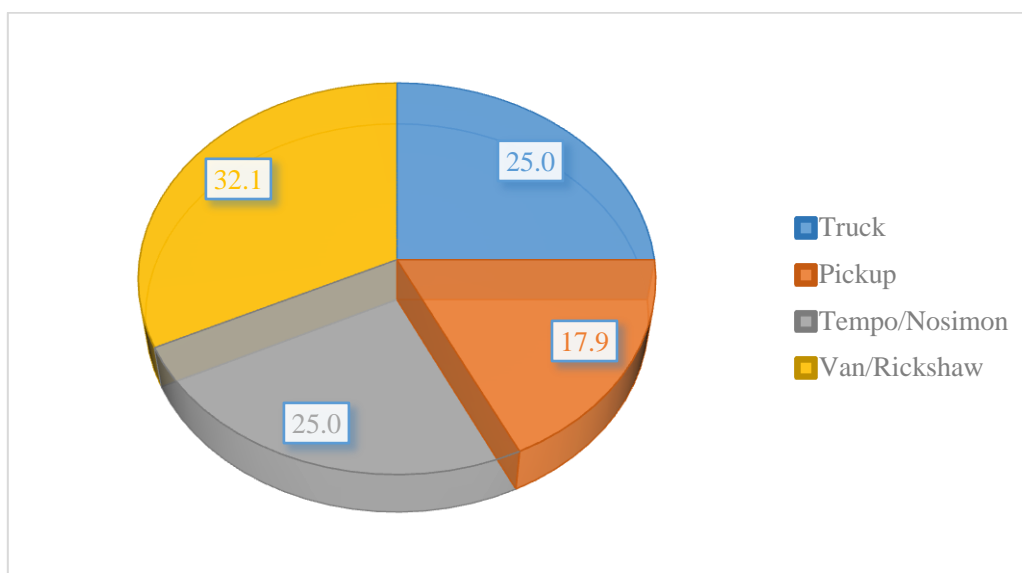


Figure 5.4: Mode of transportation of raw materials (Source: Field Survey, 2015)

5.9 Solid Waste, Management and Environment

From the survey it has been found that fisheries make highest amount (10 tons) of solid waste. Saw mill and only poultry farms make about 2 tons of solid waste yearly. And rest of the types of industries produce less than one tons of waste. Only dairy farm's half of total waste is liquid waste. For rest of the types the whole waste is solid waste. About 30% of total informal economic units dispose the waste into roadside. But the alarming is that about 70% of them also use agricultural land as waste disposal site (please see figure 4.5). Moreover, the waste contained both of refined (40%) and non-refined (60%) waste.

Table 5.7: Average waste produced

	Waste Produced (tons per year)
Poultry	0.097
Saw mill	0.43
Dairy farm	0.2
Fisheries	10
Furniture making	0.06

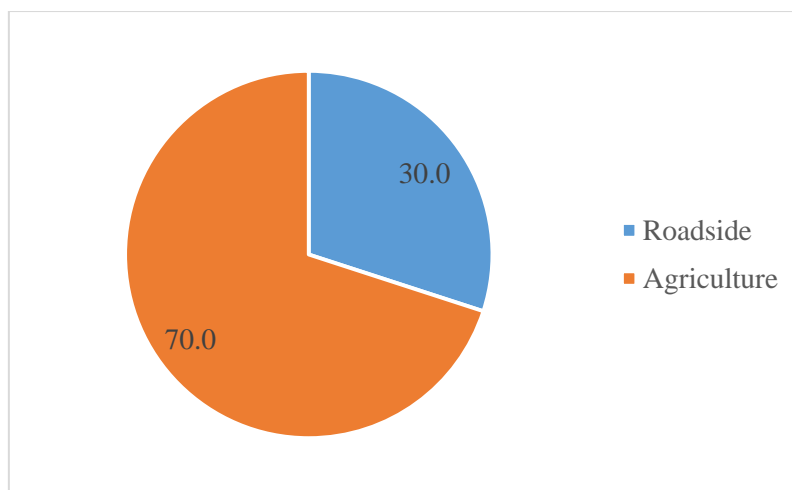


Figure 5.5: Waste disposal site (Source: Field Survey, 2015)

Moreover, approximately more than two third of total informal economic units said they do not have any waste treatment system (please see figure 5.6). Thus, the waste disposal condition of the industries of this upazila is unhealthy and unplanned. Necessary steps should be taken regarding these.

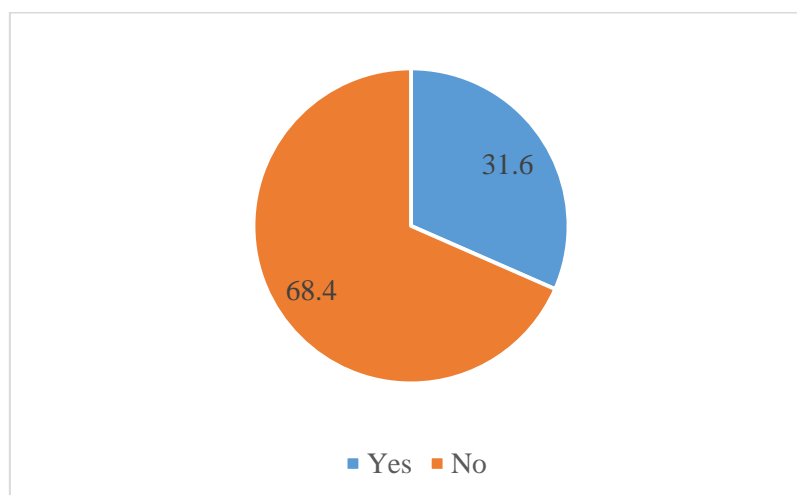


Figure 5.6: Availability of waste treatment system (Source: Field Survey, 2015)

Regarding measures taken against pollution generated by the organization about 35% of informal economic units (poultry farms, fisheries) mentioned that they dumped the waste under the soil, thus it could produce the fertilizer.

But alarming is that, about half of total industries mentioned that they do not take any measurements regarding against pollution (please see figure 4.7). In addition, not a single economic units completed their Environmental Impact Assessment (EIA) report and do not have any environmental clearance (please see figure 5.7)

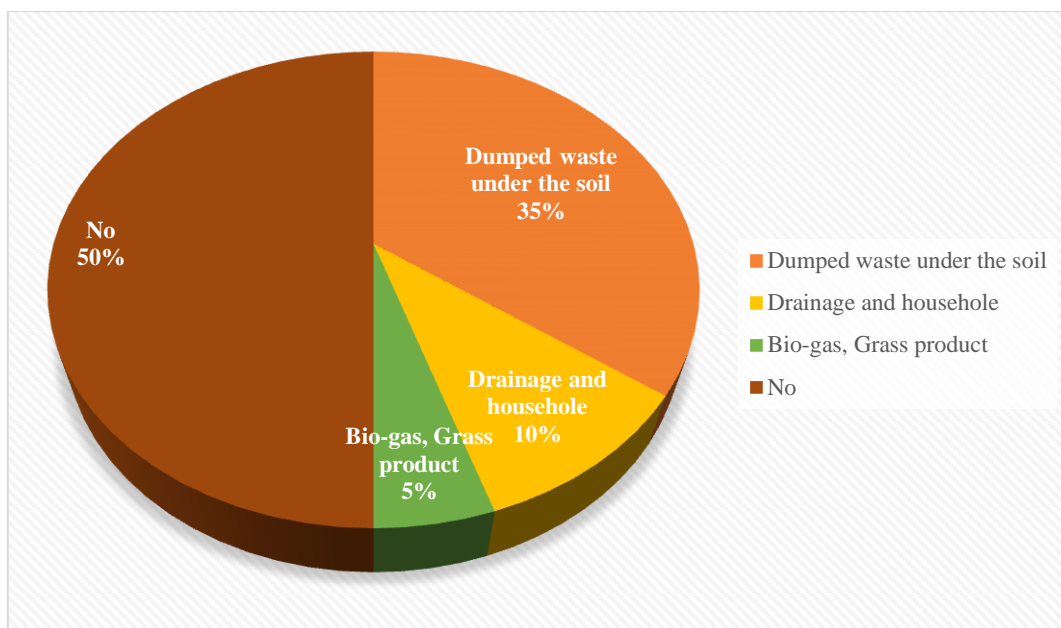


Figure 5.7: Measures taken against pollution (Source: Field Survey, 2015)

5.10 Health Security of the Worker

Most of the workers of industries (about three fourth of total) owner pays on health security of the workers. And for the 15% cases the organization pay the health expenditures if it happens on working time. Thus, in this upazila, workers get their rights of treatment in most of the time.

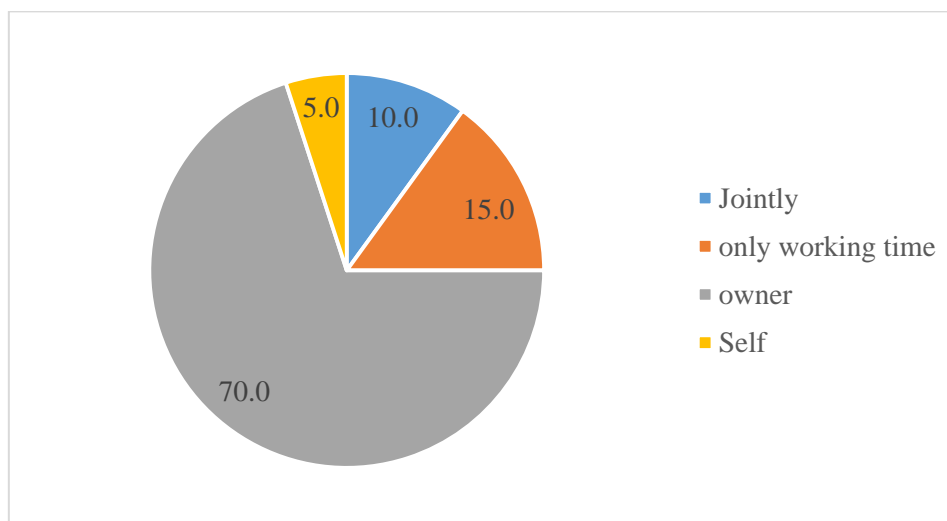


Figure 5.8: Health security of the worker (Source: Field Survey, 2015)

5.11 Problems in the Industries

About more than half (highest) of total informal economic units said that lack of skilled labor is there major problem. About 30% of them also mentioned that their next major problems infrastructure problem. Thus there are lack of skilled labor in this upazila which is mentioned strongly by the industries. The least priority for the major problems towards them is electricity problem. Extortion

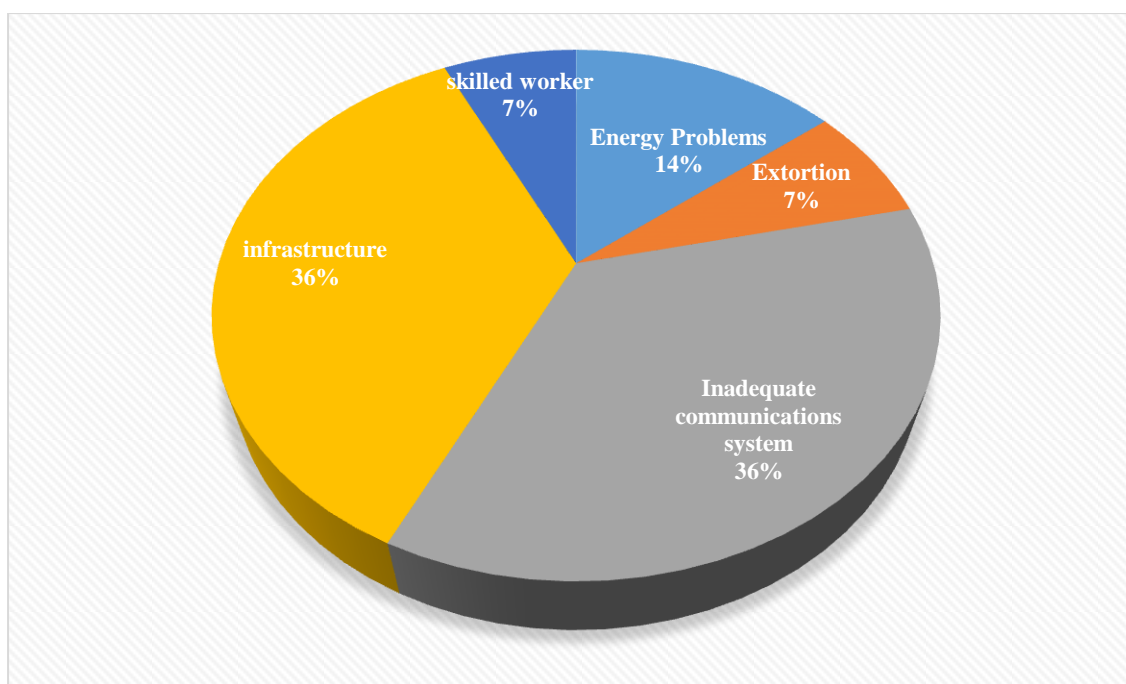


Figure 5.9: Problems in the industry (Source: Field Survey, 2015)

5.12 Suggestions to Solve the Problems

About more than one third of the total economic units notifies that the solution of above mentioned problem could be governments helps towards them by providing loan on easy terms. About one fourth of them also mentioned availability of low cost and good quality medicine also help them a lot. About 17% of them also required infrastructure development which includes roads and others. About 8% of them also wants training for the worker, thus they can get the skilled labors for their economy.

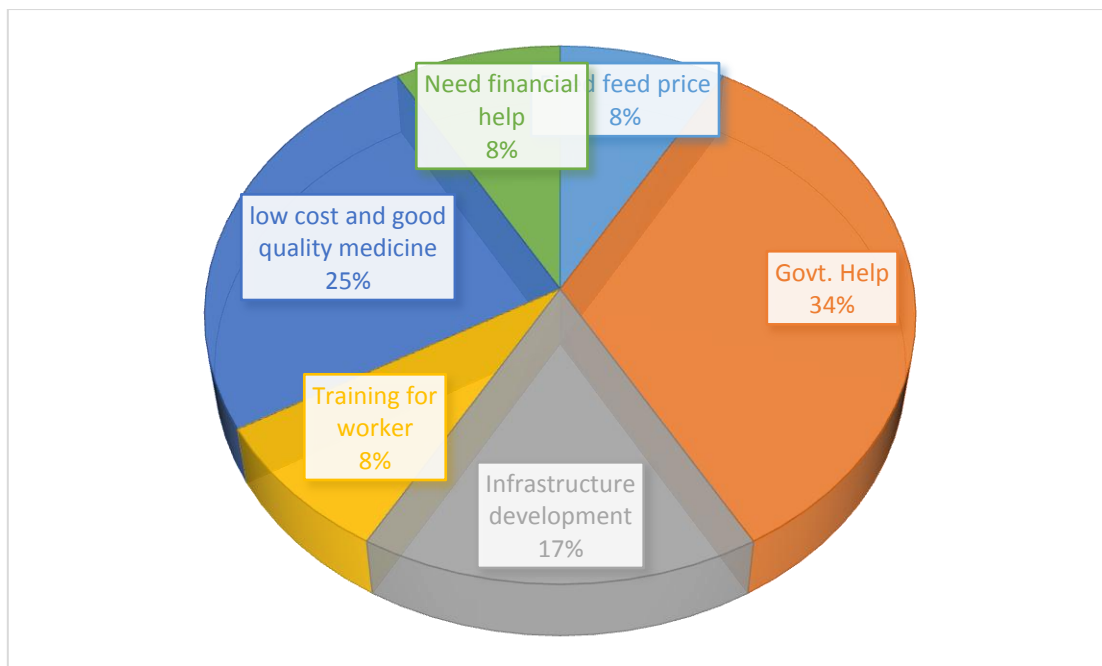


Figure 5.10: Suggestions to solve industrial problems (Source: Field Survey, 2015)

REFERENCE/BIBLIOGRAPHY

BBS (2011) *Population and Housing Census, Community Report: Narsingdi Zila, 2011*. Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning, Dhaka.

Banglapedia (2016) http://en.banglapedia.org/index.php?title=Shibpur_Upazila, Accessed on 15th August, 2016

Wikipedia (2016) https://en.wikipedia.org/wiki/Shibpur_Upazila, Accessed on 15th August, 2016

<http://www.plancomm.gov.bd/>, Accessed on 16th August, 2016

<http://www.bangladesh.gov.bd/>, Accessed on 16th August, 2016

Annexure-I

(Sample of Formal-Informal Economic Survey Questionnaire)

গৃহায়ন ও গনপূর্ত মন্ত্রণালয়

নগর উন্নয়ন অধিদপ্তর

প্রিপারেশন অব ডেভেলপমেন্ট প্লান ফর ফোরটিন উপজেলাস -প্যাকেজ-০২ এর আওতায়

শিবপুর ও রায়পুরা উপজেলা এবং ঈশ্বরগঞ্জ উপজেলার উন্নয়ন পরিকল্পনা প্রণয়ন কার্যক্রম

পরামর্শক প্রতিষ্ঠান : যৌথভাবে শেল্টেক কনসালটেন্ট প্রাঃ লিঃ ও আর্ক বাংলাদেশ লিঃ

আনুষ্ঠানিক -অনানুষ্ঠানিক অর্থনৈতিক জরিপ প্রশ্নমালা-২০১৫

প্রশ্নমালা নংঃ জরিপের তারিখঃ সময়ঃ
সাক্ষাৎকার গ্রহণকারীর নামঃ সাক্ষাৎকার গ্রহণকারীর স্বাক্ষরঃ

■ **অধ্যায়-৪ঃ শিল্প কারখানা (বৃহৎ, ক্ষুদ্র, মাঝারি ও কুটির)**

৪.১ শিল্প কারখানা / প্রতিষ্ঠানের নাম :

৪.২ শিল্প কারখানা / প্রতিষ্ঠানের ঠিকানা :

৪.৩ মালিকানার ধরনঃ ☐ ব্যক্তিগত মালিকানা ☐ লিমিটেড কোম্পানী ☐ অংশীদারী প্রতিষ্ঠান

৪.৪. মালিক/ব্যবস্থাপনা পরিচালক/ অংশীদারের নামঃ

৪.৫ প্রতিষ্ঠানের ধরন :

<input type="checkbox"/> নির্মাণ সামগ্রী	<input type="checkbox"/> দুগ্ধ খামার	<input type="checkbox"/> মৎস্য প্রক্রিয়াকরণ	<input type="checkbox"/> ওয়ার্কসপ
<input type="checkbox"/> রাসায়নিক দ্রব্যাদি	<input type="checkbox"/> ট্রেডিং হাউস	<input type="checkbox"/> করাত কল	<input type="checkbox"/> আটা মিল
<input type="checkbox"/> সুতা ও বস্ত্র শিল্প	<input type="checkbox"/> ব্যাংক	<input type="checkbox"/> নারিকেলের খোসার আঁশ ভিত্তিক শিল্প প্রতিষ্ঠান	<input type="checkbox"/> চামড়াজাত শিল্প
<input type="checkbox"/> কুটির শিল্প	<input type="checkbox"/> বাঁমা	<input type="checkbox"/> হস্ত শিল্প	<input type="checkbox"/> সিমেন্ট কারখানা
<input type="checkbox"/> গ্যাস	<input type="checkbox"/> চিংড়ি ঘের	<input type="checkbox"/> ইট ভাটা	<input type="checkbox"/> ওয়ারহাউস
<input type="checkbox"/> খাদ্য প্রক্রিয়াজাতকরণ	<input type="checkbox"/> রাইস মিল	<input type="checkbox"/> বরফ কল	<input type="checkbox"/> পাটজাত দ্রব্য প্রক্রিয়াকরণ
<input type="checkbox"/> পোস্তি	<input type="checkbox"/> দোকান	<input type="checkbox"/> গার্মেন্টস	<input type="checkbox"/> মৎস্য খামার
<input type="checkbox"/> আসবাবপত্র প্রস্তুতকরণ	<input type="checkbox"/> প্রিন্টিং প্রেস	<input type="checkbox"/> প্লাস্টিক ইন্ডাস্ট্রি	<input type="checkbox"/> অন্যান্য

৪.৬ আয়তন (একর)ঃ

৪.৭ কর্মকর্তা ও কর্মচারীর সংখ্যা :

(ক) সর্বমোট সংখ্যা : পুরুষঃ মহিলা :

(খ) প্রশাসনিক কর্মকর্তা ও কর্মচারীর সংখ্যা :

(গ) শ্রমিক ও অন্যান্য কর্মচারীর সংখ্যা :

৪.৮ কাঁচামাল সংক্রান্ত তথ্য :

ক্রমিক নং	ব্যবহৃত কাঁচামাল	কাঁচামালের উৎস	
		স্থানীয় (%)	আমদানীকৃত (%)

৪.৯. উৎপাদিত পণ্য :

(ক) উৎপাদিত পণ্যের প্রকার :

- | | | | |
|--|---|---|---|
| <input type="checkbox"/> কুটির শিল্প | <input type="checkbox"/> প্রক্রিয়াজাত সাদা মাছ | <input type="checkbox"/> দুধ ও দুগ্ধজাত খাবার | <input type="checkbox"/> গৃহস্থালির পণ্যসামগ্রী |
| <input type="checkbox"/> ইট ভাটা | <input type="checkbox"/> পাটজাত দ্রব্য | <input type="checkbox"/> প্যাকেটজাত খাবার | <input type="checkbox"/> প্লাস্টিকের পণ্য |
| <input type="checkbox"/> বোতলকৃত তরল প্রাকৃতিক গ্যাস | <input type="checkbox"/> ডিম | <input type="checkbox"/> সুতা ও বস্ত্র | <input type="checkbox"/> অন্যান্য (উল্লেখ করুন) : |
| <input type="checkbox"/> 'স' মিল | | | |

(খ) উৎপাদিত পণ্য বাজারজাতকরণ :

বিবরণ	পরিমাণ (%)
স্থানীয় বাজার	
সারা দেশ	
রপ্তানীর জন্য স্থানীয় রপ্তানীকারকে সরবরাহ	
সরাসরি রপ্তানী (দেশের নাম)	

৪.১০. কাঁচামাল ও উৎপাদিত পণ্য বাজারজাতকরণে ব্যবহৃত পরিবহন :

সড়ক	রেলপথ	জলপথ
১. ট্রাক/ আচ্ছাদিত ট্রাক/ট্রেইলার	বাংলাদেশ রেলওয়ে	১. কার্গো
২. বাস		২. ট্রলার
৩. পিকআপ		৩. নৌকা
৪. মাইক্রোবাস/ কার		৪. অন্যান্য
৫. টেম্পু/ বেবিট্যাক্সি		
৬. ভ্যান/ রিক্সা		
৭. ঠেলাগাড়ী		

৮. অন্যান্য		
-------------	--	--

৪.১১. বর্জ্য ব্যবস্থাপনা :

(ক) দৈনিক বর্জ্য উৎপাদনের পরিমাণ ও ধরন : টন

সলিড _____ % লিকুইড _____ %

(খ) বর্জ্য অপসারণ: ☐ পরিশোধিত ☐ অপরিশোধিত

(গ) বর্জ্য অপসারণের স্থান:

☐ রাস্তার পাশে ☐ খোলা মাঠ ☐ খাল ☐ নদী ☐ কৃষিজমি

(গ) বর্জ্য অপসারণ স্থানের মালিকানা:

☐ নিজস্ব ডাম্পিং গ্রাউন্ড ☐ সরকারি স্থান ☐ বেসরকারি মালিকানাধীন জায়গা

৪.১২. বর্জ্য পরিশোধন ব্যবস্থা আছে কি না? ☐ হ্যাঁ ☐ না

৪.১৩. প্রতিষ্ঠান থেকে সৃষ্ট পরিবেশ দূষণ রোধের ব্যবস্থার বিবরণ:

.....

.....

.....

৪.১৪. EIA (এনভায়রনমেন্টাল ইমপ্যাক্ট এসেসমেন্ট) করেছেন কি না? ☐ হ্যাঁ ☐ না

৪.১৫. শিল্প কারখানার শ্রমিকদের পেশাগত স্বাস্থ্য নিরাপত্তা ব্যবস্থার বিবরণ :

.....

.....

.....

৪.১৬. শিল্প কারখানার পরিবেশ বিষয়ক ছাড়পত্র আছে কিনা (বিবরণসহ) :

.....

.....

.....

৪.১৭. কর্মকর্তা / কর্মচারীদের বাসস্থান সম্পর্কিত তথ্য: ☐ নিজস্ব ☐ ভাড়াবাড়ী ☐ অন্যান্য

৪.১৮. প্রতিষ্ঠানে উৎপাদিত পণ্যের পরিমাণ (বাৎসরিক) :

..... পিস
..... টন
..... গজ / মিটার

৪.১৯. উৎপাদিত পণ্যের মূল্য (বাৎসরিক) : টাকা

৪.২০. শিল্প কারখানার সমস্যা :

☐ অবকাঠামোগত সমস্যা ☐ অপ্রতুল যোগাযোগ ব্যবস্থা ☐ জ্বালানি সংকট ☐ দক্ষ শ্রমিকের অভাব
☐ বর্জ্য অপসারণ সমস্যা ☐ চাঁদাবাজি ☐ দূনীতি ☐ শ্রমিক অসন্তোষ

৪.২১. সমস্যা সমাধানের পরামর্শ থাকলে তার বিবরণ :

.....

.....

.....

.....

Annexure-II: List of Surveyors

SL.	Name	Designation	Date Start	Date End
1	Tarek Khan	Supervisor	12/08/2015	11/09/2015
2	Rubaiat Islam	Supervisor	12/08/2015	11/09/2015
3	Ahmed Riyadh	Supervisor	12/08/2015	11/09/2015
4	Kawsar Hamid	Supervisor	12/08/2015	11/09/2015
5	Layes Mia	Surveyor	12/08/2015	11/09/2015

Annexure-II: List of Photographs

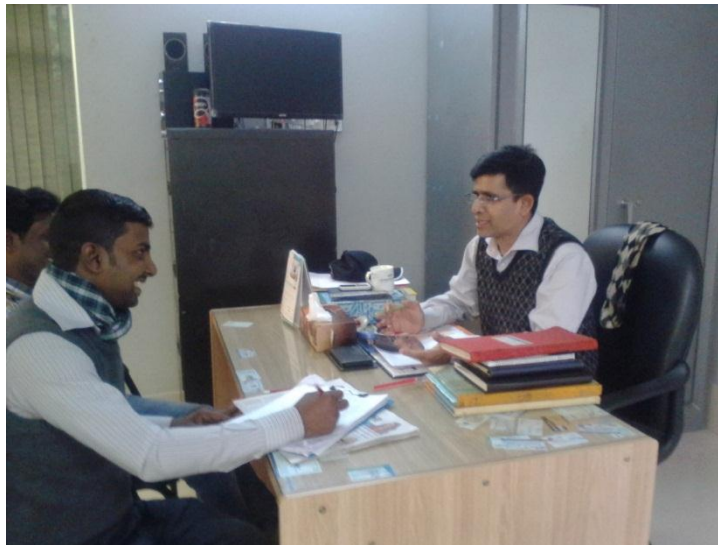


Plate-1: Industrial data collection at Shibpur Upazila



Plate-2 : Industrial data collection at Shibpur Upazila



Government of the People's Republic of Bangladesh
Ministry of Housing and Public Works
Urban Development Directorate (UDD)

Preparation of Development Plan for Fourteen Upazilas

Package-02
(Ishwarganj Upazila, Mymensingh; Raipura Upazila and Shibpur
Upazila, Narsingdi)

DRAFT SURVEY REPORT

**Formal-Informal Economic Survey
of
Shibpur Upazila, Narsingdi**

August, 2016

Joint Venture of

**Sheltech Consultants Pvt. Limited
And
Arc-Bangladesh Limited**



Government of the People's Republic of Bangladesh
Ministry of Housing and Public Works
Urban Development Directorate (UDD)

Preparation of Development Plan for Fourteen Upazilas

Package-02
(Ishwarganj Upazila, Mymensingh; Raipura Upazila and Shibpur
Upazila, Narsingdi)

DRAFT SURVEY REPORT

**Transportation Survey
of
Shibpur Upazila, Narsingdi**

August, 2016

Joint Venture of

**Sheltech Consultants Pvt. Limited
And
Arc-Bangladesh Limited**

JV of SCPL-ABL

Preparation of Development Plan for Fourteen Upazilas Project (Package-02)

Ref: SCPL-ABL/UDD/2016/ Transportation Survey Report/ Shibpur Upazila

Date:

To
The Project Director
“Preparation of Development Plan for fourteen Upazilas” Project
Urban Development Directorate
82, Segunbagicha, Dhaka, 1000.

Subject: Submission of the Final Transportation Survey Report of Shibpur Upazila, Narsingdi

Dear Sir,
We are pleased to submit herewith the Final Transportation Draft Survey Report of **Shibpur Upazila, Narsingdi** for your kind information and further action.

Thanking you and assuring you of our best services.

Your Sincerely,

(Dr. Nurul Islam Nazem)
Team Leader, Package -2

(Dr. Shahid Mamun)
Transportation Expert, Package -2

Encl: As stated.

Copy to:

1. Project Manager, Package-2, UDD
2. Director, Sheltech Consultants Pvt. Limited
3. Chairman, Arc-Bangladesh limited, Dhaka

1/E/2 Paribagh (Mazar Road), Shahbagh, Dhaka-1000, Bangladesh
Phone: +880-2-9611171 Fax: +880-2-9611172
Email: scpl.mail@gmail.com

Executive Summary

Shibpur is well connected with the communication network of the country. The national Highway N-02 from Katchpur to Sylhet has passes over at southern part of the Upazila. It is well connected by National and Regional Highway originating from different Districts/Upazilas like Narsingdi, Belabo, Monohardi, Palash, Gazipur etc. At present the national and regional highways are playing very important role in communication network. Besides the number of Zila roads and internal local roads are also providing regional connectivity. Total road length in this Upazila is 919.22 km. of which around 80.98 Km is Upazila road, around 78.14km is union road, 146.26 km is village road-A and km is village road B. (LGED-2016)

The survey reveals that no public or private bus service is available for intra-city movement. Rickshaw/van, bicycle and motorcycles are common prime modes for intra city movement. Water transport network has no significant importance in carrying out both passenger and goods in Shibpur. There are main bus stoppages in the study area, namely Itakhola Bus stoppage, Mannan Bhuiya Chattar stoppage, Shibpur Bus Stoppage, C & B Bazar Bus stoppage, Chaitannaya Bus Stoppage. At present, there is no defined truck terminal at Shibpur Upazila but informally Itakhola using as truck-stand. Till now, there is no Railway line in Shibpur Upazila.

Though there is no significant traffic congestion within the Upazila but the consultants identified some important places for traffic congestion. The Traffic Congestion areas of the Upazila are Itakhola Moor and Shibpur Bus Stand.

There is 6 (six) intersections and Two important link within the Upazila. Within all links the highest PCU passing through the link on Off-Day is 1797 PCU at Itakhola-Narsingdi link and the lowest on On-Day is 83 at Kamrabo-Belabo link. Within all vehicles passes through the different link of the intersection above 80% are motorized vehicle and up-to 20% are non-motorized vehicle except Lakpur Bazar Intersection. In lakpur Bazar intersection within all vehicles passes through the different links are 68% motorized vehicle and 32% are non-motorized vehicle

Within all the trips passes over the Upazila have originated and distributed within Shibpur and Narsingdi sadar upazila. The rest of the trips go to the other places such as Dhaka, Bhairab Monohordi and Habiganj. Around 43.8% of the trip are generating for work purpose, 21.9% for educational purpose, 25.6% for shopping and 3% because of social purposes such as visiting relatives, social programs etc.

In the passenger survey shows the relation between age-group and male and female who travel. In the age-group of 16-20, Male and Female travel respectively 81.80% and 18.20%. In every age-group the percentages of male travelers are more than the female. In case of below 15 age-group 100% travelers are male. In the 31-40 and 41-50 age-groups the percentages of female travelers are increasing.

This is a submission of the traffic and transportation survey report as a part of Survey Report as per TOR of the project and mainly describes the traffic and transportation survey activities performed as per TOR.

Abbreviation/Acronyms

BR	- Bangladesh Railway
DC	- District Commissioner
LGED	- Local Government Engineering Department
OD	- Origin and Destination
PCE	- Passenger Car Equivalent
PCU	- Passenger Car Unit
PRA	- Participatory Rural Appraisal
RHD	- Roads and Highway Department
TAZ	- Traffic Analysis Zone
TOR	- Terms of Reference
UDD	- Urban Development Directorate

Table of Contents	Page No
Letter of Transmittal	i
Executive Summary	ii
Abbreviation/Acronyms	iii
Table of Contents	iv
List of Figures	v
List of Tables	v
List of Maps	v
Chapter 1: Introduction	1
1.1 Introduction	1
1.2 Understanding the Existing Road Infrastructure and Facilities	1
1.3 Methodology of Traffic and Transportation Survey	2
1.3.1 Reconnaissance Survey	2
1.3.2 Sample Size Determination	2
1.3.3 Conducting Traffic and Transportation Survey	2
1.4 Formulation and Mobilization of Survey team	8
1.4.1 Orientation of meeting	8
1.4.2 Guidance to the Survey Members	8
1.4.3. Selection of Survey locations	8
1.4.4 Formation of Survey Team	9
Chapter 2: Existing Circulation Network and Infrastructure	10
2.1 Regional Connectivity	10
2.2 Road network	10
2.2.1 Existing Road network	10
2.2.2 Functional Classification of Road	11
2.2.3 Major Road Inventory of Shibpur Upazila	11
2.3 Waterway Network	11
2.4 Railway Network	11
2.5 Air Network	11
Chapter 3: Analysis of Survey Findings	12
3.1 Traffic Volume Count Survey	13
3.1.1 Traffic flow at Surveyed Intersections	13
3.1.2 Motorized and Non-Motorized Vehicle	15
3.1.3 Traffic flow status at Shibpur Upazila	17
3.1.4 Traffic Volume and PCE at Roadway Segments	18
3.1.5 Pedestrian Survey	19
3.2 Origin and destination Findings	19
3.2.1 Trip Distribution Pattern	19
3.2.2 Mode Choice	21
3.2.3 Purpose of Trip	21
3.2.4 Origin Destination Behavior	22
3.2.5 Passengers Occupancy in different vehicle mode	22
3.2.6 Major Prioritized Problems	23
3.3 Passenger Interview Survey Findings	23
3.3.1 Age group according to the Gender	24

3.3.2	Trip Purpose	25
3.3.3	Types of Mode	25
3.3.4	Trip Distribution by Passengers	26
3.3.5	Trip production according to the trip purpose	26
3.3.6	Travel cost according to the trip purpose	27
3.3.7	Travel Cost according to the distance	28
3.4	Regional Transport Survey	29
Chapter 4 : Findings From Socio Economic and PRA About Transportation		30
4.0	4.1 Findings from Socioeconomic Survey	30
	4.1.1 Mode of Communication	30
	4.1.2 Types of Road	30
	4.1.3 Mode of Access to Main Road	31
	4.1.4 Condition of Road	31
	4.1.5 Maintenance of Road	32
4.2	4.2.0 Findings from PRA	33
Chapter 5 : Conclusion		34
References		35
Appendix		
Appendix A		36
Appendix B		46
Appendix C		54
List of Figure		
Figure 1.1	Six Major Intersection for traffic Volume Count	5
Figure 3.1	Traffic Flow at Itakhola Intersection	13
Figure 3.2	Traffic Flow at C & B Bazar Intersection	14
Figure 3.3	Traffic Flow at Chaitannya Bus Stand Intersection	15
Figure 3.4	Traffic Flow at Itakhola Intersection	15
Figure 3.5	Traffic Flow at Lakpur Bazar Intersection	15
Figure 3.6	Traffic Flow at Kamrabo Intersection	16
Figure 3.7:	Average PCE at Links of Six Intersections	18
Figure 3.8:	Type of Mode	21
Figure: 3.9	Trip purposes of surveyed respondents	21
Figure 3.10:	Passengers Occupancy in Different Modes	22
Figure 3.11:	Purpose of Trip	25
Figure 3.12	Types of Mode used in a Trip	25
Figure 3.13	Trip Frequency	26
Figure 4.1	Mode of Communication	30
Figure 4.2	Types of Road	31
Figure 4.3	Mode of Access to Main Road	31
Figure 4.4	Condition of Road	32
Figure 4.5	Maintenance of Road	32

List of Table

Table 1.1	Traffic Volume Count Survey Schedule	3
Table 1.2	Considered List of PCE value for various vehicles	3
Table 1.3	Output and methodology of the conducted survey	6
Table 1.4	List of members in Traffic and Transportation Survey	9
Table 2.1	Existing Road Infrastructure of Shibpur Upazila	11
Table 2.2	Major Roads of Shibpur Upazila	11
Table 3.1	PCE and Traffic Volume at Intersections	17
Table 3.2	Traffic Volume and PCE at Roadway Segments	18
Table 3.3	Pedestrian flow at selected intersections	19
Table 3.4	Origin Destination Matrix within Unions of Shibpur Upazila	20
Table 3.5	Origin Destination Matrix surrounding Upazilas /Districts of Shibpur Upazila	20
Table 3.6	Origin and Destination behavior	22
Table 3.7	Major problems in Transportation	23
Table 3.8	Age Sex Structure of the Respondents	24
Table 3.9	Trip Production according to the Trip Purpose	26
Table 3.10	Travel cost according to the Trip Purpose	27
Table 3.11	Travel cost according to the distance	28

List of Map

Map-1.1	Traffic Volume Survey Locations	6
Map-1.2	Roadway Segment Surveyed at Shibpur Upazila	7
Map-1.3	Origin and Destination (O-D) Survey	7
Map-1.4	Passenger Interview Survey	8
Map- 1.5	Regional Transportation Network Survey	8
Map-2.1	Regional Connectivity	10
Map 3.1:	Road Map of Shibpur Upazla	12

CHAPTER 1: INTRODUCTION

1.1 Introduction

The role of transportation in the development of civilization is inevitable. Transportation is a non-separable part of any development. It showcases a very intense relation to the style of life, the range and location of activities and the goods and services which will be available for consumption. Transportation plays different roles in the up gradation of a civilization. None of its role can be neglected. The future progress of a city depends mostly how the transportation of that area functions. In master plan transportation planning is the main element around which other facilities and development revolves. In the preparation of Development plan for Shibpur Upazila, the consultant has done transportation survey which has great implications on the Development Plan.

To analyze the present scenario of traffic and depict the future traffic demand and forecast, several relevant survey has done in the study area which will analyze the traffic trends.

1.2 Understanding the Existing Road Infrastructures and Facilities

An inventory of road, railway, water way and airway network, regional transport network system and its linkage with Upazila area, information on pedestrian facilities, bus/ rail/ water way routes and parking facilities has been conducted and the base map will be upgraded with this information for providing traffic and transportation policy. A survey has provided to gather current traffic information not readily available from other sources and other relevant data have been collected form LGED, RHD and Upazila Parishad. The following data will be focused on this traffic study:

Road Geometrics

- ✓ Curves and grades (if significant enough to affect capacity or traffic operations);
- ✓ Number of lanes, lane usage, and presence and type of medians;
- ✓ Lane, median, and shoulder widths;

Traffic Control

- ✓ Traffic signals and phasing;
- ✓ Traffic signs (particularly regulatory signs and posted speed limits);
- ✓ Marked and unmarked crosswalk locations;

Traffic

- ✓ Presence and needs of children, elderly persons, disabled, transportation disadvantaged, pedestrians, and bicyclists;
- ✓ Sidewalks, bicycle lanes, and multi-use paths;
- ✓ Transit stop locations and amenities, transit schedules, and types of transit vehicles in service;
- ✓ Travel times (e.g., queues at intersections);

Land Use/Access

- ✓ Driveways for major vehicle generators or truck generators (collect the same information as would be collected for side streets);
- ✓ Adjacent land use, density, and occupancy;

Others

- ✓ Pavement conditions;
- ✓ Presence and type of on-street parking and parking regulations

1.3 Methodology of Traffic and Transportation Survey

Authentic and viable road infrastructure and vehicle volume information is vital for planning of road infrastructures and policies. The traffic and transportation survey has subdivided into following surveys:

1. Traffic Volume Count Survey
2. Origin and Destination(O D) Survey
3. Passenger Interview Survey
4. Regional Transportation Network Survey

1.3.1 Reconnaissance Survey

Before performing traffic and transportation survey, a reconnaissance survey has been carried out to identify where the above mentioned surveys will be done. According to the judgment and local knowledge, survey locations points have been selected. For this study, survey has been done on the basis of Hat Day and Non Hat Day.

1.3.2 Sample Size Determination

Sample Size determination is important task on which the study's time frame, outputs depend. In transportation survey, the consultant has to determine how many questionnaire surveys will be done. In Shibpur Upazila, the number of households is 65,094. Sample size is calculated by taking confidence interval 13% and confidence level 95%. The following sampling equation has been applied:

$$n = \frac{z^2 p(1-p)}{c^2}$$

(Cochran, 1963)

Z = Z value

p = percentage picking a choice, expressed as decimal

c = confidence interval, expressed as decimal

These sample size was adjusted by using the following formula:

$$n = \frac{n_0}{1 + \frac{n_0}{N}}$$

Where n is requiring sample size and N is no. of Household of Upazila. So, the required sample size is 63 for O D Survey, Passenger Interview and Regional Transportation Survey.

1.3.3 Conducting Traffic and Transportation Survey

✓ Traffic Volume Count

Traffic volume studies are conducted to determine the number, movements, and classifications of roadway vehicles at a given location. These data can help to identify critical flow time periods, determine the influence of large vehicles or pedestrians on vehicular traffic flow, or document traffic volume trends. For this study, Manual counting method has been applied for acquiring the required data. Manual counts are typically used to gather data for determination of vehicle classification, turning movements, direction of travel, pedestrian movements, or vehicle occupancy. The selection of study method should be determined using the count period. The count period should be representative

of the time of day, day of month, and month of year for the study area. The count period should avoid special event or compromising weather conditions (Sharma, 1994). Count periods may range from 5 minutes to 1 year. Typical count periods are 15 minutes or 2 hours for peak periods, 4 hours for morning and afternoon peaks, 6 hours for morning, midday, and afternoon peaks, and 12 hours for daytime periods (Robertson, 1994). For this survey, six major intersections have been identified. The intersections are: C & B Bazar Bus Stand, Chaitannya Bus Stand, Itakhola Bus Stand, Kamrabo Intersection, Lakhpur Bazar and Mannan Bhuiyan Chattar. In addition, survey has been also carried out in three roadway segments respectively Thana Moar, Dulalpur Moar and Syed Nagar Bus Stand. (Please see **Figure 1.1, Map 1.1 & Map 1.2**) Hat Day and Non Hat Day has been taken into consideration for each intersection and roadway segment. Peak hour and off peak hour have been varied in each intersection and roadway segment depending on its impact on the Upazila. The volume of traffic using the road in a given interval of time is one of the elemental measures of road traffic that is also termed as flow and expressed in vehicles per hour or vehicles per day. But the roads normally comprise different types of vehicles offering different degrees of interference to other traffic. However, it is obligatory to bring all types of vehicles to a common unit. The normal practice to convert the flow into common unit is Passenger Car Equivalence (PCE) by using certain equivalency factors. The flow is then expressed as PCE per hour or PCE per day. The Table 1.1 and Table 1.2 the Survey Schedule for Traffic Volume Count Survey and PCE value for the traffic volume calculation.

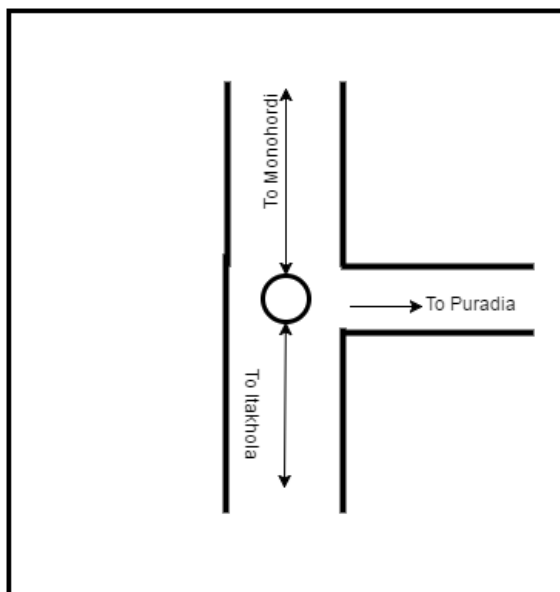
Table 1.1: Traffic Volume Count Survey Schedule

Intersection/ Segment Name		Working days
Intersections	C & B Bazar Bus Stand	7/01/2016
	Chaitannya Bus Stand	10/01/2016
	Itakhola Bus Stand	8/01/2016 & 11/01/2016
	Kamrabo Intersection	10/01/2016
	Lakhpur Bazar	9/01/2016
	Mannan Bhuiyan Chattar	6/01/2016
Roadway Segments	Thana Moar	10/01/2016
	Syed Nagar Bus Stand	8/01/2016
	Dulalpur Moar	9/01/2016

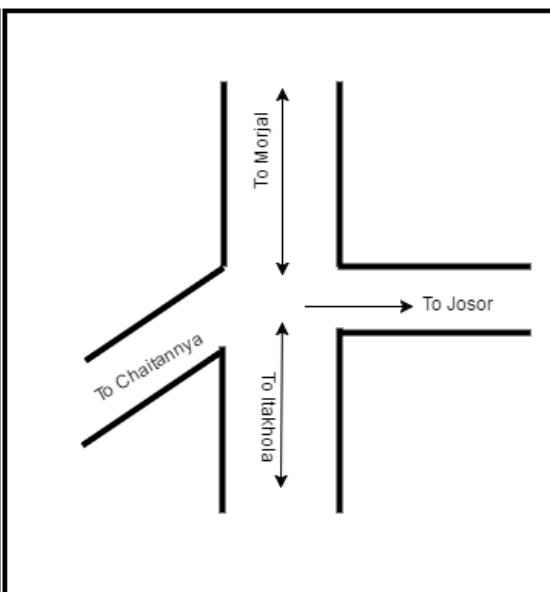
Table 1.2: Considered List of PCE value for various vehicles

Sl. No.	Vehicle Categories	PCE
1	Passenger Car	1.00
2	Light Goods Vehicle	1.00
3	Truck	3.00
4	Bus	3.00
5	Auto-Rickshaw	0.75
6	Motor-cycle, moped, scooter	0.75
7	Paddle Cycle	0.50

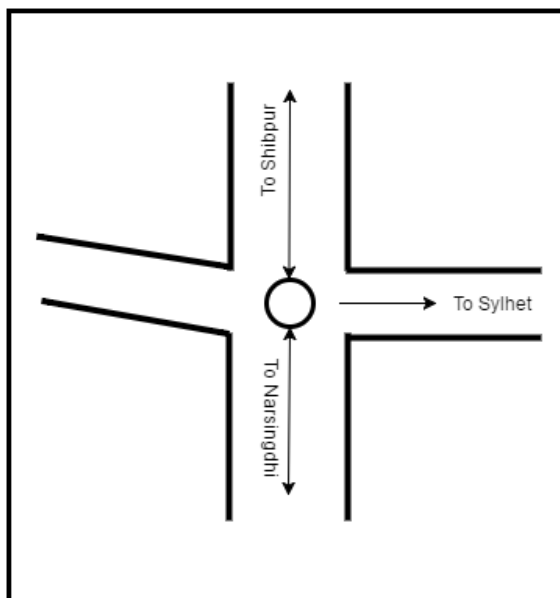
Source: Ministry of Communications, 2000.



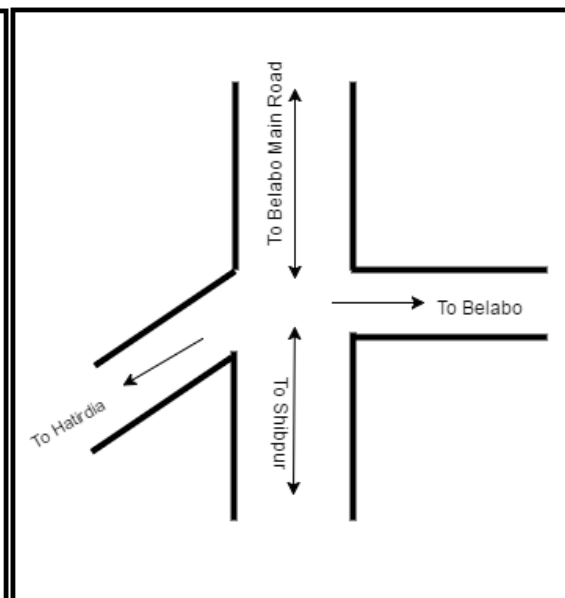
C & B Bazar Intersection



Chaitannaya Bus Stand



Itakhola Bus Stand



Kamrabo Intersection

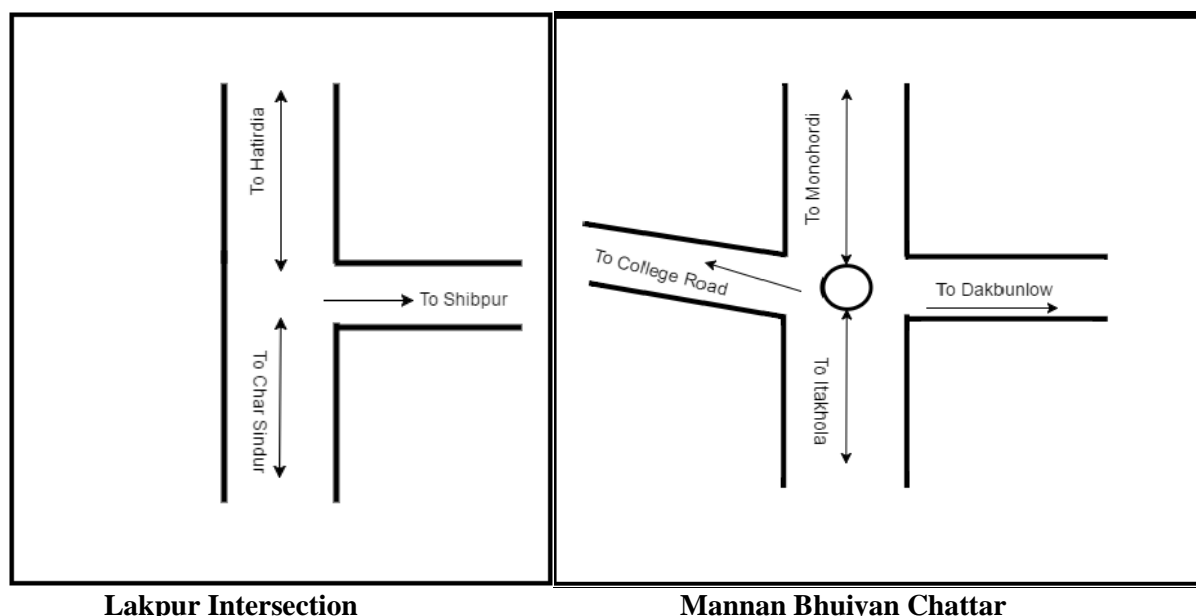


Figure 1.1: Six Major Intersections for Traffic Volume Count

✓ Origin and Destination (O D) Survey

Origin Destination (O-D) survey provides a detailed picture of the trip patterns and travel choices of a study area. The survey data related to households, individuals and trips allows stakeholders to understand travel patterns and characteristics; measure trends; provide input to travel demand model development, forecasting, and planning for area-wide transportation infrastructure needs and services; and, monitor progress in implementing transportation policies. Origin Destination (O-D) Survey has been conducted using the standard format incessantly for 2 days. The survey was accomplished by enumerators who were locally recruited and adequately oriented and trained by experienced supervisors. Three independent shifts having 2 enumerators and 1 supervisor each had given the responsibility to carry out the origin destination survey at some selected locations such as C & B Bazar Bus Stand, Chaitannya Bus Stand, Itakhola Bus Stand, Syed Nagar Bus Stand etc. (Please see **Map 1.2**) The survey has carried out through random questionnaire according to the sample size.

✓ Passenger Interview Survey

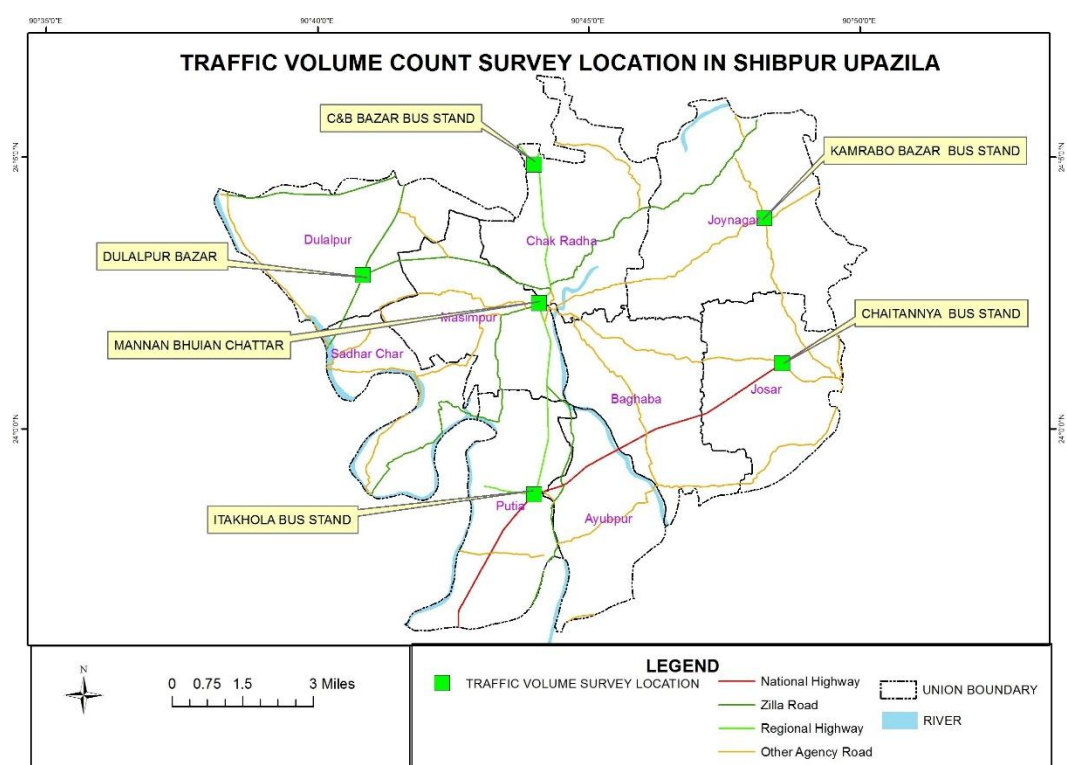
Passenger Interview Survey has done to know about the travel behavior of the passengers. In order to ensure the findings of the survey were representative, random sampling method was applied on this on-board face-to-face interview survey. Target respondents were picked by a random process. Passenger Interview Survey has been carried out in Bus Terminal, Bus stoppages etc. Bus Passenger Interview Survey has been conducted using the standard format incessantly for 4 days at Shibpur Bus Stand, C & B Bazar Bus Stand, Itakhola Bus Stand, Lakhpur Bazar, Dulalpur Moar. The survey was accomplished by enumerators who were locally recruited and adequately oriented and trained by experienced supervisors. (Please see **Map 1.2**)

✓ Regional Transportation Network Survey

Regional Transport is an enabler for growth but it can also be a catalyst for urban sprawl. It has implications not only for mobility and quality of life but also for the economic prosperity of cities. Regional Transport survey has been done to better understand the transport and mobility challenges and priorities for planning, infrastructure and service requirements over the short and longer term. For this survey, few locations have been considered where it will be easy to know the regional impact and regional transport network. The selected survey locations are: Shibpur Bus Stand, Itakhola Bus Stand and random questionnaire survey has been applied. (Please see **Map 1.4**)

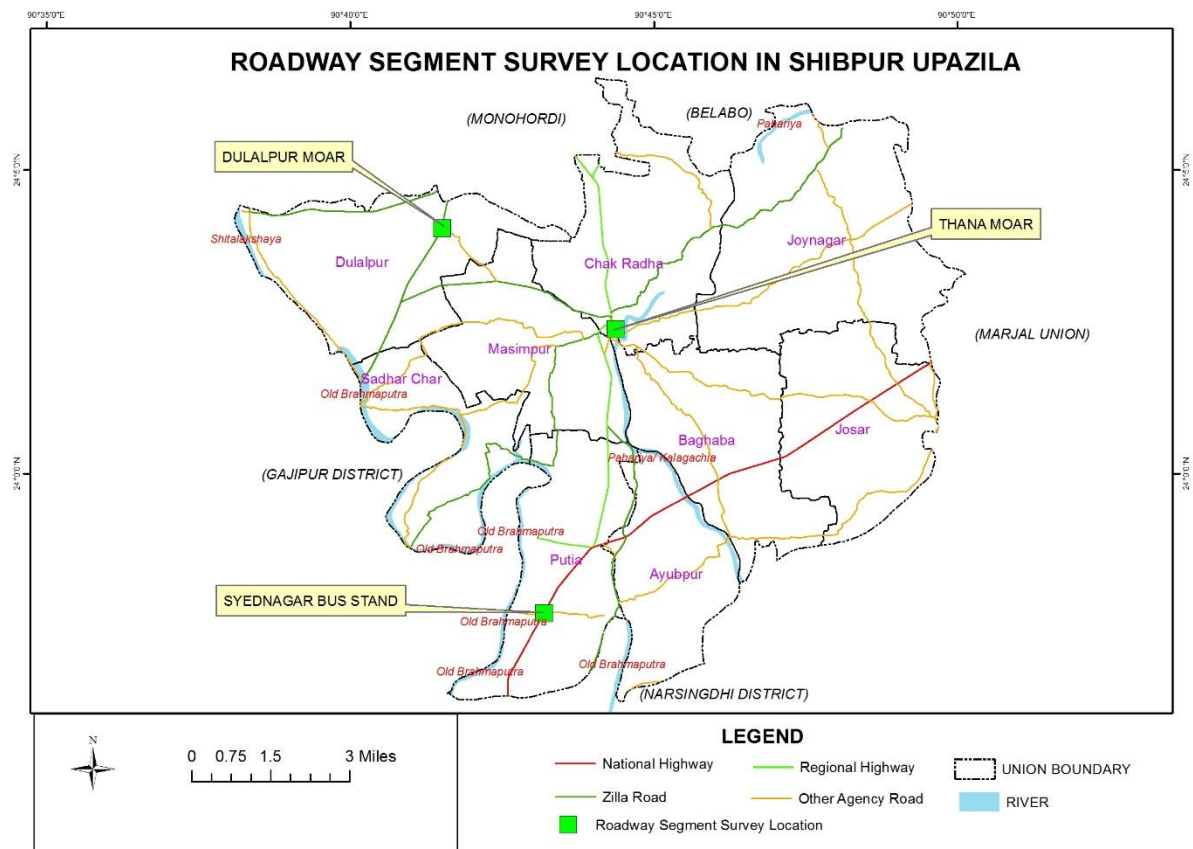
Table 1.3: Output and methodology of the conducted survey

Survey	Data	Methodology
Traffic Volume Count	Details of vehicle classification, fluctuation of flow, specific vehicular movements, road features, no. of vehicle per hour.	<ul style="list-style-type: none"> Manual counting method Hat Day and Non Hat Day Peak Hour and Off Peak Hour
O D survey	Origin zones, destination zones, internal and external origin and destinations.	<ul style="list-style-type: none"> Simple Random Survey after determining the sample size. Before conducting the interview, the questionnaire prepared for interviewing the travelers which is approved by UDD.
Passenger Interview Survey	Trip destination, trip purpose, mode of transport, cost, distance etc.	<ul style="list-style-type: none"> Simple Random Survey At first, the questionnaire has been prepared to cover all information required for the survey according to the TOR. The questionnaire has been approved by UDD and finally a sample of passengers has been selected for collecting data through approved questionnaire.
Regional Transport Network Survey	Urban growth, accessibility with nearer areas, communication and infrastructure facilities, potentiality of the area etc.	<ul style="list-style-type: none"> Simple Random Survey after determining sample size through approved questionnaire. (Please see Appendix-C for approved Questionnaire Format of all transport Surveys)



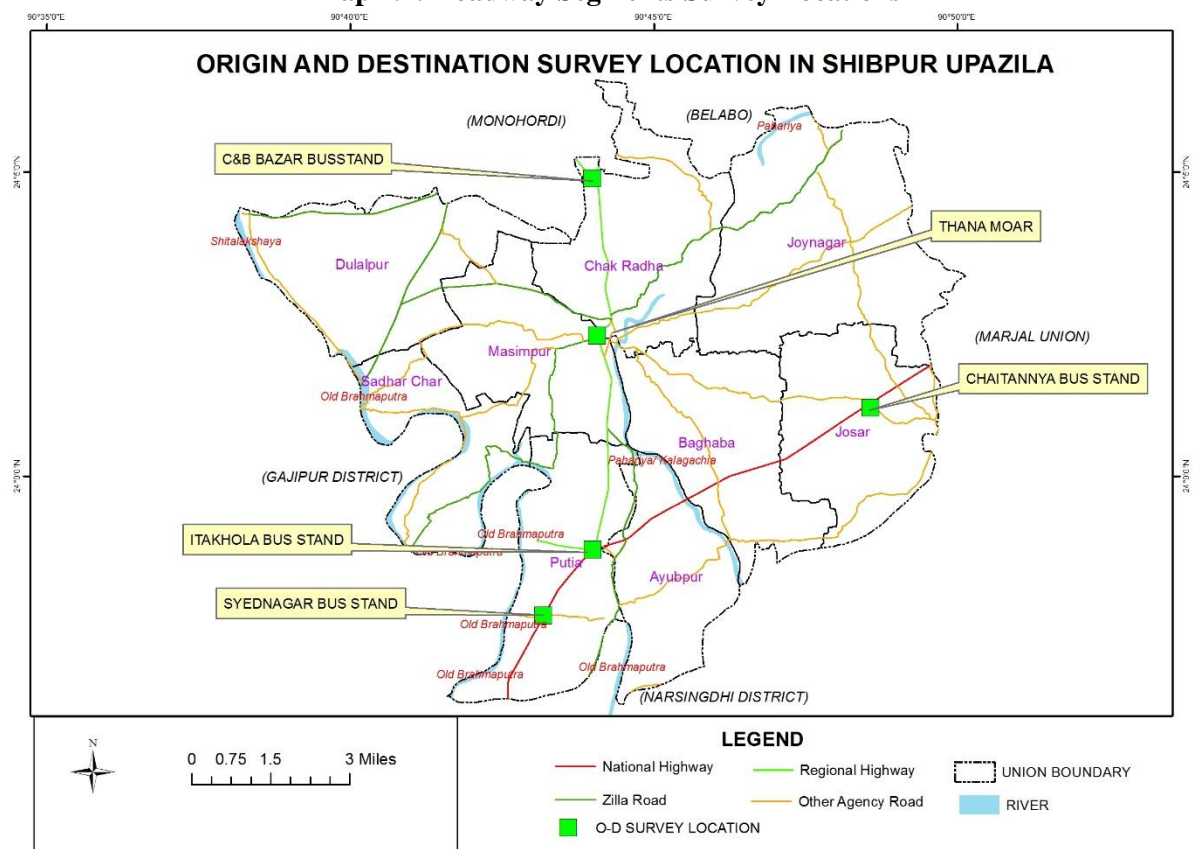
Source: Traffic and Transportation Survey, 2016.

Map 1.1: Traffic Volume Survey Locations



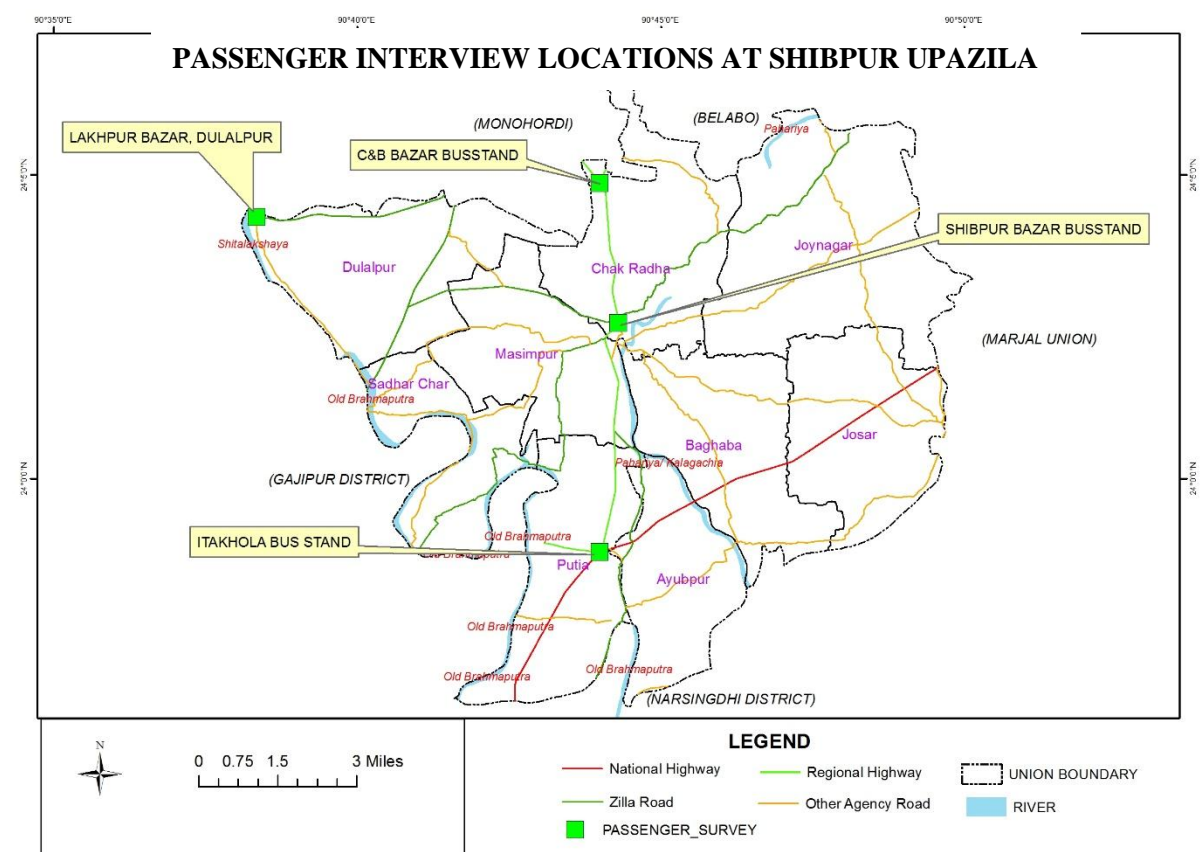
Source: Traffic and Transportation Survey, 2016.

Map 1.2: Roadway Segments Survey Locations



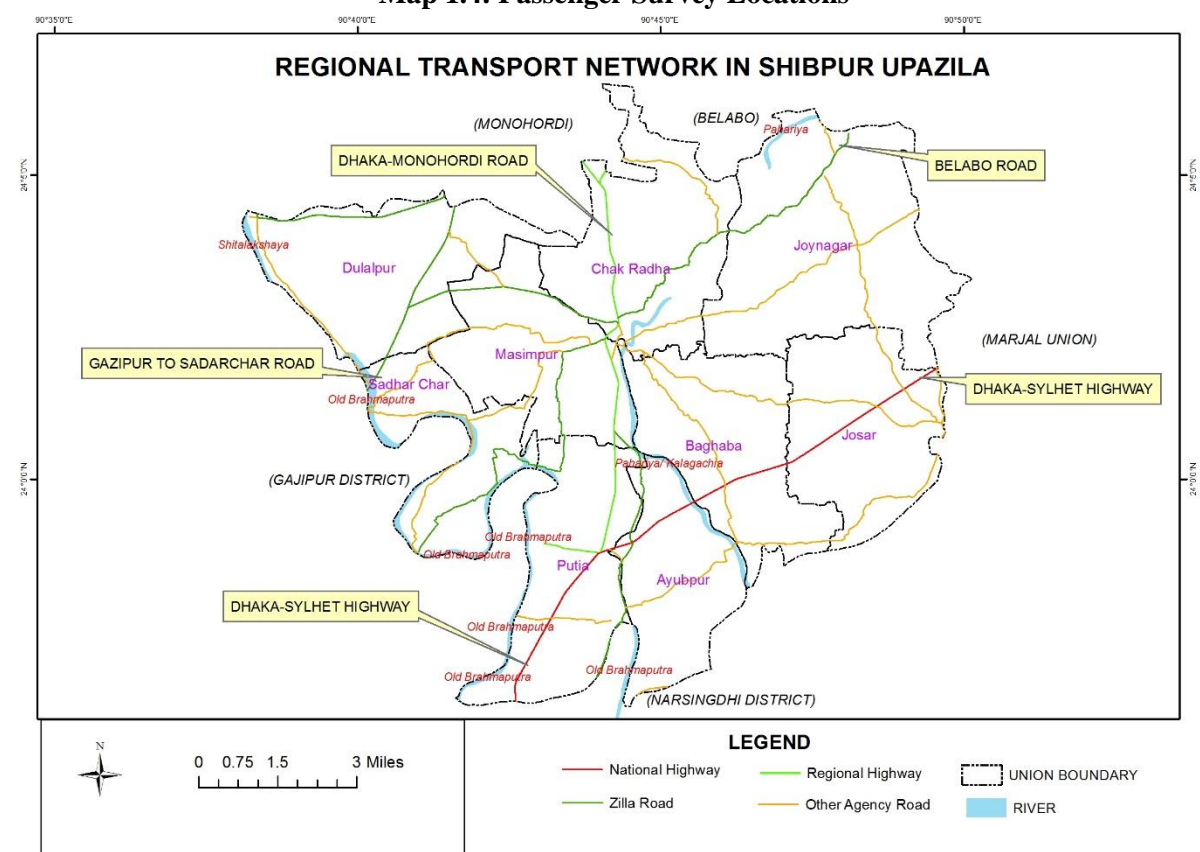
Source: Traffic and Transportation Survey, 2016.

Map 1.3: Origin Destination Survey Locations



Source: Traffic and Transportation Survey, 2016.

Map 1.4: Passenger Survey Locations



Source: Traffic and Transportation Survey, 2016.

Map 1.5: Regional Survey Location

1.4 Formulation and Mobilization of Survey Team

1.4.1 Orientation & Meeting

In order to carry out various surveys related with traffic and transportation, at first an orientation program was held at Shibpur Upazila Office (January, 2016) for giving a clear concept about the objectives of the project and different type of surveys. The Transport expert has attended the orientation program and Mr. Uday Sankar Das (Senior Planner, UDD) was present on that orientation program on the behalf of UDD.

1.4.2 Guidance to the Survey Members

After giving orientation, the consultants have provided guidelines to the survey members who are representatives of the Consultancy firm. The survey members have been guided by proper understanding of Questionnaire formats of different types of survey formats, time schedule of conducting survey, location of conducting survey etc.

1.4.3 Selection of Survey Locations

Considering the intensity, linkage and movement of traffic, different survey locations have been selected to conduct different types of survey including Volume Count, O-D Survey, Pedestrian, Passenger Survey etc. Major intersections, Major Roads, Bus Terminal and Railway Station have been identified for conducting different types of Survey. Details of survey locations have been given in corresponding type of survey.

1.4.4 Formation of Survey Team

The transport surveys have been carried out according to the consent of Transport Expert. The surveyors were deployed sufficiently according to the need of each survey locations; the consultant team has considered the previous working experience of similar types of survey activities and educational qualifications. The following table represents the team formations for traffic and transportation survey at Shibpur Upazila.

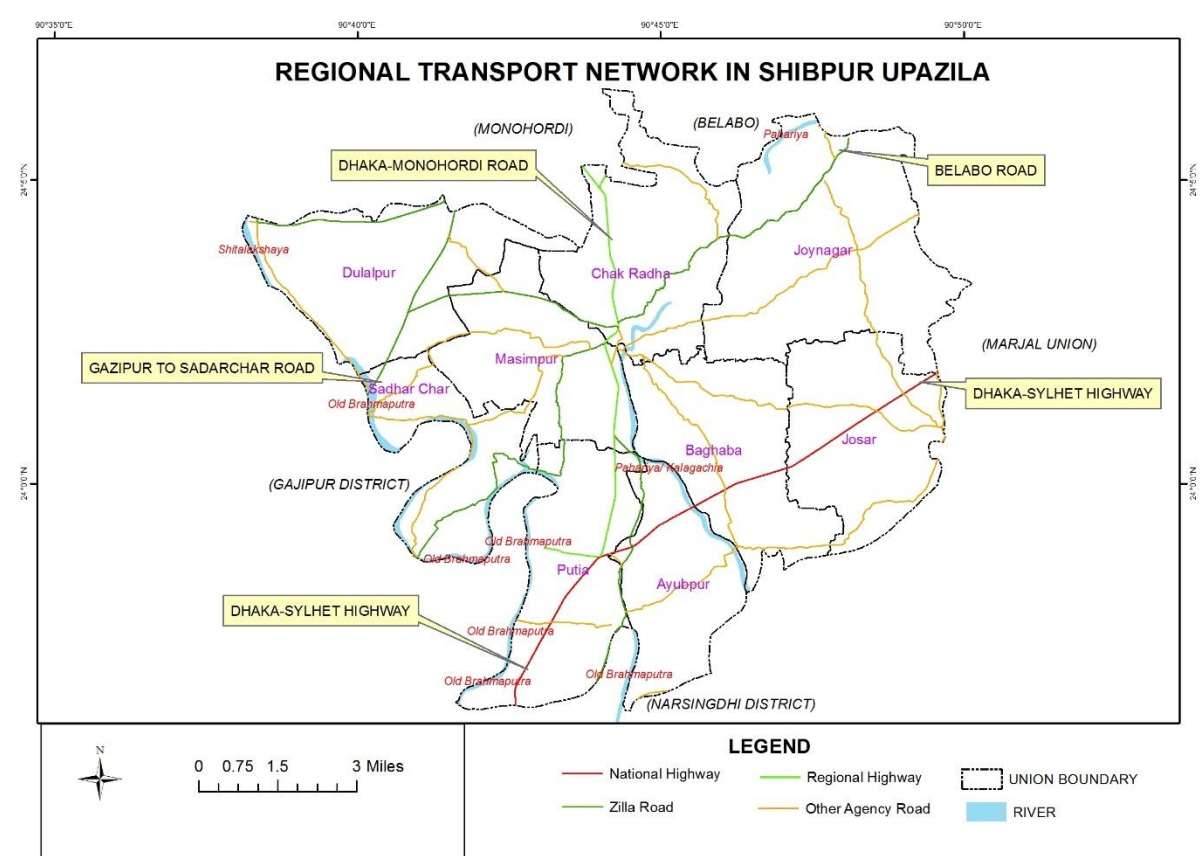
Table 1.4: List of members in Traffic and Transportation Survey

Sl. No.	Name	No.	Activities
1	Transport Expert Dr. Md. Shahid Mamun	1	Planning, preparation of questionnaire and overall supervision of the survey activities and subsequent report preparation.
2	Planner K. M Abul Bashar	1	Training and supervision of field level activities.
3	Mustaq Ahmed & Md. Halim	2	Data base format preparation and supervision of data entry activities.
4	Survey Supervisor Md. Rubayet Hossain, Md. Tarek Khan, K. M Kawser Hamid & Ahmed Riyad	4	Inspection of Field Survey.
5	Enumerators	16	Field Survey
6	Data Entry Operators	10	Data Entry in Excel, Analysis and presentation in tabular format.

CHAPTER 2: EXISTING CIRCULATION NETWORK AND INFRASTRUCTURE

2.1 Regional Connectivity

Shibpur Upazila under the jurisdiction of Narsingdi District occupies an area of 217.71sq. km. which is located between 23°56' and 24°07' north latitudes and between 90°38' and 90°50' east longitudes. The Upazila is bounded on the north by Monohardi Upazila on the east by Raipura and Belabo Upazila s on the south by Narsingdi Sadar Upazila s and on the west by Palash Upazila and Kapasia and Kaliganj Upazila of Gazipur Zila. (BBS, 2012) The national Highway N-02 from Katchpur to Sylhet has passes over at southern part of the Upazila. It is well connected by National and Regional Highway originating from different Districts/Upazilas like Narsingdi, Belabo, Monohardi, Palash, Gazipur etc. At present the national and regional highways are playing very important role in communication network. Besides the number of Zila roads and internal local roads are also providing regional connectivity. (Please see **Map 2.1**)



Source: Traffic and Transportation Survey, 2016.

Map 2.1: Regional Connectivity Map

2.2 Road Network

2.2.1 Existing Road Network

Shibpur Upazila has great significance in the context of road network. Regional Highway and Railway has gone through it which makes the Upazila Center more viable. The detailed road network has shown in **Map 2.2**. Which will be further updated by physical feature survey.

Table 2.1: Existing Road Infrastructure of ShibpurUpazila

Road Type	Earthen Road (km)	Pavement Road (km)	Total Length (km)
Upazila Road	1.19	79.79	80.98
Union Road	2.50	75.64	78.14
Village Road-A	31.31	114.95	146.26
Village Road-B	462.44	151.41	613.84

Source: LGED, 2016.

2.2.2 Functional Classification of Road

Considering the significance of road function, the road will be classified into primary, secondary, collector and access road which will be revealed after the physical feature survey. Each category of road has its particular functions to perform. Access road carries traffic from buildings to the collector road and collector road carry traffic to the major road and vice versa. In reality, however, it is almost impossible to maintain this hierarchical use of roads except in an entirely planned area.

2.2.3 Major Road Inventory of Shibpur Upazila

The Regional Highway and several Zila Road has passed through Shibpur Upazila. The major roads of Shibpur Upazila has shown in Table 2.2.

Table 2.2: Major Roads of ShibpurUpazila

Road ID	Name of the Road	Length of Road (km)
R211	Itakhola-Motkhola-Kotiadi Road	45
R212	Akdaria (C&B Bazar)-Shekher Bazar-Puradia-Agarpur Road	22
Z3710	Netrokona-Bishiura-Shibpur Road	27
Z2044	Shibpur (Itakhola-Katiadi Regional Highway)-Dulalpur-Lakpur-Monohardi (Hatirdia) Road	25
Z2035	Shibpur-Daripura-Kamrabo (Belabo) Road	15

Source: RHD, 2016.

2.3 Waterway Network

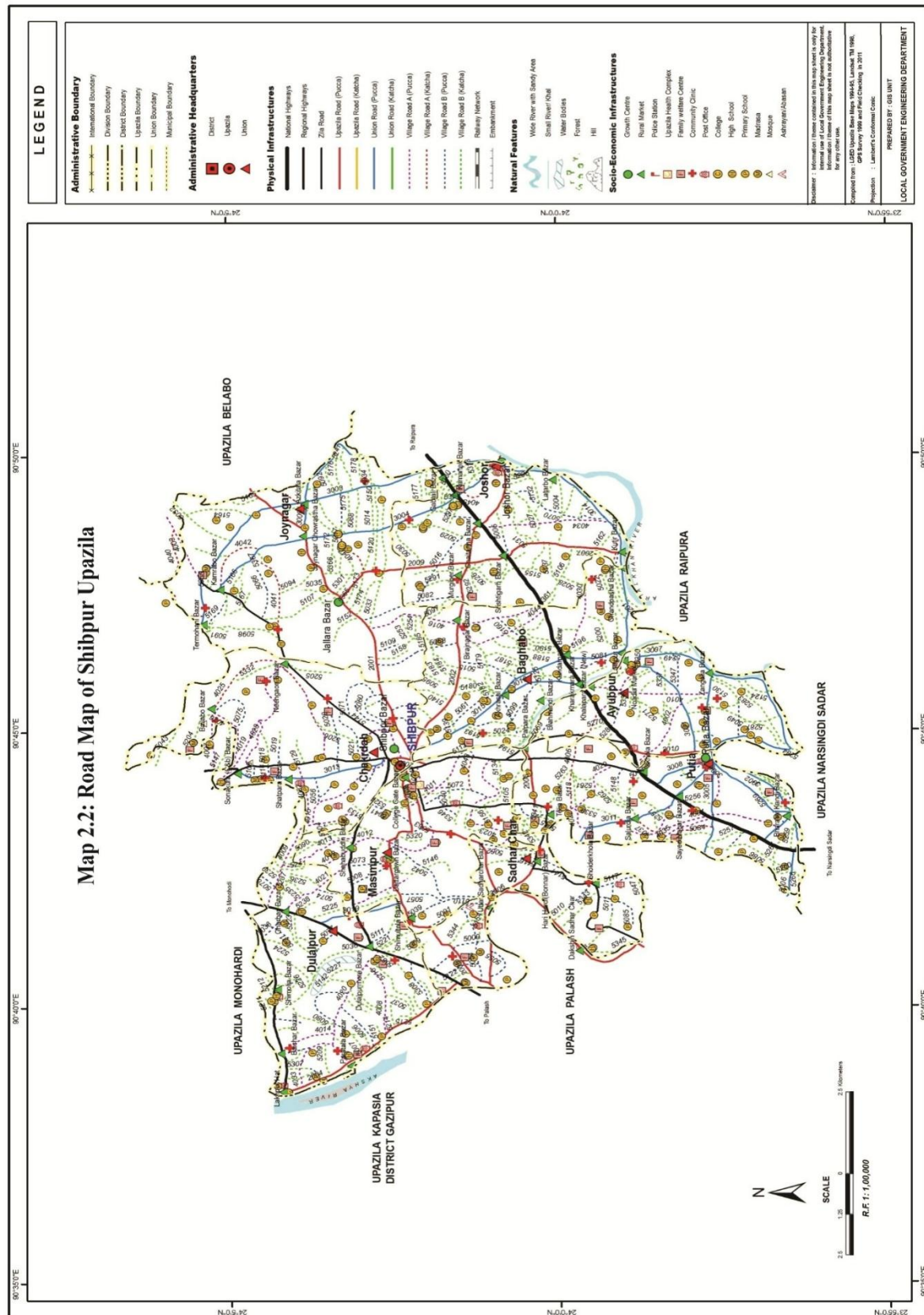
The main rivers are Shitalakshya, Arial Khan, Brahmaputra and Paharia flow through the Upazila, the water way is used for peoples' daily commuting.

2.4 Railway Network

Shibpur Upazila is not connected with the railway network.

2.5 Air Network

Shibpur has no provision of air service.



Map 3.1: Road Map of Shibpur Upazila

CHAPTER 3: ANALYSIS OF SURVEY FINDINGS

3.1 Traffic Volume Count Survey

Traffic volume count survey has been done in six important intersections and three road way segments in Shibpur Upazila. As different areas have different impacts, the peak time and off peak time vary according to its activities. The surveyed locations are given below:

- ❖ C & B Bazar Bus Stand,
- ❖ Chaitannya Bus Stand,
- ❖ Itakhola Bus Stand,
- ❖ Kamrabo Intersection,
- ❖ Lakhpur Bazar,
- ❖ Mannan Bhuiyan Chattar,
- ❖ Thana Moar,
- ❖ Dulalpur Moar,
- ❖ Syed Nagar Bus Stand

3.1.1 Traffic flow at Surveyed Intersections

Traffic flow varies according to the significance of the intersections. The vehicles are diverted to the different link through the intersections. In the study area, it has been shown that traffic flows are varied in the intersections.

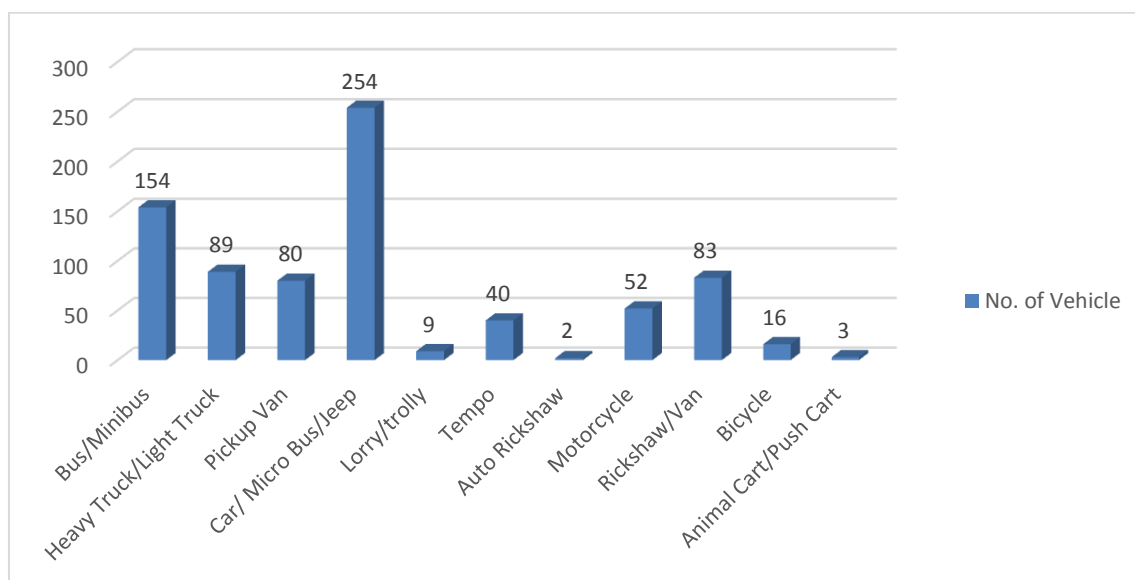


Figure 3.1: Traffic Flow at Itakhola Intersection

Source: Traffic and Transportation Survey, 2016

From the above bar chart, it has shown that Itakhola intersection is experienced different type of vehicle every day. The above data represents the frequency of traffic mode per hour. It can depict that Car or Micro Bus has marked as the highest at the intersection numerically 254. And similarly Bus or Mini bus is passing at a considerable rate which is 154. The other vehicles movement is fluctuated at the Itakhola Intersection.

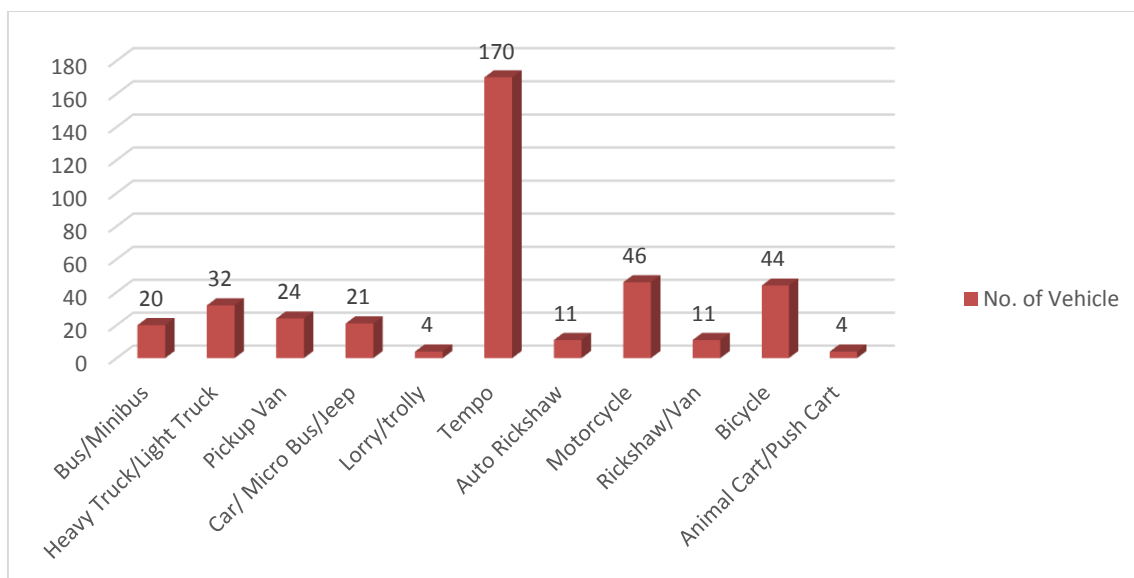


Figure 3.2: Traffic Flow at C & B Bazar Intersection

Source: Traffic and Transportation Survey, 2016

At the C & B Bazar Intersection, Motorized and Non-Motorized vehicles are implying at the same rate. But it has great impact of Tempo. People are using this type of vehicle more. Bicycle is also emerged as one of the frequent transport vehicles.

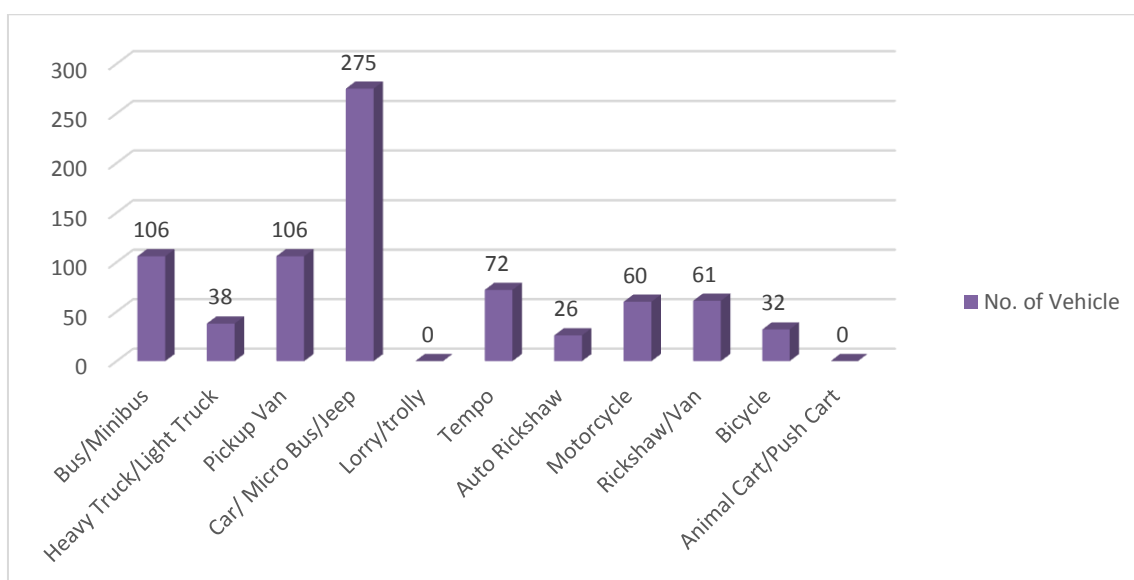


Figure 3.3: Traffic Flow at Chaitannya Bus Stand Intersection

Source: Traffic and Transportation Survey, 2016

Traffic modes are used at different rate at Chaitannya Bus Stand. From the above figure, it can be asserted that Bus is using as the main transport option for the people. On the other way, people are using Car or Micro Bus for their commuting purposes. NMV vehicles are also implying at different rate at the study area having considerable amount.

3.1.2 Motorized and Non-Motorized Vehicle

In the surveyed intersections, Motorized and Non-Motorized Vehicles are flowed at different rate. At a glance, MV and NMV vehicles are flowed respectively more than 70% and within 30%. In the following figures, percentages of MV and NMV are shown at important intersections.

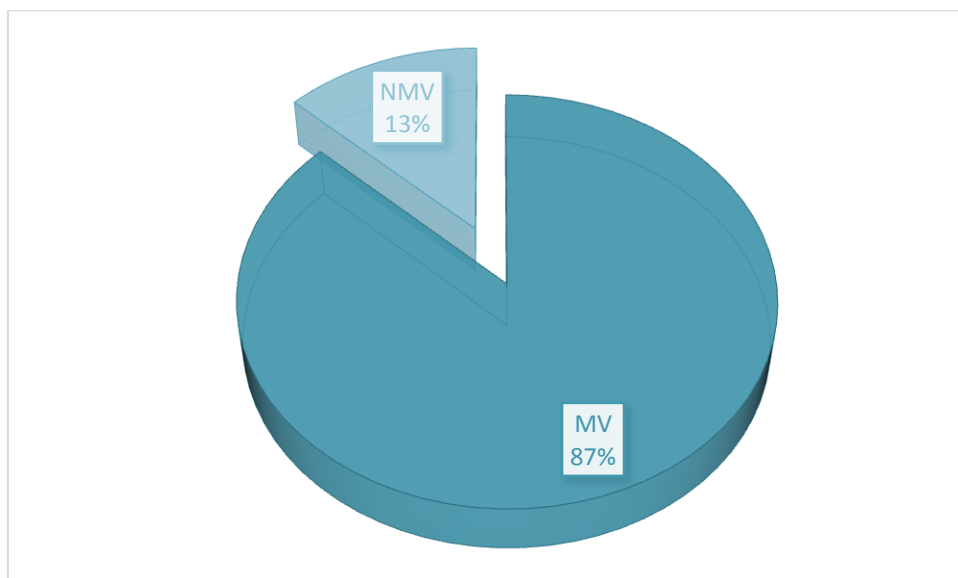


Figure 3.4: Traffic Flow at Itakhola Intersection

Source: Traffic and Transportation Survey, 2016

From the figure, it can depict that Itakhola is one of the busiest intersections at the Shibpur Upazila. And MV vehicles are flown at 87% of the total vehicles.

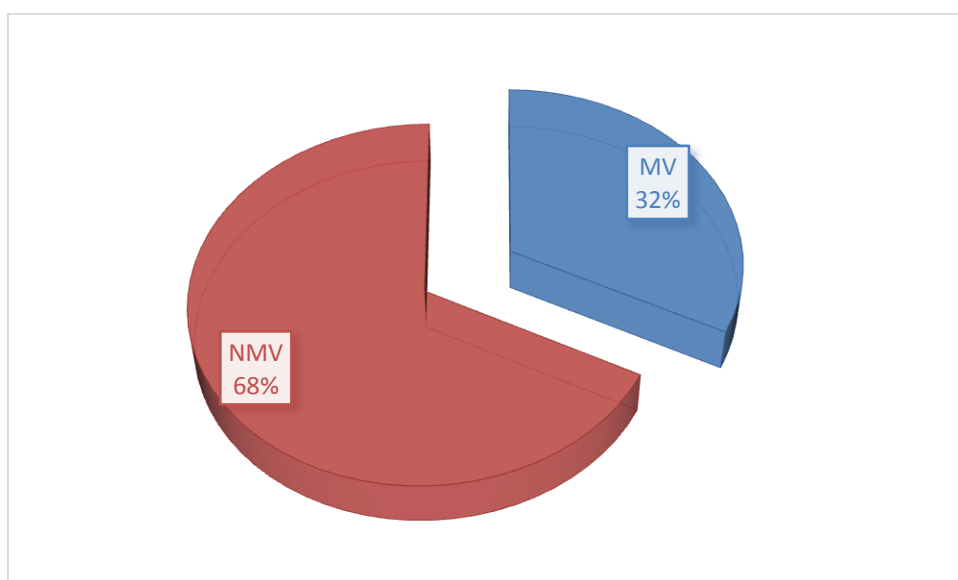


Figure 3.5: Traffic Flow at Lakpur Bazar Intersection

Source: Traffic and Transportation Survey, 2016

Lakpur Bazar has higher percentages of NMV vehicle. Bazar or Hat has higher demand of NMV vehicle, So Lakpur Bazar are experiencing 68% NMV of total vehicles.

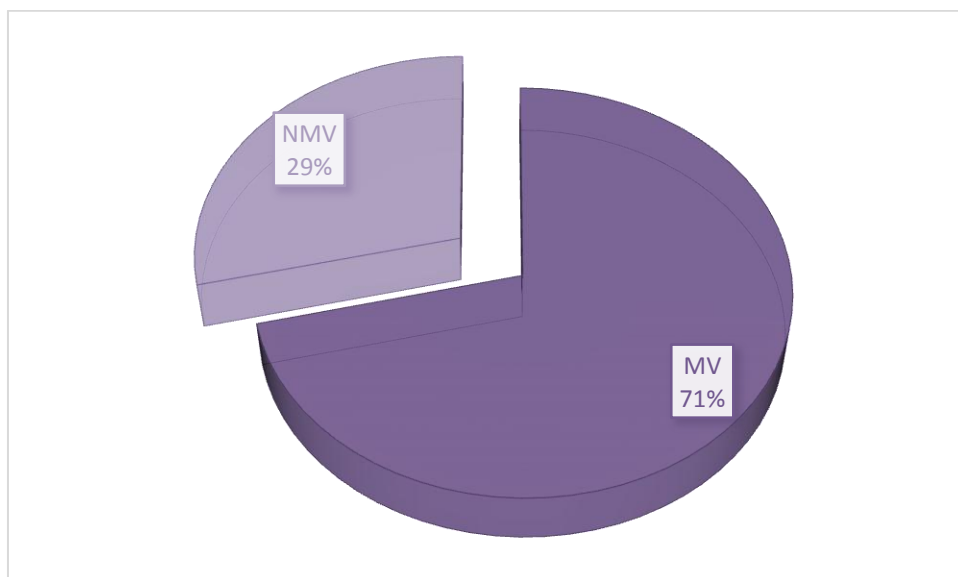


Figure 3.6: Traffic Flow at Kamrabo Intersection

Source: Traffic and Transportation Survey, 2016

From the above figure, it has been shown that MV and NMV are flowing at respectively 71% and 29% of the total vehicles at Kamrabo intersection.

3.1.3 Traffic flow status at Shibpur Upazila

Table 3.1: PCE and Traffic Volume at Intersections

Intersection	Link	Average Vehicle/Hour	Average PCE/Hour
C & B Bazar	C & B Bazar-Itakhola	473	533.17
	C & B Bazar-Monohordi	370	431.92
	C & B Bazar-Puradia	187	178.92
Itakhola	Itakhola-Sylhet	767	1337.92
	Itakhola-Narsingdi	1049	1797.83
	Itakhola-Shibpur	493	785.08
Kamrabo	Kamrabo-Hatirdia	236	295.58
	Kamrabo-Shibpur	247	283.25
	Kamrabo-Belabo	78	83.08
	Kamrabo-Belabo Main Road	183	213.08
Chaitannya Bus Stand	Chaitannya Bus Stand-Josor	174	201.00
	Chaitannya Bus Stand-Itakhola	674	981.08
	Chaitannya Bus Stand-Morjal	657	931.92
	Chaitannya Bus Stand-Chaitannya	149	155.17
Lakpur Bazar	Lakpur Bazar-Shibpur	145	131.50
	Lakpur Bazar-Hatirdia	176	172.42
	Lakpur Bazar-Chor sindur	195	184.08
Mannan Bhuiyan Chattar	Mannan Bhuiyan Chattar-Itakhola	849	992.67
	Mannan Bhuiyan Chattar-Monohordi	843	2528.00
	Mannan Bhuiyan Chattar-College Road	357	424.33
	Mannan Bhuiyan Chattar-Dakbunglow Road	388	427.67

Source: Traffic and Transportation Survey, 2016

The above table gives an overall idea about the total traffic flow where Itakhola and Mannan Bhuiyan Chattar are the busiest roads. The detail traffic flows are given at **Appendix-A**.

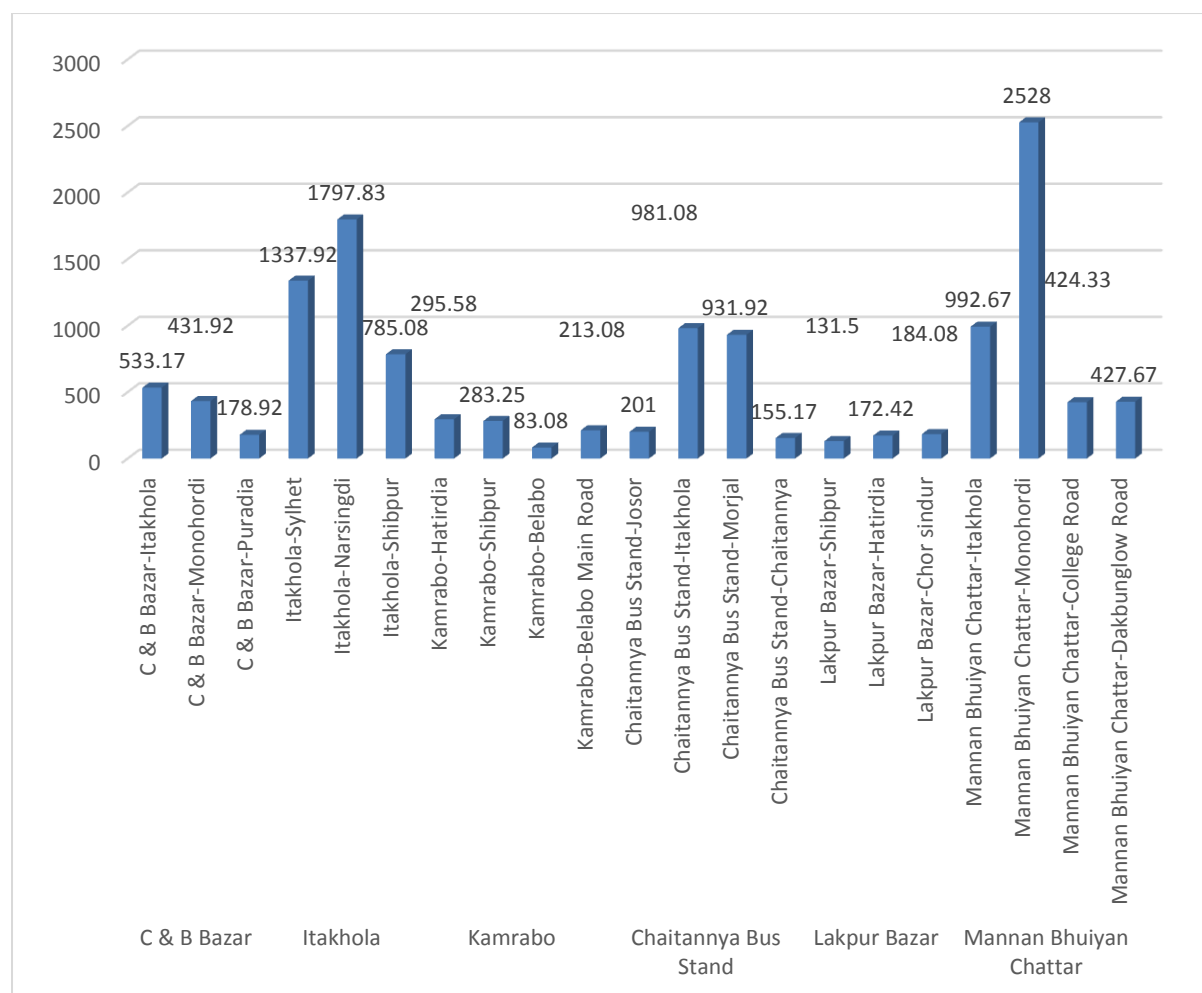


Figure 3.7: Average PCE at Links of Six Intersections

Source: Traffic and Transportation Survey, 2016

From the above figure, it has been seen that PCE value of traffic flow is 1797.83 at the link of Itakhali to Narsingdi. The highest PCE value is at the Mannan Bhuiyan Intersection which is 2528 at the link of Mannan Bhuiyan Chattar to Monohordi. And at the other links traffic flows are fluctuated.

3.1.4 Traffic Volume and PCE at Roadway Segments

Table 3.2: Traffic Volume and PCE at Roadway Segments

Roadway Segment Name	Link Name	Average Vehicle/Hour	Average PCE/Hour
Dulalpur Moar	Chor sindur-Monohordi	254	264.08
Syed Nagar Bus Stand	Narsingdi-Sylhet	729	1230.50
Thana Moar	Baniyadi-Joynogor Road	249	310.25

Source: Traffic and Transportation Survey, 2015

At Roadway Segments, Traffic vehicles are flown at the rate of 729 per hour at the Syed Nagar Bus Stand. At other road segments traffic flows are comparatively low.

3.1.6 Pedestrian Survey

Pedestrian is an important part of traffic. In case of designing an intersection or roadway, it is necessary to survey the pedestrian. In the traffic survey, pedestrian count has done in every link of three intersections which have summarized below.

Table 3.3: Pedestrian flow at selected intersections

Intersection	Link	Average Pedestrian/ Hour	Average Pedestrian/ Minute
C & B Bazar	C & B Bazar-Itakhola	250	4
	C & B Bazar-Monohordi	395	7
	C & B Bazar-Puradia	303	5
Itakhola	Itakhola-Sylhet	239	4
	Itakhola-Narsingdi	262	4
	Itakhola-Shibpur	301	5
Kamrabo	Kamrabo-Hatirdia	22	0
	Kamrabo-Shibpur	31	1
	Kamrabo-Belabo	45	1
	Kamrabo-Belabo Main Road	33	1
Lakpur Bazar	Lakpur Bazar-Shibpur	243	4
	Lakpur Bazar-Hatirdia	265	4
	Lakpur Bazar-Chor sindur	286	5
Mannan Bhuiyan Chattar	Mannan Bhuiyan Chattar-Itakhola	41	1
	Mannan Bhuiyan Chattar-Monohordi	59	1
	Mannan Bhuiyan Chattar-College Road	61	1
	Mannan Bhuiyan Chattar-Dakbunglow Road	49	1

Source: Traffic and Transportation Survey, 2015

From the table, it is seen that pedestrian movement is comparatively higher at C & B Bazar. In three link of C & B Bazar, pedestrians are moved more than 5 persons per minute. In Lakpur Bazar has the same significance of pedestrian movement. At other intersections pedestrians are moved at more than 1 person per minute.

3.2 Origin and Destination Findings

Origin and Destination Survey has been reflected different desired issues such as types of mode used in study area, origin and destination pattern, behavior etc. The output of the O D Survey has been depicted in below paragraphs.

3.2.1 Trip Distribution Pattern

The number of O D survey has been carried out 43 where trip distribution pattern can easily determine. From the survey, it has been seen that people lean to travel internally within Unions and also travel other Upazilas and Districts. The following tables represent the trip distribution pattern of Shibpur Upazila respectively within Unions and other Upazila s/Districts.

Table 3.4: Origin Destination Matrix within Unions of Shibpur Upazila

Destination Origin	Chakradha	Josor	Masimpur	Pourashava	Putia	Total
Chakradha	0	0	0	1	1	2
Josor	0	0	1	1	0	2
Masimpur	0	0	0	0	1	1
Pourashava	1	0	1	0	0	2
Putia	0	2	0	1	0	3
Total	1	2	2	3	2	10

Source: Traffic and Transportation Survey, 2016.

From the above table, it has been seen that people travel main center of the Upazila from almost every union. As Pourashava is the main concentration of works, people prone to visit here for their purposes. On the survey day, the findings have found some concentration of areas where people are commuting. From the above matrix, Putia and Pourashava has more travelers on that day. From the matrix, we can know that how trips distributed throughout the Upazilas.

Table 3.5: Origin Destination Matrix surrounding Upazilas /Districts of ShibpurUpazila

Destination Origin	Bhairab	Dhaka	Habiganj	Hatirdia	Madhobdi	Monohordi	Narsingdi	Sylhet	Vela nagar	Total
Bhairab	0	2	0	0	0	0	0	0	0	2
Dhaka	1	0	0	0	0	0	0	0	0	1
Habiganj	0	1	0		0	0	0	0	2	3
Hatirdia	1	0		0	0	0	1	0	0	2
Madobdi	0	0	0	1	0	0	0	0	1	2
Monohordi	0	3	0	0	0	0	1	0	0	4
Narsingdi	0	0	0	0	0	0	0	0	0	0
Sylhet	0	2	0	0	0	0	1	0	0	3
Velanagar	0	0	0	0	0	0	1	0	0	1
Total	2	8	0	1	0	0	4	0	3	18

Source: Traffic and Transportation Survey, 2016.

The above matrix represents that Narsingdi is marked as the Destination point in most cases. And most trip is originated from Monohordi which is 4 on the survey day. On the same way, Sylhet, Vela nogor, Habiganj have the concentrations of trip distributions.

3.2.2 Mode Choice

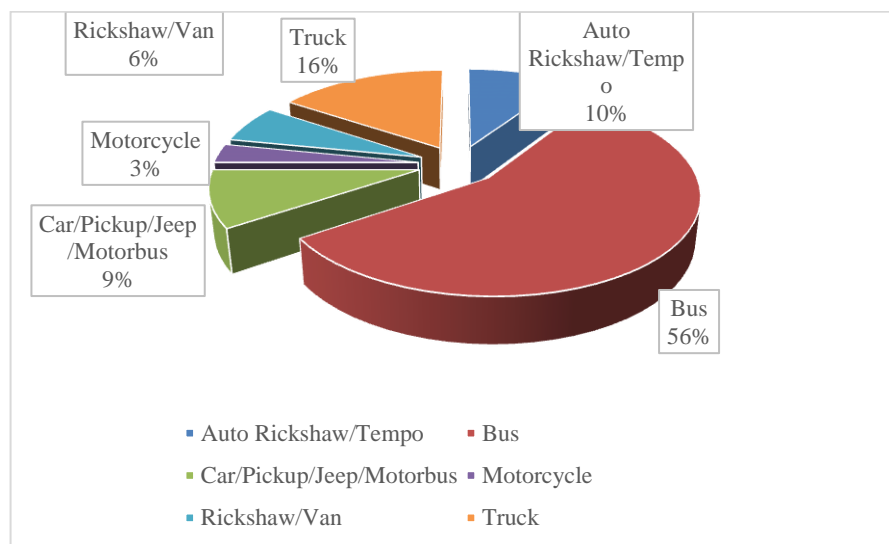


Figure 3.8: Types of Mode

Source: Traffic and Transportation Survey, 2016.

The pie chart depicts the mode choice of passengers during travel. The above data significantly presents that 56% passengers chose bus to travel. 16% use truck and which is mostly for loading and unloading goods. 9% passengers use car/pickup/jeep/motorbus. 6% use rickshaw and van whereas only 3% chose motorcycle to travel. 10% passengers chose auto rickshaw/tempo.

3.2.3 Purpose of Trip

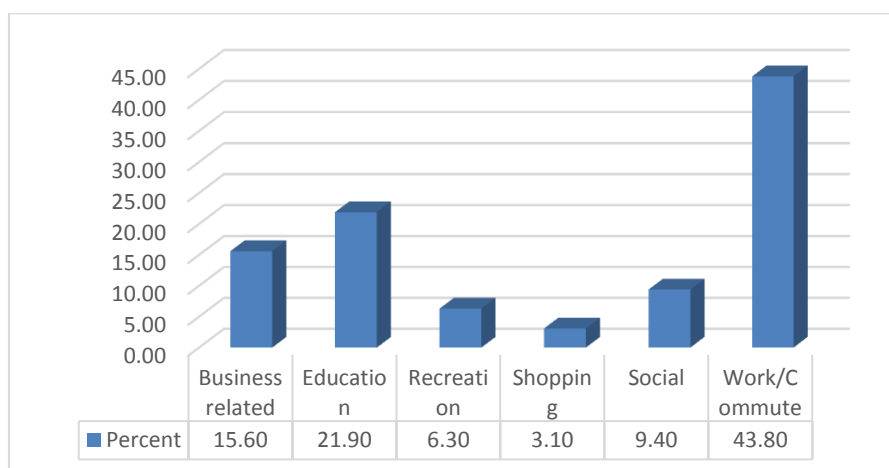


Figure 3.9: Trip purposes of surveyed respondents

Source: Traffic and Transportation Survey, 2016.

The bar chart represents the purpose of trip of different passengers. The data of the chart clearly shows that mostly people travel due to work purpose and which percentage is 43.8%. 21.9% travel due to education purpose. 15.6% travel to meet their business needs. 3% because of social purposes such as visiting relatives, social programs etc.

3.2.4 Origin Destination Behavior

Table 3.6: Nature of Origin and Destination

Origin \ Destination			Type of Destination						Total
			Recreational	Residence	School/College/University	Shopping	Social	Workplace	
Type of Origin	Residence	Frequency	2	0	5	1	2	12	22
		Percentage	9.10%	0.00%	22.70%	4.50%	9.10%	54.50%	100.00%
	School/College/University	Frequency	0	1	0	0	0	0	1
		Percentage	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	100.00%
	Social	Frequency	0	1	0	0	0	0	1
		Percentage	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	100.00%
	Workplace	Frequency	0	6	0	0	0	2	8
		Percentage	0.00%	75.00%	0.00%	0.00%	0.00%	25.00%	100.00%
	Total	Frequency	2	8	5	1	2	14	32
		Percentage	6.30%	25.00%	15.60%	3.10%	6.30%	43.80%	100.00%

Source: Traffic and Transportation Survey, 2016

The above cross table shows the origin-destination data of the passengers. From residence most of the people travel to workplaces which percentage is 54.50%. 22.70% travel to school/college/universities from residence. From school/college/universities 100% people travel to residence. From the residence people's destinations are different. People travel for social purposes also have the same destination which is residence and its percentage is 100%. 75% people travel to residence from work places and 25% to another work places.

3.2.5 Passengers Occupancy in different vehicle mode

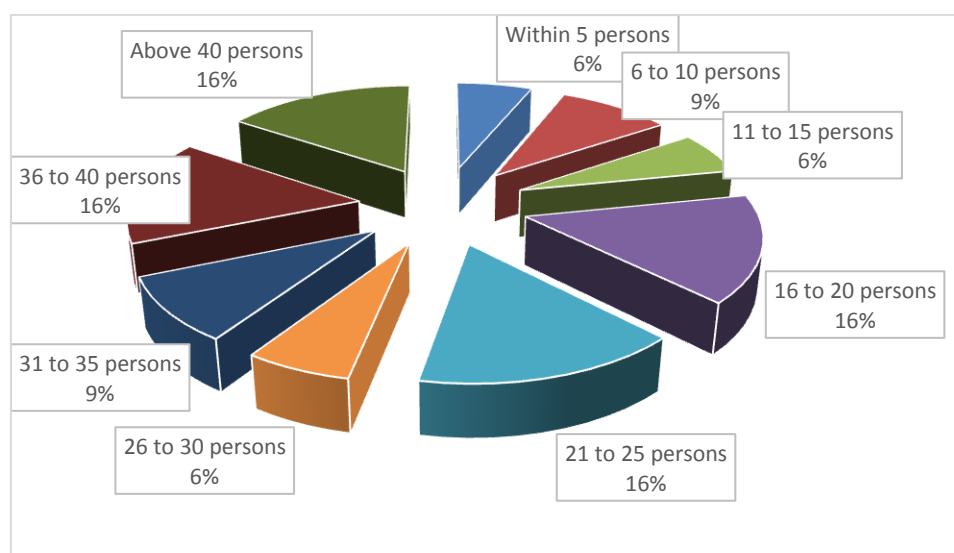


Figure 3.10: Passengers Occupancy in Different Modes

Source: Traffic and Transportation Survey, 2016.

The pie chart represents the density of passengers in different vehicles. From the percentages it is visible that mostly people travel in big vehicles which can carry above 40 persons and which percentage is 16%. Secondly people travel in relatively less big vehicle from the first one such as 16 to 20 persons and which percentage is also 16% and other vehicles which can carry 30 to 40 persons also have the same percentage. 9% travel in such vehicle which can carry 31 to 35 persons, 6 to 10 persons respectively. 6% travel in vehicles which have capacity to carry 6 to 10 persons.

3.2.6 Major Prioritized Problems

Table 3.7: Major problems in Transportation

Comments	Frequency	Percent
Damaged of Road	5	16.67
Encroachment along the roadside	1	3.33
Excessive fare	1	3.33
Incompatible Roads	1	3.33
Incompatible vehicle plying	1	3.33
Insufficiency of Street lightening	1	3.33
Insufficiency of Traffic police	1	3.33
Narrow Road	2	6.67
Police harassment	4	13.33
Theft	1	3.33
Traffic jam	12	40.00
Total	30	100.00

Source: Traffic and Transportation Survey, 2016.

The data of the above table shows the major problems that passengers face during travel. On the basis of the opinions of the passengers the problems are prioritized. People mostly think that traffic jam is the major problem and which percentage is 40%. 16.67% people gave their opinion on the problem of damaged road. 13.33% think that police harassment is the major problem. 6.67% think that narrow road is the main problem. 3.33% think that theft, insufficiency of traffic police, incompatible vehicle plying, incompatible roads, excessive fare are the major problems respectively.

3.3 Passenger Interview Survey Findings

Passenger's Interview Survey has been conducted for Bus, Boat and Train. As people mostly travel by bus, the findings reflect the about the transport communication through bus. The findings are when people prefer buses, travel cost, travel distance, types of modes for getting into buses through Bus terminal or bus stoppages.

3.3.1 Age group according to the Gender

Table3.8:Age Sex Structure of the Respondents

Age \ Sex			Sex		Total
			Female	Male	
Age Group	Below 15	Frequency	0	1	1
		Percent	0.00%	100.00%	100.00%
	16-20	Frequency	2	9	11
		Percent	18.20%	81.80%	100.00%
	21-30	Frequency	6	22	28
		Percent	21.40%	78.60%	100.00%
	31-40	Frequency	10	16	26
		Percent	38.50%	61.50%	100.00%
	41-50	Frequency	3	6	9
		Percent	33.30%	66.70%	100.00%
	Above 51	Frequency	2	5	7
		Percent	28.60%	71.40%	100.00%
	Total	Frequency	23	59	82
		Percent	28.00%	72.00%	100.00%

Source: Traffic and Transportation Survey, 2016.

The above cross table shows the relation between age-group and male and female who travel. In the age-group of 16-20, Male and Female travel respectively 81.80% and 18.20%. It is noticeable that in every age-group the percentages of male travelers are more than the female. In case of below 15 age-group 100% travelers are male. In the 31-40 and 41-50 age-groups the percentages of female travelers are increasing.

3.3.2 Trip Purpose

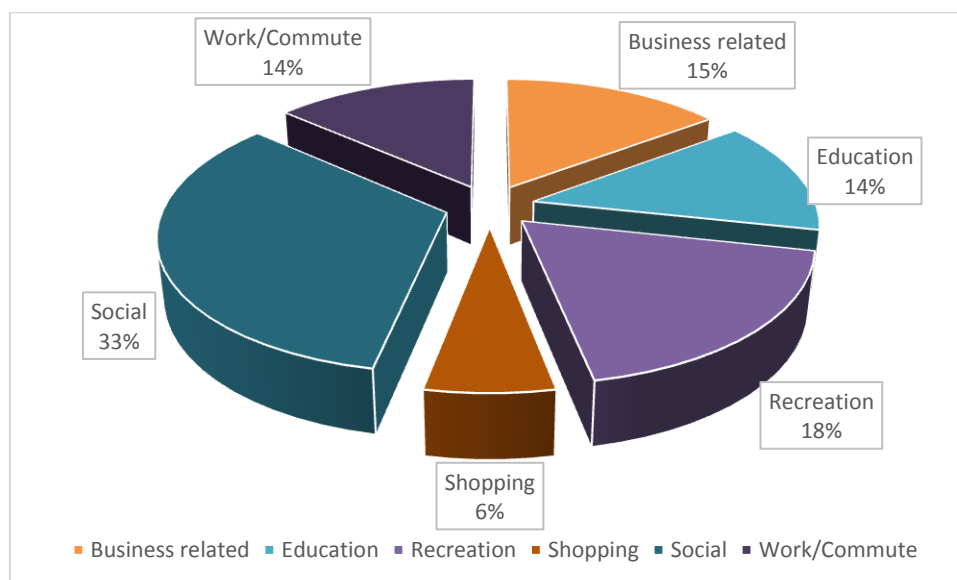


Figure 3.11: Purpose of Trip

Source: Traffic and Transportation Survey, 2016.

The pie chart depicts the percentages of bus passengers who travel by bus for different purposes. The data reveals that 33% bus passengers travel by bus because of social purposes. 18% bus passengers use bus due to recreation purpose. 15% and 14% passengers use bus because of business and work purposes respectively. Only 6% passengers use bus for shopping.

3.3.3 Types of Mode

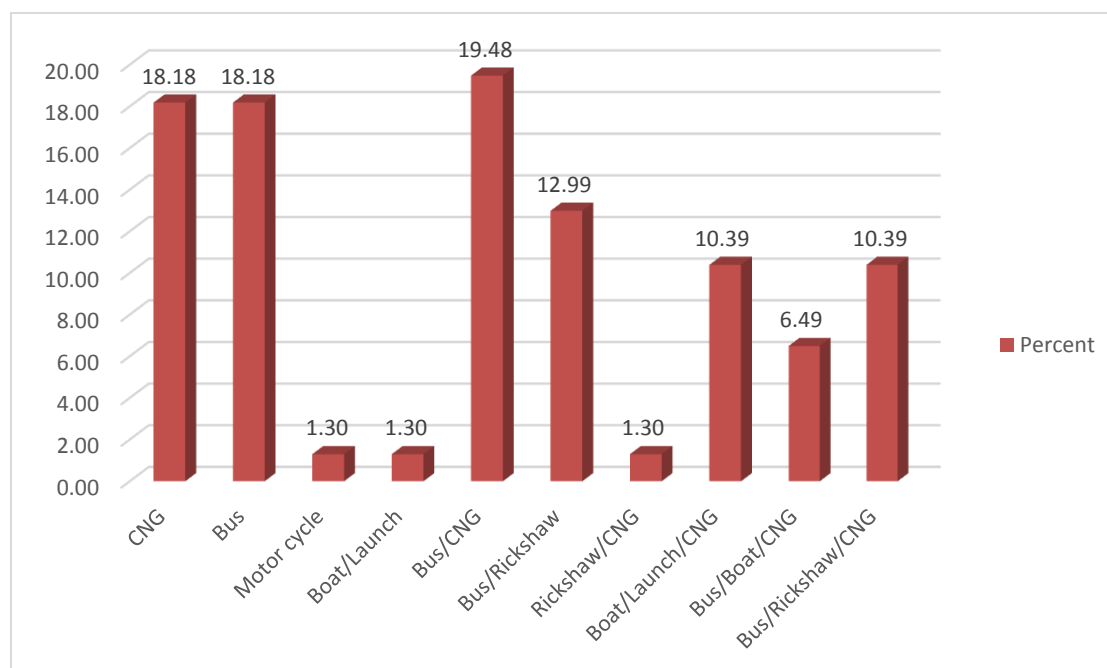


Figure 3.12: Types of Mode used in a Trip

Source: Traffic and Transportation Survey, 2016.

The bar chart represents the types of modes used by the passengers. From the data it is visible that 38.96% passengers use one type of mode to complete their journey. 61.04% passengers use two or

three types of modes to finish their journey. The data also shows that people are using all kinds of modes in Shibpur. But more than half of the passengers use more than one type of modes to reach to their destination. (Please see **Appendix-B**)

3.3.4 Trip Distribution by Passengers

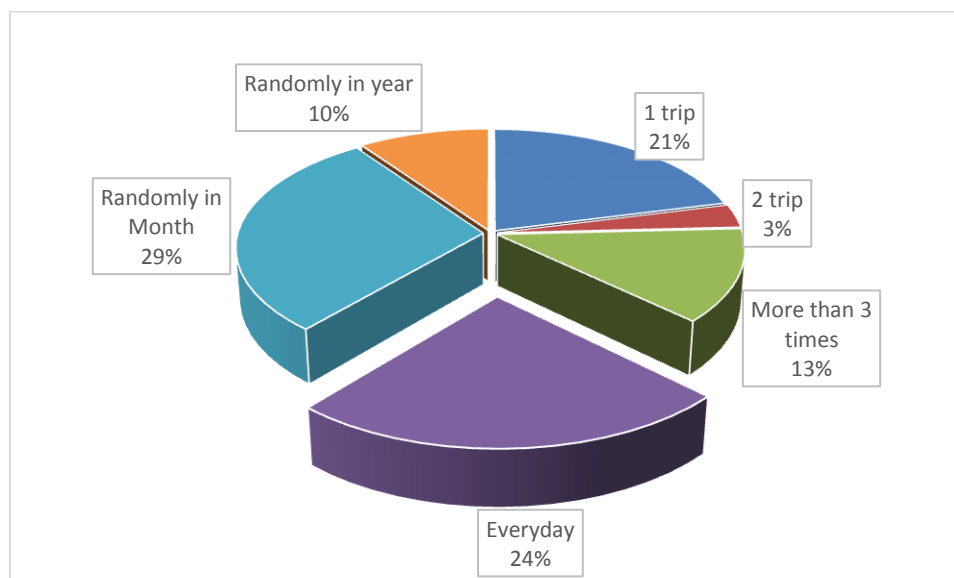


Figure 3.13: Trip Frequency

Source: Traffic and Transportation Survey, 2016.

The pie chart shows the trip distribution by passengers. From the data it is shown that 29% people arrange trip randomly in month. 24% people make a trip everyday. 10% people travel randomly in a year. 13% people make more than 3 trips and 3% people make 2 trips.

3.3.5 Trip production according to the trip purpose

Table 3.9: Trip Production according to the Trip Purpose

Trip Frequency Trip Purpose		Trip per week						Total
		1 trip	2 trips	More than 3 trips	Every day	Randomly in Month	Randomly in year	
Trip Purpose	Business related	3	1	1	7	0	0	12
	Education	0	0	6	2	1	0	11
	Recreation	2	0	0	1	1	0	15
	Shopping	2	1	0	0	0	0	5
	Social	4	0	0	1	12	5	27
	Work/Com mute	2	0	1	4	3	1	11
	Total	13	2	8	15	18	6	81

Source: Traffic and Transportation Survey, 2016.

The data of the table depicts that most of the people travel due to business purposes every day in a week. For education purpose people make trip more than 3 times in a day. For recreation purpose people every day. For social purposes most people travel randomly in month.

3.3.6 Travel cost according to the trip purpose

Table 3.10: Travel cost according to the Trip Purpose

Trip Purpose			Travel Cost						Total
			Within 50 taka	51 to 100 taka	101 to 150 taka	151 to 200 taka	251 to 300 taka	More than 300 taka	
Trip Purpose	Business related	Frequency	11	0	1	0	0	0	12
		Percent	91.70 %	0.00%	8.30%	0.00%	0.00 %	0.00 %	100.00 %
	Education	Frequency	10	0	1	0	0	0	11
		Percent	90.90 %	0.00%	9.10%	0.00%	0.00 %	0.00 %	100.00 %
	Recreation	Frequency	11	3	0	1	0	0	15
		Percent	73.30 %	20.00 %	0.00%	6.70%	0.00 %	0.00 %	100.00 %
	Shopping	Frequency	4	0	0	1	0	0	5
		Percent	80.00 %	0.00%	0.00%	20.00 %	0.00 %	0.00 %	100.00 %
	Social	Frequency	17	2	4	2	1	1	27
		Percent	63.00 %	7.40%	14.80 %	7.40%	3.70 %	3.70 %	100.00 %
	Work/Com mute	Frequency	7	2	1	1	0	0	11
		Percent	63.60 %	18.20 %	9.10%	9.10%	0.00 %	0.00 %	100.00 %
	Total	Frequency	61	7	7	5	1	1	81
		Percent	74.40 %	8.50%	8.50%	6.10%	1.20 %	1.20 %	100.00 %

Source: Traffic and Transportation Survey, 2016.

The cross table shows the relation between trip purpose and travel cost. 91.7% people pay for travel within 50tk for business purpose. It is noticeable that for different types of purposes passengers pay cost within 50 taka which depicts that people try to stay close to their activity area. For work purpose 63.6% people pay within 50tk and 18.2% pay 51 to 100tk. For shopping purpose also people pay within 50 taka.73.3% people pay within 50tk for recreation and 20.0% pay 51 to 100tk for recreation.

3.3.7 Travel Cost according to the distance

Table 3.11: Travel cost according to the distance

Travel Distance \ Travel Cost			Travel Cost						Total
			Within 50 taka	51 to 100 taka	101 to 150 taka	151 to 200 taka	251 to 300 taka	More than 300 taka	
Total Distance	Within 5 km	Frequency	4	0	0	0	0	0	4
		Percent	100.00 %	0.00%	0.00%	0.00%	0.00 %	0.00 %	100.00 %
	6 to 10 km	Frequency	12	0	0	0	0	0	12
		Percent	100.00 %	0.00%	0.00%	0.00%	0.00 %	0.00 %	100.00 %
	11 to 15 km	Frequency	6	0	0	0	0	0	6
		Percent	100.00 %	0.00%	0.00%	0.00%	0.00 %	0.00 %	100.00 %
	16 to 20 km	Frequency	13	3	0	0	0	0	16
		Percent	81.30%	18.80 %	0.00%	0.00%	0.00 %	0.00 %	100.00 %
	21 to 30 km	Frequency	6	1	0	0	0	0	7
		Percent	85.70%	14.30 %	0.00%	0.00%	0.00 %	0.00 %	100.00 %
	31 to 40 km	Frequency	8	1	2	0	0	0	11
		Percent	72.70%	9.10%	18.20 %	0.00%	0.00 %	0.00 %	100.00 %
	41 to 50 km	Frequency	3	1	1	0	0	0	5
		Percent	60.00%	20.00 %	20.00 %	0.00%	0.00 %	0.00 %	100.00 %
	More than 51 km	Frequency	8	1	4	5	1	1	20
		Percent	40.00%	5.00%	20.00 %	25.00 %	5.00 %	5.00 %	100.00 %
	Total	Frequency	60	7	7	5	1	1	81
		Percent	74.10%	8.60%	8.60%	6.20%	1.20 %	1.20 %	100.00 %

Source: Traffic and Transportation Survey, 2016

From the above data of the cross table it is visible that most of the people are supporting to pay within 50tk cost to travel to different distant places. Such as within 5km, 6 to 10km and 11 to 15km all respondents pay within 50 taka as travel cost. From the table it is noticeable that to go to a more distant place people pay within 50k which percentage varies from 81.3% to 40.0%. The highest the passengers pay to travel to different distant places 150 taka.

3.4 Regional Transport Survey

Regional transport network survey has been done for Buses, Trucks and Trains which are coming into study area and going out form study area. From the survey, we can know the carrying capacity of the buses, types of goods carrying by trucks, connectivity pattern with other Upazila s and Districts.

Regional Bus Survey has been carried out in Shibpur Bus Stand and Itakhola Bus Stand. Most of the buses have more than 40 persons carrying capacity. Buses are originating and commuting in different areas. Trucks are coming into study area or going out form study area for goods carrying purposes such as vegetables, agricultural products like paddy; departmental products etc. (Please see **Appendix-B**)

CHAPTER 4: FINDINGS FROM PRA AND SOCIO ECONOMIC ABOUT TRANSPORTATION

4.1 Findings from Socioeconomic survey

4.1.1 Mode of Communication

As there are very limited number of waterways are available almost all of the households' main mode of communication is road. It also represents that road condition in Shibpur Upazila is good. A small percentage of total households also traveled by train for long distance travel as they think it is more safe mode of communication than others (please see Figure:4.1) .

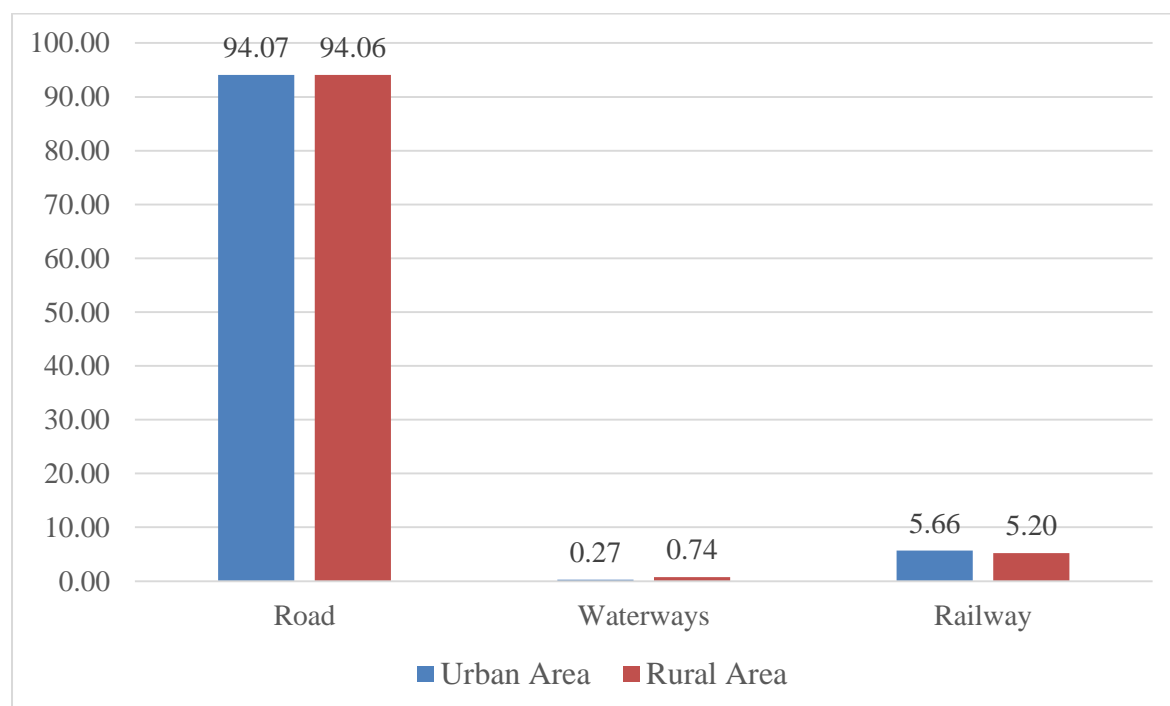


Figure 4.1: Mode of Communication (Source: Field Survey, 2015)

4.1.2 Types of Road

In urban area about three fourth of total road is bituminous road. Concrete made roads are the second highest in urban area which represents that in urban area road condition of Shibpur Upazila is satisfactory. Besides, in rural area, the percentage of bituminous made or concrete made road percentage is almost same which represents that road condition in both of urban and rural area is almost the same. In rural area a significant percentage of roads are katcha that represents the fact that some steps could be taken for the development of these road (please see Figure: 4.2).

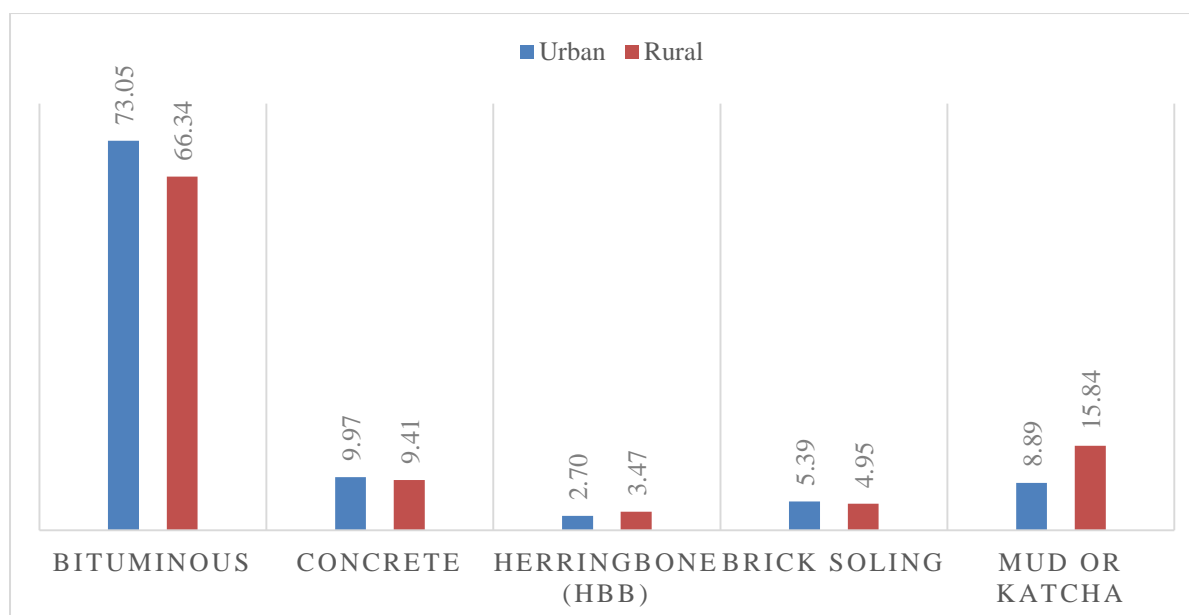


Figure 4.2: Types of Road (Source: Field Survey, 2015)

4.1.3 Mode of Access to Main Road

It has been found that about two third of total households in urban area got access to main road through footpath, whereas in rural area about the percentage is about half of the total respondents. This is because in urban area, there are sufficient establishments has been made as footpath than in rural area. In rural area most of the households went to main road by *Halot* or field boundary (please see Figure: 4.3).

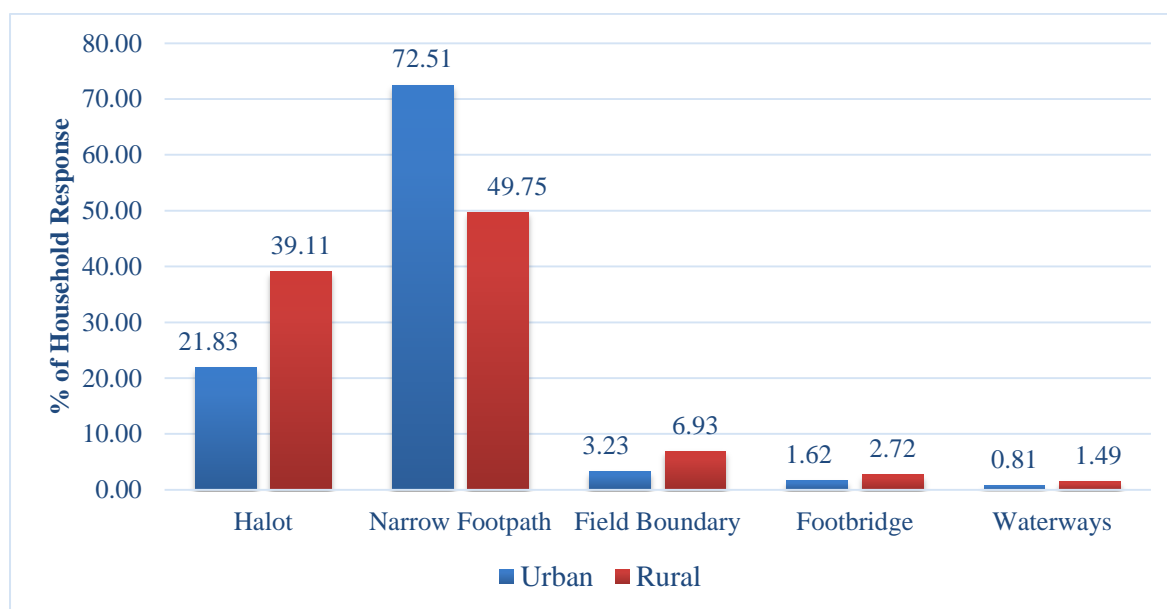


Figure 4.3 : Mode of Access to Main Road (Source: Field Survey, 2015)

4.1.4 Condition of Road

In urban area, about one third of total road's condition is good, on the other hand, more than about half of total roads have been reported as deteriorated. This represents the situation that there is not enough maintenance for urban road though about two third of total urban road is made by bituminous. On the other hand, the percentage of deteriorated road is lower in rural area than urban area, but there

are about four times higher destroyed roads in rural area which needs quick maintenance before totally destroyed condition. The percentage of seasonal waterlogged road in rural area is about three times higher for than urban area. Besides, the percentage of good roads is also not much significant in rural areas than urban area. In a nutshell, it can be easily understood that enough maintenance of road is not present in both of rural and urban area. But the condition in rural area is worse than urban area (please see Figure: 4.4).

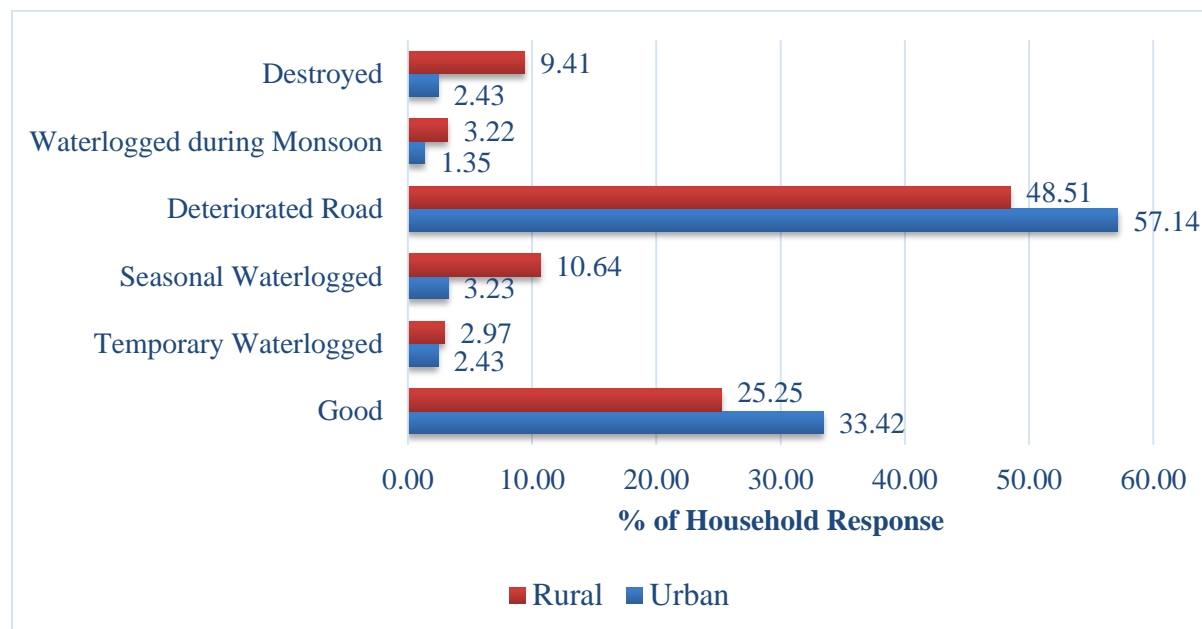


Figure 4.4: Condition of Road Source: Field Survey, 2015

4.1.5 Maintenance of Road

As from the previous section discussion, it has been proved that enough road maintenance has not been carried out in both of urban and rural area, the below Figure:4.5 again proved that. There is almost never annual maintenance has been carried out for both of urban and rural area. For about half of the cases irregular maintenance has been occurred. In urban area for about one fourth of the cases roads are being maintained periodically 2-3 years. But the percentage is almost half in rural area than in urban area. In rural area almost about one fourth of the cases roads are being again made by after extremely damaged. Thus, it can be said that effective regular maintenance should be carried out in both of urban and rural area by the responsible authorities

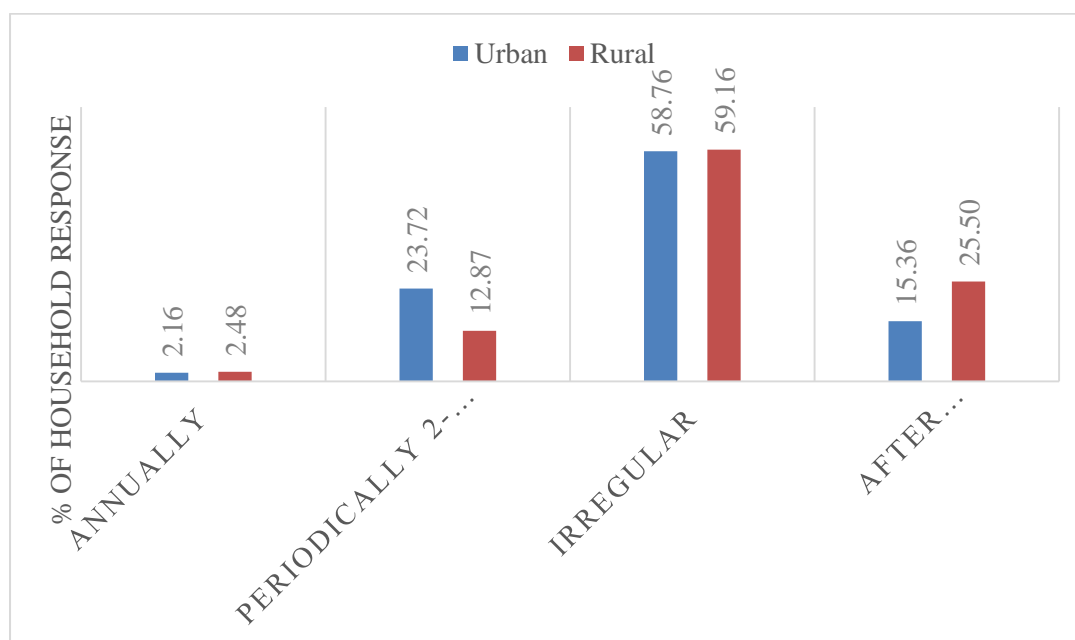


Figure 4.5: Maintenance of Road (Source: Field Survey, 2015)

4.2.0 Findings from PRA

PRA (Participatory Rural Appraisal) is an innovative approach to empower the people by sharing information and making decisions regarding the Development Project and to involve the local people in the planning process by letting the local people identify their own problems, potentials, development needs and planning priorities for next 20 years. In the PRA Session, different types of problems have identified where transportation problem was significant.

The findings related to traffic and transportation of the PRA Session of Shibpur Upazila are summarized below:

- Poor communication system and broken road
- Poor transportation system
- Develop modern transportation system
- Development of transportation

CHAPTER 5: CONCLUSION

The findings from transport and traffic management survey are of vital issue in preparing master plan for the study area. The survey reveals that no public or private bus service is available for intra-city movement. Rickshaw/van, bicycle and motorcycles are common prime modes for intra city movement. Water transport network has no significant importance in carrying out both passenger and goods in Shibpur. The survey results of the Transportation and Traffic Management has become the basis for further analysis and interpretation in the process of preparing master plan for Shibpur Upazila. In future, care should be taken not only to the conditions of the roads and vehicles but also to the traffic management. Transport study provides special attention to urban transportation planning as it greatly influences the location decisions and travel behavior of people, goods and services. Transportation is critical for the efficiency of towns contributing to their productivity and economic growth. A good network of roads and other transportation mode coupled with an efficient transport management system makes a substantial contribution to the "working efficiency" of cities and towns and enables them to become catalysts for social and economic development. On the other hand, the impact of a poorly designed urban transport system is manifested in terms of traffic congestion, delays, accidents, high energy consumption, high pollution of the environment and inequitable access to services. A well-planned transportation system results in orderly urban growth, greater use of urban public transport, lower vehicular pollution, and shorter auto trips. A comprehensive transportation study is undertaken to investigate the existing transportation infrastructure, transportation modes and modal share scenario of Shibpur Upazila. Accordingly, the transportation study is conducted to determine the present travel patterns and the characteristics of existing transportation facilities to forecast the future travel demand and develop a transportation plan.

References

Cochran, W. G. (1963). Sampling Techniques, 2nd Ed., New York: John Wiley and Sons, Inc.

LGED (2016), Road Database. URL: <http://www.lged.gov.bd/ViewRoad2.aspx> accessed on 15 June, 2016.

Roads and Highways Department (1994), Road Materials and Standards Study Bangladesh, Final Report, Volume **V11A**, Development of Geometric Design Standards, Ministry of Communications, Government of the People's Republic of Bangladesh

Wikipedia (2016), Roads and highways

URL: <https://en.wikipedia.org/wiki/List-of-roads-in-Bangladesh> accessed on 15 June, 2016.

Urban Development Directorate
PREPARATION OF DEVELOPMENT PLAN FOR FOURTEEN UPAZILAS
(PACKAGE: 02): UDD

Bus/ Boat or Launch/ Train Passenger Interview Survey Questionnaire

Name of Upazila :
Date :
Time of Interview :
Location of Interview point :

A. Present Address of the respondent

B. Sex: (a) Male (b) Female

C. Age: 1. Below 15 years 2. 16-20 Years 3. 21-30 Years 4. 31-40 Years 5. 41-50 Years 6. Above 51 Years

D. Where did your trip begin?

E. Where did your trip end point?

F. What was the purpose of your trip?

1. Work/Commute 2. Business related 3. Shopping 4. Education 5. Social 6. Recreation

G. No. of trips in a week?

H. How many times you changed modes to complete this trip?

1	2	3
---	---	---

I. What are types of modes you used to complete the trip?

1. Bus 2. Motor cycle 3. Rickshaw 4. Van 5. Rail 6. Boat/Launch 5. On foot 6. Others (specify)

J. Total travel time of the trip?(In min/hour)

K. Total costs of the trip? (In Taka)

L. Total distances of the trip? (In k.m.)

M. Any comments on transportation?

Name of Enumerator:

Name of Supervisor:

Signature of Enumerator:

Signature of Supervisor:

Urban Development Directorate
PREPARATION OF DEVELOPMENT PLAN FOR FOURTEEN UPAZILAS
(PACKAGE-02):UDD

Traffic and Transportation Survey
Traffic Volume Count Tally Sheet

(24 Hours long) Weather condition

Name of Upazila:

Date:

Route Name:

Hours counted: **Start**am/pm, **Finish**am/pm

Traffic Direction: Fromto..... Intersection Name:

Type of traffic	Number of Traffic	Total
Bus/Minibus		
Heavy Truck/ Light Truck		
Car/Micro-bus/Jeep		
Auto Rickshaw/Tempo/Nosimon		
Motorcycle		
Rickshaw/Van		
Bicycle		
Animal cart/Push cart		
Pedestrian		
Others (specify)		

Name of Enumerator

Signature of Enumerator

Name of Supervisor

Signature of Supervisor

Urban Development Directorate
PREPARATION OF DEVELOPMENT PLAN FOR FOURTEEN UPAZILAS
(Package: 02): UDD
Roadside Interview Survey (O-D Survey) Questionnaire

Time: Every half an Hour Interval (24 hours clock)

Name of Upazila:

Date:

Route Name:

Hours counted: **Start**am/pm, **Finish**am/pm

Traffic Direction: Fromto.....

A. Vehicle Type:

1. Truck 2. Bus 3. Car/Pickup/Jeep/Motorbus 4. Auto Rickshaw/Tempo 5. Motorcycle 6. Rickshaw/Van 7. Bicycle

B. Where did your trip begin?

City/Town.....

C. What type of place is your trip start point?

1. Residence 2. Workplace 3. Shopping 4. School/College/University 5. Social 6. Recreational

D. Where did your trip end?

City/Town.....

E. What type of place is your trip end point?

1. Residence 2. Workplace 3. Shopping 4. School/College/University 5. Social 6. Recreational

F. What was the purpose of your trip?

1. Work/Commute 2. Business related 3. Shopping 4. Education 5. Social 6. Recreation

G. How many people were in the vehicle including the driver?

No. of people.....

H. Any comments on Transportation?

Name of Enumerator:

Name of Supervisor:

Signature of Enumerator:

Signature of Supervisor:

Urban Development Directorate
PREPARATION OF DEVELOPMENT PLAN FOR FOURTEEN UPAZILAS
(PACKAGE: 02): UDD

Pedestrian Interview Survey Questionnaire

Name of Upazila :
Date :
Time of Interview :
Location of Interview point :

A. Present Address of the respondent

B. Sex:

(a) Male

(b) Female

C. Age:

1. Below 15 years

2. 16-20 Years

3. 21-30 Years

4. 31-40 Years

5. 41-50 Years

6. Above 51 Years

D. Where did your trip begin?

.....

E. Where did your trip end point?

.....

F. What was the purpose of your trip?

1. Work/Commute

2. Business related

3. Shopping

4. Education

5. Social

6. Recreation

G. Total distances of the trip?

..... (In k.m.)

H. Any comments on transportation?

.....

Name of Enumerator: Name of Supervisor:

Signature of Enumerator: Signature of Supervisor:

Urban Development Directorate
PREPARATION OF DEVELOPMENT PLAN FOR FOURTEEN UPAZILAS
(PACKAGE: 02): UDD

Questionnaire on Regional Transportation Network System

Name of Upazila :

Date of survey :

A. Information of trip going out from study area to other region (upazila/district)

1) Type of Mode (Bus/Truck/Train/Water way):

(Response will be collected from every mode)

- 2) Name of trip destination point (Upazila/District):
- 3) No. of trips per day (hour basis)
- 4) Average no. of passengers carried by per mode (per trip):
- 5) Types of goods carried by per mode (per trip):

B. Information of trip coming into study area from other region (upazila/district)

1) Type of Mode (Bus/Truck/Train/Water way):

(Response will be collected from every mode)

- 2) Name of trip origin point (Upazila/District):
- 3) No. of trips per day (hour basis)
- 4) Average no. of passengers carried by per mode (per trip):
- 5) Types of goods carried by per mode (per trip):
- 6) Stoppage area inside the upazila area

TRAFFIC VOLUME CALCULATION**A) Itakhola Moor Intersection****Table A-1: Hourly Traffic Volume according to the vehicles types for Itakhola – Sylhet link on January 01, 2016 at 9:30am**

Mode of Transport		PCU	Sylhet-Narsingdi	Narsingdi-Sylhet	Sylhet-Shibpur	Shibpur-Sylhet	Total Vehicle	Total PCU	Percentage
MV	Bus/Minibus	3	60	92	0	2	154	462	19.69
	Heavy Truck/Light Truck	3	43	30	6	10	89	267	11.38
	Pickup Van	1	36	36	6	2	80	80	10.23
	Car/ Micro Bus/Jeep	1	105	147		2	254	254	32.48
	Lorry/trolley	1	3		6		9	9	1.15
	Tempo	0.75	30	1	6	3	40	30	5.12
	Auto Rickshaw	0.75	1	1			2	1.5	0.26
	Motorcycle	0.75	17	21	8	6	52	39	6.65
	Total MV						680	1142.5	86.96
NMV	Rickshaw/Van	2	49	18	7	9	83	166	10.61
	Bicycle	0.5	10			6	16	8	2.05
	Animal Cart/Push Cart	4			3		3	12	0.38
	Total NMV						102	186	13.04
Grand Total							782	1328.5	100

Table A-2: Hourly Traffic Volume according to the vehicles types for Itakhola – Sylhet link on January 01, 2016 at 11:30am

	Mode of Transport	PC U	Sylhet- Narsingdi	Narsingdi- Sylhet	Sylhet- Shibpur	Shibpur- Sylhet	Total Vehicle	Total PCU	Percentage
MV	Bus/Minibus	3	75	97	0	0	172	516	22.48
	Heavy Truck/Light Truck	3	42	33	7	17	99	297	12.94
	Pickup Van	1	20	29	8	2	59	59	7.71
	Car/ Micro Bus/Jeep	1	70	140	18	3	231	231	30.20
	Lorry/trolley	1	2	4	1		7	7	0.92
	Tempo	0.75	31	4	2	3	40	30	5.23
	Auto Rickshaw	0.75	3			1	4	3	0.52
	Motorcycle	0.75	21	19	13	3	56	42	7.32
	Total MV						668	1185	87.32
NM V	Rickshaw/Van	2	40	13	15	4	72	144	9.41
	Bicycle	0.5	10	4	7	4	25	12.5	3.27
	Animal Cart/Push Cart	4					0	0	0.00
	Total NMV						97	156.5	12.68
	Grand Total						765	1341.5	100

Table A-3: Hourly Traffic Volume according to the vehicles types for Itakhola – Sylhet link on January 01, 2016 at 3:00 pm

Mode of Transport		PC U	Sylhet-Narsingdi	Narsingdi-Sylhet	Sylhet-Shibpur	Shibpur-Sylhet	Total Vehicle	Total PCU	Percentage
MV	Bus/Minibus	3	85	82	0	4	171	513	22.68
	Heavy Truck/Light Truck	3	47	31	7	14	99	297	13.13
	Pickup Van	1	26	37	11	1	75	75	9.95
	Car/ Micro Bus/Jeep	1	79	78	5	4	166	166	22.02
	Lorry/trolley	1	2		8		10	10	1.33
	Tempo	0.75	35	5	12	3	55	41.25	7.29
	Auto Rickshaw	0.75	5	8		2	15	11.25	1.99
	Motorcycle	0.75	2	22	8	5	37	27.75	4.91
	Total MV						628	1141.25	83.29
NMV	Rickshaw/Van	2	46	19	16	12	93	186	12.33
	Bicycle	0.5	19		6	8	33	16.5	4.38
	Animal Cart/Push Cart	4					0	0	0.00
	Total NMV						126	202.5	16.71
Grand Total							754	1343.75	100

Table A-4: Hourly Traffic Volume according to the vehicles types for Itakhola – Sylhet link on January 11, 2016 at 10:30 am

Mode of Transport		PCU	Sylhet-Narsingdi	Narsingdi-Sylhet	Sylhet-Shibpur	Shibpur-Sylhet	Total Vehicle	Total PCU	Percentage
MV	Bus/Minibus	3	173	69	0	0	242	726	26.36
	Heavy Truck/Light Truck	3	95	17		8	120	360	13.07
	Pickup Van	1	38	54		1	93	93	10.13
	Car/ Micro Bus/Jeep	1	112	68	6	4	190	190	20.70
	Lorry/trolley	1	6	1			7	7	0.76
	Tempo	0.75	45	2	7	5	59	44.25	6.43
	Auto Rickshaw	0.75	45	4	2	1	52	39	5.66
	Motorcycle	0.75	60	28	9	3	100	75	10.89
	Total MV								
NMV	Rickshaw/Van	2	26	3		3	32	64	3.49
	Bicycle	0.5	5	2	5	1	13	6.5	1.42
	Animal Cart/Push Cart	4	10				10	40	1.09
	Total NMV								
	Grand Total						918	1644.75	100

Table A-5: Hourly Traffic Volume according to the vehicles types for Itakhola – Sylhet link on January 11, 2016 at 12:30 pm

Mode of Transport		PCU	Sylhet-Narsingdi	Narsingdi-Sylhet	Sylhet-Shibpur	Shibpur-Sylhet	Total Vehicle	Total PCU	Percentage
MV	Bus/Minibus	3	83	62	0	0	145	435	23.77
	Heavy Truck/Light Truck	3	56	27	4	9	96	288	15.74
	Pickup Van	1	23	47	3		73	73	11.97
	Car/ Micro Bus/Jeep	1	100	84	6	4	194	194	31.80
	Lorry/trolley	1					0	0	0.00
	Tempo	0.75	45	2		2	49	36.75	8.03
	Auto Rickshaw	0.75	1				1	0.75	0.16
	Motorcycle	0.75	20	8		1	29	21.75	4.75
	Total MV						587	1049.25	96.23
NMV	Rickshaw/Van	2	9	4	2	4	19	38	3.11
	Bicycle	0.5	1		1	2	4	2	0.66
	Animal Cart/Push Cart	4					0	0	0.00
	Total NMV						23	40	3.77
Grand Total							610	1089.25	100

Table A-6: Hourly Traffic Volume according to the vehicles types for Itakhola – Sylhet link on January 11, 2016 at 4:00 pm

Mode of Transport		PCU	Sylhet-Narsingdi	Narsingdi-Sylhet	Sylhet-Shibpur	Shibpur-Sylhet	Total Vehicle	Total PCU	Percentage
MV	Bus/Minibus	3	95	106	1	0	202	606	29.79
	Heavy Truck/Light Truck	3	47	27	3	4	81	243	11.95
	Pickup Van	1	21			3	24	24	3.54
	Car/ Micro Bus/Jeep	1	115	138		5	258	258	38.05
	Lorry/trolley	1	3			1	4	4	0.59
	Tempo	0.75	30	2		3	35	26.25	5.16
	Auto Rickshaw	0.75	2	1		1	4	3	0.59
	Motorcycle	0.75	23	18	6	6	53	39.75	7.82
	Total MV								
NMV	Rickshaw/Van	2	6	2		6	14	28	2.06
	Bicycle	0.5	2			1	3	1.5	0.44
	Animal Cart/Push Cart	4					0	0	0.00
	Total NMV								
Grand Total							678	1233.5	100

Table A-7: Hourly Traffic Volume according to the vehicles types for Itakhola – Narsingdi link on January 01, 2016 at 9:30 am

	Mode of Transport	PCU	Narsingdi -Sylhet	Sylhet- Narsingdi	Narsingdi -Shibpur	Shibpur- Narsingdi	Total Vehicle	Total PCU	Percentage
MV	Bus/Minibus	3	92	60	41	22	215	645	19.76
	Heavy Truck/Light Truck	3	30	43	25	10	108	324	9.93
	Pickup Van	1	36	36	16	10	98	98	9.01
	Car/ Micro Bus/Jeep	1	147	105	23	32	307	307	28.22
	Lorry/trolley	1		3			3	3	0.28
	Tempo	0.75	1	30	29	6	66	49.5	6.07
	Auto Rickshaw	0.75	1	1	6	2	10	7.5	0.92
	Motorcycle	0.75	21	17	28	20	86	64.5	7.90
	Total MV						893	1498.5	82.08
NM V	Rickshaw/Van	2	18	49	57	38	162	324	14.89
	Bicycle	0.5		10	11	12	33	16.5	3.03
	Animal Cart/Push Cart	4					0	0	0.00
	Total NMV						195	340.5	17.92
	Grand Total						1088	1839	100

Table A-8: Hourly Traffic Volume according to the vehicles types for Itakhola – Narsingdi link on January 01, 2016 at 11:30 am

	Mode of Transport	PCU	Narsingdi -Sylhet	Sylhet- Narsingdi	Narsingdi -Shibpur	Shibpur- Narsingdi	Total Vehicle	Total PCU	Percentage
MV	Bus/Minibus	3	97	75	28	21	221	663	21.15
	Heavy Truck/Light Truck	3	33	42	16	19	110	330	10.53
	Pickup Van	1	29	20	13	11	73	73	6.99
	Car/ Micro Bus/Jeep	1	140	70	43	42	295	295	28.23
	Lorry/trolley	1	4	2	6		12	12	1.15
	Tempo	0.75	4	31	26	12	73	54.75	6.99
	Auto Rickshaw	0.75		3	1	3	7	5.25	0.67
	Motorcycle	0.75	19	21	31	22	93	69.75	8.90
	Total MV						884	1502.75	84.59
NM V	Rickshaw/Van	2	13	40	34	37	124	248	11.87
	Bicycle	0.5	4	10	17	6	37	18.5	3.54
	Animal Cart/Push Cart	4					0	0	0.00
	Total NMV						161	266.5	15.41
	Grand Total						1045	1769.25	100

Table A-9: Hourly Traffic Volume according to the vehicles types for Itakhola – Narsingdi link on January 01, 2016 at 3:00 pm

	Mode of Transport	PCU	Narsingdi-Sylhet	Narsingdi	Narsingdi-Shibpur	Narsingdi	Total Vehicle	Total PCU	Percentage
MV	Bus/Minibus	3	82	85	31	37	235	705	23.18
	Heavy Truck/Light Truck	3	31	47	23	17	118	354	11.64
	Pickup Van	1	37	26	14	11	88	88	8.68
	Car/ Micro Bus/Jeep	1	78	79	18	51	226	226	22.29
	Lorry/trolley	1		2			2	2	0.20
	Tempo	0.75	5	35	24	9	73	54.75	7.20
	Auto Rickshaw	0.75	8	5	5	7	25	18.75	2.47
	Motorcycle	0.75	22	2	23	26	73	54.75	7.20
	Total MV						840	1503.25	82.84
NMV	Rickshaw/Van	2	19	46	24	41	130	260	12.82
	Bicycle	0.5		19	11	14	44	22	4.34
	Animal Cart/Push Cart	4					0	0	0.00
	Total NMV						174	282	17.16
	Grand Total						1014	1785.25	100

B) Mannan Bhuiyan Chattar Intersection**Table B-1: Hourly Traffic Volume according to the vehicles types for Itakhola – Monohordi link on January 06, 2016 at 1:30 pm**

	Mode of Transport	PC U	Dakbunglow Road-Itakhola	Itakhola-Dakbunglow Road	Dakbunglow Road-Monohordi	Monohordi-Dakbunglow Road	Total Vehicle	Total PCU	Percentage
MV	Bus/Minibus	3	0	0	0	0	0	0	0.00
	Heavy Truck/Light Truck	3					0	0	0.00
	Pickup Van	1		3		1	4	4	1.18
	Car/ Micro Bus/Jeep	1		1	1	1	3	3	0.88
	Lorry/trolley	1					0	0	0.00
	Tempo	0.75	4	8	3	5	20	15	5.90
	Auto Rickshaw	0.75	12	10	3	6	31	23.25	9.14
	Motorcycle	0.75	23	30	12	15	80	60	23.60
	Total MV						424	499.5	57.07
NMV	Rickshaw/Van	2	29	44	13	15	101	202	29.79
	Bicycle	0.5	13	25	13	26	77	38.5	22.71
	Animal Cart/Push Cart	4			23		23	92	6.78
	Total NMV						319	365	42.93
	Grand Total						339	437.75	100.00

C) Chaittana Bus Stand Intersection

Table C-1: Hourly Traffic Volume according to the vehicles types for Chaittana Bus Stand– Jossor link on January 10, 2016 at 11:30 am

	Mode of Transport	PC U	Josor- Itakhola	Itakhola- Josor	Josor- Morjal	Morjal- Josor	Total Vehicl e	Total PCU	Percentag e
MV	Bus/Minibus	3	0	0	0	0	0	0	0.00
	Heavy Truck/Light Truck	3	2	2			4	12	2.52
	Pickup Van	1					0	0	0.00
	Car/ Micro Bus/Jeep	1	4	10		2	16	16	10.06
	Lorry/trolley	1					0	0	0.00
	Tempo	0.75	16	6		7	29	21.75	18.24
	Auto Rickshaw	0.75	4	6		2	12	9	7.55
	Motorcycle	0.75	3	22	9	7	41	30.75	25.79
	Total MV						102	89.5	64.15
NM V	Rickshaw/Van	2	20	10	3	8	41	82	25.79
	Bicycle	0.5	4	1	3	5	13	6.5	8.18
	Animal Cart/Push Cart	4	1			2	3	12	1.89
	Total NMV						57	100.5	35.85
	Grand Total						159	190	100

D) C & B Bazar Intersection**Table D-1: Hourly Traffic Volume according to the vehicles types for Itakhola - Monohordi link on January 07, 2016 at 9:40 am**

Mode of Transport		PC U	Itakhola- Monohordi	Monohordi- Itakhola	Itakhola- Puradia	Puradia- Itakhola	Total Vehicle	Total PCU	Percentage
MV	Bus/Minibus	3	13	21	0	0	34	102	7.30
	Heavy Truck/Light Truck	3	12	6	5	2	25	75	5.36
	Pickup Van	1	10	3			13	13	2.79
	Car/ Micro Bus/Jeep	1	4	6	2	1	13	13	2.79
	Lorry/trolley	1	1	2			3	3	0.64
	Tempo	0.75	63	65	16	14	158	118.5	33.91
	Auto Rickshaw	0.75	7	5	4	1	17	12.75	3.65
	Motorcycle	0.75	12	24	24	16	76	57	16.31
	Total MV						339	394.25	72.75
NMV	Rickshaw/Van	2	5	6	14	12	37	74	7.94
	Bicycle	0.5	20	15	28	21	84	42	18.03
	Animal Cart/Push Cart	4		6			6	24	1.29
	Total NMV						127	140	27.25
Grand Total							466	534.25	100.00

E) Lakpur Bazar Intersection**Table E-1: Hourly Traffic Volume according to the vehicles types for Lakpur Bazar- Shibpur link on January 09, 2016 at 10:00 am**

Mode of Transport		PC U	Shibpur-Chor sindur	Chor-sindur- Shibpur	Shibpur- Hatirdia	Hatirdia- Shibpur	Total Vehicle	Total PCU	Percentag e
MV	Bus/Minibus	3	0	0	0	0	0	0	0.00
	Heavy Truck/Light Truck	3					0	0	0.00
	Pickup Van	1	1				1	1	0.64
	Car/ Micro Bus/Jeep	1		1			1	1	0.64
	Lorry/trolley	1	6	6			12	12	7.69
	Tempo	0.75	16	2	14	22	54	40.5	34.62
	Auto Rickshaw	0.75		3			3	2.25	1.92
	Motorcycle	0.75	8	8	9	5	30	22.5	19.23
	Total MV						71	56.75	45.51
NMV	Rickshaw/Van	2			6	13	19	38	12.18
	Bicycle	0.5		13	10	13	36	18	23.08
	Animal Cart/Push Cart	4					0	0	0.00
	Total NMV						85	78.5	54.49
Grand Total							156	135.25	100

F) Kamrabo Bazar Intersection**Table F-1: Hourly Traffic Volume according to the vehicles types for Kamrabo- Hatirdia link on January 10, 2016 at 11:00 am**

	Mode of Transport	PCU	Hatirdia-Shibpur	Shibpur-Hatirdia	Hatirdia-Belabo Main Road	Belabo Main Road-Hatirdia	Total Vehicle	Total PCU	Percentage
MV	Bus/Minibus	3	0	0	0	0	0	0	0.00
	Heavy Truck/Light Truck	3	2	3	3	2	10	30	3.75
	Pickup Van	1	1	12	4	1	18	18	6.74
	Car/ Micro Bus/Jeep	1	2	3	2	3	10	10	3.75
	Lorry/trolley	1				2	2	2	0.75
	Tempo	0.75	11	18	17	16	62	46.5	23.22
	Auto Rickshaw	0.75	6	11	7	16	40	30	14.98
	Motorcycle	0.75	5	7	4	7	23	17.25	8.61
	Total MV						165	153.75	61.80
NMV	Rickshaw/Van	2	15	17	20	17	69	138	25.84
	Bicycle	0.5	5	4	7	8	24	12	8.99
	Animal Cart/Push Cart	4	3	3	1	2	9	36	3.37
	Total NMV						102	186	38.20
	Grand Total						267	339.75	100

ORIGIN AND DESTINATION SURVEY

Table B-1: Types of Mood

Types of Vehicle	Frequency	Percent
Auto Rickshaw/Tempo	3	9.4
Bus	18	56.3
Car/Pickup/Jeep/Motorbus	3	9.4
Motorcycle	1	3.1
Rickshaw/Van	2	6.3
Truck	5	15.6
Total	32	100

Table B-2: Trip Purpose

Trip Purpose	Frequency	Percent
Business related	5	15.6
Education	7	21.9
Recreation	2	6.3
Shopping	1	3.1
Social	3	9.4
Work/Commute	14	43.8
Total	32	100

Table B-3: Nature of Origin

Origin Type	Frequency	Percent
Residence	22	68.8
School/College/University	1	3.1
Social	1	3.1
Workplace	8	25
Total	32	100

Table B-4: Nature of Destination

Destination Type	Frequency	Percent
Recreational	2	6.3
Residence	6	18.8
School/College/University	6	18.8
Shopping	1	3.1
Social	3	9.4
Workplace	14	43.8
Total	32	100

Table B-5: Origin and Destination Pattern

Origin \ Destination			Type of Destination						Total
			Recreational	Residence	School/College/University	Shopping	Social	Workplace	
Type of Origin	Residence	Frequency	2	0	5	1	2	12	22
		Percentage	9.10 %	0.00 %	22.70 %	4.50 %	9.10 %	54.50 %	100.00 %
	School/College/University	Frequency	0	1	0	0	0	0	1
		Percentage	0.00 %	100.00 %	0.00 %	0.00 %	0.00 %	0.00 %	100.00 %
	Social	Frequency	0	1	0	0	0	0	1
		Percentage	0.00 %	100.00 %	0.00 %	0.00 %	0.00 %	0.00 %	100.00 %
	Workplace	Frequency	0	6	0	0	0	2	8
		Percentage	0.00 %	75.00 %	0.00 %	0.00 %	0.00 %	25.00 %	100.00 %
	Total	Frequency	2	8	5	1	2	14	32
		Percentage	6.30 %	25.00 %	15.60 %	3.10 %	6.30 %	43.80 %	100.00 %

Table B-6: Frequency of Passengers Occupancy

No. of people in vehicle	Frequency	Percent
Within 5 persons	2	6.3
6 to 10 persons	3	9.4
11 to 15 persons	2	6.3
16 to 20 persons	5	15.6
21 to 25 persons	5	15.6
26 to 30 persons	2	6.3
31 to 35 persons	3	9.4
36 to 40 persons	5	15.6
Above 40 persons	5	15.6
Total	32	100

Table B-7: Origin Destination Matrix within Unions of ShibpurUpazila

Destination Origin	Chakradha	Josor	Masimpur	Pourashava	Putia	Total
Chakradha	0	0	0	1	1	2
Josor	0	0	1	1	0	2
Masimpur	0	0	0	0	1	1
Pourashava	1	0	1	0	0	2
Putia	0	2	0	1	0	3
Total	1	2	2	3	2	10

Table B-8: Origin Destination Matrix surrounding Upazilas /Districts of ShibpurUpazila

Destination Origin	Bhairab	Dhaka	Habiganj	Hatirdia	Madhobdi	Monohordi	Narsingdi	Sylhet	Vela nagar	Total
Bhairab	0	2	0	0	0	0	0	0	0	2
Dhaka	1	0	0	0	0	0	0	0	0	1
Habiganj	0	1	0		0	0	0	0	2	3
Hatirdia	1	0		0	0	0	1	0	0	2
Madobdi	0	0	0	1	0	0	0	0	1	2
Monohordi	0	3	0	0	0	0	1	0	0	4
Narsingdi	0	0	0	0	0	0	0	0	0	0
Sylhet	0	2	0	0	0	0	1	0	0	3
Vela nagar	0	0	0	0	0	0	1	0	0	1
Total	2	8	0	1	0	0	4	0	3	18

PASSENGERS INTERVIEW SURVEY

Table B-9: Trip Purpose of Bus Passengers

Trip Purpose	Frequency	Percent
Business related	12	14.81
Education	11	13.58
Recreation	15	18.52
Shopping	5	6.17
Social	27	33.33
Work/Commute	11	13.58
Total	81	100.00

Table B-10: Modes used by Bus Passengers

Types of Mode	Frequency	Percent
CNG	14	18.18
Bus	14	18.18
Motor cycle	1	1.30
Boat/Launch	1	1.30
Bus/CNG	15	19.48
Bus/Rickshaw	10	12.99
Rickshaw/CNG	1	1.30
Boat/Launch/CNG	8	10.39
Bus/Boat/CNG	5	6.49
Bus/Rickshaw/CNG	8	10.39
Total	77	100.00

Table B-11: Travel Cost for Bus Passengers

Travel Cost	Frequency	Percent
Within 50 taka	61	74.40
51 to 100 taka	7	8.50
101 to 150 taka	7	8.50
151 to 200 taka	5	6.10
251 to 300 taka	1	1.20
More than 300 taka	1	1.20
Total	82	100.00

Table B-12: Travel Distance by Bus Passengers

Total Distance	Frequency	Percent
Within 5 km	4	4.9
6 to 10 km	12	14.8
11 to 15 km	6	7.4
16 to 20 km	16	19.8
21 to 30 km	7	8.6
31 to 40 km	11	13.6
41 to 50 km	5	6.2

More than 51 km	20	24.7
Total	81	100

Table B-13: Frequency of Travelling

Trip per week	Frequency	Percent
1 trip	13	20.97
2 trips	2	3.23
More than 3 times	8	12.90
Everyday	15	24.19
Randomly in Month	18	29.03
Randomly in year	6	9.68
Total	62	100.00

Table B-14: Age pattern of Respondents

Age	Frequency	Percent
Below 15	1	1.25
16-20	11	13.75
21-30	27	33.75
31-40	25	31.25
41-50	9	11.25
Above 51	7	8.75
Total	80	100.00

Table B-15: Age Sex Structure of the Respondents

Age \ Sex			Sex		Total
			Female	Male	
Age Group	Below 15	Frequency	0	1	1
		Percent	0.00%	100.00%	100.00%
	16-20	Frequency	2	9	11
		Percent	18.20%	81.80%	100.00%
	21-30	Frequency	6	22	28
		Percent	21.40%	78.60%	100.00%
	31-40	Frequency	10	16	26
		Percent	38.50%	61.50%	100.00%
	41-50	Frequency	3	6	9
		Percent	33.30%	66.70%	100.00%
	Above 51	Frequency	2	5	7
		Percent	28.60%	71.40%	100.00%
	Total	Frequency	23	59	82
		Percent	28.00%	72.00%	100.00%

Table B-16: Trip Production according to the Trip Purpose

Trip Frequency Trip Purpose		Trip per week						Total
		1 trip	2 trips	More than 3 trips	Everyday	Randomly in Month	Randomly in year	
Trip Purpose	Business related	3	1	1	7	0	0	12
	Education	0	0	6	2	1	0	11
	Recreation	2	0	0	1	1	0	15
	Shopping	2	1	0	0	0	0	5
	Social	4	0	0	1	12	5	27
	Work/Commute	2	0	1	4	3	1	11
	Total	13	2	8	15	18	6	81

Table B-17: Travel cost according to the Trip Purpose

Travel Cost Trip Purpose			Travel Cost						Total
			Within 50 taka	51 to 100 taka	101 to 150 taka	151 to 200 taka	251 to 300 taka	More than 300 taka	
Trip Purpose	Business related	Frequency	11	0	1	0	0	0	12
		Percent	91.70%	0.00%	8.30%	0.00%	0.00%	0.00%	100.00%
	Education	Frequency	10	0	1	0	0	0	11
		Percent	90.90%	0.00%	9.10%	0.00%	0.00%	0.00%	100.00%
	Recreation	Frequency	11	3	0	1	0	0	15
		Percent	73.30%	20.00%	0.00%	6.70%	0.00%	0.00%	100.00%
	Shopping	Frequency	4	0	0	1	0	0	5
		Percent	80.00%	0.00%	0.00%	20.00%	0.00%	0.00%	100.00%
	Social	Frequency	17	2	4	2	1	1	27
		Percent	63.00%	7.40%	14.80%	7.40%	3.70%	3.70%	100.00%
	Work/Commute	Frequency	7	2	1	1	0	0	11
		Percent	63.60%	18.20%	9.10%	9.10%	0.00%	0.00%	100.00%
	Total	Frequency	61	7	7	5	1	1	81
		Percent	74.40%	8.50%	8.50%	6.10%	1.20%	1.20%	100.00%

Table B-18: Travel cost according to the distance

Travel Cost Travel Distance			Travel Cost						Total
			Within 50 taka	51 to 100 taka	101 to 150 taka	151 to 200 taka	251 to 300 taka	More than 300 taka	
Total Distance	Within 5 km	Frequency	4	0	0	0	0	0	4
		Percent	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
	6 to 10 km	Frequency	12	0	0	0	0	0	12
		Percent	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
	11 to 15 km	Frequency	6	0	0	0	0	0	6
		Percent	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
	16 to 20 km	Frequency	13	3	0	0	0	0	16
		Percent	81.30%	18.80%	0.00%	0.00%	0.00%	0.00%	100.00%
	21 to 30 km	Frequency	6	1	0	0	0	0	7
		Percent	85.70%	14.30%	0.00%	0.00%	0.00%	0.00%	100.00%
	31 to 40 km	Frequency	8	1	2	0	0	0	11
		Percent	72.70%	9.10%	18.20%	0.00%	0.00%	0.00%	100.00%
	41 to 50 km	Frequency	3	1	1	0	0	0	5
		Percent	60.00%	20.00%	20.00%	0.00%	0.00%	0.00%	100.00%
	More than 51 km	Frequency	8	1	4	5	1	1	20
		Percent	40.00%	5.00%	20.00%	25.00%	5.00%	5.00%	100.00%
	Total	Frequency	60	7	7	5	1	1	81
		Percent	74.10%	8.60%	8.60%	6.20%	1.20%	1.20%	100.00%

REGIONAL TRANSPORT SURVEY

Table B-19: Regional Bus Survey

Survey location	Company/ Agency name	Type of Mode	Origin point	Destination point	No. of trips/Day	Average no. of passengers per trip	Major stoppage area inside the Upazila
Shibpur Bus Stand	Meghaloy	Bus	Monohordhi	Dhaka	12	45	Shibpur&Itakhola Bus Stand,
Shibpur Bus Stand	RTB	Bus	Shaheb protap Bazar	C&B Bazar	4	30	Shibpur&Itakhola Bus Stand,
Shibpur Bus Stand	MonohordiParibahan	Bus	Mothkhola	Dhaka	6	45	Shibpur&Itakhola Bus Stand,
Shibpur Bus Stand	BRTC	Bus	Katiadi, Kishoreganj	Dhaka	3	40	Shibpur&Itakhola Bus Stand,
Itakhola Bus Stand	Satata Transport Service	Bus	Dhaka`	Bhairab	12	35	Itakhola&Chaitannya
Itakhola Bus Stand	Tisha	Bus	KuliarChar	Dhaka	8	50	Itakhola&Chaitannya
Itakhola Bus Stand	BadshahParibahan	Bus	Dhaka	Bhairab	30	45	Itakhola&Chaitannya
Itakhola Bus Stand	N.P Paribahan	Bus	Itakhola, Shibpur	Chatak, Sunamganj	1	40	Itakhola
Itakhola Bus Stand	ENA Paribahan	Bus	Dhaka	Sylhet	30	40	Itakhola
Itakhola Bus Stand	DigantaParibahan	Bus	Itakhola	Moulizar, Sylhet	1	50	Itakhola
Itakhola Bus Stand	Uttara Paribahan	Bus	Dhaka	Brahmanbaria	1	45	Itakhola
Itakhola Bus Stand		Truck	Shibpur	Dhaka	1		Shibpur Bus Stand
Itakhola Bus Stand		Truck	Shibpur	Dhaka	1		Shibpur Bus Stand



Government of the People's Republic of Bangladesh
Ministry of Housing and Public Works
Urban Development Directorate (UDD)

Preparation of Development Plan for Fourteen Upazilas

Package-02

(Ishwarganj Upazila, Mymensingh; Raipura Upazila and Shibpur Upazila, Narsingdi)

DRAFT SURVEY REPORT

**Socio-economic Survey
of
Shibpur Upazila, Narsingdi**

August, 2016

Joint Venture
of



Sheltech Consultants Pvt. Ltd

and



ARC Bangladesh Ltd

JV of SCPL-ABL

Preparation of Development Plan for Fourteen Upazilas Project (Package-02)

Ref: SCPL-ABL/UDD/2016/ Socio-economic Survey Report/Shibpur Upazila Date:

To
The Project Director
“Preparation of Development Plan for fourteen Upazilas” Project
Urban Development Directorate
82, Segunbagicha, Dhaka, 1000.

Subject: Submission of the Final Socio-economic Survey Report of Shibpur Upazila, Narsingdi.

Dear Sir,

We are pleased to submit herewith the Final Socio-economic Draft Survey Report of Shibpur Upazila, Narsingdi for your kind information and further action.

Thanking you and assuring you of our best services.

Your Sincerely,

(Dr. Nurul Islam Nazem)
Team Leader, Package -2

(Md. Azibar Rahman)
Socio-economic Expert, Package -2

Encl: As stated.

Copy to:

1. Project Manager, Package-2, UDD
2. Director, Sheltech Consultants Pvt. Limited
3. Chairman, Arc-Bangladesh limited, Dhaka

1/E/2 Paribagh (Mazar Road), Shahbagh, Dhaka-1000, Bangladesh
Phone: +880-2-9611171 Fax: +880-2-9611172
Email: scpl.mail@gmail.com

Executive Summary

This report aims to explore the socioeconomic condition of Shibpur upazila, Narsingdi. Socio-economic survey tools provide a means of improving understanding of local resource management systems, resource use and the relative importance of resources for households and villages. Shibpur, Narsingdi is a densely industrial area having textile mills, gas field, famous for vegetables and fruits like Latkon and Jackfruits along with several tourist places including Sonay Muri Pahar, Three Domed Mosque (Ashrafpur, 1524) etc. The upazila also show high potentialities of entering in “Demographic Bonus” window soon. Like others area of Bangladesh, middle income people also lives in high percentage. These people are attracted to the urban facilities of urban portion of this upazila, which leads them to make new settlement here. Consequently, the land price is also rising in Shibpur Upazila. People of Both of rural and urban area are satisfied with the water quality, sanitation, retail market location, fire service station, and recreational facilities etc. which are some of the basic needs of living a healthy life. On the other hand, there are poor maintenance found in roads and recreational facilities. But the alarming is about this upazila’s education quality. It is deteriorating day by day because of lack enough qualified teacher and high student -teacher ratio. Moreover, there are not enough provision for maternal and child health. So necessary steps should be taken by concerned authorities regarding these problems.

Abbreviation/Acronyms

BDT	Bangladesh Taka
BBS	Bangladesh Bureau of Statistics
BREB	Bangladesh Rural Electrification Board
FPC	Finite Population Correction
GoB	Government of Bangladesh
HDI	Human Development Index
HBB	Herring Bone Bond
HH	House Hold
PDB	Power Development Board
NGO	Non-Government Organization
SDG	Sustainable Development Goal
SPSS	Statistical Packages for the Social Sciences
SCPL	Sheltech Consultants Pvt. Ltd.
SRS	Simple Random Sampling
ToR	Terms of Reference
TL	Team Leader
UDD	Urban Development Directorate

Table of Contents

Letter of Transmittal	i
Executive Summary	ii
Abbreviation/Acronyms	iii
Table of Contents	iv
List of Figures	v
List of Tables	vi
Chapter 1: Introduction	
1.1 Background	1
1.2 Location and Background of the Project Area	1
1.3 Importance in the Regional Context	1
1.4 Social Information	2
Chapter 2: Approach and Methodology	
2.1 Study Objective (s) and Specific Objectives	3
2.2 Scope of Work	3
2.3 Sampling	3
2.4 Tools Development	6
2.4.1 Preparation of Questionnaire	6
2.4.2 Pre-testing	6
2.4.3 Training of Enumerators and Survey Supervisors	6
2.5 Survey Team Mobilization	7
2.6 Quality Control Measures	7
2.7 Database Preparation and Processing	7
2.8 Limitation of the Study	7
Chapter 3: Study Findings	
3.1 Introduction	9
3.2 Age Sex Structure of Household Members	9
3.3 Marital Status	11
3.4 Religious Status	11
3.5 Level of Education	13
3.6 Types of Occupation	13
3.7 Monthly Income and Expenditure of Households	16
3.7.1 Income Status	16
3.7.2 Monthly Expenditure	18
3.8 Migration	19
3.9 Housing Status	20
3.9.1 Pattern of Household Land Ownership	20
3.9.2 Types of House Structure	21
3.9.3 Source of Land Ownership and Duration of Living	21
3.10 Land Value	22
3.11 Transport	23
3.11.1 Mode of Communication	23

3.11.2	Types of Road	23
3.11.3	Mode of Access to Main Road	24
3.11.4	Condition of Road	25
3.11.5	Maintenance of Road	25
3.12	Utility Service	26
3.12.1	Energy	26
a.	Source of Energy for Cooking Purpose	26
b.	Source of Lighting	27
c.	Electricity Supply Status	28
3.12.2	Drinking Water	28
a.	Source of Drinking Water	28
b.	Drinking Water Quality	29
c.	Distance of Water Source	29
3.12.3	Sanitation	30
3.12.4	Waste Management	31
a.	Waste Management System	31
b.	Distance to Waste Disposal Place	32
3.13	Medical Facility	32
3.14	Educational Facility	35
3.15	Recreational Facility	36
3.16	Law and Order Situation	38
3.17	Available Services in Shibpur Upazila	38
3.17.1	Distance and Service Quality of Retail Market	38
3.17.2	Distance and Service Quality of Post Office	39
3.17.3	Distance and Service Quality of Fire Service Station	40
3.17.4	Distance and Service Quality of Playground	42
3.18	Problems of the Area	42
3.19	Traditional cultural festival of the area	43
3.20	People's Aspiration about the Development of the Upazila	44
Chapter 4: Conclusion and Policy Framework		45
Reference/Bibliography		46
Annexures		
Annexure-I:	Sample Socio-economic Questionnaire	47
Annexure-II:	List of Socioeconomic Survey Team Members	63
Annexure-III:	Plate: Socio-economic survey at Shibpur	64

List of Figure

Figure 1.1:	Upazila Map, Shibpur, Narsingdi	2
Figure 3.1:	Age and Sex Structure of Households at Shibpur	9
Figure 3.2:	Age-sex Pyramid of Urban Population	10
Figure 3.3:	Age-sex Pyramid of Rural Population	10
Figure 3.4:	Sex of Household Members	11
Figure 3.5:	Marital Status	12
Figure 3.6:	Religious Status	12
Figure 3.7:	Level of Education	13
Figure 3.8:	Occupation in Urban and Rural Area	14
Figure 3.9:	Income Source	17
Figure 3.10:	Monthly Income	18
Figure 3.11:	Monthly Expenditure	18
Figure 3.12:	Causes of Migration (in percentage)	20
Figure 3.13:	Pattern of Household Land Ownership	20
Figure 3.14:	Type of Household Structure	21
Figure 3.15:	Source of Household Land Ownership	22
Figure 3.16:	Duration of Living	22
Figure 3.17:	Price of Present Household Land in 2015	23
Figure 3.18:	Mode of Communication	23
Figure 3.19:	Types of Road	24
Figure 3.20:	Mode of Access to Main Road	24
Figure 3.21:	Condition of Road	25
Figure 3.22:	Maintenance of Road	26
Figure 3.23:	Source of Energy for Cooking Purpose	27
Figure 3.24:	Source of Lighting	27
Figure 3.25:	Electricity Supply Status	28
Figure 3.26:	Source of Drinking Water	29
Figure 3.27:	Drinking Water Quality	29
Figure 3.28:	Distance of Water Source	30
Figure 3.29:	Sanitation System	31
Figure 3.30:	Type of Sanitation Management System	31
Figure 3.31:	Distance to Waste Disposal Place	32
Figure 3.32:	Type of Treatment Facility	34
Figure 3.33:	Quality of Treatment Facility	34
Figure 3.34:	Drawbacks of Treatment Facility	35
Figure 3.35:	Problems of Educational Service	36
Figure 3.36:	Out-Door Recreation	37
Figure 3.37:	Drawbacks of Recreation Facilities	37
Figure 3.38:	Types of Crimes	38
Figure 3.39:	Location and Distance of Retail Market from Household	39
Figure 3.40:	Service Quality of Retail Market	39
Figure 3.41:	Location and Distance of Post Office from Household	40
Figure 3.42:	Service Quality of Post Office	40

Figure 3.43:	Location and Distance of Fire Service from Household	41
Figure 3.44:	Service Quality of Fire Service	41
Figure 3.45:	Service Quality of Play Ground	42
Figure 3.46:	Problems of the Area	43
Figure 3.47:	Traditional Cultural Festival of the Area	43
Figure 3.48:	Prioritization of Development Works	44

List of Table

Table 2.1:	Selected Samples for Socio-economic Survey	5
Table 2.2:	Socio-economic Survey Format as per TOR	6
Table 3.1:	Education and Occupation Pattern in Urban Area (In Percentage)	15
Table 3.2:	Education and Occupation Pattern in Rural Area	16
Table 3.3:	Distribution of Waste Management System	32
Table 3.4:	Type of Sickness	33
Table 3.5:	Distance from Household	42

Chapter 1: Introduction

1.1 Background

This report aims to explore the socioeconomic condition of Shibpur upazila, Narsingdi. Socio-economic survey tools provide a means of improving understanding of local resource management systems, resource use and the relative importance of resources for households and villages. Here the phenomena that lie at the intersection of the social and economic spheres of society are being studied. Moreover, while planning an area, there is a need for information about the level of socio-economic development, the population's quality of life (urban, rural, etc.), local problems, and the peculiarities of people's economic behavior. The main source of such information is intricate and comprehensive social research. Studies are directed towards the analysis of complicated social processes in an area and examine the spectrum of problems concerning changes in social structure and the configuration of social consciousness. It includes family structure, satisfaction with living conditions, housing and communal services, assessment of educational service quality (public schools, vocational training, higher education), quality of medical services etc.

1.2 Location and Background of the Project Area

The Shibpur, the second biggest upazila of Narsingdi zila in respect of area, came into existence in 1918 and was upgraded to upazila in 1984. It is generally believed that in long past it was a centre of worship of God Shib. The upazila might have derived its name as Shibpur from the name of Shib a hero of mythology. Shibpur Upazila (Narsingdi district) is located in between 23°56' and 24°07' North Latitudes and in between 90°38' and 90°50' East Longitudes. It has an area of 206.89 sq. km. It has 9 Wards, 9 Unions, 132 Mouzas and Mahallas, and 194 villages (BBS, 2011). It is bounded by Monohardi Upazila on the North, Raipura, Narsingdi Sadar and Palash Upazilas on the South, Belabo and Raipura Upazilas on the East, Palash and Kapasia Upazilas on the West (please see Figure 1.1). It is formed as Thana on 12 January 1918.

1.3 Importance in the Regional Context

It is a densely industrial area and is home to many textile mills. Narsingdi gas field is located in the Shibpur Upazila under Narsingdi district adjacent to the Dhaka-Sylhet Highway about 45 km away of Northern most East direction from Capital City of Bangladesh, Dhaka. This field is discovered by Petrobangla in 1990. Total recoverable gas reserves of this field re-estimated by Hydrocarbon Unit is 215 billion cubic feet (6.1×10^9 m³). Commercial gas production is started in 1996 and till 31 August 2006 total 66.304 billion cubic feet (1.8775×10^9 m³) or 30.84 percent of gas reserves has been recovered. Apart from these there are some historical tourist places like Sona Muri Pahari, Archaeological heritage and relics like Three Domed Mosque (Ashrafpur, 1524), Single Domed Mosque (Kumardi), tomb of Shah Mansur, two copperplate inscriptions (seventeenth century) discovered at village Ashrafpur, a gold coin (Gupta period) discovered at village Baghaba. There are also the graveyard of Shaheed Asad, (the Hero of 1969) at Dhanua (Banglapedia, 2016).

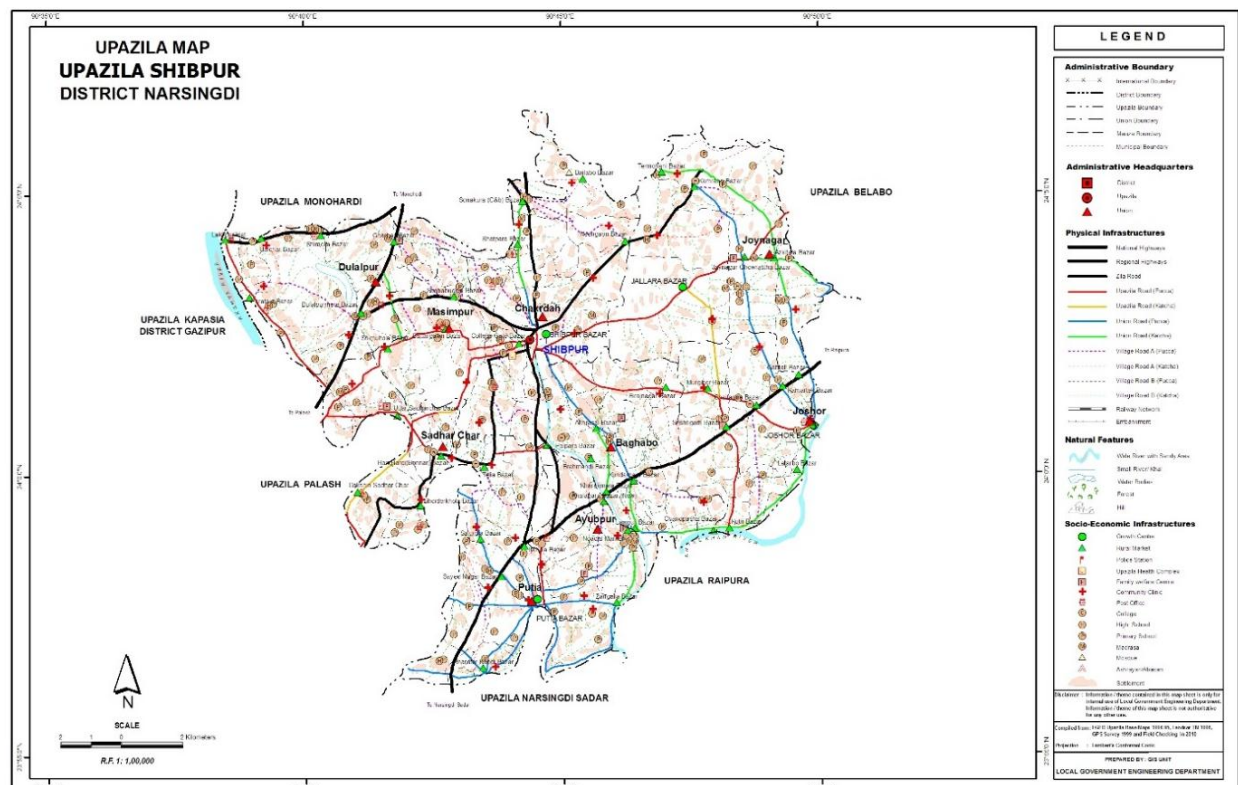


Figure 1.1 Upazila Map, Shibpur, Narsingdi (Source: LGED, 2016)

1.4 Social Information

According to BBS (2011), there are total 65,094 households at Shibpur Upazila and average size of households is 4.64. Total number of population is 3,03,813 where the number of male is about 1,48,419 and number of female is 1,55,384. Density of this area is about 1395 per sq. km. More than half of the population is literate and the percentage has increased than 2001. It has 113 Government primary school, 31 Non-government secondary school, 5 government and non-government college, 11 Madrasa, and 1 technical and vocational institution. Among them Noted educational institutions are Lakhpur Simulia High School (1917), Shibpur Pilot High School (1918), Moharpara High School (1919), Afsar Uddin High School (1968), Kumardi Senior Madrasa (1927). There are 7 filing station, 1 fire brigade station, 3 police station etc. It also has 1554 ponds and a river flow named Arial Kha.

Chapter 2: Approach and Methodology

2.1 Study Objective (s) and Specific Objectives

The broad objective of this report was to map the socio economic condition of Shibpur Upazila, Narsingdi.

Specific objectives

The specific objectives of this report were:

- To assess the social services and infrastructures situation of Shibpur Upazila.
- To seek information about the livelihood sources, income ratio, expenditure, investments and savings of the inhabitants of Shibpur.
- To identify the basic needs of the area with intensive participatory practices and to suggest some concrete recommendations for development of Shibpur Upazila.

2.2 Scope of Work

1. Preparation of five tiers Development Plan such as Sub Regional Plan, Structure Plan, Urban Area Plan, Rural Area Plan and Action Area Plan.
2. Preparation of Land Use Plan, Traffic and Transportation Management Plan, Drainage and Environmental Plan, Disaster Management Plan, Urban and Rural Area Plan and Action Plans for the project area.

2.3 Sampling

Three criteria usually will need to be specified to determine the appropriate sample size: the level of precision, the level of confidence or risk, and the degree of variability. The determination of sample size for this project is concerned with the following issues under the assumption that the characteristic of the population for Urban and Rural belongs to different homogenous group.

- The definition of the population;
- The creation of sampling frame;
- The choice of Probability versus Non-probability sampling;
- The calculation of sample size.

The definition of the population: Households of the project area are considered as the statistical population. The rural populations are more homogeneous. For Shibpur Upazila total household number is 65094. Whereas 60816 are rural and 4278 are Urban. (BBS, 2011)

The creation of sampling frame: The standard rule for sampling frame has been followed based on SRS (Simple Random Sampling).

The choice of Probability versus Non-probability sampling: Probability sampling has been followed.

The calculation of sample size: To determine the minimum sample size the following formula has been followed: $n = \frac{z^2}{d^2} pq$ (Cochran, 1963)

Where,

$n = \text{Sample size ,}$

$z = \text{Statistical certainty chosen ,}$

$p = \text{Coverage rate/estimated prevalence ,}$

$q = 1 - p \text{ and}$

$d = \text{precision desired : 0.05}$

Considering 97% Confidence Interval

Let, $p = .5 \text{ and } z = 1.96$

$$\Rightarrow n = \frac{1.96^2}{0.03^2} \times .5 \times (1 - .5)$$

Or, $n = 1067$

Considering Finite Population Correction (FPC), the adjusted the sample size for the field level administration is as follows.

For Urban area of Shibpur Upazila

$$n^1 = \frac{n}{1 + (\frac{n}{N})}$$

$$\Rightarrow n^1 = \frac{384}{1 + (\frac{384}{4278})}$$

$$\Rightarrow n^1 \cong 352$$

For Rural area of Shibpur Upazila

$$n^1 = \frac{n}{1 + (\frac{n}{N})} \Rightarrow n^1 = \frac{384}{1 + (\frac{384}{60816})}$$

$$\Rightarrow n^1 \cong 381$$

So, using 95% confidence interval and $\pm 3\%$ precision level total no of surveys are calculated .Distribution of sample for Shibpur Upaliza is given below:

Sl. No	Urban	Rural	Total Sample
1	352	381	733

Then, they used stratified sampling technique under probability sampling technique to collect questionnaire based primary data for socioeconomic analysis. The stratified sampling technique is further used for collecting samples from all the sub zones such as wards and unions of Shibpur Upazila. For each unions then random sampling technique is used to select the households for survey using Microsoft excel. The selected samples from total sample of households of Shibpur is illustrating by a table 2.1 below:

Table 2.1: Selected Samples for Socio-economic Survey

District	Upazila Name	Paurashava/ Union Name	Household	Population			Sampling HH
				Male	Female	Total	
Narsingdi	Shibpur	Ward-01	540	1182	1240	2422	44
		Ward-02	547	1267	1288	2555	45
		Ward-03	338	996	962	1958	28
		Ward-04	829	1886	1880	3766	68
		Ward-05	512	1311	1190	2501	42
		Ward-06	454	1000	1099	2099	37
		Ward-07	298	688	753	1441	25
		Ward-08	376	854	872	1726	31
		Ward-09	384	896	908	1804	32
		Ayubpur Union	6353	14726	15517	30243	40
		Baghaba Union	6054	14157	14866	29023	38
		Chak Radha	5281	11825	12838	24663	33
		Dulalpur Union	7278	15950	17270	33220	46
		Josar Union	6494	15038	15389	30427	41
		Joynagar Union	6890	14983	15557	30540	43
		Masimpur Union	5993	13517	14626	28143	38
		Putia Union	12024	27007	27496	54503	75
		Sadhar Char Union	4449	11146	116333	127479	28
		Total	65094	148429	155384	303813	733

2.4 Tools Development

The Survey tool was developed following the below steps. (1) Literature Review (2) Collection of Upazila Map (3) Find out sectors, indicators and variables (4) Preliminary questionnaire develop and share with Team leader as well as Project Management Office (5) Pretesting at field level (6) Questionnaire Finalization

2.4.1 Preparation of Questionnaire

In order to conduct the survey, a compact and extensive pre-coded structured questionnaire (please see Annexure-I) has been prepared for all the packages and it has been approved by the authority of Urban Development Directorate (UDD). The questionnaire has intended to capture information (see Table 2.2) according to the provided format in the TOR. Socioeconomic survey outputs represent the overall social, religious and economic condition of Shibpur Upazila.

Table 2.2: Socioeconomic Survey Format as per TOR

Item	Illustrated
Demographic Information	Age, sex, growth rate, household size, migration etc.
Family Size	Number of households, number of family members
Age, Religious Group	Age specific group, religious status
Economic Status	Primary, secondary, higher and others
Occupational Pattern	Government, private, formal, informal and others
Income Level	Lower, medium and higher (Income Range)
Ownership Pattern	Land ownership information, transfer procedures etc.
Land Value	Low land, ditch land, built-up land, buildable land etc.
Health Facilities	Type of facilities in hospital, private clinic and dispensary etc.
Recreation Facilities	Active and passive, type of facilities (Active, Passive)

2.4.2 Pre-testing

The questionnaires were pretested in urban and rural areas with participation of survey team (Survey supervisors, Enumerators) and members of Project management team. Then the survey team discussed about the field level problem with the socio-economic expert, Team leader and Project Management team for finalization of Questionnaire format.

2.4.3 Training of Enumerators and Survey Supervisors

JV of SCPL-ABL considered the experience of working in similar types of survey functions and educational qualifications for selection in the socioeconomic survey team. Considering these issues, a survey team of 28 members were selected for carrying out socioeconomic survey work at Shibpur Upazila (see Annexure-II). An arrangement has also been made to provide orientation and training to the survey team by the Team Leader (TL). After

orientation and training at the headquarters of JV of SCPL-ABL, the survey team has been sent to the field.

2.5 Survey Team Mobilization

The survey started in 12.08.2015 and the total survey is taken about 30 days from that date.

2.6 Quality Control Measures

To ensure quality of data, a number of validation checks were conducted during data collection period:

- (a) The survey supervisor went back to the respondent as well as talked over mobile phone number for validate or accurate the collected data by enumerator.
- (b) After data collection had been completed, 5% household was randomly chosen, and then the supervisors went to the field for further investigation. If any inconsistencies were found, then the supervisors discussed the issue with the enumerators.
- (c) Project Manager from Project Management Office as well as Socio-economic expert had been checked randomly for quality of collected data.

2.7 Database Preparation and Processing

After completing the survey works in the field, a detail database has been prepared to follow the survey questionnaire. The database has prepared by using SPSS 20 software. To make the data input process easier, coding system has been used in the necessary field. Few data have been stored in MS Excel software. 3 micro computers are exclusively used for data entry. SPSS 20 software is used for all data management that has been collected from the field. In this chapter socioeconomic survey data have been presented into three forms/styles viz. tabular form, geographical and textual/report form.

2.8 Limitation of the Study

Socio-economic Questionnaire Survey is comparatively costly and time consuming. Ideally, to conduct face to face questionnaire survey, enumerators and supervisors are required. Training of enumerators and supervisors is essential. Questionnaire surveys generally cannot provide strong evidence of cause and effect. Because collected data of surveys on status and perceptions of community people of various socio economic features at the same time. It is very difficult to prove that the reputed risk factor actually causes the problem.

Other constraints to using surveys to gather data:

- The lack of time to carry out the survey format.
- While a survey provides us with quantitative and qualitative data offering insight to various socio economic features; it will not produce the kind of data needed to create a full picture of the state of socio economic profile of a certain area.
- Respondents may not feel encouraged to provide accurate, honest answers
- Respondents may not feel comfortable providing answers that present themselves in an unfavorable manner.
- Respondents may not be fully aware of their reasons for any given answer because of lack of memory on the subject.

- Surveys with closed-ended questions may have a lower validity rate than other question types.
- Data errors due to question non-responses may exist. The number of respondents who choose to respond to a survey question may be different from those who chose not to respond, thus creating bias.
- Survey question answer options could lead to unclear data because certain answer options may be interpreted differently by respondents. For example, the answer option “somewhat agree” may represent different things to different subjects, and have its own meaning to each individual respondent. ‘Yes’ or ‘no’ answer options can also be problematic. Respondents may answer “no” if the option “only once” is not available.
- Customized surveys can run the risk of containing certain types of errors

Chapter 3: Study Findings

3.1 Introduction

This chapter describes the survey findings of different socio-economic factors in both urban and rural areas of Shibpur. Here, urban areas means data gathered in 9 Wards of Shibpur Municipality/Pourashava and rural areas means data gathered from 9 Unions of Shibpur Upazila. The socio-economic factors are: age, sex, marital status, religious status, level of education, types of occupation, monthly income and expenditure of households, migration, housing status, land value, transport, utility services, medical facility, recreation facility, education facility, law and order situation, available services in Shibpur Upazila, problems of the area, traditional cultural festival of the area, people's aspiration about the development of the Upazila. The following factors are described below.

3.2 Age Sex Structure of Household Members

In the surveys, about half of the total respondents are found as male and the rest are female. When the respondents are categorized into different ages, it has been seen that, about two third of total respondents are between 18-59 age group irrespective of their sex which indicates that the Upazila might have been entered into the window of 'Demographic Bonus' in the coming years (please see Figure 3.1).

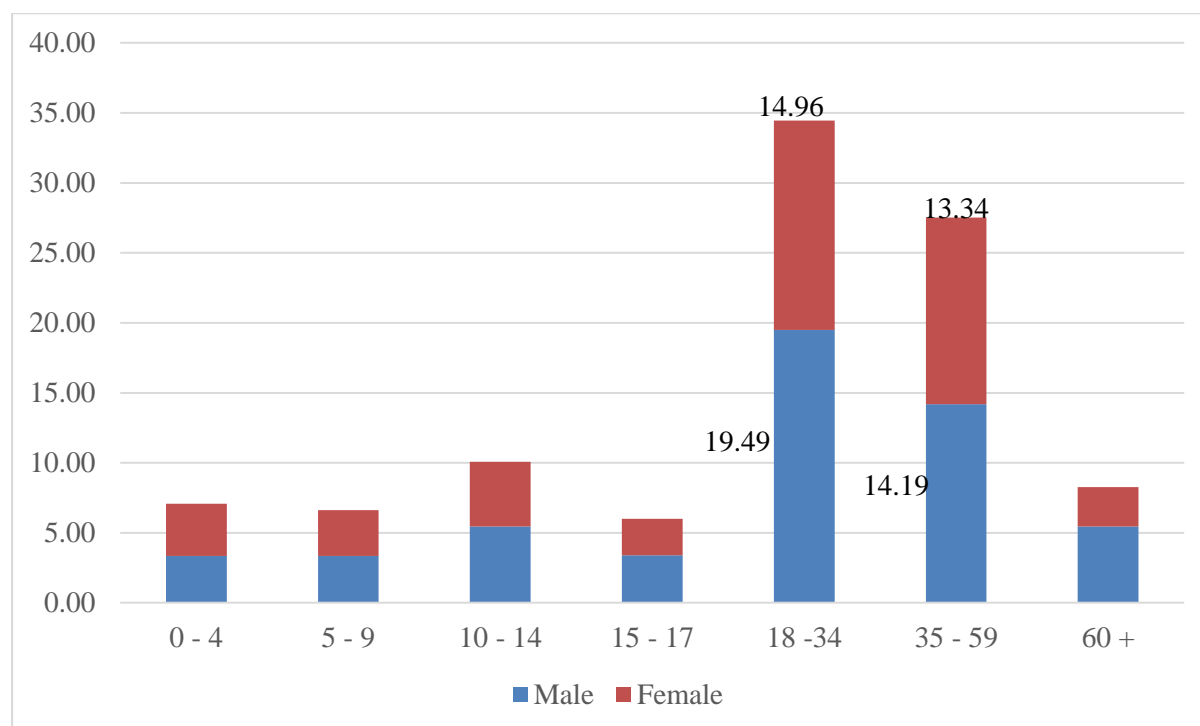


Figure 3.1: Age and Sex Structure of Households at Shibpur (Source: Field Survey, 2015)

The pyramid shows dependent and working age population by urban and rural area in Shibpur Upazila. In urban area, 29 percent population were below 18 years of age and they are depended group of people. At the working age level, age between 18 and 59 about 64 percent people are found. While in rural areas of Shibpur, the corresponding figures were almost the similar (29 % and 65 % respectively). Please see Figure 3.2 and 3.3 below:

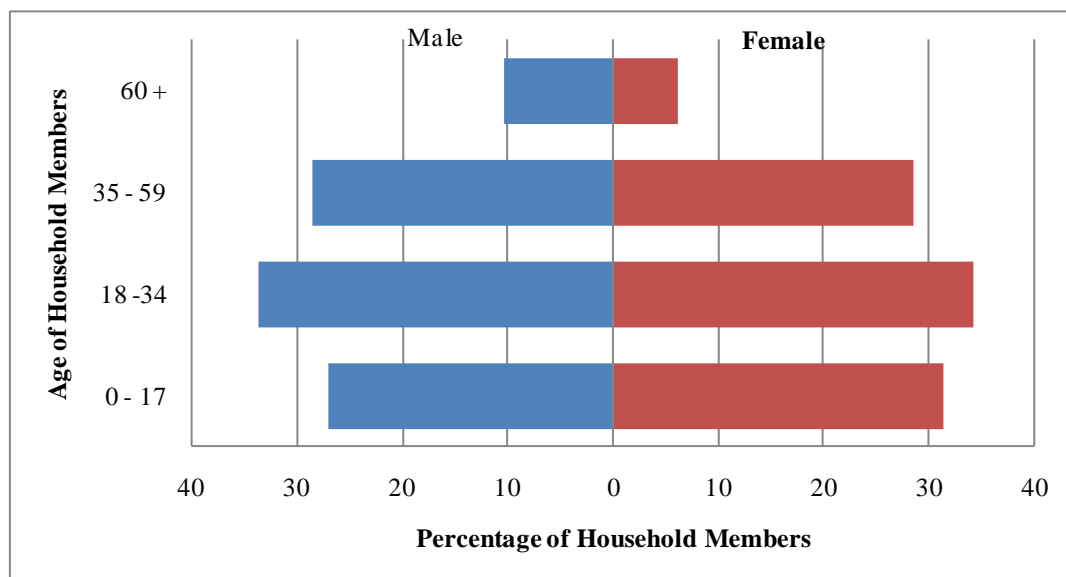


Figure 3.2: Age and Sex Pyramid of Urban Population (Source: Field Survey, 2015)

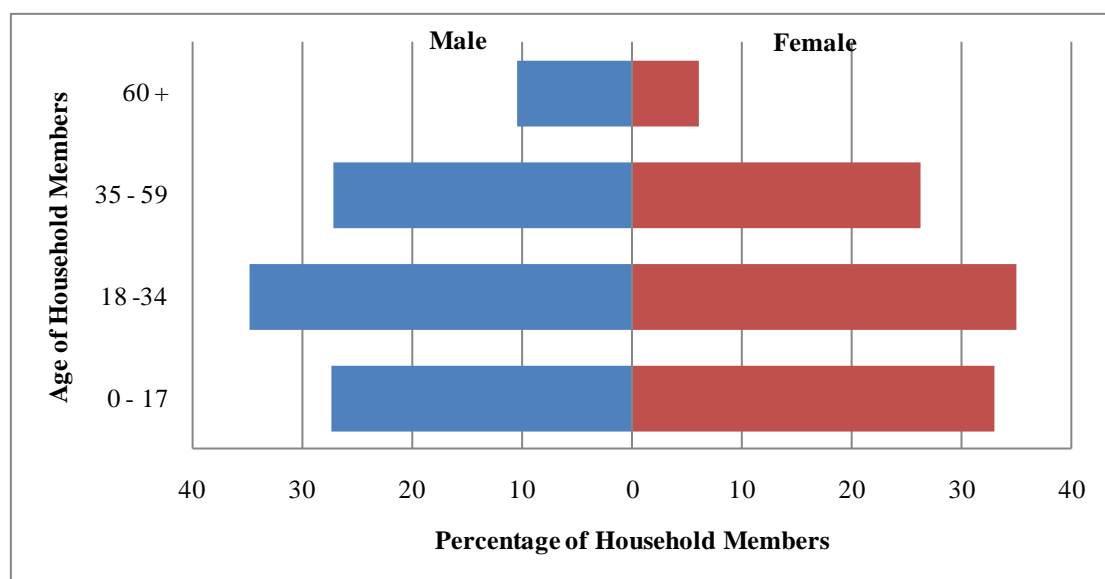


Figure 3.3: Age-sex Pyramid of Rural Population (Source: Field Survey, 2015)

Moreover, among senior citizen group male percentage is found higher than female. Again the age sex pyramid of Shibpur urban and rural area also represents almost the same condition (please see Figure 3.2& 3.3). From the above figures it could be easily anticipated that in the coming years people from age group 0-13 of both rural and urban area would be shifted into age group 14+ which would be resulted into to bring about opportunities for Shibpur upazila to enter into the window of ‘Demographic Bonus’.

3.3 Sex

From Figure 3.4, it has been seen that both in urban and rural area the male percentage is slightly higher than female percentage. And the male and female ratio is about the same for both in urban and rural area.

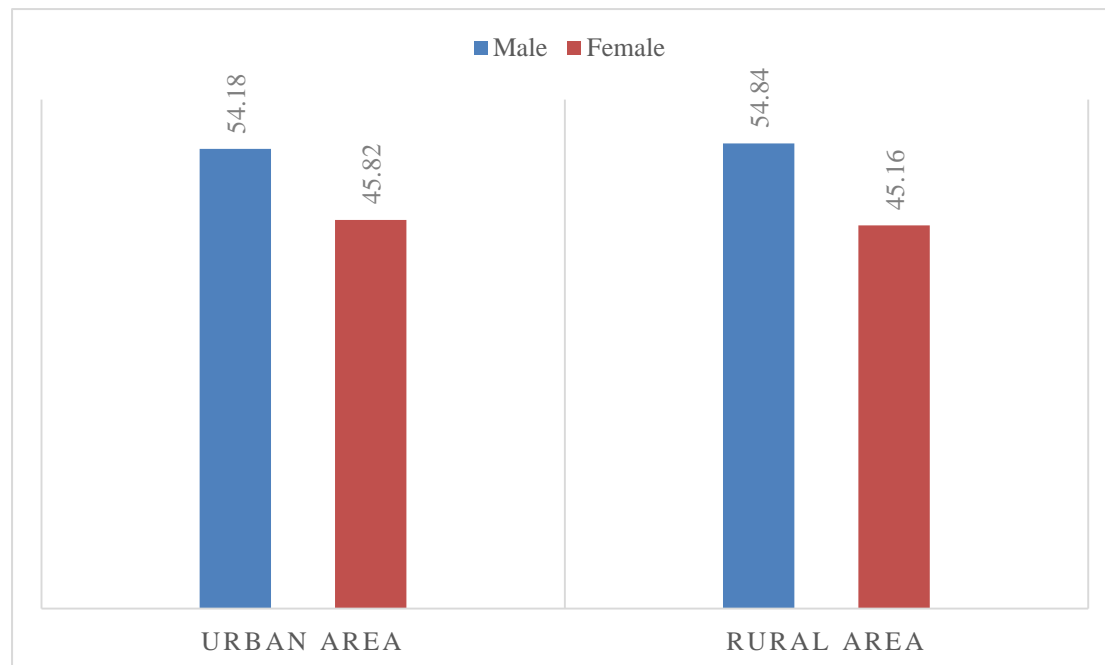


Figure 3.4: Sex of Household Members (Source: Field Survey, 2015)

3.4 Marital Status

It has been found in Shibpur Upazila most of the respondents are either single or married irrespective of rural or urban area. Among them the percentage of marital status “single” is slightly higher in rural area than urban area. Apart from these some of them also found as widow (about 2%), and the percentage remains same in both of rural and urban area (see Figure: 3.5)

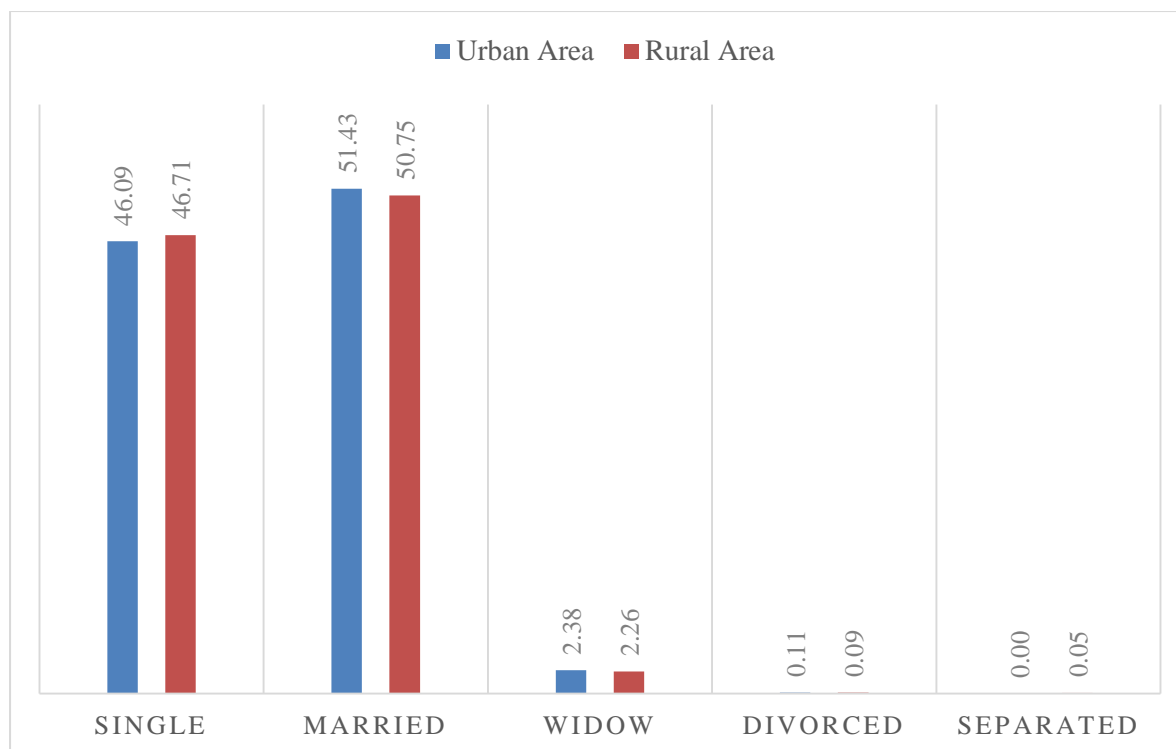


Figure 3.5: Marital Status(Source: Field Survey, 2015)

3.5 Religious Status

In Shibpur Upazila there are no Christian, Buddhist or other tribal religious people. More than 90% people of urban and rural area is found Muslim, and rest of them are Hindu. In rural area the percentage of Muslim people are found higher than the urban area (see Figure: 3.6).

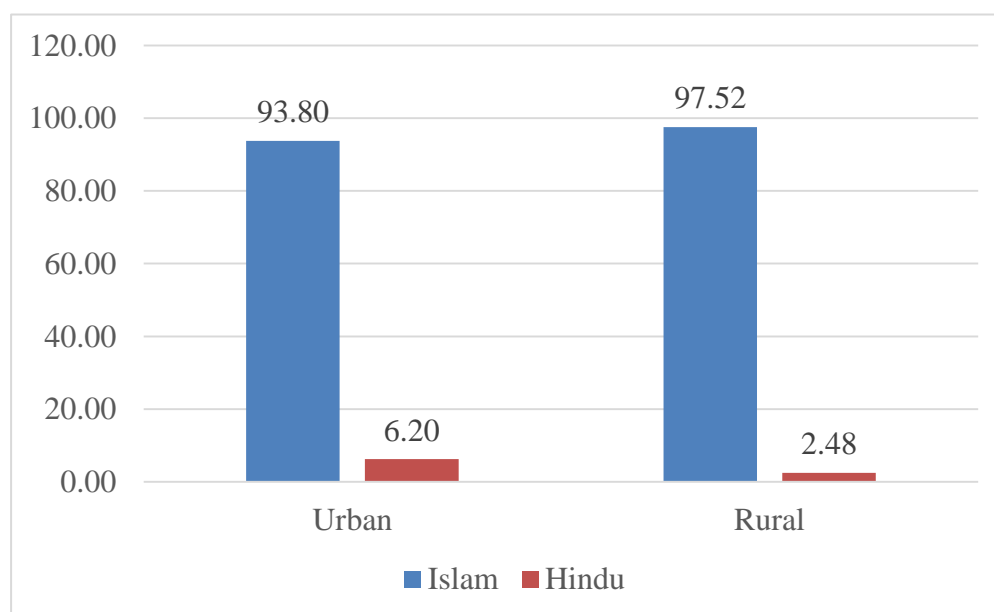


Figure 3.6: Religious Status (Source: Field Survey, 2015)

3.5 Level of Education

In Shibpur upazila, it has been found that irrespective of rural or urban area about half of the respondents are below the primary level of education. About more than one third of total respondents are found who completed their Secondary School level of education both in urban and rural area. The percentage that completed their SSC/HSC/Degree level of education is higher in urban area than rural area (please see Figure: 3.7). So it can be anticipated that people from urban area is more attached with higher education than in rural area. As about half of the total population is from below primary school level, some initiatives should be taken to increase the percentages.

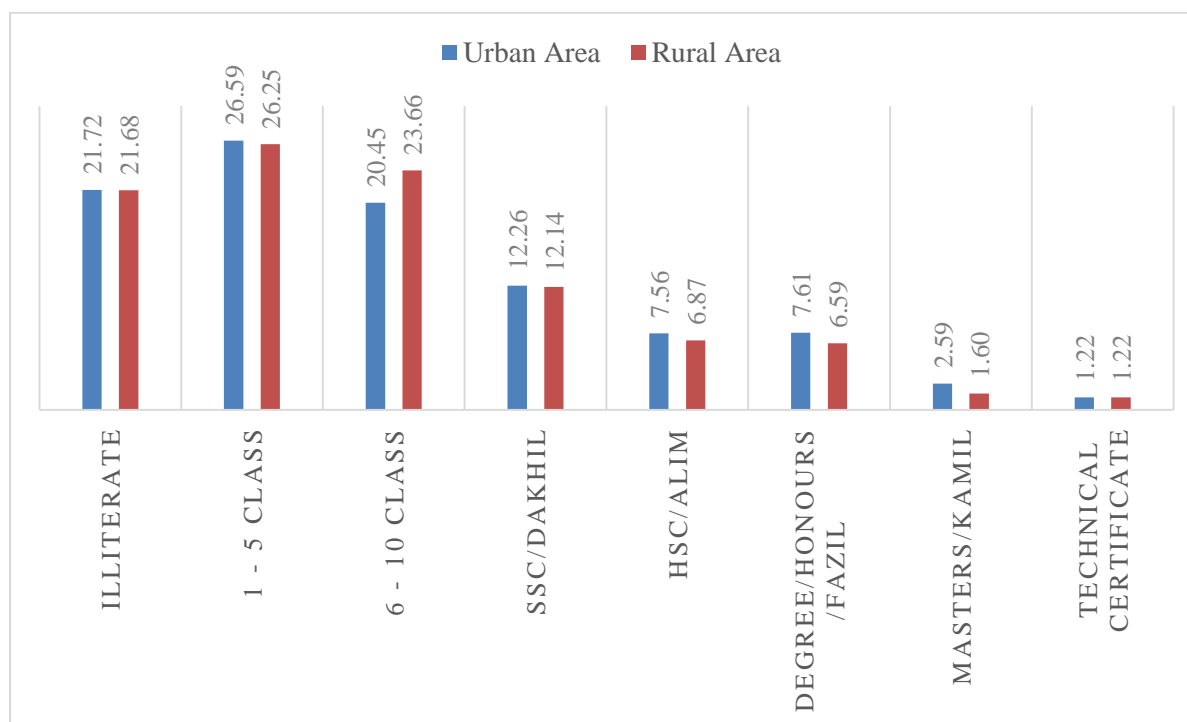


Figure 3.7: Level of Education (Source: Field Survey, 2015)

3.6 Types of Occupation

In Shibpur upazila, it has been found that in urban area most of the respondents (about 90%) are engaged in Job, Business and Labour types of occupation, the rest of them are engaged in vocational and traditional occupation. And the maximum percentage (about 40%) of respondents are from business category in urban area whereas about the same maximum percent respondents are from labor category in rural area. Further, in rural area about one third of the total respondents are engaged in Business types of occupation. Moreover, respondents involved in vocational occupation are found about the double in rural area than urban area (please see Figure 3.8).

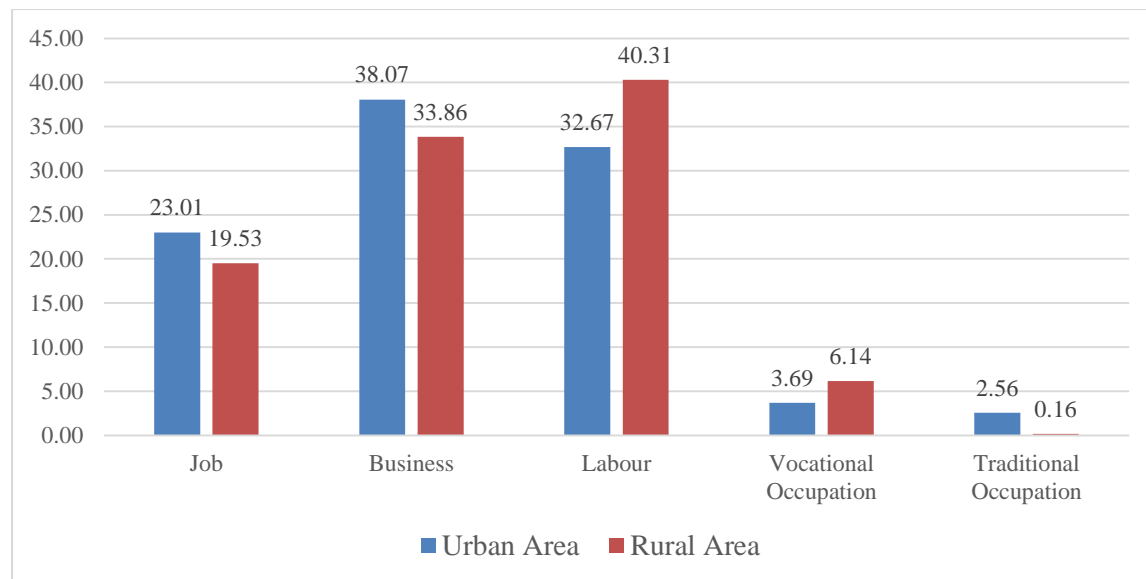


Figure 3.8: Occupation in Urban and Rural Area (Source: Field Survey, 2015)

The relations also have been studied between education level and occupation pattern in urban area. **In urban areas**, it has been found that people who are below the primary level of education mostly (about half) engaged in labor types of jobs. Some of them (about 10%) also tried to earn their living as small entrepreneurs and into Non-government jobs. Respondents who started their higher school but did not complete SSC has been found as remaining in the about same types of occupations. A significant amount of them (about one fourth) engaged in Hawker and small entrepreneurship. On the other hand, respondents who completed SSC, about half of them are Shop keeper, Small entrepreneur and Hawker. Respondents from above SSC level started to engage in Government and Non-government jobs. Respondents with technical certificate mostly got engaged in non-government jobs (please see Table 3.1).

Table 3.1: Education and Occupation Pattern in Urban Area (In Percentage)

	Level of Education								Total
	Illiterate	1 - 5 Class	6 - 10 Class	SSC/ Dakhil	HSC / Alim	Degree/Honours/Fazil	Masters /Kamil	Technical Certificate	
Government Job Holder	0	1.5	1.9	2.8	13.6	0	5.6	12.5	2.8
Non-Government Job Holder	9.2	10	9.3	5.6	18.2	20	25	37.5	12.1
Family Worker	0	1.5	2.8	2.8	4.5	10	22.2	0	4
NGO Worker	5.1	3.8	3.7	6.9	4.5	10	8.3	0	5.3
Hawker	5.1	9.2	18.7	15.3	6.8	8	5.6	12.5	10.6
Small Entrepreneur	11.2	13.8	9.3	12.5	11.4	8	13.9	12.5	11.6
Shopkeeper	4.1	6.9	6.5	16.7	6.8	14	8.3	0	8.3
Medium Entrepreneur	3.1	5.4	2.8	6.9	18.2	8	5.6	0	5.9
Large Entrepreneur	1	0	0.9	1.4	2.3	0	0	0	0.7
Agricultural Labour	2	0.8	2.8	0	0	2	0	0	1.3
Industrial Labour	4.1	0.8	0.9	2.8	2.3	6	0	0	2.2
Construction Labour	10.2	9.2	11.2	0	0	0	0	0	6.2
Transport Labour	2	2.3	0	1.4	2.3	2	2.8	0	1.7
Service Labour	12.2	3.8	5.6	0	2.3	0	0	0	4.4
Day Labour	23.5	20	13.1	15.3	6.8	8	0	25	15.2
Electrician	0	0	0	2.8	0	2	0	0	0.6
Mason	1	3.1	1.9	0	0	0	0	0	1.3
Rod Mechanic	0	0.8	0	0	0	0	0	0	0.2
Plumber	0	0.8	0.9	0	0	2	0	0	0.6
Woodcarver	0	0.8	1.9	0	0	0	0	0	0.6
Painter	0	0	0	1.4	0	0	0	0	0.2
Fridge or AC Mechanic	0	0.8	0.9	1.4	0	0	2.8	0	0.7
Blacksmith	1	0	0.9	2.8	0	0	0	0	0.7
Potter	2	2.3	1.9	0	0	0	0	0	1.3
Fisherman	3.1	0.8	0.9	0	0	0	0	0	0.9
Carpenter	0	1.5	0.9	1.4	0	0	0	0	0.7
	100	100	100	100	100	100	100	100	100

Source: Field Survey, 2015

On the other hand, **in rural areas**, respondents who has technical certificate two third of them are engaged in Government and non-government jobs. Rest of them worked as NGO worker and small entrepreneur. Respondents who completed Masters level of education about 40% of them are found as worked in family works. Like in urban area, the percentage of engaging in Government and Non-government jobs also increased in rural area for those who completed their education level above HSC. Respondents from below HSC level of education most of them started their small business and lead their life as small entrepreneurs. A significant amount of them also engaged in agriculture labor which is very much different than in urban area. In urban area the percentage are too small. Total 10.92 percent (rural and

urban) people of total respondents are agricultural Labor where 1.28 percent are from urban area and 19.18 percent from rural area, which represents rural area is the core working area for agricultural labors (Please see Table 3.2). The percentage of engaging in small entrepreneurship is about double in rural area than urban, which represents agriculture based rural area's economy provide more option to conduct business for small entrepreneurs. Again, those who are illiterate, about half of them are in agricultural labor or day labor.

Table 3.2: Education and Occupation Pattern in Rural Area

	Level of Education								Total
	Illiterate	1 - 5 Class	6 - 10 Class	SSC/ Dakhil	HSC/ Alim	Degree/ Honours /Fazil	Masters/ Kamil	Technical Certificate	
Gov. Job Holder	1.7	0.0	3.2	5.6	6.8	27.7	16.7	33.3	5.2
Non-Government Job Holder	1.7	5.3	13.3	15.6	15.9	17.0	27.8	33.3	10.5
Family Worker	.8	0.0	1.9	1.1	2.3	8.5	38.9	0.0	2.7
NGO Worker	.8	.7	0.0	0.0	2.3	4.3	5.6	16.7	1.1
Hawker	0.0	2.6	1.3	8.9	2.3	2.1	0.0	0.0	2.5
Small Entrepreneur	12.4	13.2	24.1	23.3	25.0	12.8	5.6	16.7	17.8
Shopkeeper	5.8	5.9	11.4	11.1	20.5	2.1	0.0	0.0	8.5
Medium Entrepreneur	3.3	3.9	4.4	7.8	2.3	10.6	5.6	0.0	4.9
Large Entrepreneur	0.0	0.0	0.0	0.0	2.3	2.1	0.0	0.0	.3
Agricultural Labour	28.9	30.3	15.2	11.1	9.1	6.4	0.0	0.0	19.2
Industrial Labour	.8	2.6	2.5	0.0	2.3	2.1	0.0	0.0	1.7
Construction Labour	6.6	9.2	1.9	5.6	2.3	0.0	0.0	0.0	4.9
Transport Labour	0.0	.7	1.9	1.1	0.0	0.0	0.0	0.0	.8
Service Labour	7.4	4.6	2.5	0.0	0.0	0.0	0.0	0.0	3.1
Day Labour	24.8	10.5	7.6	5.6	4.5	4.3	0.0	0.0	10.5
Electrician	0.0	0.0	1.3	0.0	2.3	0.0	0.0	0.0	.5
Mason	2.5	7.9	5.1	3.3	0.0	0.0	0.0	0.0	4.1
Rod Mechanic	0.0	.7	.6	0.0	0.0	0.0	0.0	0.0	.3
Woodcarver	1.7	.7	1.3	0.0	0.0	0.0	0.0	0.0	.8
Painter	0.0	1.3	.6	0.0	0.0	0.0	0.0	0.0	.5
Fisherman	.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.2
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Field Survey, 2015

3.7 Monthly Income and Expenditure of Households

3.7.1 Income Status

In rural area, about one fourth of total respondents' income source is found as agriculture. Another one fourth of theirs' income source is poultry and business. So, about half of the rural people are engaged in poultry, business and agricultural sector, who have available agricultural lands to cultivate. On the other hand, in urban area most of the respondents are engaged in business or government or non-government jobs, as a result about 40% respondents' income source is either business or job salary. Again, the percentage of income from gardening is found significantly higher (about 6 times) than urban area. In rural area foreign remittance percentage also found as higher than in urban area (please see Figure: 3.9).

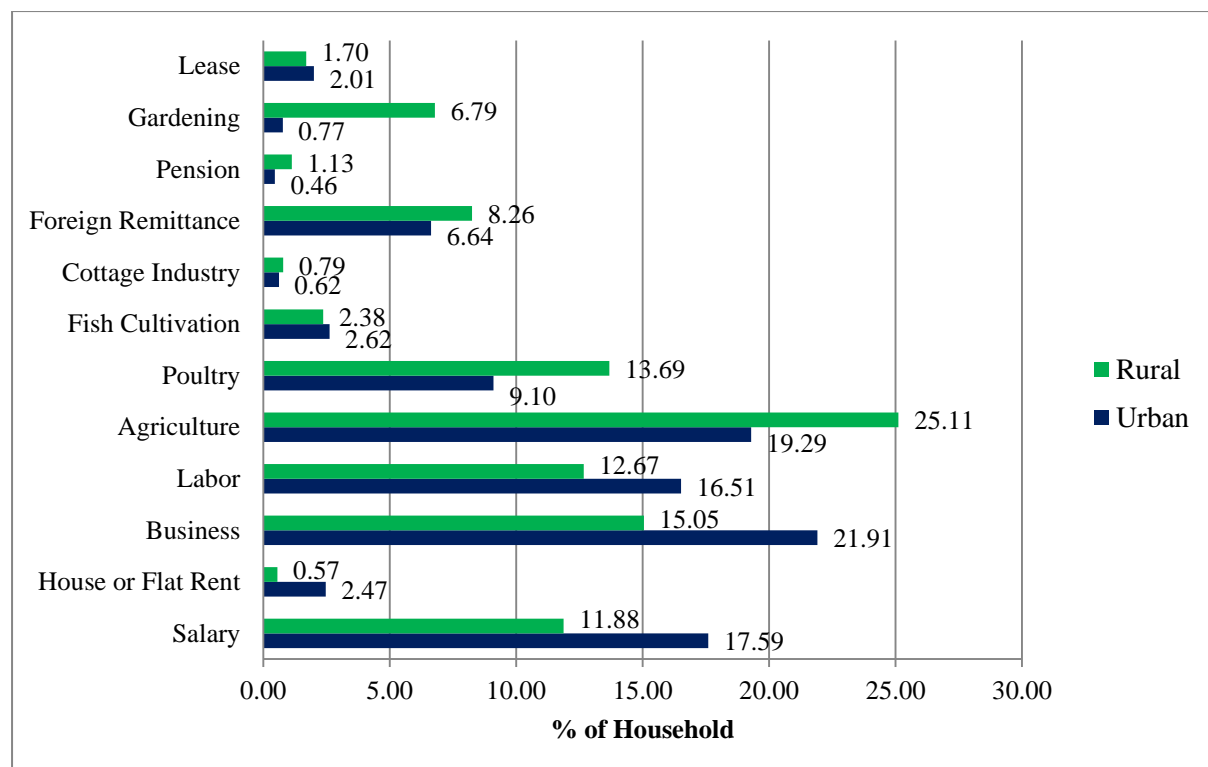


Figure 3.9: Income Source Note: Multiple Response Counted (Source: Field Survey, 2015)

Again, from the below figure it has been seen that the highest percentage of rural people's (about half) income lies between 10000-20000 range. About one fourth of rural people's income is less than 10000. On the other hand, about 40% of urban respondents' income range is between 10000-20000 and the second highest percentage (about 20%) people's income is less than 10000 (please see Figure:3.10) . Thus, it has been observed that, monthly income is about same irrespective of rural or urban area. And sometimes rural people's income is found higher than urban people.

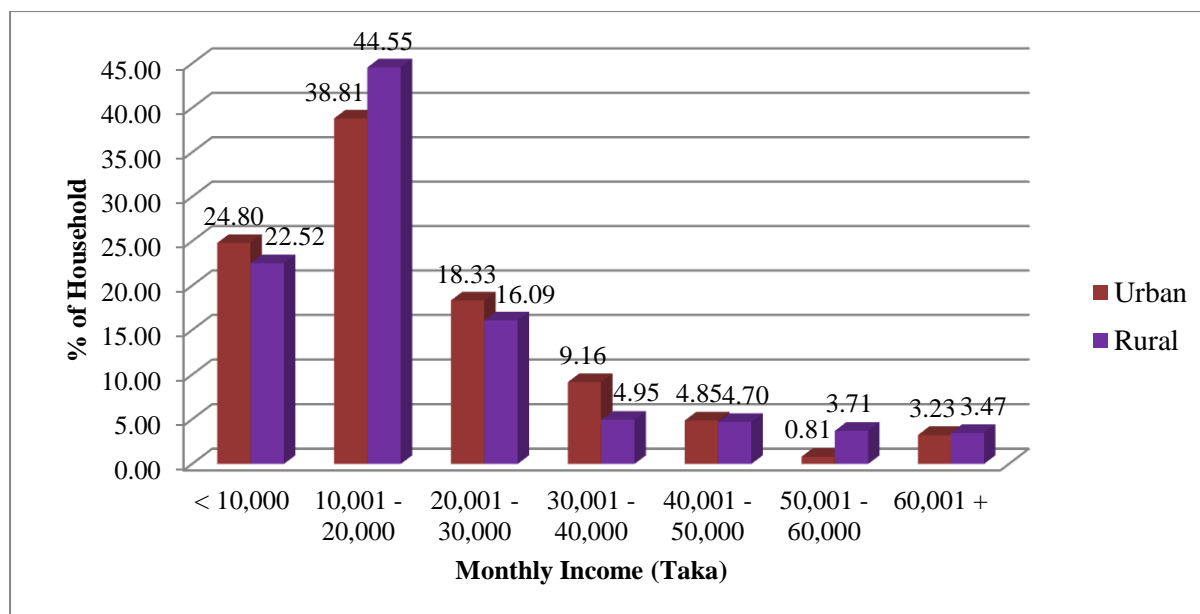


Figure 3.10: Monthly Income (Source: Field Survey, 2015)

3.7.2 Monthly Expenditure

The percentage of households, who has expenditure below BDT 10000, is found higher in urban area than rural. About one third of total urban households have the expenditure below Tk. 10000 whereas about half of the rural people have expenditure between BDT 10000-BDT 20000 which is higher than the rural percentage. Apart from that, for expenditure more than BDT 20000 urban percentage is more than the rural (please see Figure: 3.11). Most the monthly income is expended in food and education sector both in urban and rural areas.

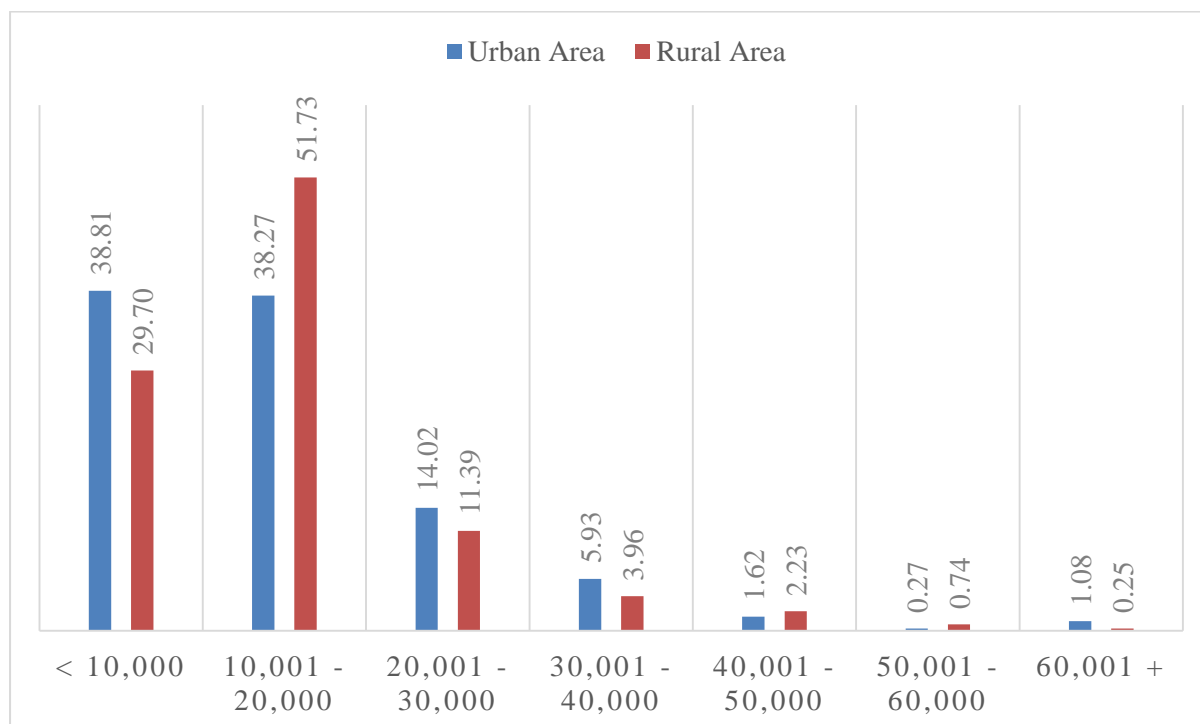


Figure 3.11: Monthly Expenditure (Source: Field Survey, 2015)

The percentage of food cost per month is a vital indicator of socioeconomic situation of household. About 26 percent households' food cost within 61 to 90 percent those are poor people. About 32 percent households food cost within 40 percent of monthly expenditure those households have more option to spend money at other sectors. Thus, the percentage of food cost at total monthly expenditure is comparatively high at rural area (please see Figure 3.11)

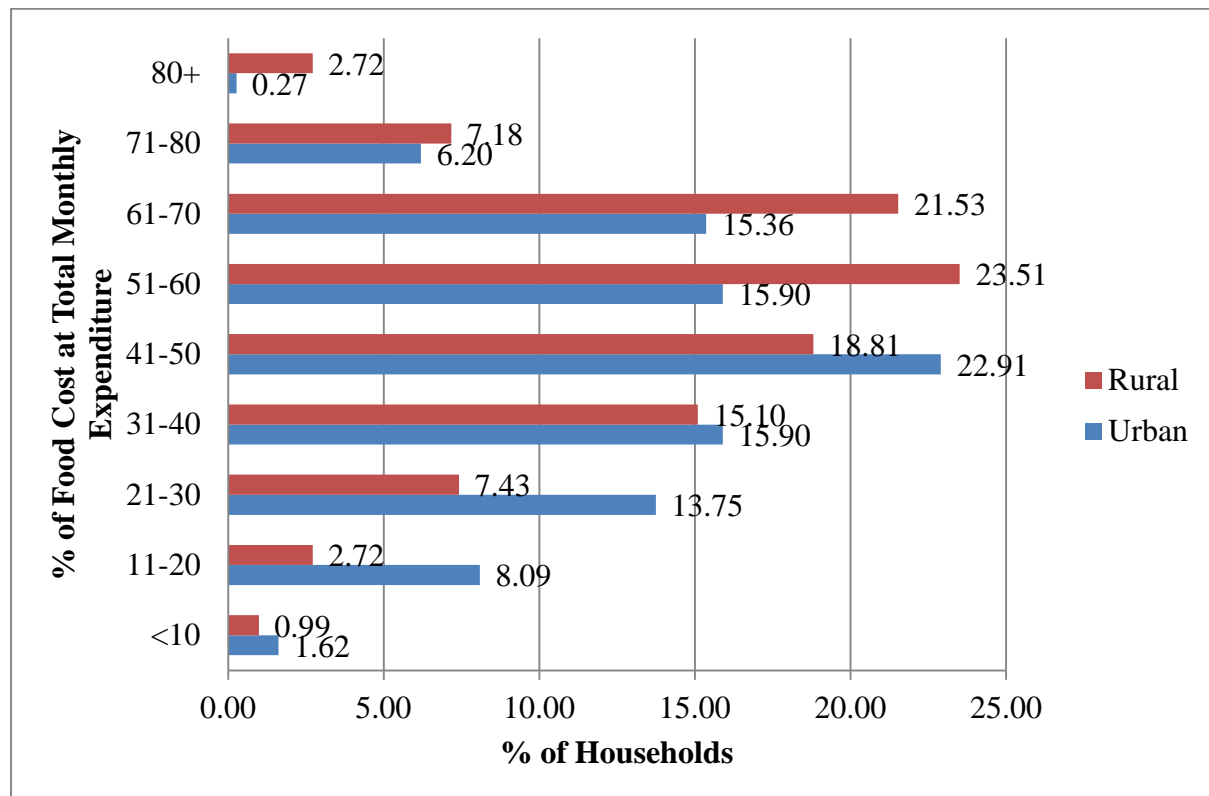


Figure 3.11: Percentage of Food Cost at Total Monthly Expenditure (Source: Field Survey, 2015)

3.8 Migration

Almost all of the households of this Upazila are non-migrant, lived in here from their birth. Only about 4% of them are migrant, among them maximum migrants came here due to eradicate poverty (please see Figure: 3.12).

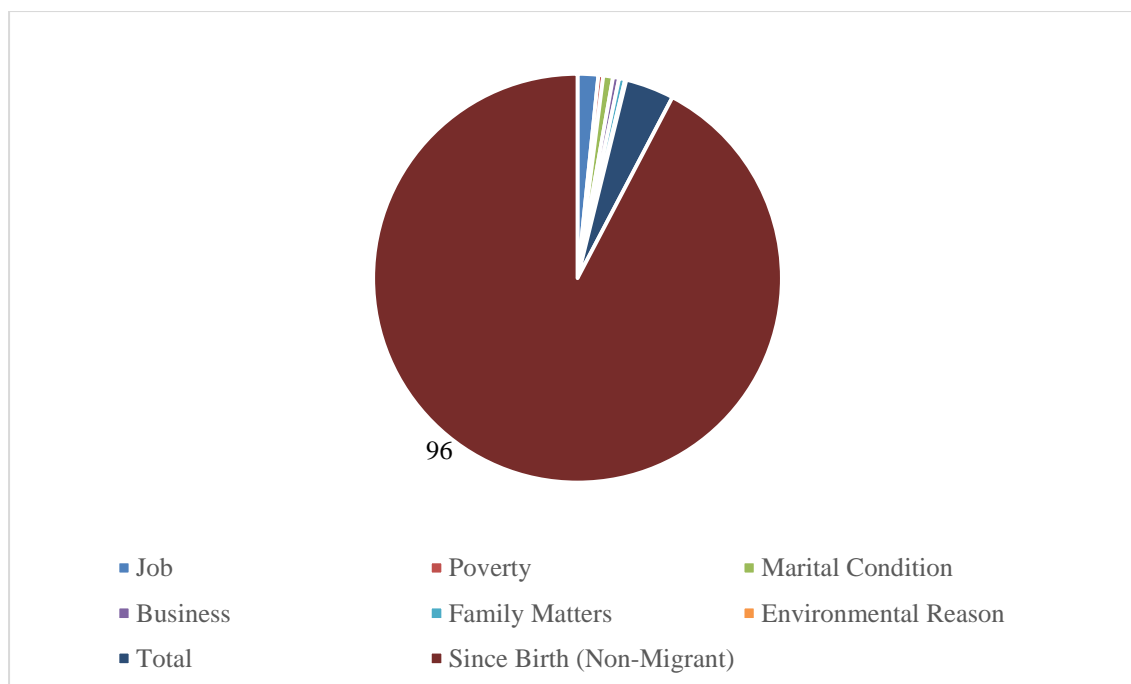


Figure3.12: Causes of Migration (in percentage)Source: Field Survey, 2015

3.9 Housing Status

3.9.1 Pattern of Household Land Ownership

In Shibpur Upazila, almost all of the households lived in their own house, and they are the owner of their household land. The families are living at the area for long time as migration rate also found very low. Thus, most of the people of Shibpur Upazila are there by their inheritance. The percentage of this types of household is slightly higher in rural area, thus in rural area most of the households are living in their own house. On the other hand, some of the respondents also lived in “Joint” owned land. These households own their household land with other members of their families. Very small percentage of people lived in rent house both in urban and rural area (please see Figure:3.13).

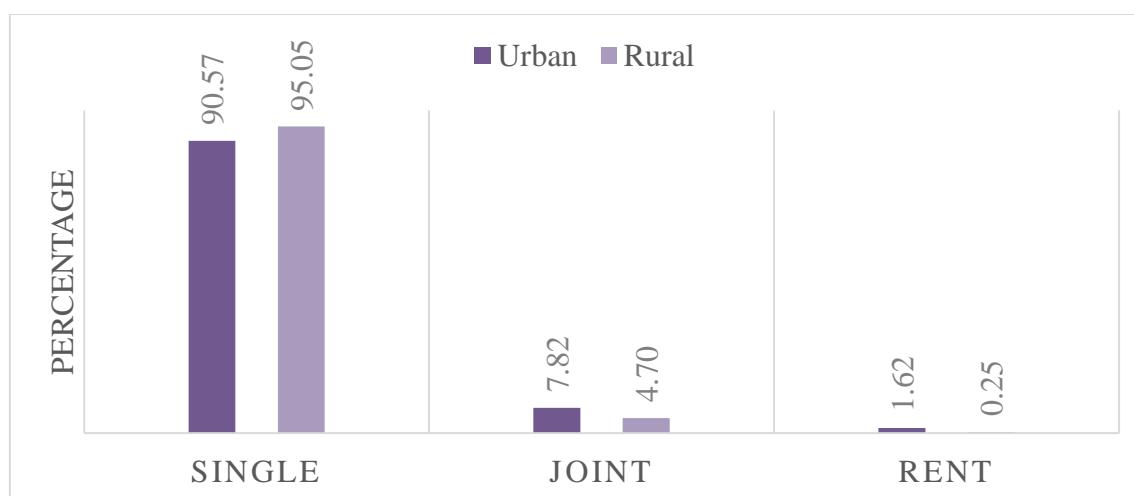


Figure 3.13: Pattern of Household Land Ownership (Source: Field Survey, 2015)

3.9.2 Types of House Structure

About half of the households of both urban and rural area those are middle income households of Shibpur lived in semi-pucca house and the percentage is almost the same and highest than other categories. Besides, in urban area about one fourth lived in Pucca house structure which represents relatively high economic status and the percentage is lower in rural area. On the other hand, in rural area about one third of total households lived in katcha house, and in urban area the percentage is lesser than urban (please see Figure: 3.14). Thus, it represents the fact that housing condition in urban and rural area are not about the same.

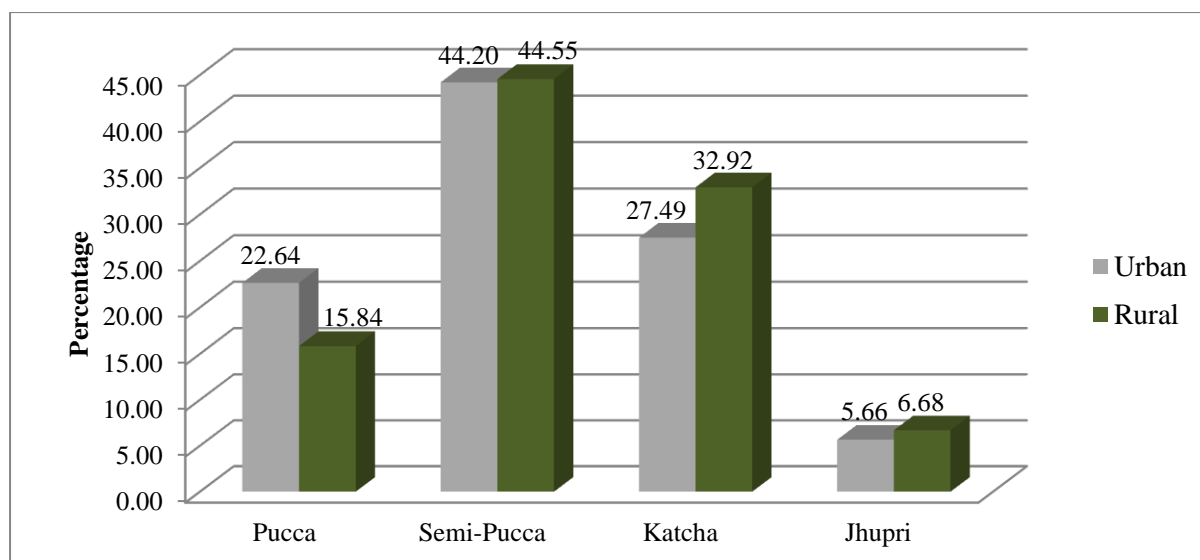


Figure 3.14: Type of Household Structure(Source: Field Survey, 2015)

3.9.3 Source of Land Ownership and Duration of Living

Both in urban and rural area most of the households owned their land by inheritance. Thus, they are living in the same house since 21 or more years. And the percentage is lower in urban area than rural area. In urban area land owned by purchasing are the second highest as the urban facility attracted people to purchase land at Shibpur and live with modern facilities (please see Figure: 3.15).

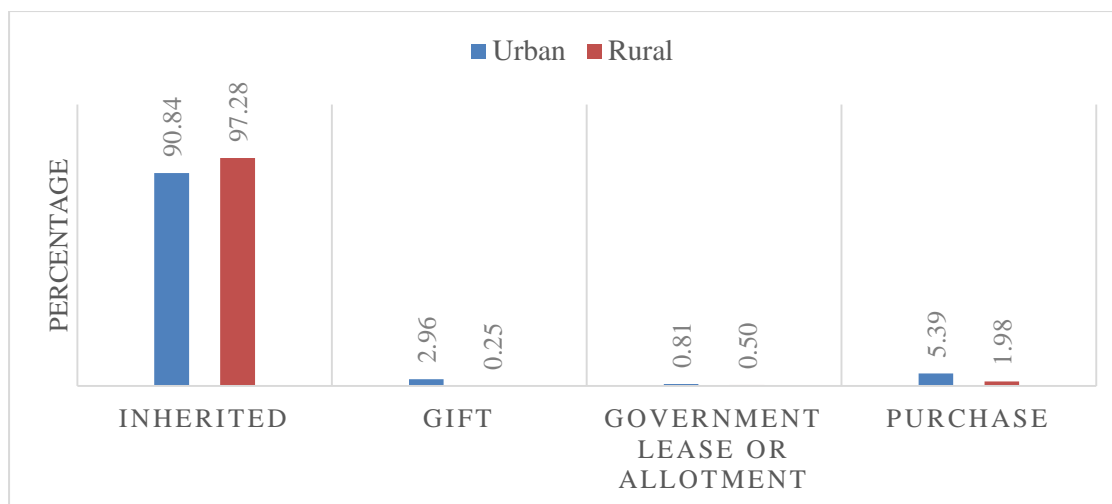


Figure3.15: Source of Household Land Ownership (Source: Field Survey, 2015)

From Figure 3.16, it is evident that, about more than two third of total respondents of both urban and rural area living in the same house 21 or more years as they got it by inheritance. The percentage is lower in urban area as in urban area a significant number of people lived there by purchasing the land and they are newly started living households as a result the ratio of living in the same households 16-20 years is about the same for both in rural and urban areas. In urban area some of new households build their own house recently because of the attraction of urban facilities.

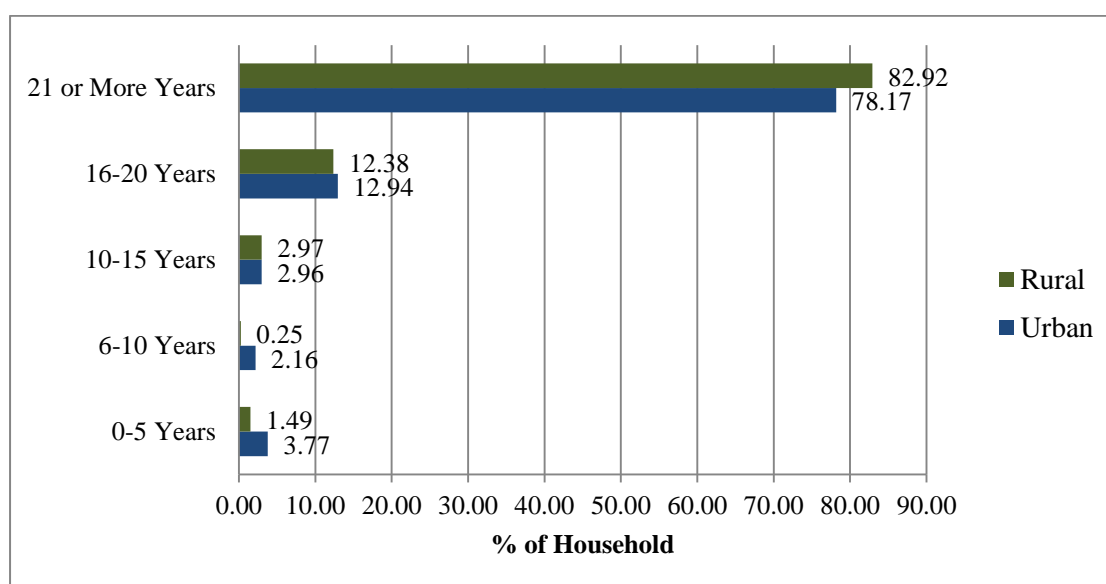


Figure 3.16: Duration of Living (Source: Field Survey, 2015)

3.10 Land Value

Land price highly varied with locations. It has been found that in rural area about to third of the land's price is below BDT 1 lakh, where as in urban area about one third of land's price is more than BDT 5 lakhs. As land price varies with location in urban area also about one fourth urban land's price varies from BDT 2to 5 lakhs. But only 10% land of rural area's land are in the same price range (please see Figure:3.17). Thus the urban facilities have highly influence on land value.

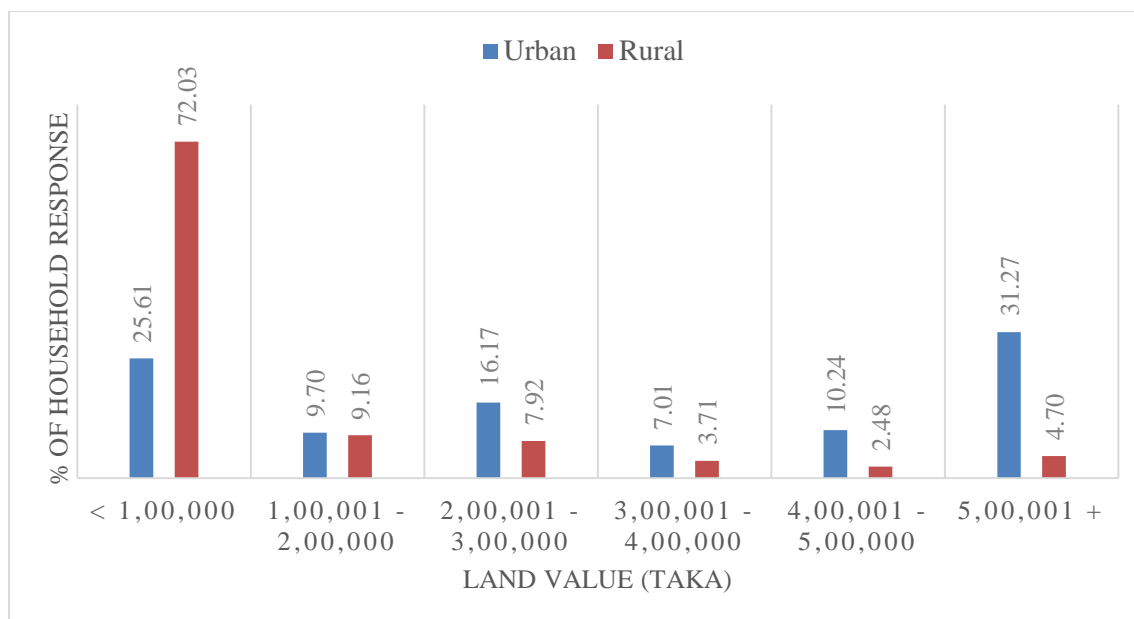


Figure 3.17: Price of Present Household Land in 2015(Source: Field Survey, 2015)

3.11 Transport

3.11.1 Mode of Communication

As there are very limited number of waterways are available almost all of the households' main mode of communication is road. It also represents that road condition in Shibpur Upazila is good. A small percentage of total households also traveled by train for long distance travel as they think it is more safe mode of communication than others (please see Figure:3.18).

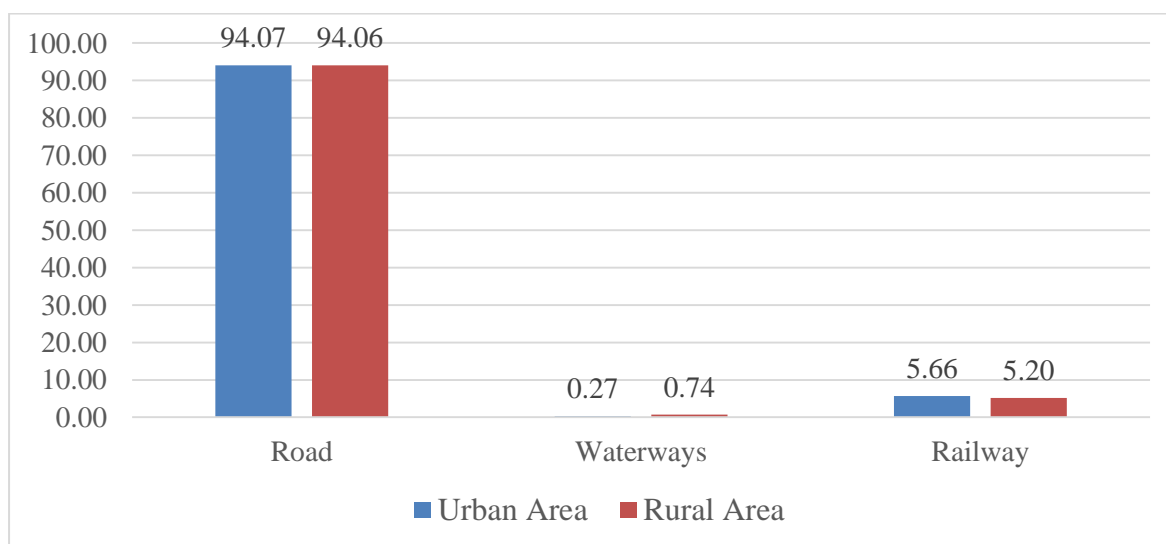


Figure 3.18: Mode of Communication (Source: Field Survey, 2015)

3.11.2 Types of Road

In urban area about three fourth of total road is bituminous road. Concrete made roads are the second highest in urban area which represents that in urban area road condition of Shibpur Upazila is satisfactory. Besides, in rural area, the percentage of bituminous made or concrete made road percentage is almost same which represents that road condition in both of urban

and rural area is almost the same. In rural area a significant percentage of roads are katcha that represents the fact that some steps could be taken for the development of these road (please see Figure: 3.19).

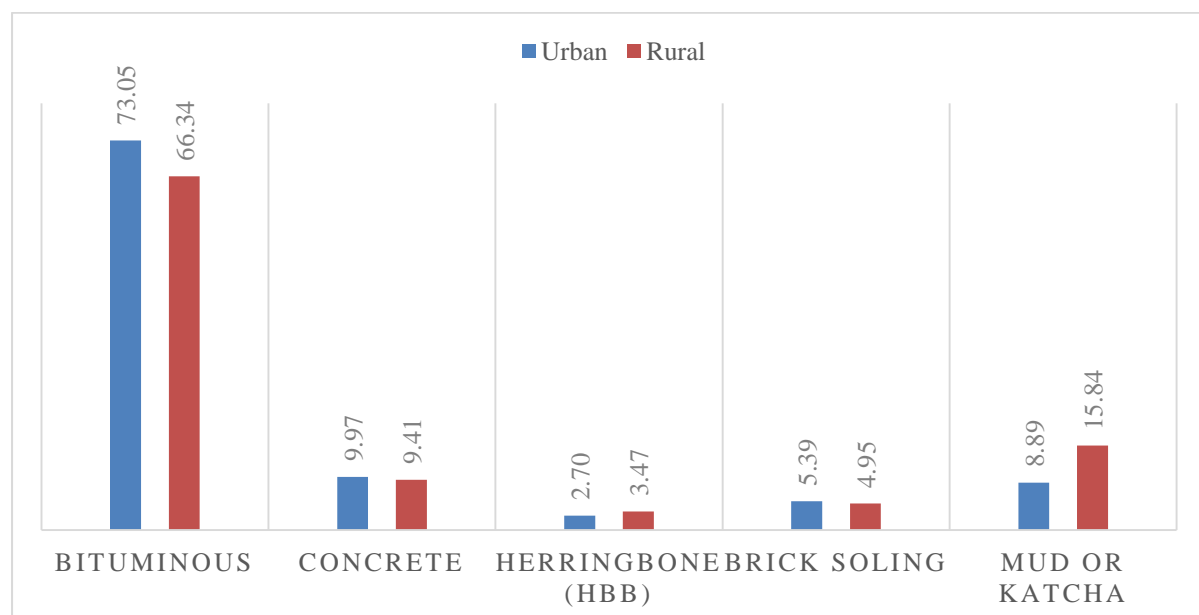


Figure 3.19: Types of Road(Source: Field Survey, 2015)

3.11.3 Mode of Access to Main Road

It has been found that about two third of total households in urban area got access to main road through footpath, whereas in rural area about the percentage is about half of the total respondents. This is because in urban area, there are sufficient establishments has been made as footpath than in rural area. In rural area most of the households went to main road by *Halot* or field boundary (please see Figure: 3.20).

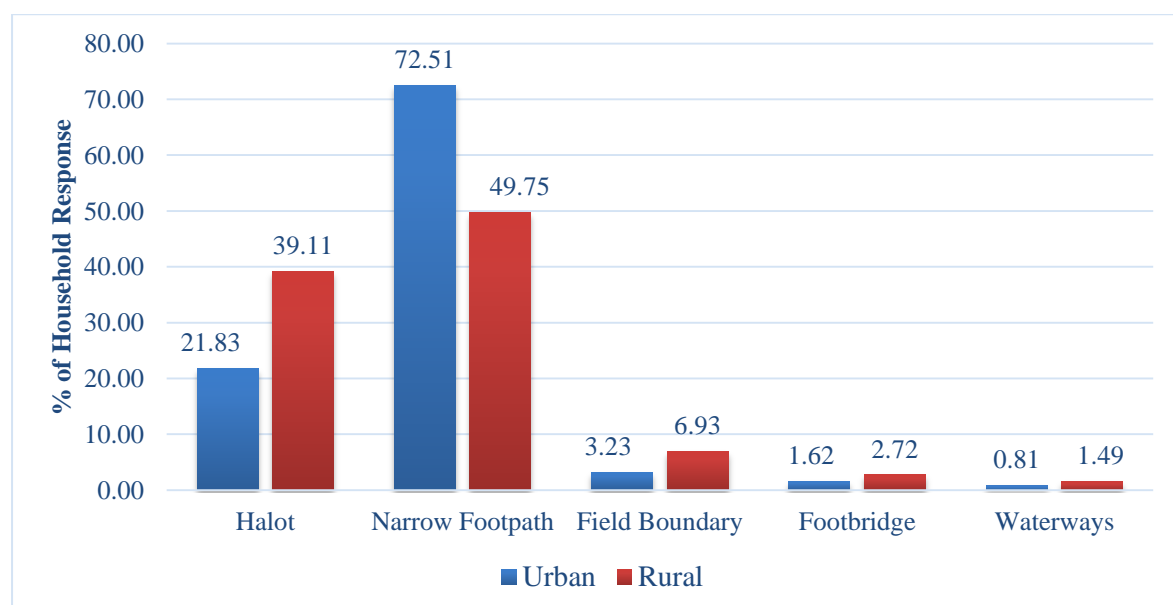


Figure 3.20: Mode of Access to Main Road (Source: Field Survey, 2015)

3.11.4 Condition of Road

In urban area, about one third of total road's condition is good, on the other hand, more than about half of total roads have been reported as deteriorated. This represents the situation that there is not enough maintenance for urban road though about two third of total urban road is made by bituminous. On the other hand, the percentage of deteriorated road is lower in rural area than urban area, but there are about four times higher destroyed roads in rural area which needs quick maintenance before totally destroyed condition. The percentage of seasonal waterlogged road in rural area is about three times higher for than urban area. Besides, the percentage of good roads is also not much significant in rural areas than urban area. In a nutshell, it can be easily understood that enough maintenance of road is not present in both of rural and urban area. But the condition in rural area is worse than urban area (please see Figure:3.21).

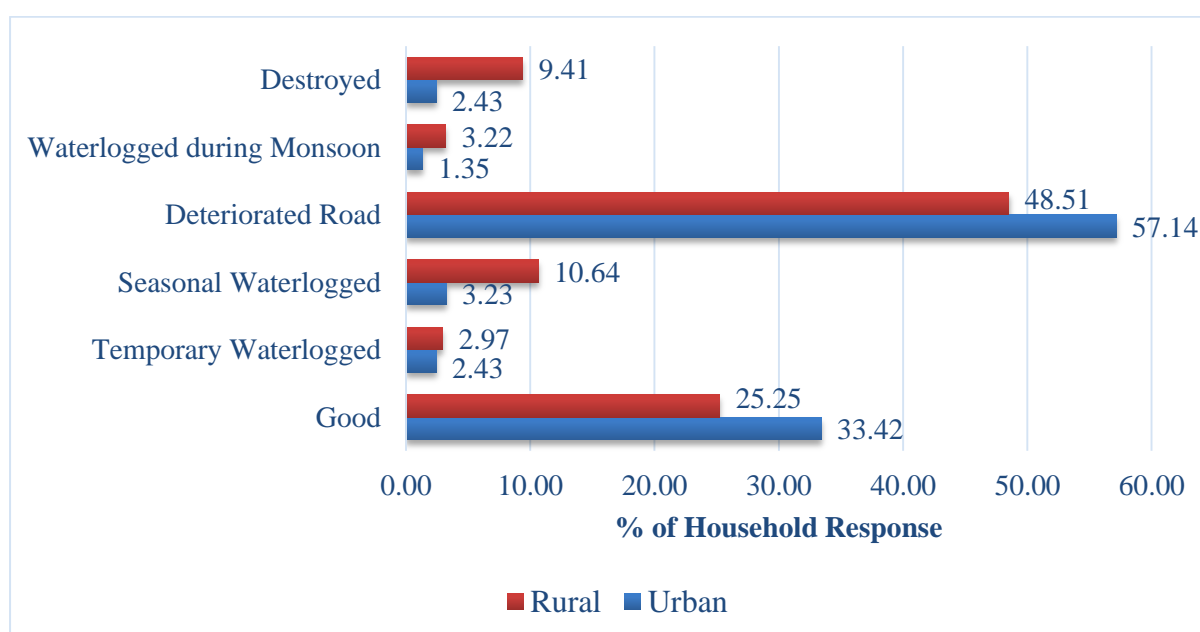


Figure 3.21: Condition of Road (Source: Field Survey, 2015)

3.11.5 Maintenance of Road

As from the previous section discussion, it has been proved that enough road maintenance has not been carried out in both of urban and rural area, the below Figure:3.22 again proved that. There is almost never annual maintenance has been carried out for both of urban and rural area. For about half of the cases irregular maintenance has been occurred. In urban area for about one fourth of the cases roads are being maintained periodically 2-3 years. But the percentage is almost half in rural area than in urban area. In rural area almost about one fourth of the cases roads are being again made by after extremely damaged. Thus, it can be said that effective regular maintenance should be carried out in both of urban and rural area by the responsible authorities

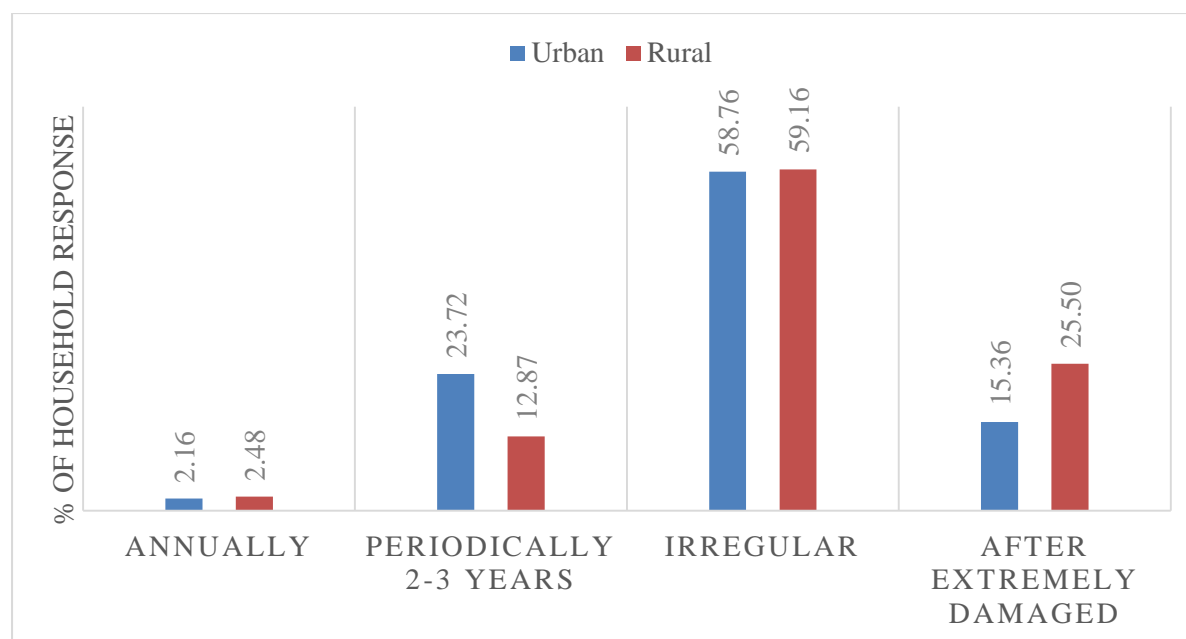


Figure 3.22: Maintenance of Road (Source: Field Survey, 2015)

3.12 Utility Service

3.12.1 Energy

a. Source of Energy for Cooking Purpose

In Shibpur Upazila, about three fourth of total households use *lakri/vusi* as source of energy for cooking purpose. It represents that most of the rural households' source of energy pattern for cooking purpose is from informal sources (please see Figure: 3.23). Thus for cooking purpose most of the households of Shibpur upazila follow the traditional pattern.

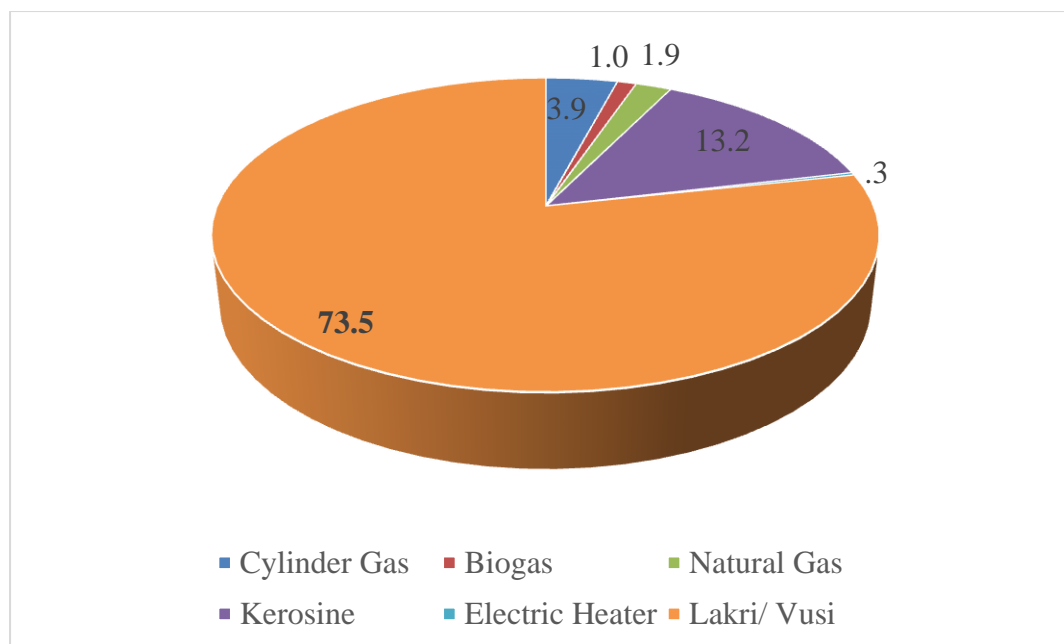


Figure 3.23: Source of Energy for Cooking Purpose (Source: Field Survey, 2015)

b. Source of Lighting

Both in urban and rural area about 90% households source of lighting is electricity. The percentage is slightly lower for rural area as in rural area electricity provider Bangladesh Rural Electrification Board (BREB) faced high demand but lesser supply (please see Figure: 3.24). Moreover, electricity connection costs more in rural area than urban area as households in rural area are scattered. In rural area, those who are not getting electricity supply use alternative lighting source like kerosene light as light source, thus the percentage is about double than in urban area. Solar power needs high installment cost as the percentage of using solar power is quite low in both of urban and rural area (please see Figure: 3.24).

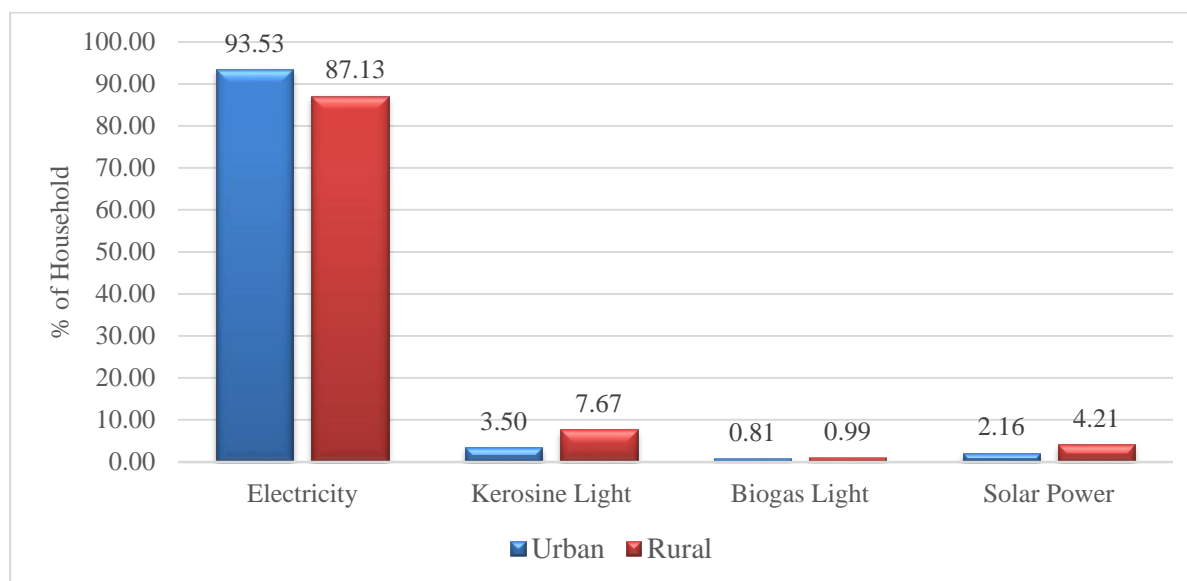


Figure 3.24: Source of Lighting (Source: Field Survey, 2015)

c. Electricity Supply Status

Because of high load shedding and high pressure in peak period with insufficient electricity, supply both in urban and rural area very small percentage households has said that they enjoy uninterrupted electricity supply. Otherwise about half of the total respondents said that electricity is irregular in their areas. About half of the total respondents said that routine based load shedding occurred in their area. In rural area, a certain percentage of households (about 7%) still do not have or experience electricity facility in their households. And the scenario is almost same irrespective of rural or urban areas in case of irregular or routine based load shedding (please see Figure: 3.25).

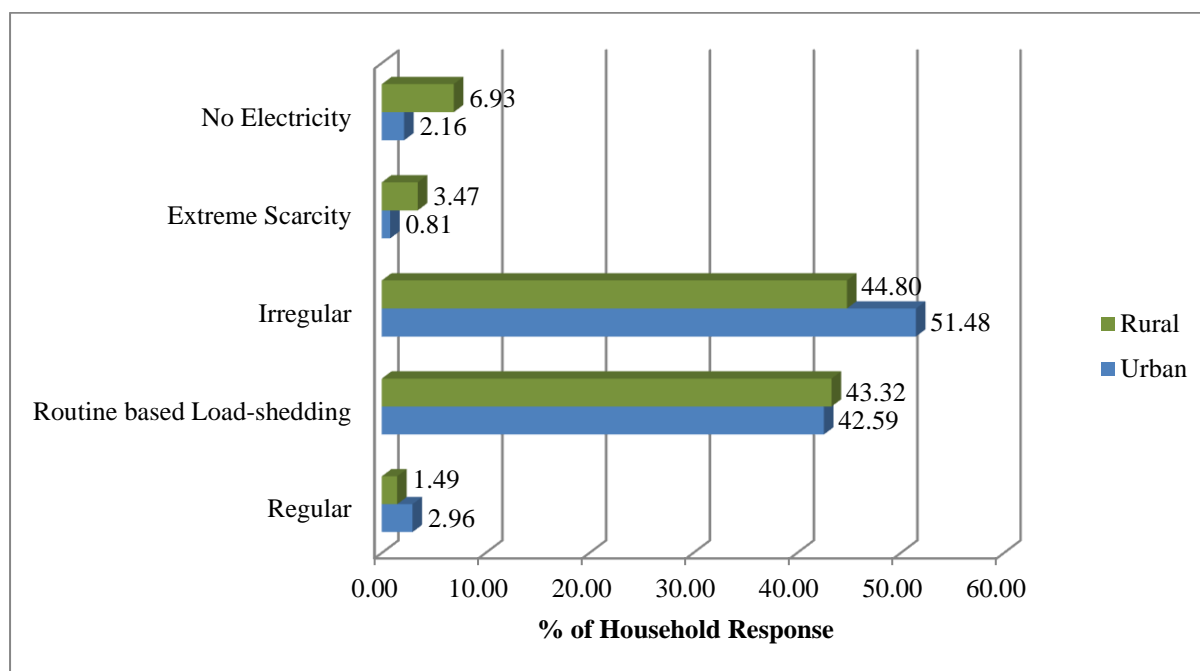


Figure 3.25: Electricity Supply Status (Source: Field Survey, 2015)

3.12.2 Drinking Water

a. Source of Drinking Water

In Shibpur Upazila, almost all of the households (about 90%) use their own tube-well for source of drinking water. As most of them lived in their own house, the percentage of having own tube-well is quite higher both in urban and rural areas. Though in urban areas a significant number of households (about 10%) use pipe line services for drinking water, generally those are the new households living in urban area (please see Figure: 3.26).

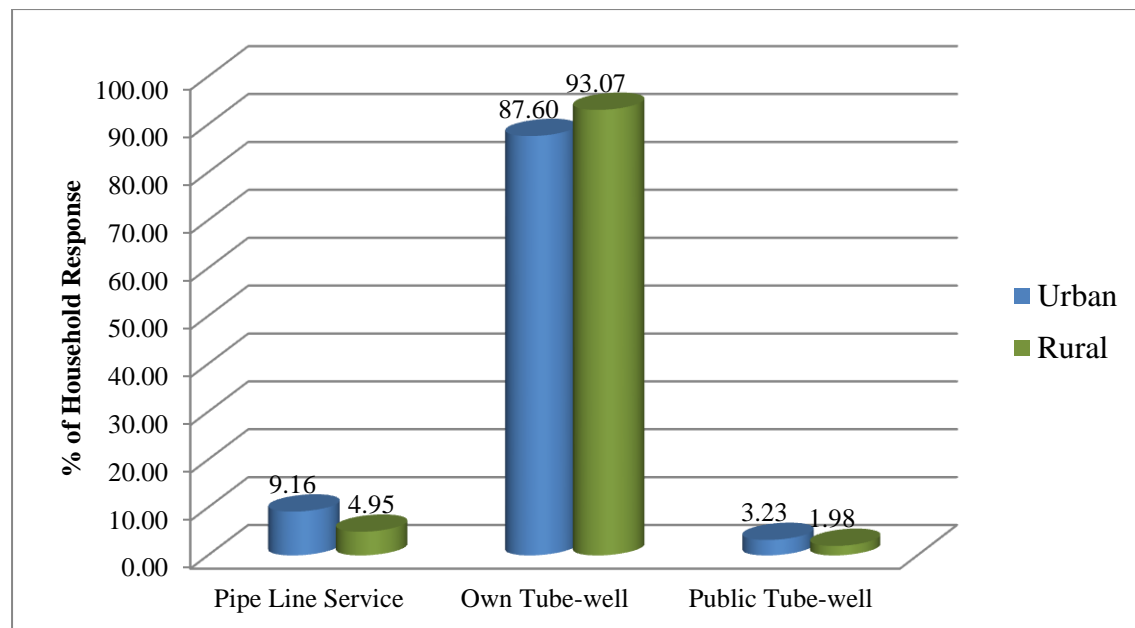


Figure 3.26: Source of Drinking Water (Source: Field Survey, 2015)

b. Drinking Water Quality

Overall drinking water quality at both urban and rural areas at Shibpur is satisfactory. About 80% of total households said that they are satisfied or highly satisfied with the quality of drinking water. On the other hand, in urban area some of the households also said that they are not satisfied with the drinking water quality. Most of them have no own tube-well and they have to use water from adjacent ponds or other sources of water (please see Figure: 3.27).

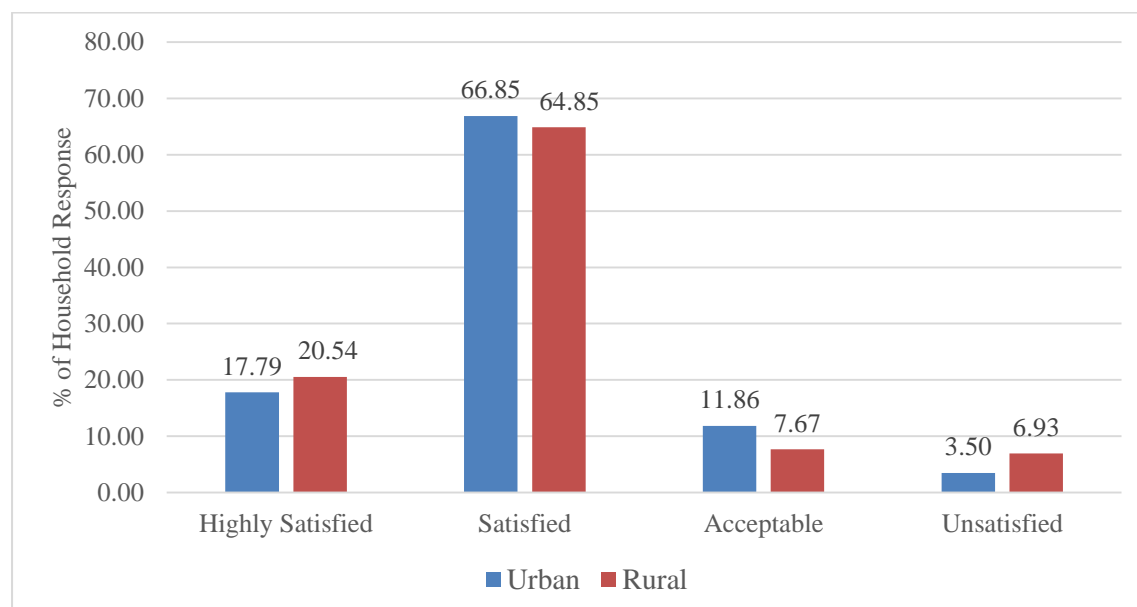


Figure 3.27: Drinking Water Quality (Source: Field Survey, 2015)

c. Distance of Water Source

Moreover, almost all of the households collect water from 0.5 km of water source. Among them, about 90% of total households are within .25 km radius of water source. So the basic

right of having enough potable water within walking reach is being maintained here (please see Figure: 3.28).

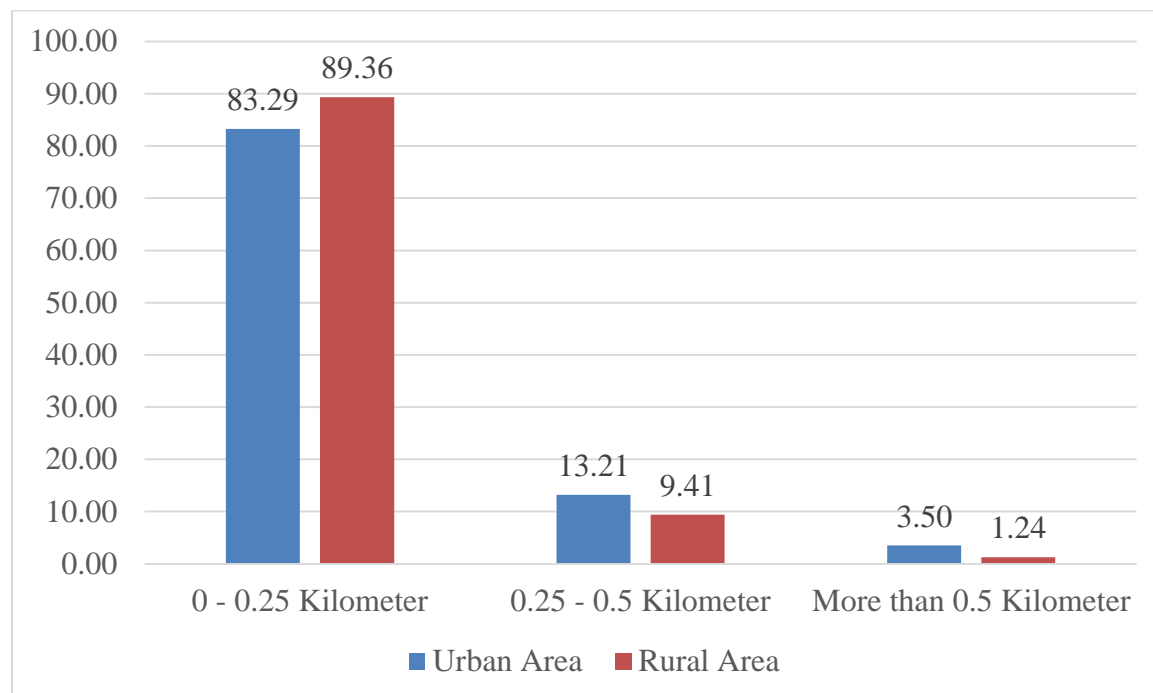


Figure 3.28: Distance of Water Source(Source: Field Survey, 2015)

3.12.3 Sanitation

Percentage of using pit latrine is satisfactory in both of urban and rural area. About almost all of the households use commode or pit latrine. Only a small percentage of households do not maintain healthy sanitation facilities and use open toilet. The percentage of using open toilet is higher in rural area than urban are, thus awareness building program can be carried out in rural area about using healthy sanitation systems (please see Figure: 3.29).

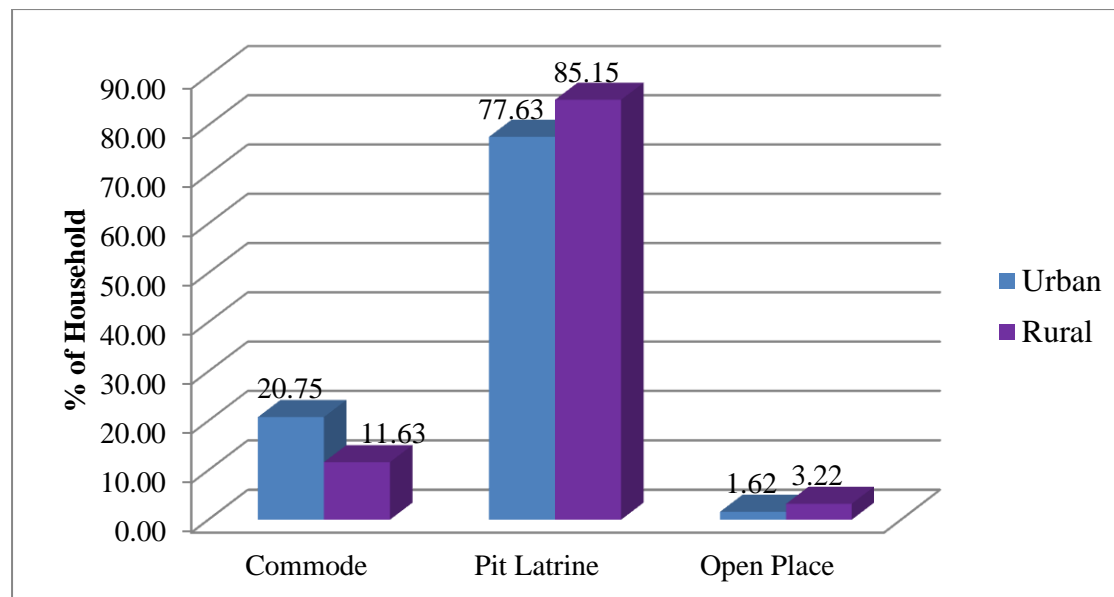


Figure 3.29: Sanitation System (Source: Field Survey, 2015)

About more than half of the households used absorb well sanitations system both in urban and rural area. About one third of total respondents also used septic tank sanitation system though the system's installation cost is comparatively high. The percentage of using different systems is almost the same for both of urban and rural area thus there are no significant differences in using sanitation system in between urban and rural areas (please see Figure: 3.30).

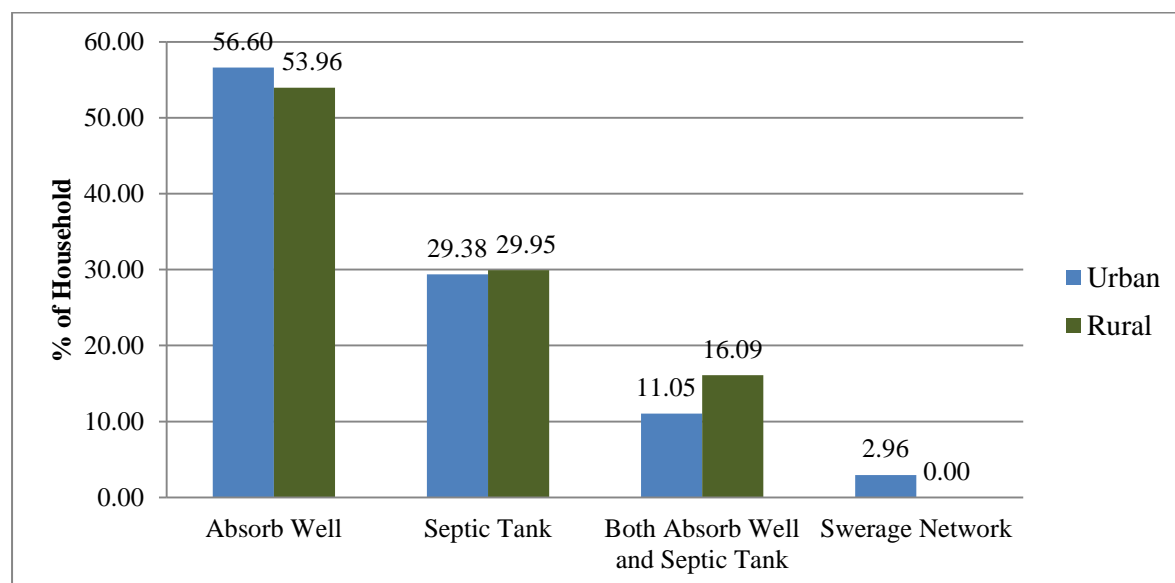


Figure 3.30: Type of Sanitation Management System (Source: Field Survey, 2015)

3.12.4 Waste Management

a. Waste Management System

From table 3.3, it is found that, in Shibpur Upazila, most of the households manage their waste through their own management. Among them, more than half of them use lowland besides their house. About one third of them also use hole within their yard for

wastemanagement. Only small percentage (about 3%) of them use canal or river or small water-body or beside the road which is not environment friendly. The small percentage can also be lessened down by creating awareness about waste management system.

Table 3.3: Distribution of Waste Management System

Waste Management	Number	Percent
Door to Door Collection	43	5.5
Own Management	732	94.5
Dustbin	45	5.8
Hole Within Yard	257	33.2
Lowland Beside House	435	56.1
Canal or River or Small Water-body	23	3.0
Beside Road	15	1.9
Total	775	100.0

Source: Field Survey, 2015

b. Distance to Waste Disposal Place

Again the distance from waste disposal place to households is within 50m for almost all of the households (please see Figure: 3.31). So, it can be seen as advantages for the households as they can put away their waste easily. But the less distance also keeps them in vulnerable position as several diseases can easily be spread out from the waste disposal place.

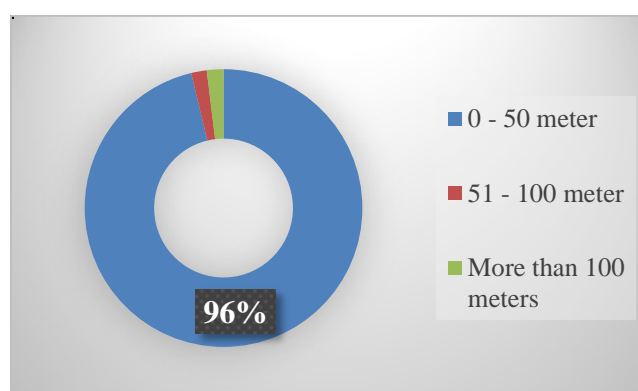


Figure 3.31: Distance to Waste Disposal Place (Source: Field Survey, 2015)

3.13 Medical Facility

From Table 3.4, it is found that, in Shibpur Upazila, most common disease is fever in both urban and rural area. The percentage is higher in rural area than urban. Moreover, the second highly common disease is flux/cough both in urban and rural area. And the percentage of

affecting with this disease is higher in urban area than rural area. Thus the environmental condition is better in rural area than urban area which results into more disease affected people are found in urban area. Water borne diseases like diarrhea, dysentery, skin diseases etc. also are more common in urban area.

Table 3.4: Type of Sickness

Type of Sickness in Last 6 Months	Urban Area		Rural Area		Total	
	No.	%	No.	%	No.	%
Fever	196	52.83	250	61.88	446	57.55
Flux/Cough	82	22.10	75	18.56	157	20.26
Diarrhea/Dysentery	36	9.70	10	2.48	46	5.94
Jaundice	5	1.35	12	2.97	17	2.19
Polio	2	0.54	2	0.50	4	0.52
Worms Disease	1	0.27	9	2.23	10	1.29
Sexual Disease	0	0.00	6	1.49	6	0.77
Bone-loss Disease	4	1.08	12	2.97	16	2.06
Diabetes	16	4.31	3	0.74	19	2.45
Skin Disease/Itching	4	1.08	2	0.50	6	0.77
Gynecological Disease	7	1.89	8	1.98	15	1.94
Gastric	13	3.50	2	0.50	15	1.94
Ulcers	1	0.27	9	2.23	10	1.29
Piles	4	1.08	4	0.99	8	1.03
Total	371	100.00	404	100.00	775	100.00

Source: Field Survey, 2015

In urban area, according to Figure 3.32, it is found that about two third of total urban households said that the general health service is found at nearest health service centers and Upazila Health Complex is providing good operation facilities for both urban and rural people. The percentage is low in rural area, thus about half of the total households are deprived of having general health service in the nearest health service centers. The percentage of getting quality health service in nearest health service centers is better in urban area in comparison to rural area. The mother and child health care service is almost close in urban and rural area. But the alarming situation is that most of the households' nearest health service center is not able to provide enough medical service facilities for mother and child health.

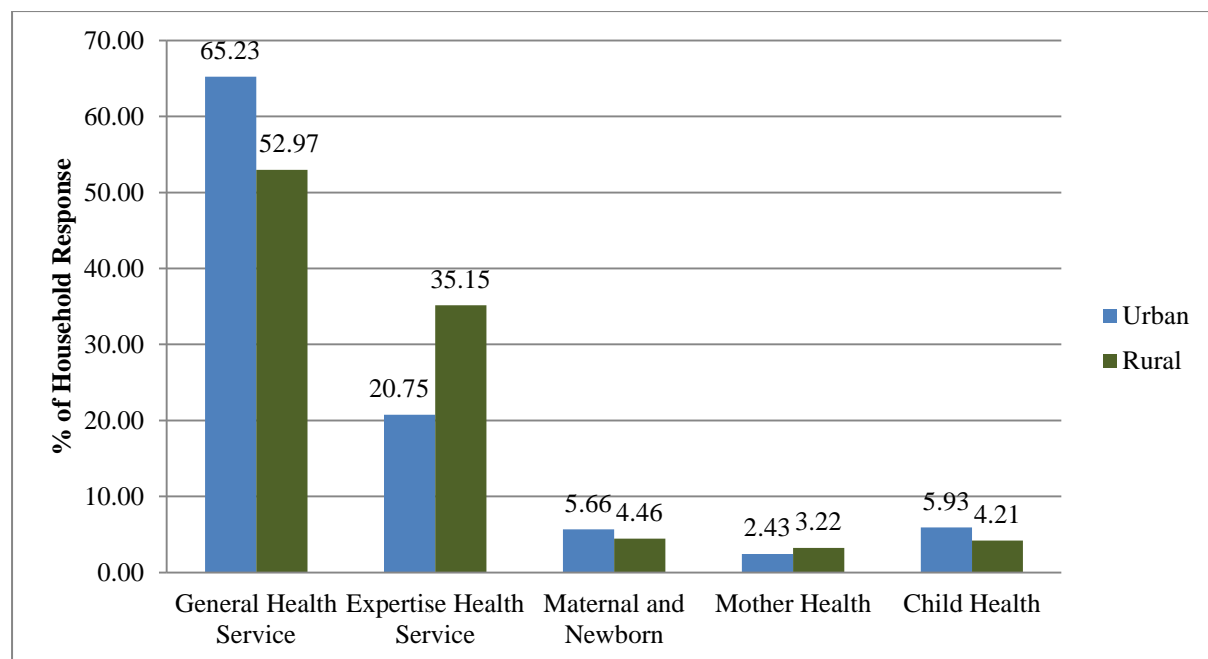


Figure 3.32: Type of Treatment Facility (Source: Field Survey, 2015)

On the other hand, despite of such shortcomings discussed in earlier section about more than two third of total household in both of urban and rural area anticipated that, they are satisfied with the treatment quality provided by the health service centers. Rural people generally are highly satisfied with their services as the percentage for “Highly Satisfied” and “Acceptable” is higher in rural area. Which represents the fact that though the medical centers could not have enough expertise for maternal and child health, but they are providing a satisfactory service for general health issues (please see Figure: 3.33).

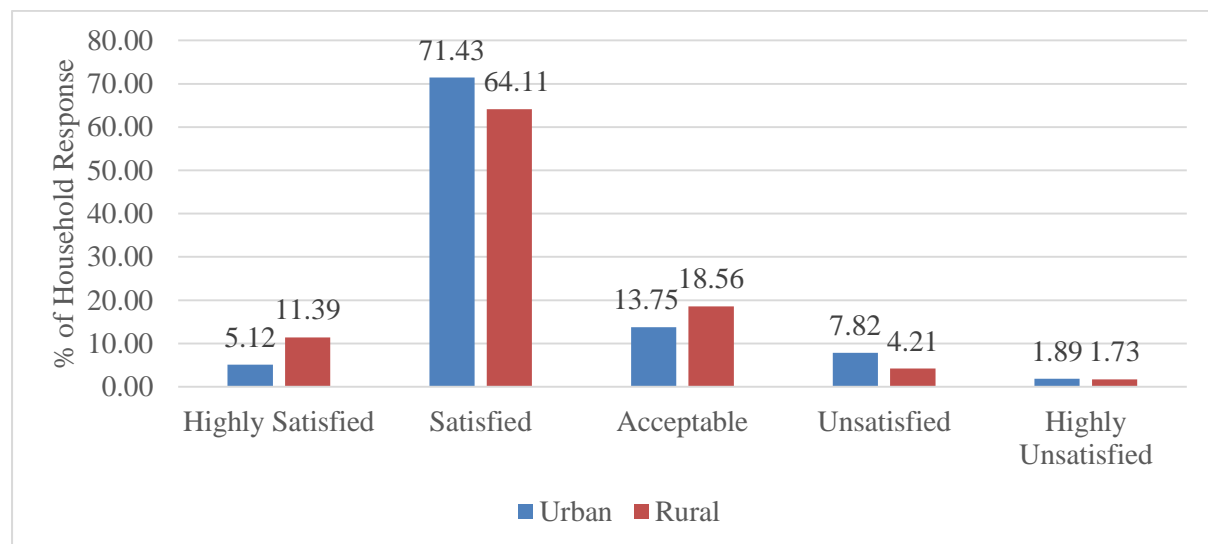


Figure 3.33: Quality of Treatment Facility (Source: Field Survey, 2015)

Apart from these positive situations of treatment facilities of Shibpur Upazila, the most important drawbacks of this upazila is lacking of community clinic in both rural and urban area. And the percentage is higher in urban area ((please see Figure: 3.34). Moreover, there is

also lack of enough free medical center services. Thus steps for establishing new community clinic and government clinic should be taken by proper authorities. Moreover, there are also lack of necessary medicines, for which immediate measurements should be taken.

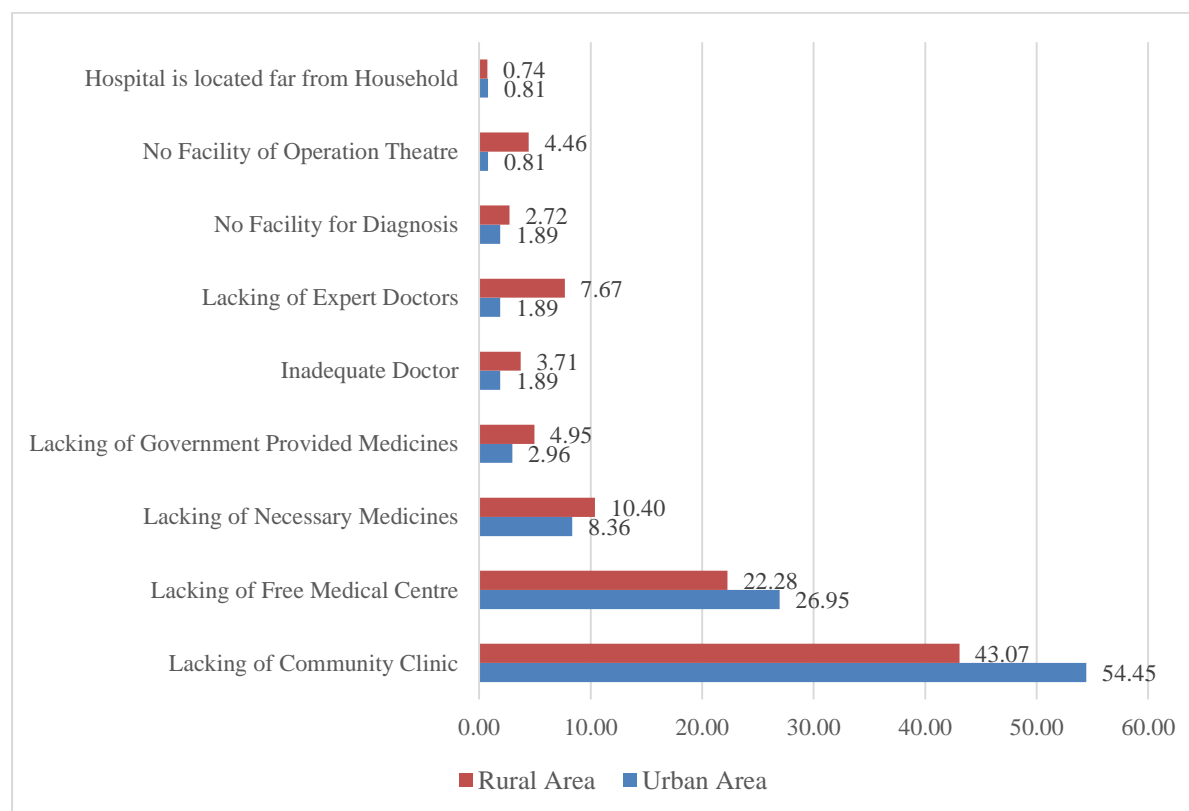


Figure 3.34: Drawbacks of Treatment Facility (Source: Field Survey, 2015)

3.14 Educational Facility

In Shibpur Upazila, it has been found that there is not enough qualified teacher. The dearth of this problem is about the same for both in urban and rural area. Moreover, the number of student against teacher is too high, which deteriorates the quality of education. In addition, lacking of laboratory and library also hinders the quality education of Shibpur Upazila (please see Figure: 3.35).

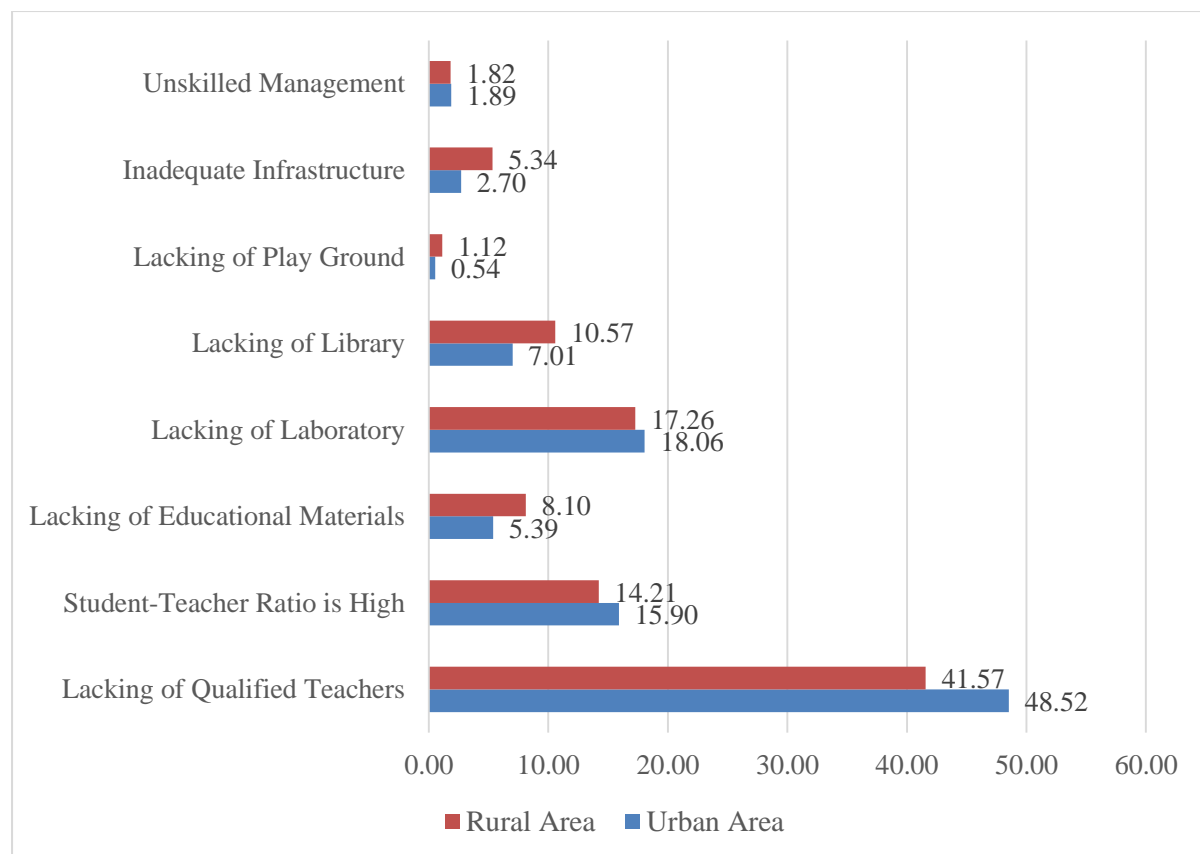


Figure 3.35: Problems of Educational Service (Source: Field Survey, 2015)

3.15 Recreational Facility

In Shibpur upazila about two third of total households' source of outdoor recreation is sports/playing in the field both in urban and rural area. A significant number of households also watch the sports as their recreation. In rural area fishing is another important source of recreation for some of the households (please see Figure: 3.36).

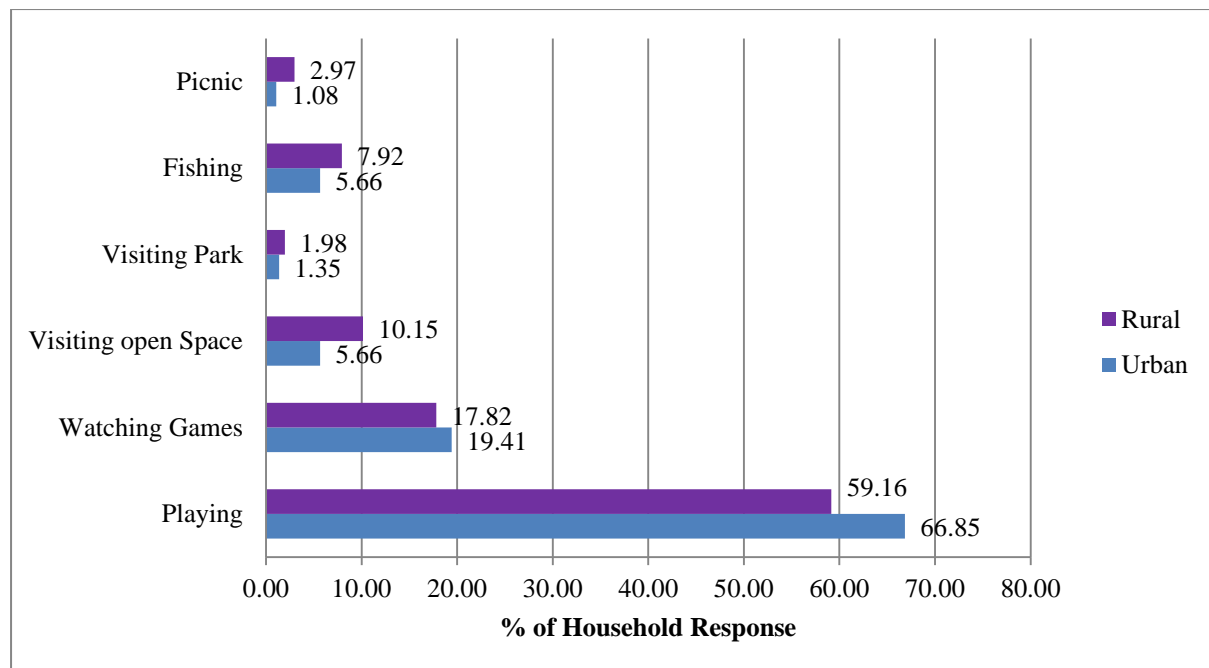


Figure 3.36: Out-Door Recreation (Source: Field Survey, 2015)

It is evident from Figure 3.37 that about half of total households in both of urban and rural area anticipated that there are not enough recreational facilities in their area. It occurred in the urban area most than rural area. On the other hand, economic insolvency is one of the important reasons for hindering outdoor reaction for some of the households of rural area, whereas in urban area lack of proper recreational environment and management of recreational areas are the prime drawbacks of recreational facilities.

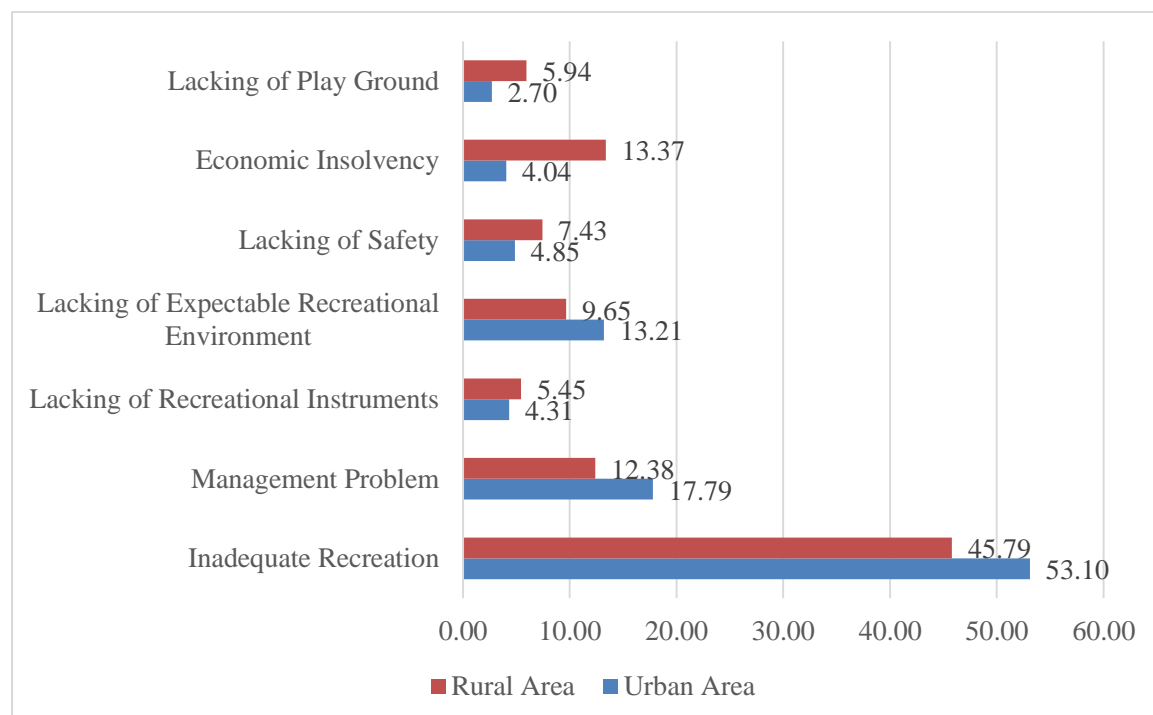


Figure 3.37: Drawbacks of Recreation Facilities (Source: Field Survey, 2015)

3.16 Law and Order Situation

Sneaking is the most common crime in Shibpur Upazila both in rural and urban area. In urban area the percentage is higher than rural area as the community bonding is much better in rural areas. On the other hand, heinous crimes like burgling, robbery, extortion, land or resource grabbing occurred in rural area more frequently than urban area (please see Figure: 3.38). It represents the fact that security condition in urban area is better from some perspectives than the rural area.

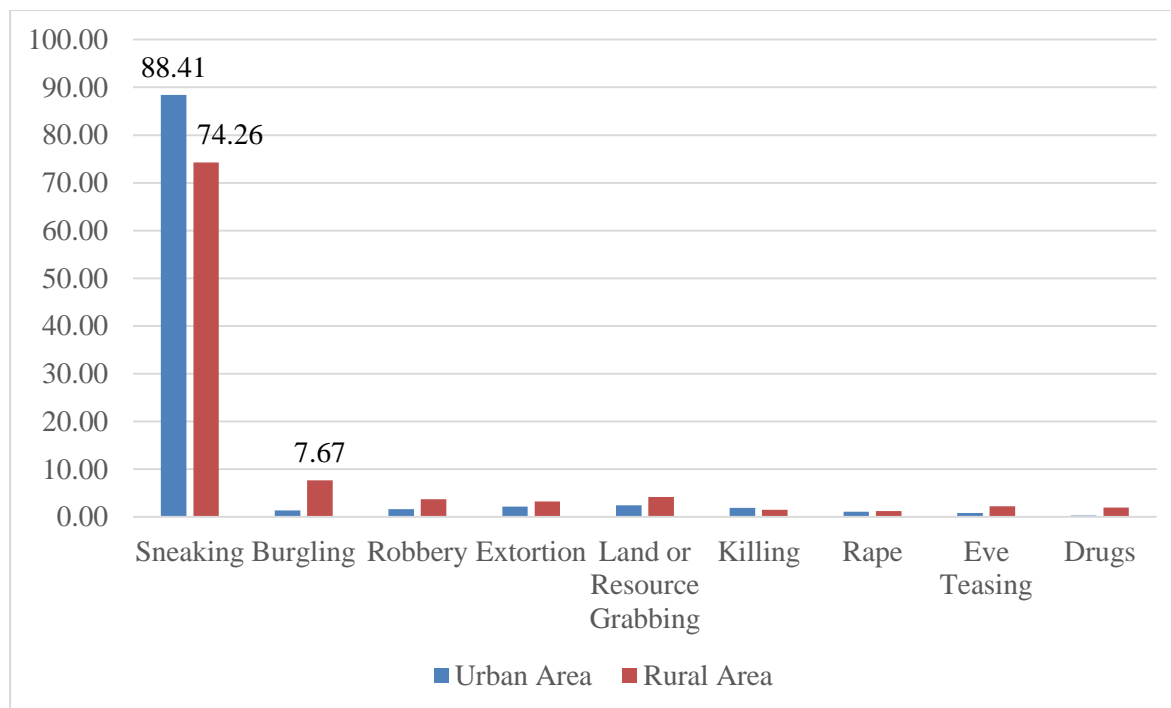


Figure 3.38: Types of Crimes (Source: Field Survey, 2015)

3.17 Available Services in Shibpur Upazila

The consultant analyzed retail market, post office, fire service and playground condition as vital services of Shibpur where the location, distance from the household and service quality has been studied.

3.17.1 Distance and Service Quality of Retail Market

More than half of the households has retail market within 1-2 km and more than two third of total households has it within 3 km. Thus, the service of retail markets could easily be taken by most of the households as the distance is not too far. Also, both in urban area about two third of total households said that they are highly satisfied with the service of it. The ratio is about the same for both in urban and rural area for all of the categories like (highly satisfied, satisfied, unsatisfied etc.). Thus, the service is about the same for in urban and rural area (please see Figure: 3.39 & 3.40).

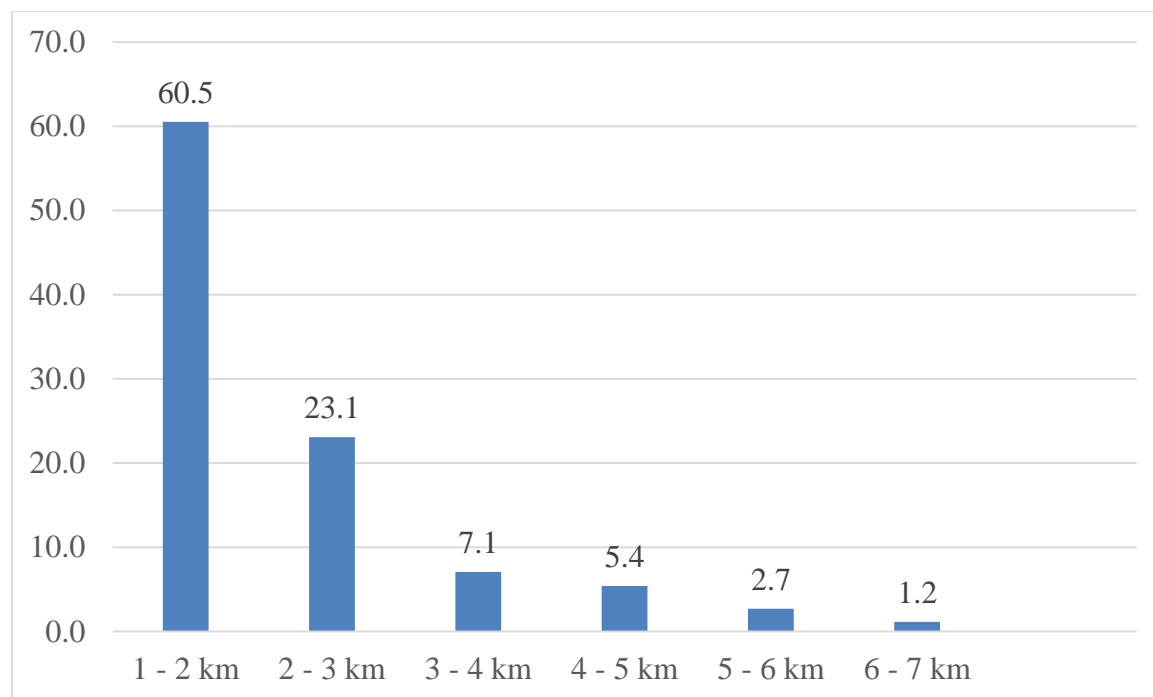


Figure3.39: Location and Distance of Retail Market (Source: Field Survey, 2015)

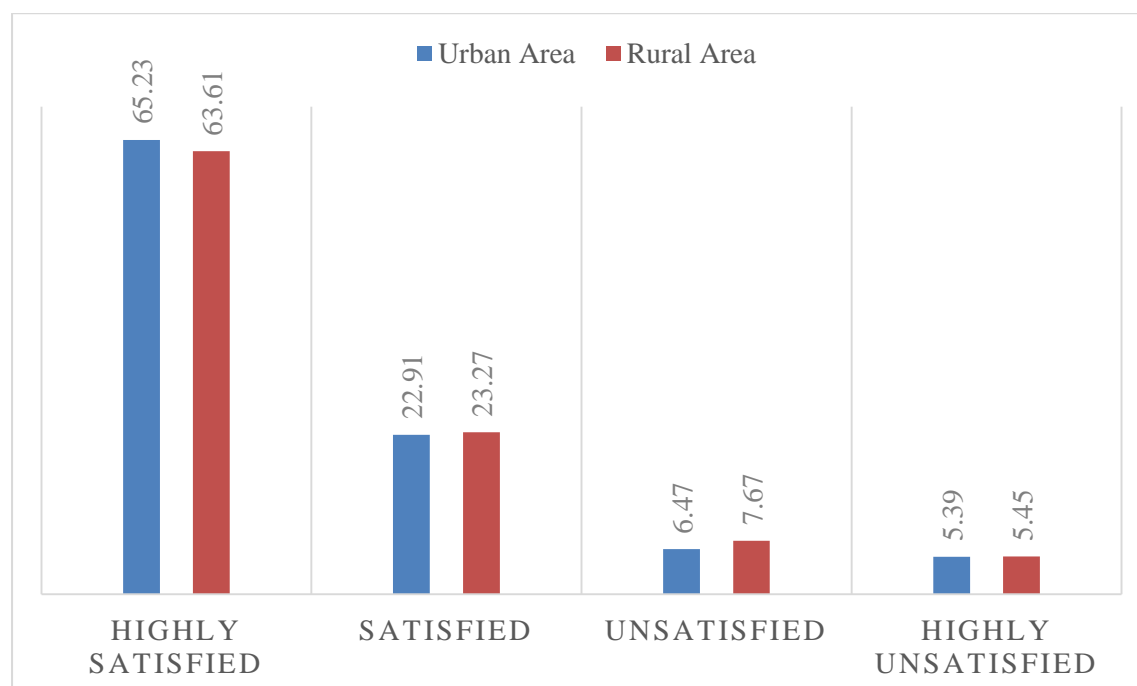


Figure 3.40: Service Quality of Retail Market(Source: Field Survey, 2015)

3.17.2 Distance and Service Quality of Post Office

Again, there are 17 post offices in Shibpur Upazila. Most of them are within 3km radius for about 90% household. More than half of total households have their post office within 2 km. Thus, the location is convenient for most of the households (please see Figure: 3.41).

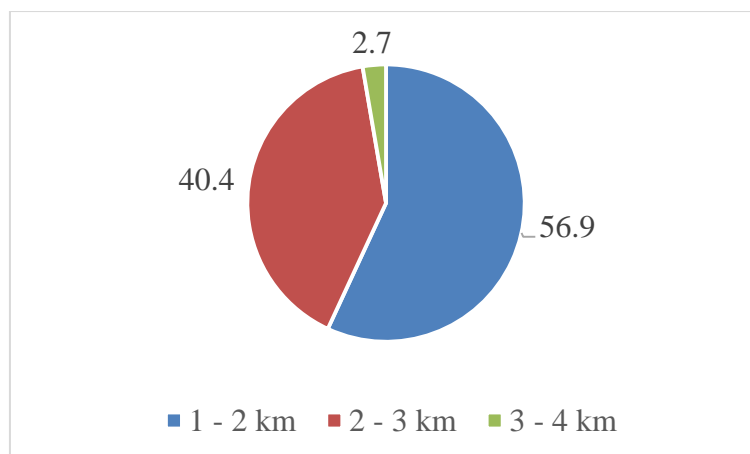


Figure3.41: Location and Distance of Post Office (Source: Field Survey, 2015)

In urban area, more than two third of total households are satisfied about the service quality of post office, but in rural areas the percentage is significantly low compared to the urban area (please see Figure: 3.42). So, the service facilities highly varied with the regions. In rural area, the percentage, those who are unsatisfied with the service of post office or even did not know about it as they did not get any service from post office, is significantly higher than in urban area. Thus, appropriate steps should be taken to improve the service facilities in rural area.

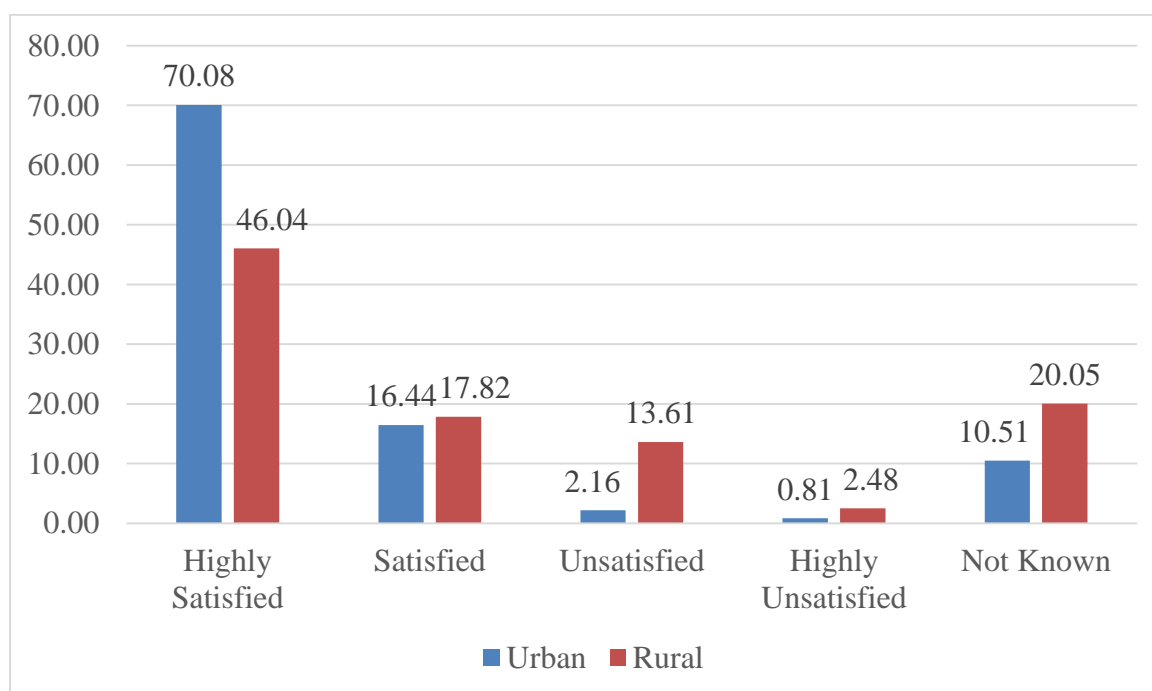


Figure 3.42: Service Quality of Post Office(Source: Field Survey, 2015)

3.17.3 Distance and Service Quality of Fire Service Station

There is a fire service station in Shibpur Upazila (BBS, 2011). It is located at Shibpur-Monohordi-Kishorgonj road at Shibpur. Distance of fire station is also convenient for almost all of the households (please see Figure: 3.43). They are located within 3km radius for about

all of the total households. Among them, for about two third of them has fire stations within 2 km radius of their households.

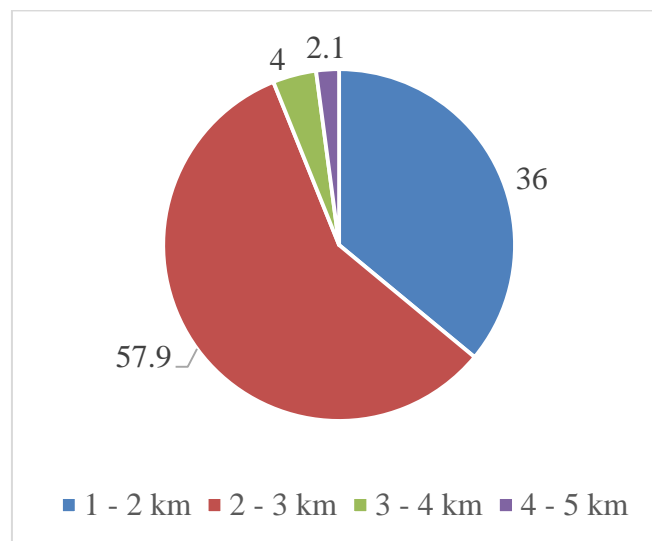


Table 3.43: Location and Distance of Fire Service(Source: Field Survey, 2015)

And in urban area, more than about two third of total households said that they are highly satisfied with the service of fire station (please see Figure: 3.44). On the other hand, in rural area the percentage is quite low as most of them said that they are not satisfied or did not even know about the service of fire station. This is because there is only one fire station and they give priority to the urban people than rural.

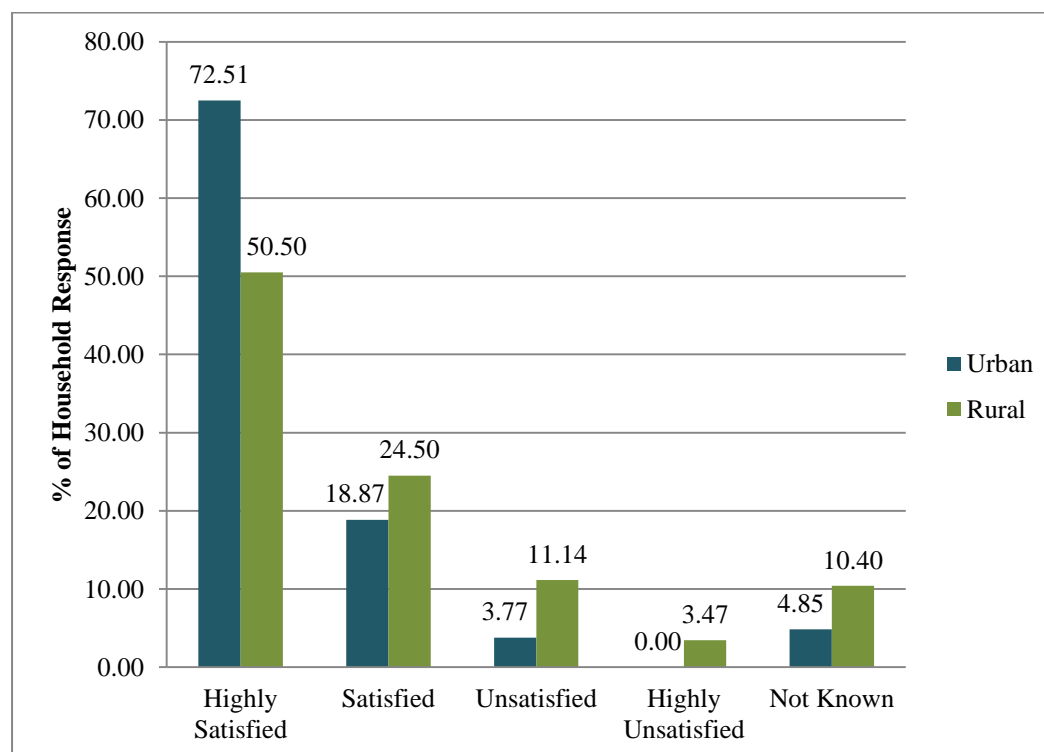


Figure 3.44: Service Quality of Fire Service(Source: Field Survey, 2015)

3.17.4 Distance and Service Quality of Playground

From table 3.5, it is found that, in Shibpur Upazila, for most of the households (about more than two third,) playground is within 2 km of their households. Thus it explains the reason why playing sports and watching playing sports are the most common recreational facilities in both urban and rural areas.

Table 3.5: Distance of Playground from Household

Distance	Number	Percent
1 - 2 km	543	70.1
2 - 3 km	232	29.9
Total	775	100.0

Source: Field Survey, 2015

And almost all of the respondents are satisfied or highly satisfied with their playground. So, it can be said that in Shibpur Upazila there are sufficient number of playgrounds for the households and they are well maintained (please see Figure: 3.45).

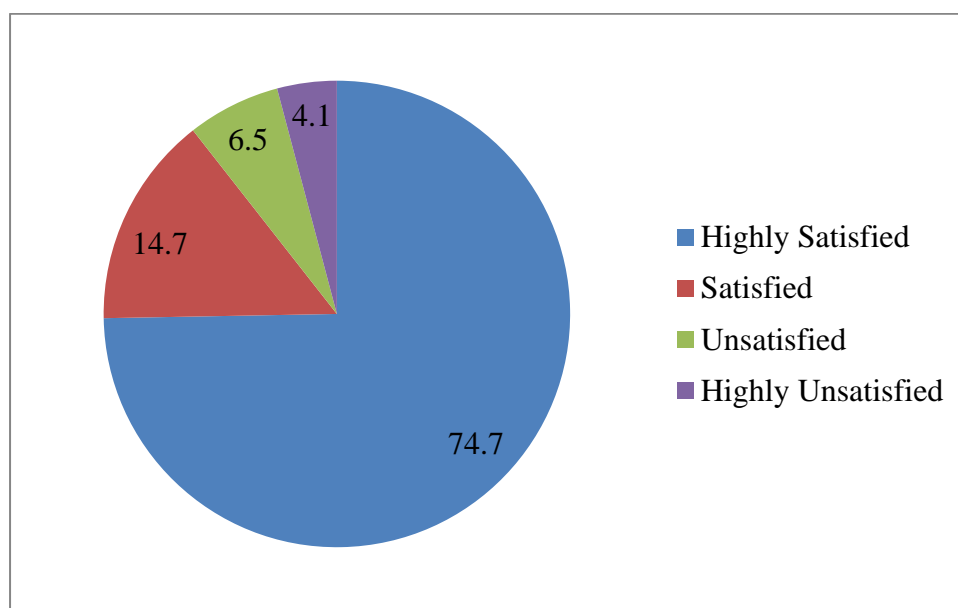


Figure 3.45: Service Quality of Play Ground (Source: Field Survey, 2015)

3.18 Problems of the Area

As discussed in the earlier section of this chapter, load shedding is the top problem in both of urban and rural area, which is generated from imbalance situation of demand and supply of electricity. The percentage of having road related problems and water logging problem is almost the same for both areas. The alarming finding is, in rural area one of the top problem is domestic violence on female which needs to be addressed. Thus the authority should give enough importance to these prioritized problems (see Figure: 3.46).

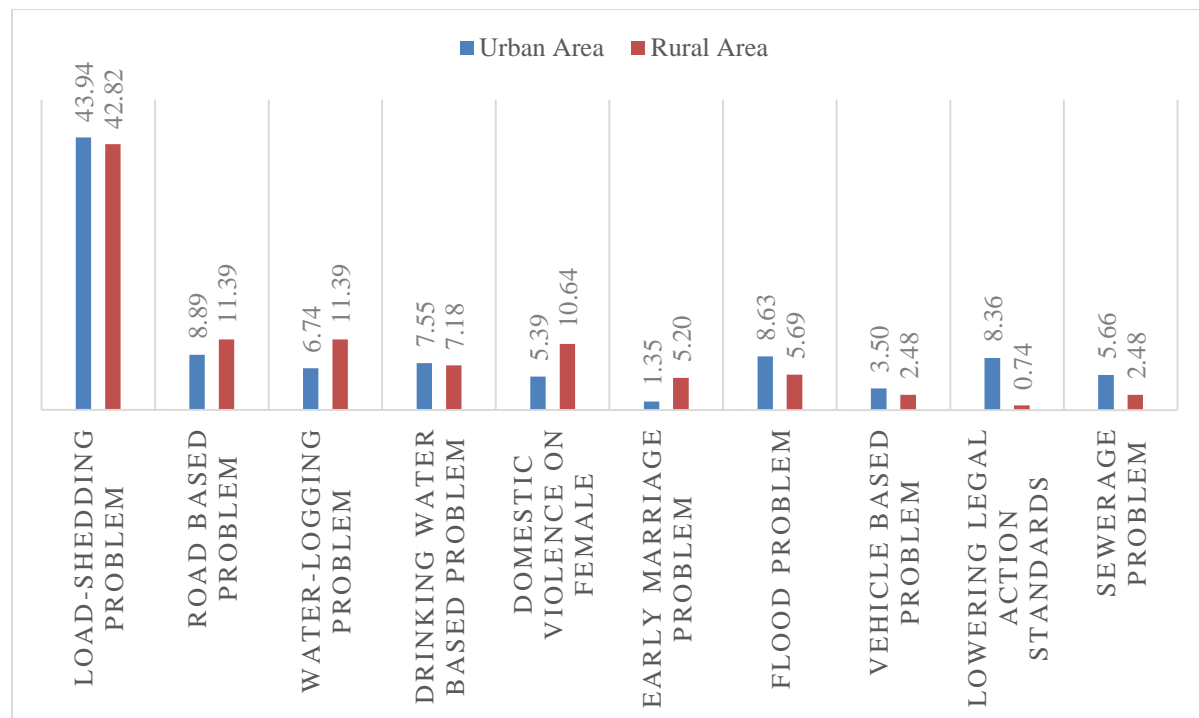


Figure3.46: Problems of the Area(Source: Field Survey, 2015)

3.19 Traditional Cultural Festival of the Area

The traditional cultural festivals data of the area collected from multiple ranks method. From Figure: 3.47, it is found that In Shibpur Upazila, about 40% of total respondents celebrate “International Mother Language Day” as their first choice of traditional culture festival. About one fourth of total respondents also described “literature and cultural competitions” as most important traditional cultural festival activities.

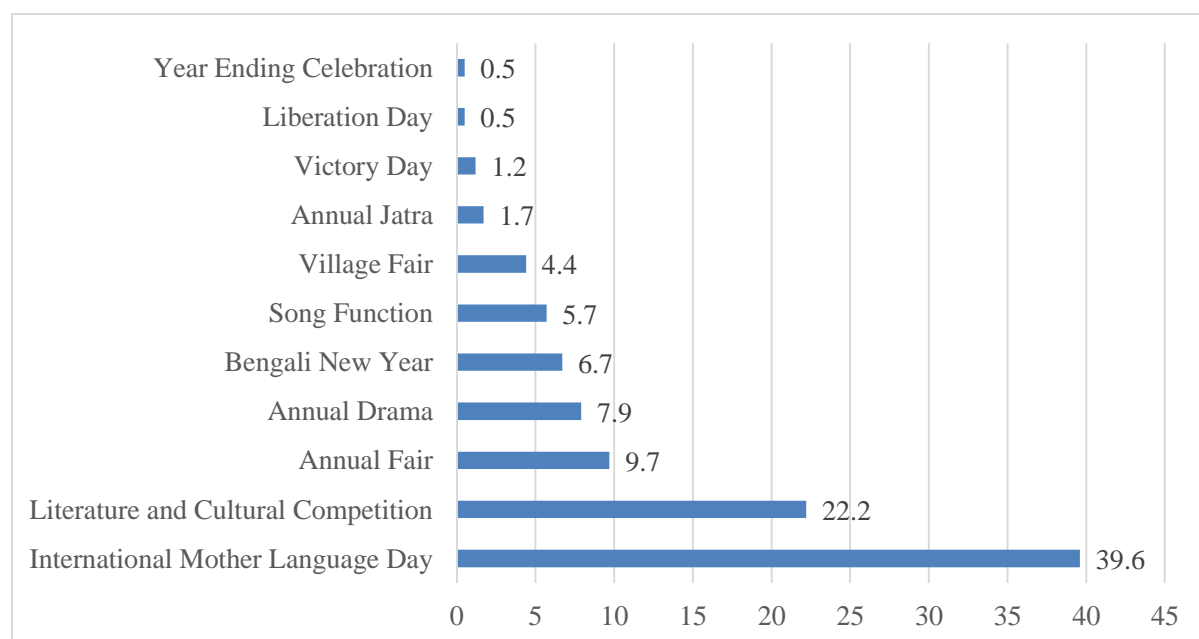


Figure3.47: Traditional Cultural Festival of the Area (Source: Field Survey, 2015)

3.20 People's Aspiration about the Development of the Upazila

The people's aspiration about the development of the area has also been collected from the respondents through multiple rank method. It plays a vital role to represent the importance of different people's aspiration about the development of the area. It has been found that about half of the total respondents wanted to improve their community service and electricity supply first of all. About more than one third of total respondent also wanted the improvement of road, drainage and increasing the number of educational institutions. On the other hand, setting up new industries is the second last ranking among them (please see Figure: 3.48).

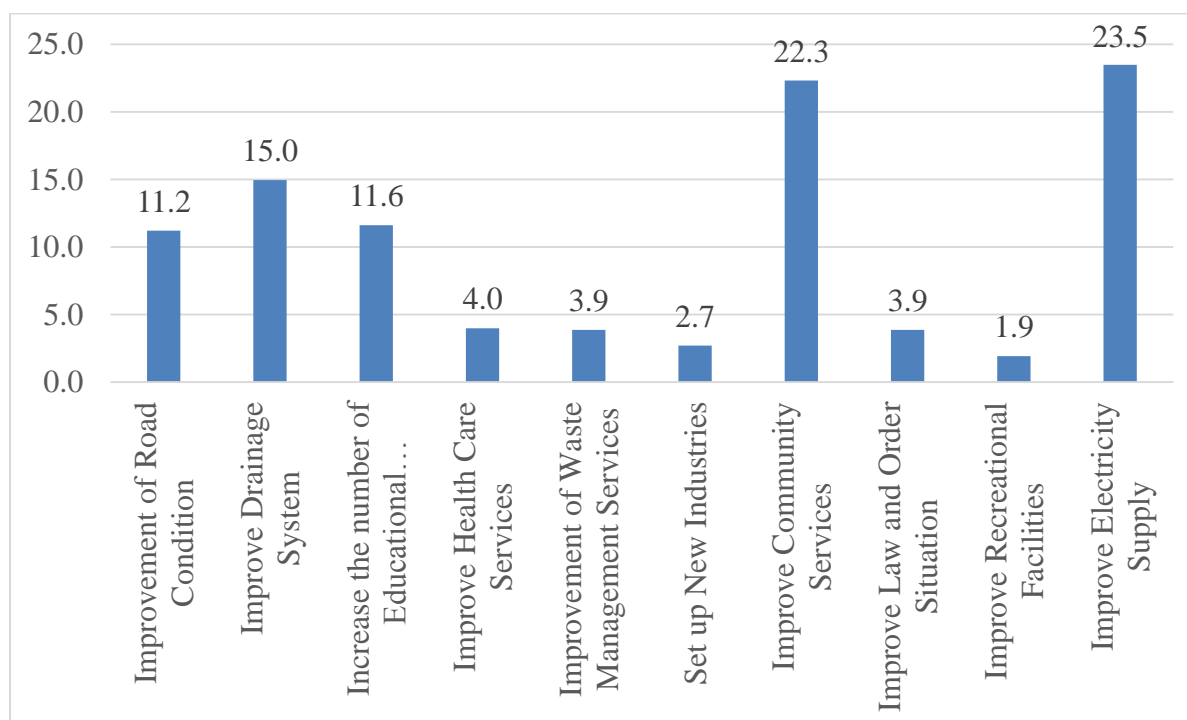


Figure3.48: Prioritization of Development Works (Source: Field Survey, 2015)

Chapter 4: Conclusion and Policy Framework

Shibpur Upazila is on the edge of entering in “Demographic Bonus” window within the coming years as the percentage of working people is high and will increase in the near future. So, there is immense need to build skilled and educated youth generation. But it has been found that the level of education of this area is not satisfactory. Moreover, there is not enough vocational and youth training centers. One of the main reasons behind it is the very high student-teacher ratio and lacking of qualified teachers. So, concerned authorities should pay attention to the issues of the Upazila. Moreover, the Upazila’s main mode of communication is by road, and the condition of road is decent but because of lack of regular maintenance both rural and urban roads are deteriorating day by day. So, road authorities should take some necessary steps regarding it. In addition, electricity supply condition in this area is one of the main problems expressed by the most of the households especially in rural area, so Bangladesh Rural Electrification Board (BREB) should take some necessary steps. It should be bear in mind that development goes hand in hand with development of roads and electrification. Moreover, concerned authority should consider taking some steps regarding improvement of maternal and child health. Apart from these, this Upazila is in good condition regarding drinking water, recreational facilities, sanitation, law and order situation, retail markets etc.

References/Bibliography

BBS (2011) Bangladesh Population Census, Bangladesh Bureau of Statistics

Banglapedia (2016) Asiatic Society of Bangladesh

Cochran, W.G. (1963), Sampling Techniques, 2nd Ed., New York: John Wiley and Sons, Inc.

7th Five Year Plan (2015) General Economics Division (GED), Planning Commission,
Government of the People's Republic of Bangladesh

Websites: <http://www.lged.gov.bd/ViewMap2.aspx?DistrictID=24>

Annexure-I

গৃহায়ন ও গনপূর্ত মন্ত্রণালয় নগর উন্নয়ন অধিদপ্তর (ইউ ডি ডি)

প্রিপারেশন অব ডেভেলপমেন্ট প্লান ফর ফোরটিন উপজেলাস -প্যাকেজ-০২ এর আওতায়
শিবপুর ও রায়পুরা উপজেলা এবং ঈশ্বরগঞ্জ উপজেলার উন্নয়ন পরিকল্পনা প্রণয়ন কার্যক্রম
পরামর্শক প্রতিষ্ঠান : যৌথভাবে শেল্টেক কনসালটেন্ট প্রাঃ লিঃ ও আর্ক বাংলাদেশ লিঃ
আর্থ সামাজিক জরিপ প্রশ্নমালা-২০১৫

প্রশ্নমালা নংঃ জরিপের তারিখঃ সময়ঃ

সাক্ষাৎকার গ্রহণকারীর নামঃ সাক্ষাৎকার গ্রহণকারীর স্বাক্ষরঃ
.....

অধ্যায়-১ঃ খানার তথ্যঃ

১.১ অবস্থানঃ

ওয়ার্ড নংঃ মহল্লা/ঃ রোড নংঃ হোল্ডিং নংঃ
মৌজাঃ :

অধ্যায়-২ঃ তথ্যপ্রদানকারীর পারিবারিক তথ্যঃ

২.১ তথ্যপ্রদানকারীর নাম : ২.২ তথ্যপ্রদানকারীর মোবাইল নম্বরঃ
.....

২.৩ খানা/পরিবার প্রধানের নাম :
..... 1. 2.

২.৪ খানা প্রধানের পৈত্রিক বাড়ী এই এলাকায় কিনা? (ইউনিয়ন/ওয়ার্ডে)ঃ হ্যাঁ না; ২.৫ 'না' হলে কোথায়ঃ
.....

২.৬ কত বছর যাবৎ খানা প্রধান এখানে বসবাস করেনঃ

২.৭ এখানে চলে আসার কারণ (কোড)ঃ ☐ , ☐ , ☐ , ☐ ২.৭.১ অন্যান্য :
.....

কোড ২.৭ : এখানে চলে আসার কারণ

১. চাকরি/কর্মস্থল	২. বেকারত্ব	৩. দারিদ্র	৪. বৈবাহিক কারণ	৫. উচ্চ শিক্ষা
৬. সামাজিক অস্থিরতা	৭. ব্যবসা	৮. পারিবারিক কারণ	৯. পরিবেশগত কারণ	১০. অন্যান্য (উল্লেখ করুন)

২.৮ বসতবাড়ির ধরণ (কোড):

কোড ২.৮ঃ বসতবাড়ির ধরণ

১.পাকা	২. আধা-পাকা	৩. কাঁচা(টিন)	৪. খুপড়ি	৫. অন্যান্য:
--------	-------------	---------------	-----------	--------------

২. ৯ মালিকানার ধরন (কোড)ঃ

২.৯.১ অন্যান্যঃ

কোড ২.৯ঃ মালিকানার ধরন

১. একক	২. যৌথ	৩. সরকারি	৪. ভাড়া (মালিকানাহীন)
--------	--------	-----------	------------------------

২.১০ মালিকানার উৎস (কোড)ঃ

২.১০.১ অন্যান্যঃ

কোড ২.১০ঃ মালিকানার উৎস

১.উত্তরাধিকার	২. দান	৩. সরকারি লিজ/বরাদ্দ	৪. ক্রয়
---------------	--------	----------------------	----------

২.১১ বসবাসের মেয়াদকাল (কোড)ঃ

কোড ২.১১ঃ বসবাসের মেয়াদকাল

১. ০-৫	২. ৬-১০	৩. ১১-১৫	৪. ১৬-২০	৫) ২০ এর অধিক
--------	---------	----------	----------	---------------

২.১২ নিজস্ব জমির পরিমাণ (একরে)ঃ..... ২.১২.১ বসত বাড়ীর জমির পরিমাণ (একরে)ঃ..... ২.১২.২ কৃষি জমির পরিমাণ (একরে)ঃ.....

২.১২.৩ অন্যান্য(বাগান,পুকুর) জমির পরিমাণ (একরে)ঃ.....

২.১৩ ভূমিহীন হলে কি ভাবে থাকে?ঃ.....

২.১৪ নিচে উল্লিখিত বছরগুলোতে বর্তমান বসবাসস্থানের জমির দাম প্রতি শতকে কেমন ছিল?

২০০৭ [২.১৪.১]	২০০৯ [২.১৪.২]	২০১১ [২.১৪.৩]	২০১৩ [২.১৪.৪]	২০১৫ [২.১৪.৫]

২.১৫ খানার সদস্যদের জনমিতিক তথ্যঃ

সদস্য নং	খানা প্রধানের সাথে সম্পর্ক (কোড)	বয়স (বছর)	লিঙ্গ (কোড)	বৈবাহিক অবস্থা (কোড)	শিক্ষা (কোড)	বৃত্তি / পেশা (কোড)
	২.১৫.*.১	২.১৫.*.২	২.১৫.*.৩	২.১৫.*.৪	২.১৫.*.৫	২.১৫.*.৬
১						
২						
৩						
৪						
৫						
৬						
৭						
৮						
৯						
১০						

নোটঃ তথ্যপ্রদানকারীর সদস্য নম্বর ও খানা প্রধান চিহ্নিত করুন

কোড ২.১৫.*.১ : খানা প্রধানের সাথে সম্পর্ক

১. খানা প্রধান	২. স্ত্রী/স্বামী	৩. পুত্র/কন্যা	৪. পিতা/মাতা	৫. ভাই/বোন
৬. ভাতিজা/ভাতিজি	৭. ভাগ্নে/ভাগ্নি	৮. নাতি/নাত্নি	৯. পুত্রবধূ/জামাতা	১০. অন্যান্য

কোড ২.১৪.*.৩ : লিঙ্গ

১. পুরুষ	২. মহিলা	৩. হিজড়া
----------	----------	-----------

কোড ২.১৫.*.৪ : বৈবাহিক অবস্থা

১. অবিবাহিত	২. বিবাহিত	৩. বিধবা/বিপত্নিক	৪. তালাক প্রাপ্ত	৫. পৃথক	৬. পরিত্যক্ত	৭. অন্যান্য
-------------	------------	-------------------	------------------	---------	--------------	-------------

কোড ২.১৫.*.৫ : শিক্ষা

১. নিরক্ষর	২. প্রাথমিক	৩. নিম্ন-মাধ্যমিক	৪. মাধ্যমিক/দাখিল	৫. এইচ.এস.সি/আলিম
৬. ডিগ্রি/অনার্স/ফাজিল	৭. মাস্টার্স/কামিল/*	৮. টেকনিক্যাল সার্টিফিকেট	৯. অন্যান্য	

*(উল্লেখ করুনঃ প্রকৌশলী/ডাক্তার/কৃষিবিদ/এডভোকেট/নগর পরিকল্পনাবিদ, প্রভৃতি)

কোড ২.১৫.*.৬ : বৃত্তি/পেশা

১. ছাত্র	২. গৃহিণী	৩. কর্মজীবী	৪. অবসর প্রাপ্ত	৫. বেকার	৬. অন্যান্য
----------	-----------	-------------	-----------------	----------	-------------

অধ্যায়-৩ঃ পেশা ও আয়-ব্যয় সম্পর্কিত তথ্য

পেশা ও উপার্জনের তথ্য (শুধুমাত্র কোড এ বৃত্তির মান ৩ এর জন্য প্রযোজ্য)

সদস্য নং	প্রধান পেশা					সহায়ক পেশা - ১ঃ নিয়মিত					সহায়ক পেশা - ২ঃ স্বাভাবিক				
	পেশা		উপার্জন		কর্মস্থলের	পেশা		উপার্জন		কর্মস্থলের	পেশা		উপার্জন		কর্মস্থলের
	কোড	নাম	ধরন	পরিমাণ	দুরত্ব	কোড	নাম	ধরন	পরিমাণ	দুরত্ব	কোড	নাম	ধরন	পরিমাণ	দুরত্ব
	৩.১*.১	৩.১*.২	৩.১*.৩	৩.১*.৪	৩.১*.৫	৩.১*.৬	৩.১*.৭	৩.১*.৮	৩.১*.৯	৩.১*.১০	৩.১*.১১	৩.১*.১২	৩.১*.১৩	৩.১*.১৪	৩.১*.১৫

কোড ৩.১*.১, ৩.১*.৬, ৩.১*.১১ : পেশা

১. চাকরি	২.৫. বৃহৎ ব্যবসায়ী	৫.কারিগরি পেশা	৬. ঐতিহ্যগত পেশা
১.১. সরকারি/স্বায়ত্বশাসিত সংস্থায়	৩. শ্রমিক	৫.১. বিদ্যুৎ মিস্ত্রি	৬.১. কামার
১.২. বেসরকারি অফিসের কর্মী	৩.১. কৃষি কাজে নিয়োজিত	৫.২. রাজ মিস্ত্রি	৬.২. কুমার
১.৩. পরিবার পর্যায়ে নিয়োজিত কর্মী	৩.২. শিল্প কারখানায় নিয়োজিত	৫.৩. রড মিস্ত্রি	৬.৩. জেলে
২. ব্যবসা	৩.৩. নির্মাণ কাজে নিয়োজিত	৫.৪. স্যানিটারি মিস্ত্রি	৬.৪. তাঁতি
২.১. ফেরিওয়ালা	৩.৪. পরিবহন কাজে নিয়োজিত	৫.৫. কাঠমিস্ত্রি	৬.৫. ঘরামি
২.২. ক্ষুদ্র ব্যবসায়ী	৩.৫. সেবাখাত শ্রমিক	৫.৬. রং মিস্ত্রি	৬.৬. বাশের দ্রব্যাদি প্রস্তুতকারী
২.৩. দোকান ব্যবসায়ী	৩.৬. দিন মজুর	৫.৭. ফ্রিজ/এসি মিস্ত্রি	৬.৭. বেত মিস্ত্রি
২.৪. মাঝারি ব্যবসায়ী	৪. পেশাজীবী	৫.৮. ইলেকট্রনিক যন্ত্রপাতি	৬.৮. গাছি

কোড ৩.১*.৩, ৩.১*.৮, ৩.১*.১৩ : উপার্জনের ধরন

১. মাসিক বেতন	২. দৈনিক মজুরী	৩. কাজ অনুযায়ী মূল্য	৪. নিজস্ব প্রতিষ্ঠানে কর্মরত	৫. বিনা বেতনে কর্মরত	৬. অন্যান্য
---------------	----------------	-----------------------	------------------------------	----------------------	-------------

কোড ৩.১*.৪, ৩.১*.৯, ৩.১*.১৪ : উপার্জনের পরিমাণ

১. ৫০০০ এর কম	২. ৫০০০-১০০০০	৩. ১০০০১-১৫০০০	৪. ১৫০০১-২০০০০	৫. ২০০০১-২৫০০০	৬. ২৫০০১-৩০০০০	৭. ৩০০০০ এর বেশি
---------------	---------------	----------------	----------------	----------------	----------------	------------------

কোড ৩.১*.৫, ৩.১*.১০, ৩.১*.১৫ : কর্মস্থলের দুরত্ব

১. আবাসস্থল	২. ০.৫ কি.মি এর কম	৩. ০.৫ কি.মি-১ কি.মি	৪. ১ কি.মি-২ কি.মি	৫. ২ কি.মি-৫ কি.মি	৬. ৫ কি.মি.র অধিক
-------------	--------------------	----------------------	--------------------	--------------------	-------------------

৩.২.১১ পারিবারিক আয়ের তথ্যঃ

৩.২.১ আয়ের উৎস (কোড)ঃ

, , ,

৩.২.১ অন্যান্য :

কোড ৩.২.১ : আয়ের উৎস

১. বেতন	২. বাড়ি/ফ্ল্যাট ভাড়া	৩. ব্যবসা	৪. মজুরী	৫. কৃষি	৬. হাঁস, মুরগী, গরু, ছাগল পালন	
৭. মৎস্য চাষ	৮. কুটির শিল্প	৯. রেমিট্যান্স (বৈদেশিক আয়)	১০. অবসর ভাতা	১১. বাগান	১২. লিজ	১৩. অন্যান্য

৩.২.২ মাসিক আয়ঃ

উৎস	৩.২.২.১	৩.২.২.২	৩.২.২.৩	৩.২.২.৪	৩.২.২.৫	৩.২.২.৬	৩.২.২.৭	৩.২.২.৮	৩.২.২.৯	৩.২.২.১০	৩.২.২.১১	৩.২.২.১২	৩.২.২.১৩	মোট
মাসিক আয়														

৩.৩ পারিবারিক ব্যয়ের তথ্যঃ

৩.৩.১ ব্যয়ের খাত (কোড)ঃ , , , , , , ৩.৩.২ অন্যান্য :

কোড ৩.৩.১ : ব্যয়ের খাত

১. নিজস্ব বাড়ি রক্ষণাবেক্ষণ		২. বাড়ি ভাড়া (সার্ভিস চার্জসহ)		৩. ইউটিলিটি		৪. সংবাদপত্র , সাহায্যকারীর বেতন ইত্যাদি		৫. খাদ্য			
৬. যাতায়াত	৭. পরিচ্ছদ	৮. শিক্ষা	৯. স্বাস্থ্য	১০. উৎসব		১১. বিনোদন		১২. কিস্তি পরিশোধ		১৩. অন্যান্য	

ধর্মীয় অনুষ্ঠানঃ যেমন ঈদ, পূজা, বড় দিন. বৌদ্ধ পূর্ণিমা ইত্যাদি

৩.৩.২ মাসিক ব্যয়ঃ

খাত	৩.৩.২.১	৩.৩.২.২	৩.৩.২.৩	৩.৩.২.৪	৩.৩.২.৫	৩.৩.২.৬	৩.৩.২.৭	৩.৩.২.৮	৩.৩.২.৯	৩.৩.২.১০	৩.৩.২.১১	৩.৩.২.১২	৩.৩.২.১৩	মোট
মাসিক ব্যয়														

৩.৩.৩ বিনিয়োগ করেন কিনা? ☐ হ্যাঁ ☐ না ৩.৩.৩.১ উত্তর হ্যাঁ হলে বিনিয়োগের পরিমাণ(টাকায়)ঃ

৩.৩.৪ সঞ্চয় করেন কিনা? ☐ হ্যাঁ ☐ না ৩.৩.৪.১ উত্তর হ্যাঁ হলে সঞ্চয়ের পরিমাণ বৎসরে(টাকায়)ঃ

অধ্যায় ৪: প্রাকৃতিক দুর্যোগ বিষয়ক প্রশ্নাবলী

☐ ☐ ☐ ☐ ☐ ☐

৪.১ প্রাকৃতিক দুর্যোগের নাম (কোড): , , , , , , ৪.১.১ অন্যান্য:.....

কোড: ৪.১: প্রাকৃতিক দুর্যোগের নাম

১. বন্যা	২. খরা	৩. অতিবৃষ্টি	৪. অনাবৃষ্টি	৫. মঙ্গা	৬. ঘূর্ণিঝড়	৭. টর্নেডো	৮.	৯. অন্যান্য
----------	--------	--------------	--------------	----------	--------------	------------	----	-------------

৪.১.২ প্রাকৃতিক দুর্যোগের ধরণঃ

দুর্যোগ	৪.১.২.১	৪.১.২.২	৪.১.২.৩	৪.১.২.৪	৪.১.২.৫	৪.১.২.৬	৪.১.২.৭	৪.১.২.৮	মোট
কত দিন পর পর									

হয়									
-----	--	--	--	--	--	--	--	--	--

৪.২ সর্বশেষ দুর্যোগের বছর (সাল):

৪.৩ দুর্যোগে কোন ক্ষয়ক্ষতি হয়েছে কি না? ☐ হ্যাঁ ☐ না

৪.৩.১ উত্তর হ্যাঁ হলে ক্ষয়ক্ষতির পরিমাণ (টাকায়):

অধ্যায়-৫ঃ অবকাঠামোগত সুবিধাদি

৫.১ যাতায়াত সুবিধাদির তথ্যঃ

৫.১.১ বাসস্থানের নিকটতম যাতায়াত মাধ্যমঃ

1.

সড়কপথ

2.

জলপথ

3.

রেলপথ

৫.১.১.১ উত্তর সড়কপথ হলে, রাস্তার ধরন (কোড)ঃ

১. বিটুমিনাস	২. ঢালাই	৩. হেরিংবোন	৪. ব্রিকসোলিং	৫. কাঁচা
--------------	----------	-------------	---------------	----------

৫.১.১.২ রাস্তার নামঃ

৫.১.১.৩ উত্তর জলপথ হলে, পথের ধরন (কোড)ঃ

কোড ৫.১.১.৩ : জলপথের ধরন

১. বছরব্যাপি নাব্য নদী/খাল	২. ঋতুভিত্তিক নাব্য নদী/খাল	৩. বদ্ধজলাশয়/বিল
----------------------------	-----------------------------	-------------------

৫.১.১.৪ জলপথের নামঃ

৫.১.২ বাসস্থান হতে নিকটতম পথে যাতায়াতের সংযোগ (কোড)ঃ

কোড ৫.১.২ : যাতায়াতের সংযোগ

১. সরাসরি	২. হালট	৩. সরু হাটাপথ	৪. ক্ষেতের আইল	৫. সাঁকো	৬. নৌ-পথ
-----------	---------	---------------	----------------	----------	----------

৫.১.৩ রাস্তার অবস্থা (কোড)ঃ

কোড ৫.১.৩ : রাস্তার অবস্থা

১. ভালো	২. সাময়িক জলমগ্ন	৩. ঋতুভিত্তিক জলমগ্ন	৪. ভাঙ্গাচোরা	৫. বৃষ্টি-গর্তবহুল	৬. ধ্বসবহুল
---------	-------------------	----------------------	---------------	--------------------	-------------

৫.১.৪ মেরামতের সময়কাল (কোড)ঃ

কোড ৫.১.৪ : মেরামতের সময়কাল

১. প্রতিবছর	২. দুই তিন বছর পর পর	৩. অনিয়মিত	৪. চরম দূরবস্থায় পৌছালে
-------------	----------------------	-------------	--------------------------

অত্যাৱশ্যকীয় ইউটিলিটি সার্ভিস সমূহের তথ্যঃ

৫.২ উৎস/শক্তির উৎস/তথ্যঃ

৫.২.১ জ্বালানির উৎস (কোড)ঃ

৫.২.১.১ অন্যান্যঃ

কোড ৫.২.১ : জ্বালানির উৎস

১. সিলিন্ডার গ্যাস	২. বায়োগ্যাস	৩. কেরোসিন	৪. বৈদ্যুতিক হিটার	৫. লাকড়ি/ভূষি	৬. গোবর	৭. অন্যান্য
--------------------	---------------	------------	-----------------------	-------------------	---------	-------------

৫.২.২ আলোর উৎস (কোড): ৫.২.২.১ অন্যান্য: কোড ৫.২.২ : আলোর উৎস

১. বিদ্যুৎ	২. কেরোসিন বাতি	৩. মোমবাতি	৪. জেনারেটর	৫. বায়োগ্যাস বাতি	৬. সৌরশক্তি	৭. অন্যান্য
------------	--------------------	---------------	----------------	-----------------------	-------------	-------------

৫.২.৩ উত্তর বিদ্যুৎ হলে, বিদ্যুৎ প্রাপ্যতা (কোড): ৫.২.৩.১ অন্যান্য কোড ৫.২.৩ : বিদ্যুৎ প্রাপ্যতা

১. নিরবচ্ছিন্ন	২. রুটিন লোডশেডিং	৩. অনিয়মিত	৪. চরম অপ্রাপ্যতা
----------------	-------------------	-------------	-------------------

৫.৩ খাবার পানির তথ্যঃ

৫.৩.১ খাবার পানির উৎস (কোড): ৫.৩.১.১ অন্যান্য কোড ৫.৩.১ : খাবার পানির উৎস

১. পাইপ লাইন সরবরাহ	২. নিজস্ব চাপকল	৩. গণ চাপকল	৪. গণ কল ব্যবস্থা	৫. কুয়া	৬. খোলা জলাশয়
---------------------	-----------------	-------------	-------------------	----------	----------------

৫.৩.২ খাবার পানির মান (কোড): কোড ৫.৩.২ : খাবার পানির মান

১. অত্যন্ত সন্তোষজনক	২. সন্তোষজনক	৩. গ্রহণযোগ্য	৪. অসন্তোষজনক
----------------------	--------------	---------------	---------------

৫.৩.৩ উত্তর অসন্তোষজনক হলে (কোড): কোড ৫.৩.৩ : অসন্তোষের কারণ

১. আর্সেনিক	২. আয়রন/লৌহ	৩. দুর্গন্ধ	৪. জীবাণু/ প্রাণী	৫. জৈব যৌগ	৬. রাসায়নিক দ্রব্য	৭. অদ্রবনীয় দ্রব্য
-------------	--------------	-------------	-------------------	------------	---------------------	---------------------

৫.৩.৪ পানির উৎসের দূরত্ব (কোড): কোড ৫.৩.৪ : পানির উৎসের দূরত্ব

১. ০-০.২৫ কি.মি	২. ০.২৫-০.৫ কি.মি	৩. ০.৫ কি.মি এর অধিক
-----------------	-------------------	----------------------

৫.৪ পয়নিষ্কাশন তথ্যঃ

৫.৪.১ পয়নিষ্কাশন ব্যবস্থা (কোড): কোড ৫.৪.১ : পয়নিষ্কাশন ব্যবস্থা

১. জলাবদ্ধ পায়খানা	২. পিট ল্যাট্রিন	৩. খোলা জায়গা
---------------------	------------------	----------------

৫.৪.২ পয়বর্জ্য শোধনঃ 1. শোধিত 2. অশোধিত

৫.৪.৩ উত্তর শোধিত হলে, শোধন ব্যবস্থার ধরন (কোড): অন্যান্য: কোড ৫.৪.৩ : শোধন ব্যবস্থার ধরন

১. শোষণ কূপ	২. সেপটিক ট্যাংক	৩. সেপটিক ট্যাংক ও শোষণ কূপ	৪. স্যুরেজ নেটওয়ার্ক	৫. অন্যান্য
-------------	------------------	-----------------------------	-----------------------	-------------

৫.৪.৪ উত্তর অশোধিত হলে, 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. <

৫.৫ আবর্জনা ব্যবস্থাপনা তথ্যঃ

৫.৫.১ আবর্জনা অপসারণ ব্যবস্থাঃ বাড়ি থেকে সংগ্রহ নিজস্ব ব্যবস্থাপনা

৫.৫.২ নিজস্ব ব্যবস্থাপনা হলে, ময়লা ফেলার স্থান (কোড)ঃ ৫.৫.৩ অন্যান্যঃ কোড ৫.৫.২ ও ময়লা ফেলার স্থান

১. নির্দিষ্ট ডাষ্টবিন	২. বাড়ির সীমানায় মাটির গর্ত	৩. বাড়ির আশে পাশের নীচু জমি	৪. খাল/নদী/ডোবা	৫. রাস্তার ধার	৬. অন্যান্য
-----------------------	-------------------------------	------------------------------	-----------------	----------------	-------------

৫.৫.৪ বাড়ি থেকে সংগৃহীত হলে, আবর্জনা সংগ্রহের সময়সূচী (কোড)ঃ ৬.৫.৫ অন্যান্যঃ কোড ৫.৫.৪ ও সংগ্রহের সময়

১. প্রতি দিন	২. প্রতি ২ দিন পর পর	৩. অনিয়মিত	৪. অন্যান্য
--------------	----------------------	-------------	-------------

৫.৫.৬ আবর্জনা ফেলার স্থানের দূরত্ব (কোড) : কোড ৫.৫.৬ ও আবর্জনা ফেলার স্থানের দূরত্ব

১. নিজ বাড়ির সীমানায়	২. ০-৫০ মিঃ	৩. ৫১-১০০ মিঃ	৫. ১০০ মিঃ এর উপরে
------------------------	-------------	---------------	--------------------

অধ্যায়-৬ঃ সামাজিক সুবিধাদি

স্বাস্থ্য বিষয়ক তথ্যঃ

৬.১ গত ৬ মাসে আপনার পরিবারের কেউ অসুস্থ হয়েছিল কি?

১. হ্যাঁ ২. না ৩. অবগত নন

৬.২ 'হ্যাঁ' হলে,

সদস্য (ওউ)	অসুস্থতা (কোড)	চিকিৎসা নিয়েছিলেন কি? হ্যাঁ = ১; না = ২	হ্যাঁ হলে কোথায় গিয়েছিলেন (কোড)	না হলে কেন যাননি (কোড)
৬.২.*.১	৬.২.*.২	৬.২.*.৩	৬.২.*.৪	৬.২.*.৫

কোড ৬.২.*.২ ও অসুস্থতা

১. জ্বর	২. সর্দি/কাশি	৩. ডাইরিয়া/আমাশয়	৪. জন্ডিস	৫. টাইফয়েড	৬. নিউমোনিয়া
৭. হাম	৮. পোলিও	৯. ম্যালেরিয়া	১০. জল বসন্ত	১১. ডেঙ্গু জ্বর	১২. হৃদরোগ

১৩. ধনুস্টংকার	১৪. কুমিরোগ	১৫. বাত জ্বর	১৬. হাপানী/শ্বাস কষ্ট	১৭. যৌন রোগ	১৮. গলগন্ড
১৯. হাড় ক্ষয় রোগ	২০. ডায়াবেটিস	২১. চর্মরোগ/চুলকানি/পাঁচড়া	২২. স্ত্রীরোগ	২৩. জলাতঙ্ক	২৪. অন্যান্য

কোড ৬.২.*.৪ : চিকিৎসার জন্য কোথায় যান

১. ডিগ্রিধারী ডাক্তার	২. প্রাইভেট ক্লিনিক	৩. সরকারি হাসপাতাল	৪. কমিউনিটি ক্লিনিক	৫. উপজেলা স্বাস্থ্য কেন্দ্র
৬. গ্রাম্য চিকিৎসক	৭. হোমিও ডাক্তার	৮. হেকিম/কবিরাজ	৯. দাতব্য চিকিৎসালয়	১০. ওবা/ফকির
১১. রাস্তার দেশীয় ঔষধ বিক্রেতা	১২. অন্যান্য (উল্লেখ করুন):			

কোড ৬.২.*.৫ : চিকিৎসা কেন্দ্রে না যাওয়ার কারণ

১. অর্থনৈতিক অসামর্থ্য	২. প্রয়োজনবোধ করেননি	৩. ঔষধালয় থেকে ঔষধ কিনে খেয়েছেন	৪. চিকিৎসা কেন্দ্রের দূরত্ব বেশি	৫. অন্যান্য
------------------------	-----------------------	-----------------------------------	----------------------------------	-------------

৬.৩ চিকিৎসালয়ের তথ্য (বিস্তারিত হাসপাতাল থেকে)

ধরন (কোড)	অবস্থান	দূরত্ব	সেবাসমূহ (কোড)	সেবার মান (কোড)	স্থান সংকুলান (কোড)
৬.৩.*.১	৬.৩.*.২	৬.৩.*.৩	৬.৩.*.৪	৬.৩.*.৫	৬.৩.*.৬

কোড ৬.৩.*.১ : চিকিৎসালয়ের ধরন

১. সরকারি হাসপাতাল	২. প্রাইভেট ক্লিনিক	৩. ডাক্তারের চেম্বার	৪. দাতব্য চিকিৎসালয়	৫. কমিউনিটি ক্লিনিক	৬. কবিরাজ ঘর	৭. অন্যান্য
--------------------	---------------------	----------------------	----------------------	---------------------	--------------	-------------

কোড ৬.৩.*.৪ : চিকিৎসালয়ের সেবাসমূহ

১. সাধারণ চিকিৎসা	২. বিশেষজ্ঞ চিকিৎসা (উ.ক)	৩. প্রসূতি ও নবজাতক	৪. মাতৃ স্বাস্থ্য	৫. শিশু স্বাস্থ্য	৬. অন্যান্য
-------------------	---------------------------	---------------------	-------------------	-------------------	-------------

কোড ৬.৩.*.৫ : সেবার মান

১. অত্যন্ত সন্তোষজনক	২. সন্তোষজনক	৩. গ্রহণযোগ্য	৪. অসন্তোষজনক	৫. হতাশাজনক
----------------------	--------------	---------------	---------------	-------------

কোড ৬.৩.*.৬ : স্থান সংকুলান

১. পর্যাপ্ত	২. কার্যোপযোগী	৩. অপ্রতুল	৪. অত্যন্ত অপ্রতুল
-------------	----------------	------------	--------------------

৬.৪ চিকিৎসা প্রাপ্তির সমস্যাসমূহ (কোড):

☐ ☐ ☐ ☐ ☐ ☐

কোড ৬.৪ : চিকিৎসা প্রাপ্তির

১. কমিউনিটি ক্লিনিক এর অভাব	২. ফ্রি চিকিৎসা কেন্দ্র নাই	৩. প্রয়োজনীয় ঔষধ পত্রের অভাব	৪. সরকারি ঔষধ পাওয়া যায় না	৫. ডাক্তার অপ্রতুল
৬. বিশেষজ্ঞ ডাক্তারের অভাব	৭. রোগ নির্ণয়ের সুবিধা নাই	৮. অপারেশন কক্ষ নাই	৯. হাসপাতাল দূরে	১০. চিকিৎসা বিষয়ক অজ্ঞানতা
১১. অন্যান্য (উল্লেখ করুন):				

৬.৫ চিকিৎসালয়ের অবকাঠামোর ধরন (কোড) :

কোড ৬.৫ : অবকাঠামোর ধরন

১. পাকা	২. সেমি-পাকা	৩. টিনের ছাদ/টিনের বেড়া	৪. টিনের চাল বাঁশ/খড়ি/মাটির বেড়া	৫. ছন/বেড়ার চাল খড়ি/বাঁশ/ছনের বেড়া
---------	--------------	--------------------------	------------------------------------	---------------------------------------

৬.৬ চিকিৎসালয়ের অবকাঠামোর অবস্থা (কোড) :

কোড ৬.৬ : অবকাঠামোর অবস্থা

১. চমৎকার	২. ভালো	৩. পুরাতন	৪. ধবংসমুখ
-----------	---------	-----------	------------

শিক্ষা বিষয়ক তথ্যঃ

৬.৭ পরিবারের সদস্যদের শিক্ষা ব্যবস্থাঃ

সদস্য (ওউ)	শ্রেণী	শিক্ষা প্রতিষ্ঠান		বাসস্থান থেকে দূরত্ব	যাওয়ার মাধ্যম (কোড)
		সরকারি (কোড)	বেসরকারি (কোড)		
	৬.৭.*.১	৬.৭.*.২	৬.৭.*.৩	৬.৭.*.৪	৬.৭.*.৫

কোড ৬.৭.*.২, ৬.৭.*.৩ : শিক্ষা প্রতিষ্ঠান

১. কিন্ডার গার্টেন	২. প্রাইমারি স্কুল	৩. হাই স্কুল/দাখিল মাদ্রাসা	৪. কলেজ/আলিম	৫. বিশ্ববিদ্যালয় কলেজ
৬. ডিগ্রি/ফাজিল মাদ্রাসা	৭. বিশ্ববিদ্যালয়/	৮. কারিগরি শিক্ষা প্রতিষ্ঠান	৯. প্রশিক্ষণ কেন্দ্র	

কোড ৬.৭.*.৫ : যাওয়ার মাধ্যম

১. পায়ে হাটা	২. সাইকেল	৩. রিক্সা	৪. ভ্যান	৫. ভটভটি
৬. ইজিবাইক	৭. অটো রিক্সা	৮. টেম্পু/হিউম্যান হলার	৯. বাস	১০. অন্যান্য

☐ ☐ ☐ ☐ ☐ ☐ ☐

৬.৮ শিক্ষা প্রতিষ্ঠানের সমস্যা (কোড)ঃ

, , , , , , ,

কোড ৬.৮ : শিক্ষা প্রতিষ্ঠানের সমস্যা

১. দক্ষ শিক্ষকের অভাব	২. উচ্চ ছাত্র শিক্ষক অনুপাত	৩. শিক্ষা উপকরণের অভাব	৪. বিজ্ঞানাগার নেই
৫. লাইব্রেরি নাই	৬. খেলার মাঠ নেই	৭. অপরিষ্কার অবকাঠামো	৮. জরাজীর্ণ- অবকাঠামো

৯. আসবাবপত্রের অভাব	১০. অদক্ষ পরিচালনা	১১. অন্যান্য (উল্লেখ করুন):
---------------------	--------------------	--------------------------------------

৬.৯ প্রাথমিক বিদ্যালয় গমনের উপযোগী বয়সের ছেলেমেয়ের বিদ্যালয় না যাওয়ার কারণ (কোড):

 , ,

কোড ৬.৯ : বিদ্যালয় না যাওয়ার কারণ

১. আর্থিক অসচ্ছলতা	২. পরিবারের জন্যে রোজগার	৩. শিক্ষায় পরিবারের অনীহা	৪. অন্যান্য:
--------------------	--------------------------	----------------------------	-----------------------

 , ,

৬.১০ প্রাথমিক/মাধ্যমিক ছাত্র-ছাত্রীদের বারে পড়ার কারণ (কোড)

কোড ৬.১০ : বারে পড়ার কারণ

১. আর্থিক অসচ্ছলতা	২. পরিবারের জন্যে রোজগার	৩. পড়তে অনীহা	৪. বাল্য বিবাহ	৫. অন্যান্য:
--------------------	--------------------------	----------------	----------------	-----------------------

অধ্যায়-৭: সেবা ও এলাকার সমস্যাসমূহ

৭.১ বিনোদনের তথ্য:

৭.১.১ ঘরোয়া বিনোদনের উপকরণ কী (কোড): , , , , ৭.১.১.১ অন্যান্য (উল্লেখ করুন):

.....

কোড ৭.১.১ : ঘরোয়া বিনোদনের উপকরণ

১. রেডিও	২. ক্যাসেট/ সিডি প্লেয়ার	৩. টেলিভিশন	৪. ঘরোয়া খেলার উপকরণ	৫. বই	৬. অন্যান্য
----------	---------------------------	-------------	-----------------------	-------	-------------

৭.১.২ ঘরোয়া বিনোদনের জন্য কি করেন (কোড): , , , , ৭.১.২.১ অন্যান্য (উল্লেখ করুন):

.....

কোড ৭.১.২ : ঘরোয়া বিনোদন

১. টেলিভিশন/রেডিও এর অনুষ্ঠান উপভোগ করেন	২. ঘরোয়া খেলা	৩. বই পড়া	৪. গান শোনা	৫. অন্যান্য
--	----------------	------------	-------------	-------------

৭.১.৩ বহির্বিনোদনের জন্য কি করেন (কোড): , , , , , ৭.১.৩.১ অন্যান্য (উল্লেখ করুন):

.....

কোড ৭.১.৩ : বহির্বিনোদন

১. খেলাধুলা	২. খেলা উপভোগ	৩. খোলা জায়গায় ভ্রমণ	৪. ক্লাব	৫. পার্ক	৬. চিড়িয়াখানা
৭. যাদুঘর	৮. পর্যটন স্থান	৯. মাছ ধরা	১০. বনভোজন	১১. সিনেমা	১২. অন্যান্য

৭.১.৪ বহির্বিনোদনের সমস্যাসমূহ (কোড): , , , , , ৭.১.৪.১ অন্যান্য (উল্লেখ করুন):

.....

কোড ৭.১.৪ : বহির্বিনোদনের সমস্যাসমূহ

১. অপ্রতুল চিত্ত বিনোদন ব্যবস্থা	২. রক্ষণাবেক্ষণ সমস্যা	৩. বিনোদন সরঞ্জামের অভাব	৪. কাল্পনিক বিনোদন পরিবেশের অভাব
৫. নিরাপত্তার অভাব	৬. অর্থনৈতিক অসামর্থ্য	৭. অন্যান্য	

৭.১.৫ খেলার মাঠ ও পার্ক এলাকায় কোন সমস্যা আছে কী? ১. হ্যাঁ ২. না

৭.১.৬ সমস্যা থাকলে সেগুলো কি কি ?

কোডঃ ৭.১.৬ : খেলার মাঠের সমস্যা

১. মাঠের পরিবেশ ভাল না	২. ময়লা আবর্জনা মাঠে জমা থাকে	৩. মাঠের আর্থশিক পুকুরে পরিণত হয়েছে
৪. মাস্তানদের দখলে	৫. চাঁদাবাজদের উপদ্রব	৬. মাঠ/পার্ক রক্ষণাবেক্ষণ করা হয় না
৭. প্রভাবশালীরা গরু চড়ায়	৮. আর্থশিক বেদখল হয়ে গেছে	৯. অন্যান্য

৭.২ প্রয়োজনীয় সেবাসমূহের তথ্যঃ

অন্যান্য প্রয়োজনীয় সেবাসমূহের দূরত্ব (বাড়ি থেকে) ও মান :

ক্রম নং	সেবা সমূহ	দূরত্ব (কি.মি)	সেবার মান (কোড)
		৭.২.*.১	৭.২.*.২
৭.২.১	কাঁচা বাজার		
৭.২.২	বিপণি কেন্দ্র		
৭.২.৩	উপাসনালয় (মসজিদ/ মন্দির/গীর্জা)		
৭.২.৪	পাঠাগার		
৭.২.৫	কমিউনিটি সেন্টার		
৭.২.৬	স্বাস্থ্যসেবা কেন্দ্র		
৭.২.৭	পোস্ট অফিস		
৭.২.৮	ফায়ার সার্ভিস		
৭.২.৯	পুলিশ ফাঁড়ি/পুলিশ বক্স		
৭.২.১০	বাস/ টেম্পো স্ট্যান্ড		
৭.২.১১	পাবলিক টয়লেট		
৭.২.১২	ঈদগাহ		
৭.২.১৩	কবরস্থান/ শ্মশান		
৭.২.১৪	মোবাইল/ফোন/ফ্যাক্স/ই-মেইলের দোকান		
৭.২.১৫	মিলনায়তন		
৭.২.১৬	সিনেমা হল		
৭.২.১৭	ব্যায়ামাগার		
৭.২.১৮	যুব সংগঠন /		
৭.২.১৯	মহিলাদের ক্লাব		
৭.২.২০	যাদুঘর		

৭.২.২১	খেলার মাঠ		
৭.২.২২	অন্যান্য (উল্লেখ করুন)		

কোড ৭.২.*.২ : সেবার মান

১. সন্তোষজনক	২. মোটামুটি	৩. সন্তোষজনক নয়	৪. হতাশাজনক	৫. জানা নাই
--------------	-------------	------------------	-------------	-------------

৭.৩ বিদ্যমান আইন-শৃঙ্খলা ও অপ-প্রথার তথ্য :

৭.৩.১ প্রবনতা ক্রমান্বয়ে এলাকার আইন-শৃঙ্খলার হুমকিসমূহ (কোড): , , , , , অন্যান্য (উল্লেখ করুন):

.....

কোড ৭.৩.১ : আইন-শৃঙ্খলার হুমকিসমূহ

১. ছিচকে চুরি	২. সিধেল চুরি	৩. ডাকাতি	৪. হিনতাই	৫. চাঁদাবাজি	৬. জমি/সম্পদ দখল	৭. দাঙ্গা	৮. খুন
৯. গুম	১০. ধর্ষণ	১১. অপহরণ	১২. মুক্তিপণ দাবী	১৩. এসিড সন্ত্রাস	১৪. আত্মহত্যা	১৫. অন্যান্য	

৭.৩.২ এলাকায় প্রচলিত অপ-প্রথাসমূহ (কোড): , , , , , অন্যান্য (উল্লেখ করুন):

.....

কোড ৭.৩.২ : অপ-প্রথাসমূহ

১. বাল্য বিবাহ	২. পুত্রের আশায় পুনঃ বিবাহ	৩. যৌতুক	৪. নারী নির্যাতন	৫. বাড়িফাঁক/ তাবিজ দিয়ে চিকিৎসা
৬. পুরুষ ডাক্তার দিয়ে মেয়েদের চিকিৎসা না করানো	৭. মেয়েদের চাকরিতে বাঁধা দেয়া	৮. অন্যান্য		

৭.৩.৩ আইন-শৃঙ্খলা রক্ষাকারী বাহিনীর ভূমিকা (কোড) :

কোড ৭.৩.৩ : আইন-শৃঙ্খলা রক্ষাকারী বাহিনীর ভূমিকা

১. অত্যন্ত সন্তোষজনক	২. সন্তোষজনক	৩. গ্রহণযোগ্য	৪. অসন্তোষজনক	৫. হতাশাজনক	৬. জানা নাই
----------------------	--------------	---------------	---------------	-------------	-------------

৭.৩.৪ এলাকার সমস্যাসমূহ গুরুত্বের ক্রম অনুসারে সাজান

সমস্যা	ক্রম	সমস্যা	ক্রম	সমস্যা	ক্রম
লোডশেডিং		যানবাহন সম্পর্কিত		বর্জ্য নিষ্কাশনের জায়গার অভাব	
রাস্তাঘাট সম্পর্কিত		আইন শৃঙ্খলার অবনতি		বিদ্যুৎ সমস্যা (লো-ভোল্টেজ, বিদ্যুৎ নাই)	
জলাবদ্ধতা		পয়ঃনিষ্কাশন		ভাল শিক্ষা প্রতিষ্ঠানের অভাব	
খাবার পানি সংক্রান্ত		বাজার অনেক দূরে		কর্ম-সংস্থান সমস্যা	
নারী নির্যাতন		দুঃস্থ মাতৃপ্রধান পরিবারের আধিক্য		ধর্মীয় গোঁড়ামী	
বাল্য বিবাহ		বহু বিবাহ			
				অন্যান্য (উল্লেখ করুন)	

অধ্যায়-৮: বিভিন্ন গুরুত্বপূর্ণ সরকারি প্রতিষ্ঠানের সেবার মান

৮.১ ইউনিয়ন পরিষদ/পৌরসভার সেবাসমূহের মান

ক্রম নং	সেবা সমূহ	সেবার মান (কোড)	ক্রম নং	সেবা সমূহ	সেবার মান (কোড)
৮.১.১	পানি সরবরাহ		৮.১.১১	পার্ক, খেলার মাঠ, কমিউনিটি স্থাপনা রক্ষণাবেক্ষণ	
৮.১.২	স্যানিটেশন		৮.১.১২	হোল্ডিং নাম্বার/ নাম	
৮.১.৩	কঠিন আবর্জনা অপসারণ		৮.১.১২	ভূমির সীমানা নির্ধারণ	
৮.১.৪	সড়ক বাতি		৮.১.১৪	গালিস	
৮.১.৫	ড্রেন ও রাস্তা পরিষ্কার		৮.১.১৫	পারিবারিক আদালত	
৮.১.৬	ইমারতের নক্সা অনুমোদন		৮.১.১৬	পশু জবাইয়ের স্থান পরিদর্শন ও মাংশের গুণগতমান নিশ্চিতকরণ	
৮.১.৭	নাগরিকত্ব সনদ প্রদান		৮.১.১৭	মশক নিধন	
৮.১.৮	জন্ম সনদ প্রদান		৮.১.১৮	কুকুর নিধন	
৮.১.৯	মৃত্যু সনদ প্রদান		৮.১.১৯	ইপিআই (টিকা) কার্যক্রম	
৮.১.১০	উত্তরাধিকার সনদ প্রদান		৮.১.২০	গণসচেতনতা বৃদ্ধিমূলক কর্মকাণ্ড	

কোড ৮.১ : সেবার মান

১. অত্যন্ত সন্তোষজনক	২. সন্তোষজনক	৩.গ্রহণযোগ্য	৪. অসন্তোষজনক	৫. হতাশাজনক	৬. জানা নাই
----------------------	--------------	--------------	---------------	-------------	-------------

অধ্যায়-৯ঃ ধর্মীয় ও সাংস্কৃতিক কর্মকাণ্ড

৯.১ ধর্মীয় সাংস্কৃতিক কর্মকাণ্ডের তথ্য :

৯.১.১ এলাকার সাংস্কৃতিক অনুষ্ঠানগুলি কী ? (কোড): , , , , , ৯.১.১.১ অন্যান্য (উল্লেখ করুন) :

কোড ৯.১.১ : এলাকার সাংস্কৃতিক অনুষ্ঠান

১. সাহিত্য ও সাংস্কৃতিক প্রতিযোগিতা	২. বাৎসরিক নাটক	৩.গানের অনুষ্ঠান	৪. বাৎসরিক যাত্রা/পালাগান	৫. বাৎসরিক মেলা
৬. আন্তর্জাতিক মাতৃভাষা দিবস	৭. স্বাধীনতা দিবস	৮. বিজয় দিবস	৯. অন্যান্য	

৯.২ এলাকার ঐতিহ্যবাহী উৎসবগুলি কী ? (কোড): , , , , , ৯.২.১ অন্যান্য (উল্লেখ করুন):

কোড ৯.২ : এলাকার ঐতিহ্যবাহী উৎসব

১. বাংলা নববর্ষ	২. চৈত্র সংক্রান্তি	৩.নবান্ন	৪. বসন্ত বরণ	৫. বর্ষা বরণ	৬. গ্রাম্য মেলা	৭. স্বাধীনতা দিবস
৮. একুশে ফেব্রুয়ারী	৯.পহেলা বৈশাখ	১০. অন্যান্য				

অধ্যায়-১০ঃ খানা সদস্যদের প্রতিদিনের ভ্রমণ সংক্রান্ত তথ্য

১০.১ পরিবারের সদস্যদের ভ্রমণ সংক্রান্ত তথ্যঃ

সদস্য নং (ওউ)	ভ্রমণ নং	ভ্রমণের উৎস (স্থান)	ভ্রমণের গন্তব্য (স্থান)	ভ্রমণের দূরত্ব	উদ্দিষ্ট স্থান (কোড)	ভ্রমণের সময়		বাহন (কোড)	সমস্যা (কোড)
						শুরু	শেষ		
	১০.১.*.১	১০.১.*.২	১০.১.*.৩	১০.১.*.৪	১০.১.*.৫	১০.১.*.৬	১০.১.*.৭	১০.১.*.৮	১০.১.*.৯

কোড ১০.১.*.৫ : উদ্দিষ্ট স্থান

১. কর্মস্থল	২. শিক্ষা প্রতিষ্ঠান	৩. কাঁচা বাজার	৪. দোকান/বিপণি বিতান
৫. আনন্দ ভ্রমণ/বিনোদন/খেলাধুলা	৬. আত্মীয় গৃহ	৭. অন্যান্য :	

কোড ১০.১.*.৮ : বাহন

১. বাহনহীন (পায়ে হাটা)	২. সাইকেল	৩. রিক্সা	৪. ভ্যান	৫. ভটভটি	৬. ইজিবাইক	৭. অটো রিক্সা
৮. টেম্পু/হিউম্যান হলার	৯. বাস	১০. অন্যান্য				

কোড ১০.১.*.৯ : সমস্যা

১. রাস্তা সংকীর্ণ	২. যানজট	৩. বাস স্টপেজ দূরে	৪. বাহন সংখ্যা কম	৫. জরাজীর্ণ রাস্তা
৬. গন্তব্যে যেতে বাহন পরিবর্তন	৭. ভাড়া বেশি	৮. অন্যান্য :		

অধ্যায়-১১ঃ সম্পদ সম্পর্কিত তথ্য

১১.১ উল্লেখযোগ্য কি কি সম্পদ আছে?

কোড ৯.২ : এলাকার ঐতিহ্যবাহী উৎসব

১. টেলিভিশন	২. মোবাইল ফোন	৩. রেডিও	৪. ক্যাসেট প্লেয়ার	৫. ট্রাস্টার	৬. 'স' মিল	৭. রাইস মিল
৮. অন্যান্য.....						

অধ্যায়-১২ঃ উন্নয়ন পরিকল্পনা সম্পর্কিত

১২.১ শিবপুর/রায়পুর/সিঙ্গুরগঞ্জ উপজেলার উন্নয়ন পরিকল্পনা প্রণয়ন সম্পর্কে অবহিত আছেন কি?

1.

2.

হ্যাঁ

না

১২.২ গুরুত্ব অনুসারে প্রয়োজনীয় উন্নয়নমূলক কাজ কি কি হতে পারে?

(শুধুমাত্র দাপ্তরিক কাজের জন্য)

ডাটা এন্ট্রিকারীর নাম ও স্বাক্ষরঃ

তারিখ :.....

তথ্য নিরীক্ষকের নাম ও স্বাক্ষরঃ

তারিখ :.....

☐

সকল তথ্য নেয়া হয়েছে

☐

অসম্পূর্ণ

.....

সুপারভাইজারের স্বাক্ষর

তথ্য প্রদানের জন্য আপনাকে আন্তরিক ধন্যবাদ

Annexure-II

Table: List of Socioeconomic Survey Team Members

Sl	Name	Designation	Date Start	Date End
1	Tarek Khan	Supervisor	12/8/2015	12/31/2015
2	Rubaiat Islam	Supervisor	12/8/2015	12/31/2015
3	Md Jahangir	Supervisor	12/8/2015	12/31/2015
4	Kawsar Hamid	Supervisor	12/8/2015	12/31/2015
5	Md. Zahirul haque	Surveyor	12/8/2015	12/31/2015
6	Md. Babul Prodhan	Surveyor	12/8/2015	12/31/2015
7	Md. Emran	Surveyor	12/8/2015	12/31/2015
8	Tarikul Gazi	Surveyor	12/8/2015	12/31/2015
9	Shohanur Rahman	Surveyor	12/8/2015	12/31/2015
10	Badhaan Chandra	Surveyor	12/8/2015	12/31/2015
11	Md. Ebrahim Khalil	Surveyor	12/8/2015	12/31/2015
12	Tanvir Alam	Surveyor	12/8/2015	12/31/2015
13	Manik Barman	Surveyor	12/8/2015	12/31/2015
14	Harisul Haque	Surveyor	12/8/2015	12/31/2015
15	Md. Habibullah	Surveyor	12/8/2015	12/31/2015
16	Md. Touhidul Alam Tusar	Surveyor	12/8/2015	12/31/2015
17	Md. Reazuddin	Surveyor	12/8/2015	12/31/2015
18	Nadim Sarkar	Surveyor	12/8/2015	12/31/2015
19	Rocky	Surveyor	12/8/2015	12/31/2015
20	Md. Mahabub	Surveyor	12/8/2015	12/31/2015
21	Ratul Chandra	Surveyor	12/8/2015	12/31/2015
22	Md. Mohsin	Surveyor	12/8/2015	12/31/2015
23	Tahmina Akter	Surveyor	12/8/2015	12/31/2015
24	Tarikul Islam Tuhin	Surveyor	12/8/2015	12/31/2015
25	Arif Nazir	Surveyor	12/8/2015	12/31/2015
26	Md. Masud	Surveyor	12/8/2015	12/31/2015
27	Sumaia Islam	Surveyor	12/8/2015	12/31/2015
28	Mamun Khan	Surveyor	12/8/2015	12/31/2015

Annex-III

Plate: Socio-economic survey at Shibpur



Government of the People's Republic of Bangladesh
Ministry of Housing and Public Works
Urban Development Directorate (UDD)

Preparation of Development Plan for Fourteen Upazilas

Package-02

(Ishwarganj Upazila, Mymensingh; Raipura Upazila and Shibpur Upazila, Narsingdi)

DRAFT SURVEY REPORT

**Socio-economic Survey
of
Shibpur Upazila, Narsingdi**

August, 2016

Joint Venture
of

SCPL Sheltech Consultants Pvt. Ltd

and

 **ARC Bangladesh Ltd**

Table of Contents

	Page No.
Executive Summary	i
Abbreviations	ii
CHAPTER-1: PROJECT OVERVIEW	1
1.0 Background and Objective	1
CHAPTER-2: METHODOLOGY	4
2.0 Survey Method	4
2.1 Measuring Reduced Levels	4
2.2 Identification of Location	4
2.3 Data Collection	5
CHAPTER-3: FINDINGS OF SURVEY WORKS	6
3.0 Survey Results	6
3.1 Survey of Main Rivers	6
3.2 Dependencies	6
3.3 Survey of the Existing Drainage Systems	9
3.4 Samples of Collected Data	9
CHAPTER 4: HYDROLOGIC DATA ANALYSIS	13
4.0 Analysis of Hydrological Data	13
4.1 Estimation of Design Discharge and Water Level	13
4.2 Frequency Analysis	14
4.3 Analytical Frequency Analysis	14
4.3.1 Extreme Value Distributions	14
4.3.2 Frequency Analysis using Frequency Factors	15
4.3.3 Goodness of Fit Test	17
4.4 Disaggregation of Daily Rainfall Data	17
4.4.1 Rainfall Cascade Disaggregation Model	17
CHAPTER-5: DESIGNING STORM SEWER	19
5.0 Capacity Estimate and Designing Drain Sections (Prismatic)	19
5.1 Manning's Formula	19
CHAPTER-6: CONCLUSION	23
6.0 Conclusion	23
References	
List of Tables:	
Table 3.1: Sample of Collected Rainfall data of BWDB station CL76 & CL79	10
Table 3.2: Sample of Collected Water level Data of BWDB Station SW177 & SW229	11

JV of SCPL-ABL

Preparation of Development Plan for Fourteen Upazilas Project (Package-02)

Ref: SCPL-ABL/UDD/2016/ Hydrological Survey Report/Shibpur Upazila

Date:

To

The Project Director

“Preparation of Development Plan for fourteen Upazilas” Project

Urban Development Directorate

82, Segunbagicha, Dhaka, 1000.

Subject: Submission of the Final Hydrological Survey Report of Shibpur Upazila, Narsingdi.

Dear Sir,

We are pleased to submit herewith the Final Hydrological Survey Report of Shibpur Upazila, Narsingdi for your kind information and further action.

Thanking you and assuring you of our best services.

Your Sincerely,

(Dr. Nurul Islam Nazem)
Team Leader, Package -2

(D S Adibul Abedin)
Hydrologist, Package -2

Encl: As stated.

Copy to:

1. Project Manager, Package-2, 14 Upazila Project, UDD
2. Director, Sheltech Consultants Pvt. Limited
3. Chairman, Arc-Bangladesh limited, Dhaka

1/E/2 Paribagh (Mazar Road), Shahbagh, Dhaka-1000, Bangladesh

Phone: +880-2-9611171 Fax: +880-2-9611172

Email: scpl.mail@gmail.com

Abbreviations

ArcGIS	Spatial Data Analysis Software by ESRI
BADC	Bangladesh Agricultural Development Corporation
BM	Benchmark
BMD	Bangladesh Meteorological Department
BWDB	Bangladesh Water Development Board
DEM	Digital Elevation Model
EGL	Existing Ground Level
EPA SWMM	The United States Environmental Protection Agency (EPA) Storm Water Management Model (SWMM)
EV I	The first asymptotic distribution of extreme values
GCP	Ground Control Point
GPS	Global Positioning System
HEC-HMS	The Hydrologic Modeling System is designed to simulate the precipitation-runoff processes of dendritic drainage basins. HEC-HMS is a product of the Hydrologic Engineering Center within the U.S. Army Corps of Engineers.
HEC-RAS	A computer program that models the hydraulics of water flow through natural rivers and other channels developed by the US Department of Defense, Army Corps of Engineers.
HFL	Highest Flood Level
IDF	Intensity Duration Frequency
L/B	Left bank
LFL	Lowest Flood Level
LGED	Local Government Engineering Department
mPWD	RL found against a PWD benchmark in meters
PWD	Public Works Department
R\B	Right Bank
RHD	Roads and Highway Department
RL	Reduced Level
TBM	Temporary Benchmark
UDD	Urban Development Directorate

EXECUTIVE SUMMARY

This report presents the hydrological survey data obtained during the hydrological survey works conducted at Shibpur Upazila under Narshingdi district. The task is a part of the project, "Preparation of Development Plan for Fourteen Upazilas", Package-2. Bathymetric survey of Arial Khan River, Kalagachia (Paharia River) Channel and Brahmaputra river at Shibpur Upazila is still to be done when the monsoon water subsides. During the survey works, information regarding any existing water control structure, river crossings, distributaries and tributaries were collected. It also presents the detailed survey data of the existing drains within the township. While collecting data for existing drainage systems, information about water logging zones or water logging points were collected. For the natural perennial channels, cross sections were surveyed at the locations of the existing structures on the rivers, at junctions with and of other channels or rivers. For drains, sizes were charted at starting locations, junctions and end points. The reduced levels of the existing ground at those locations were measured too. To measure the reduced levels on the field, dumpy levels were used. The levels were measured with respect to nearby benchmarks or temporary benchmarks of authorized organizations like Bangladesh Water Development Board, Public Works Department, Roads and Highways Department, Local Government Engineering Department, etc. GPS locations at each BM/TBM location, at the point of start of each cross section, at any structure location and at all the control points of the drains were recorded. Other collected data include flow directions, channel names, presence of tidal effects etc. The information will be incorporated with the DEM on GIS and if needed, adjusted according to the established GCPs. This will subsequently facilitate any sort of numerical watershed analysis and hence extrapolate a prediction for the future. This report also presents the analyzed data of water level gauge stations, the rainfall data analysis and the project site data deduced from them.

CHAPTER 1 PROJECT OVERVIEW

1.0 Background and Objective

The project, “Preparation of Development Plan for Fourteen Upazilas” was initiated by Urban Development Directorate, Ministry of Housing and Public Works, Government of Bangladesh. The main objective of the project is upgrading the living standard of the local people. The Shitalakshya River, The Old Brahmaputra River, The Brahmaputra River, The Arial Khan River and The Kalagachia Channel (Paharia River) are the main drainage channels in the vicinity. The whole system of rivers in and around the Upazila are essentially connected to the Mighty Meghna River on the east. The area does not face heavy flooding during the monsoon but does face a drainage congestion during monsoon and post-monsoon. The urban areas lack proper drainage system. Flood modeling software should be used to understand flooding conditions, identify the water logging areas and establish the drainage requirements. Models should also be used to assess the efficiency of the existing and proposed drainage system.

One aspect of this Hydrological Survey is the bathymetric survey of the main rivers within the project area. The purpose of bathymetric survey is to provide bathymetric information of the Arial Khan River, Kalagachia Channel (Paharia River) and The Brahmaputra River on the south of the Upazila. Although flooding in the area is governed mainly by the Old Brahmaputra and The Meghna River, as the study area can be limited within the Upazila, the bathymetric survey of these two rivers will not be necessary. The water level data of those rivers will be used as boundary conditions for model analysis. The information obtained in the field will be incorporated in the DEM through a process called “Burning”. This will be necessary for analyzing the surface water flow to assess flood through flood modeling software. It is required to assess the flood conditions during different time period and season against different water levels and discharge (*Sample results shown in Fig: 1 & Fig: 2*). If the actual cross-section of the river or channel is not obtained, the analysis will be faulty and will overstate the flood. This type of analysis will be helpful for preparation of effective and long lasting development plans for this Upazila. Hence, accuracy of the analysis is of prime importance.

To run a flood model of the area, water level, discharge and rainfall data of the vicinity have been collected from secondary source and analyzed. Water level data of BWDB gauge stations SW 177 at Lakpur, SW 229 at Toke, SW 274 at Narshingdi and SW 295 at Ajabur have been collected. The rainfall data of the stations CL 76 at Narshingdi and CL 79 at Shibpur have been collected to obtain a rational rainfall data by interpolation. The data are to be analyzed to obtain water level, discharge and rainfall data for different return period. The water level and discharge data are needed to set the boundary condition in flood models. The rainfall data will be used to obtain runoffs to calculate discharge at pour points of the sub-catchments.

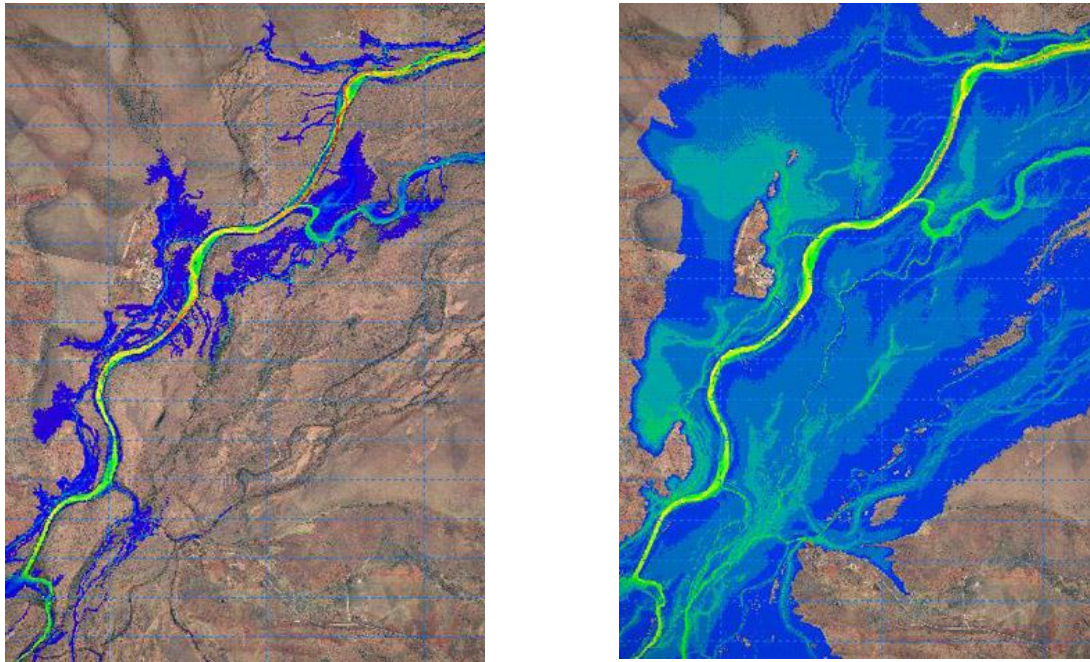


Fig-1: An integrated 1D-2D flood model on a flood plain showing flood conditions at different water level and flow time using Mike Flood (DHI)



Fig-2: An integrated 1D-2D flood model showing flood conditions in a city area using HEC-RAS

Understanding the water logging problems within the town area and proposing a comprehensive drainage system is another aspect of the survey. Drainage system development is unavoidable when it comes to sustainable urbanization. It is necessary to plan ahead for an efficient drainage system. For this, assessment of capacity and utility of the existing drainage system is essential. Information of the existing drains in Shibpur have been collected. The information includes depth, width and EGL at the junction points of the drains. 3-hourly rainfall data, collected from Goddard Earth Sciences Data and Information Service Center, will be used to prepare the hourly rainfall data or the intensity duration frequency (IDF) curve for designing storm sewer system. This will be used to assess the

capacity of the existing drainage system and in designing the proposed drainage system.
(Fig: 3)

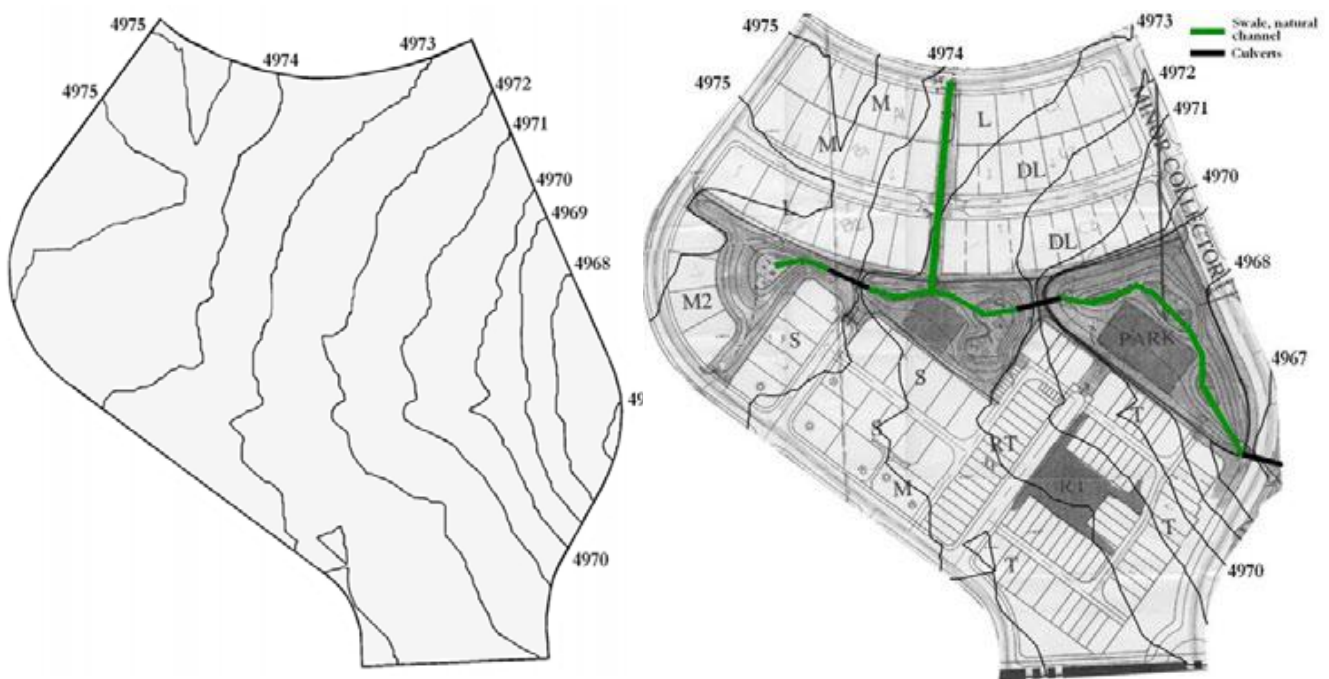


Fig-3: Model developed using EPA SWMM simulating undeveloped (left) and developed (right) conditions to calculate and compare the difference of discharge

With the above in view, the overall objectives of the survey are as listed below:

- Bathymetric survey of the major rivers.
- Identification of hydraulic structures and collecting information regarding capacity and sill levels of the structures.
- Identification of flood hazard locations.
- Identification of flow directions and tidal effects.
- Collection of observed flood levels in the field.
- Collecting information of any existing drainage system.
- Identification of water logging zones.
- Collecting information regarding encroachments of natural water bodies and drains.
- Collection of water level, discharge and rainfall data from secondary sources.

The analyses of the collected water level data done using EV I distribution are added in ANNEXURE - I(b). The Rest of the analysis using the Normal distribution, Log normal distribution and Log Pearson III distribution along with the goodness of fit analysis will be added in the final planning report of the project, "Preparation of Development Plan for Fourteen Upazilas".

CHAPTER 2 METHODOLOGY

2.0 Survey Method

2.1 Measuring Reduced Levels

To measure the reduced levels, dumpy levels and 5m staffs were used. In case of rivers, the levels were measured with respect to the nearest known benchmarks of Bangladesh Water Development Board or temporary benchmarks of any authorized government organizations viz., Roads and Highways Department or Local Government Engineering Department etc. After establishing a horizontal line of collimation / line of sight with respect to a BM/TBM, staff readings are taken within the range of visibility of the dumpy level. For any reading beyond the visibility range, the dumpy level needs a change of station. A temporary benchmark is established and further measurements are made with respect to that. In case of a change of level of more than the height of the staff (5m generally), the levelling machine needs to be shifted and setup again. Subtracting the level of line of sight from the staff readings provides the reduced levels at the point concerned. In figure 4, a schematic diagram of survey method using Dumpy Levels is shown.

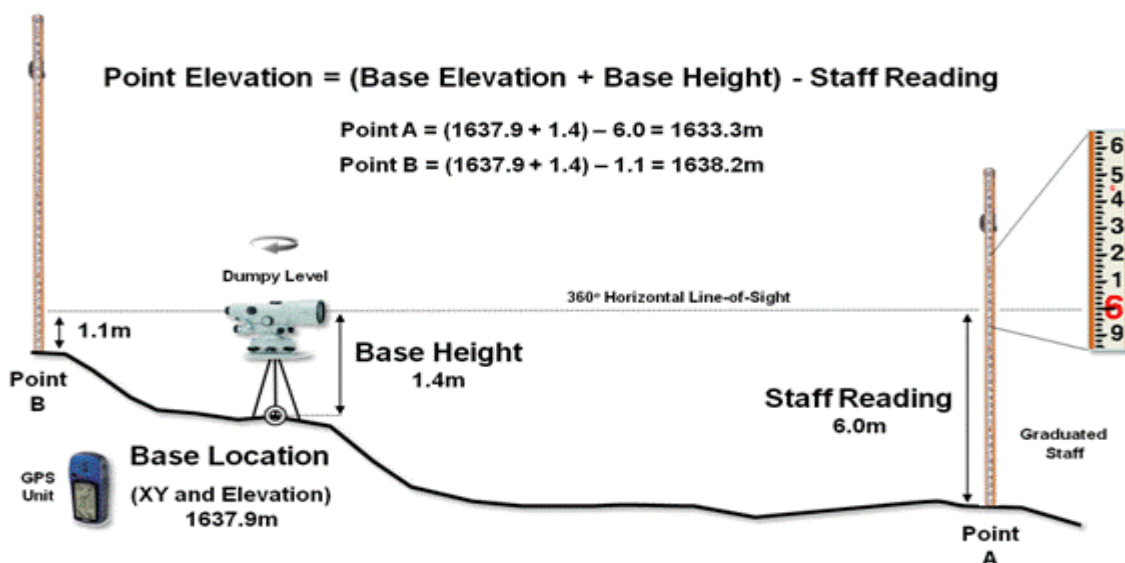


Fig-4: A Dumpy level establishes a horizontal plane to measure the relative elevation differences throughout a project area. A hand GPS is used to get the location of the base.

2.2 Identification of Location

A hand GPS was used to identify the location of the cross-sections, structures, drain control points etc.

2.3 Data Collection

To collect information regarding water control structures in the vicinity, the government organizations that are responsible for any development works regarding water resources development were contacted. The three government organizations that are active in the area are Bangladesh Water Development Board (BWDB), Local Government Engineering Department (LGED) and Bangladesh Agricultural Development Corporation (BADC). Key information of the structures about invert level, number and size of vents etc. were collected. *Plate-1* shows the bridge on Kalagachia Channel (Paharia River) at Shibpur Upazila under Narshingdi and *Plate-2* shows an abandoned bridge right next to the bridge in *Plate-1*.



Plate-1: Bridge on Kalagachia Channel (Paharia River) at Shibpur Paurashabha at Narshingdi.



Plate-2: Pier of an abandoned Bridge on Kalagachia Channel (Paharia River) at Shibpur Paurashabha at Narshingdi.

To identify locations that are prone to flood hazards or water logging problems, questionnaire was prepared and information was collected accordingly. The questionnaire is attached to ANNEXURE – II (a). During the engineering survey, information like highest and normal flood levels, highest tide levels and lowest tide levels were collected from the local farmers, fishermen or boatmen.

As for the secondary data, water level data of the gauge stations SW 177, SW 229, SW 274 and SW 295 of Bangladesh water development are collected. Daily Rainfall data of BWDB gauge CL 76 and CL 79 have also been collected.

CHAPTER 3 FINDINGS OF SURVEY WORKS

3.0 Survey Results

3.1 Survey of Main Rivers

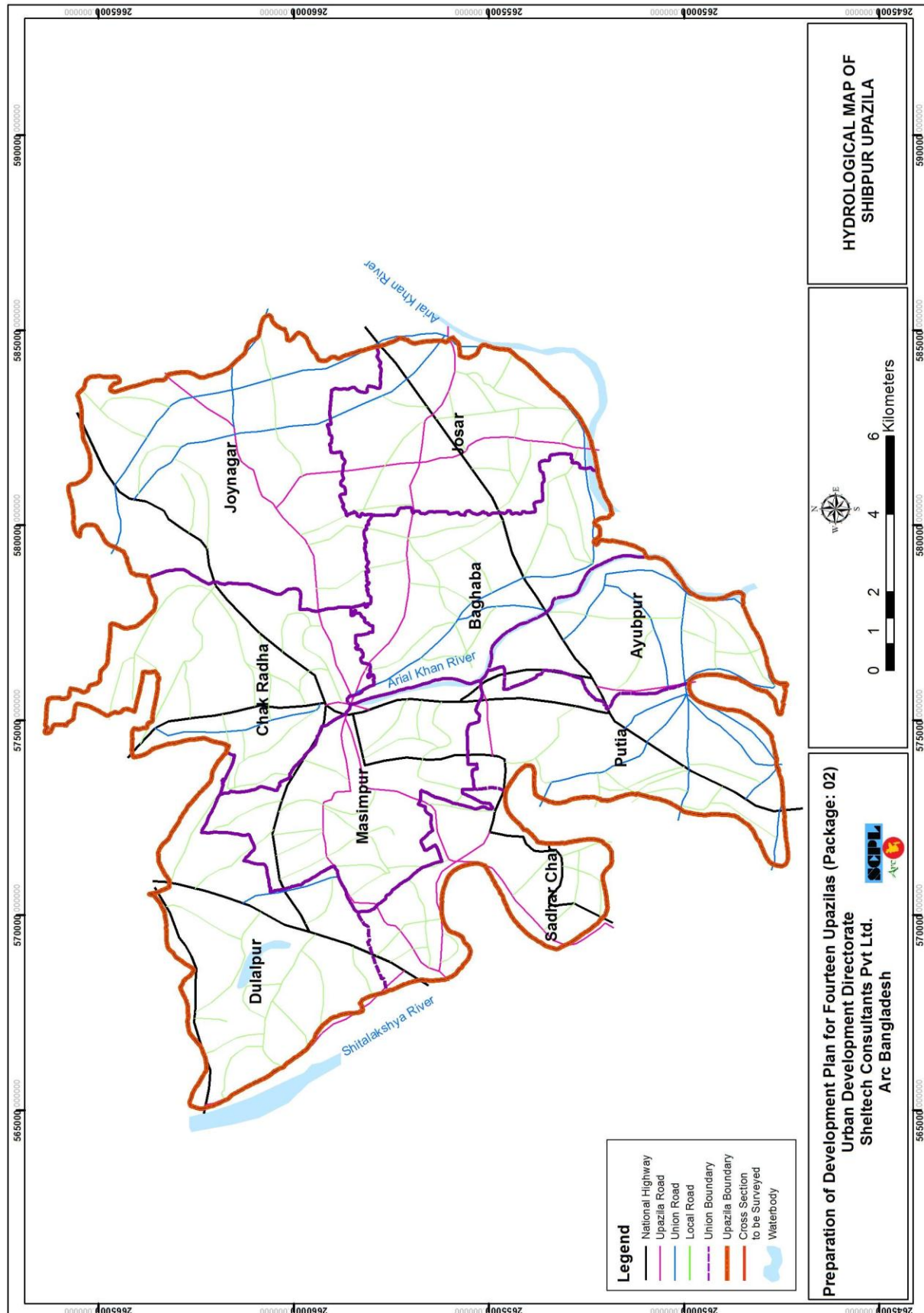
The bathymetric survey of the Arial Khan River, Kalagachia Channel (Paharia River) and The Brahmaputra Rivers are postponed due to monsoon water still not subsided making survey works complicated. As soon as the water subsides during the post monsoon, the cross-sectional survey works will be commenced. The main rivers and channels as identified are shown in *Map – 1 & 2*. Cross-sections will be prepared using the reduced levels obtained in the field against Bangladesh Water Development Board benchmarks. Later, when the photogrammetric images will be processed, the cross-sections will be converted to MSL datum. During the physical feature survey, information about hydraulic structures on the rivers and along the banks of the rivers has already been collected.

3.2 Dependencies

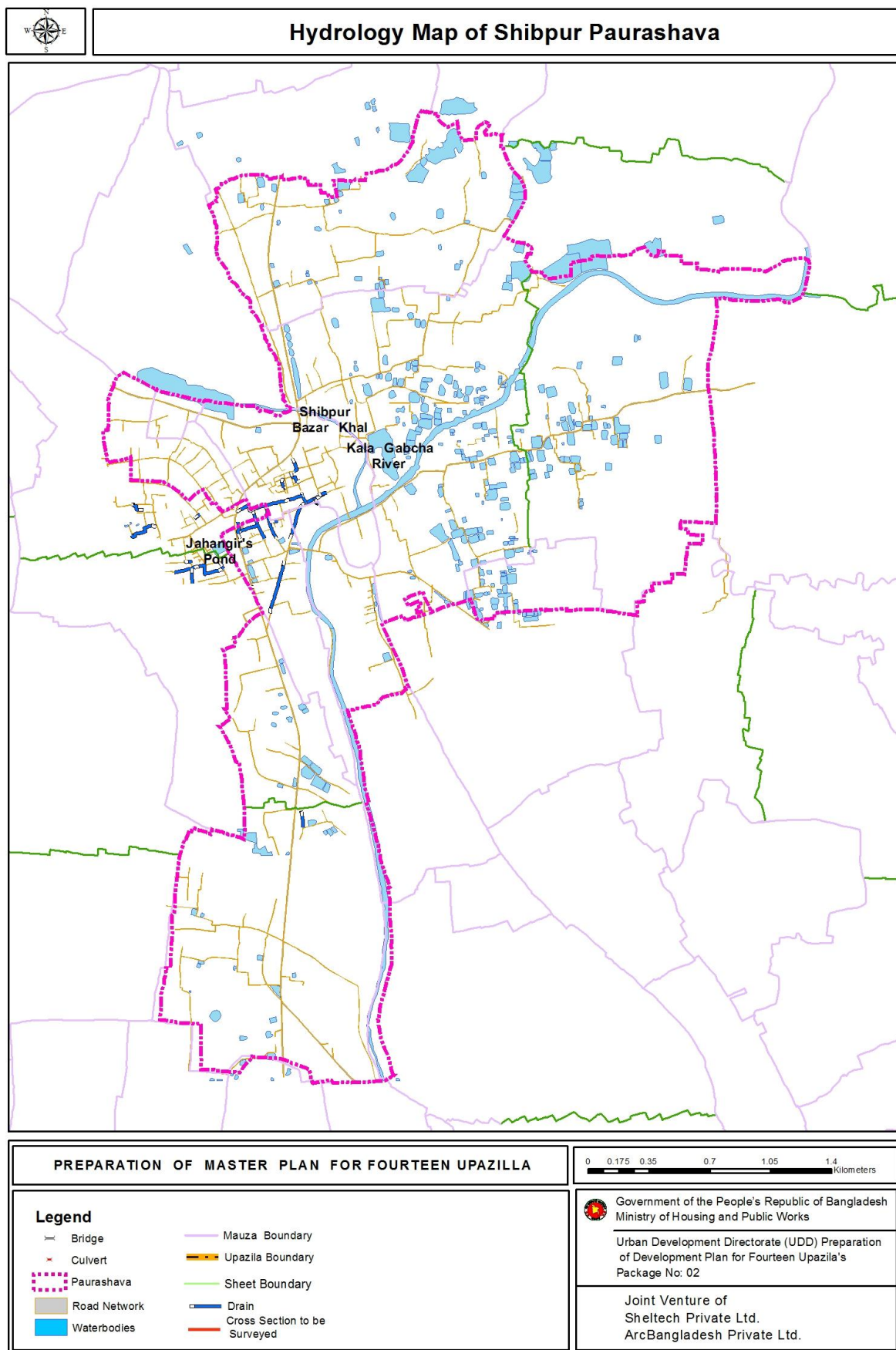
The hydrological works are dependent upon the land use survey, topographic survey and physical feature survey for the respective outcomes of those survey works done under this project. During Physical feature survey, information regarding hydraulic structures has been collected. The local offices of Government Agencies like BWDB, BADC and LGED have been contacted to get data about any irrigation projects or drainage projects that are either currently being operated or being planned by them. The responses of the local populace have been inquired to understand their attitude towards those projects.

The land use survey will be required to prepare the rainfall runoff model for Shibpur. Depending upon the use of land, the runoff over a certain segment of land will vary. On a surface exhibiting vegetation, the rainwater shall be impeded from reaching any natural or man-made drainage system. A portion of the precipitation will be intercepted by the canopy before the rain water can reach the ground, also the infiltration rate will be high. All these factors prevents the accumulation of rain water and thus reduces runoff. On the other hand, on a buildup area, much of the vegetation is gone and the land is more or less covered with impervious construction. Interception and infiltration hence reduces, resulting in an increase in net runoff.

Topographic survey is required to understand the undulations on the ground surface. On a steep slope, the water flows quicker towards drainage bodies which are vice versa for a flat land. The digital 3D stereo imageries that have been collected as a measure of the survey works will be used to prepare a Digital Elevation Model (DEM) of the land.



Map-1: Map showing the main drainage channels as identified at Shibpur Upazila under Narshingdi District.



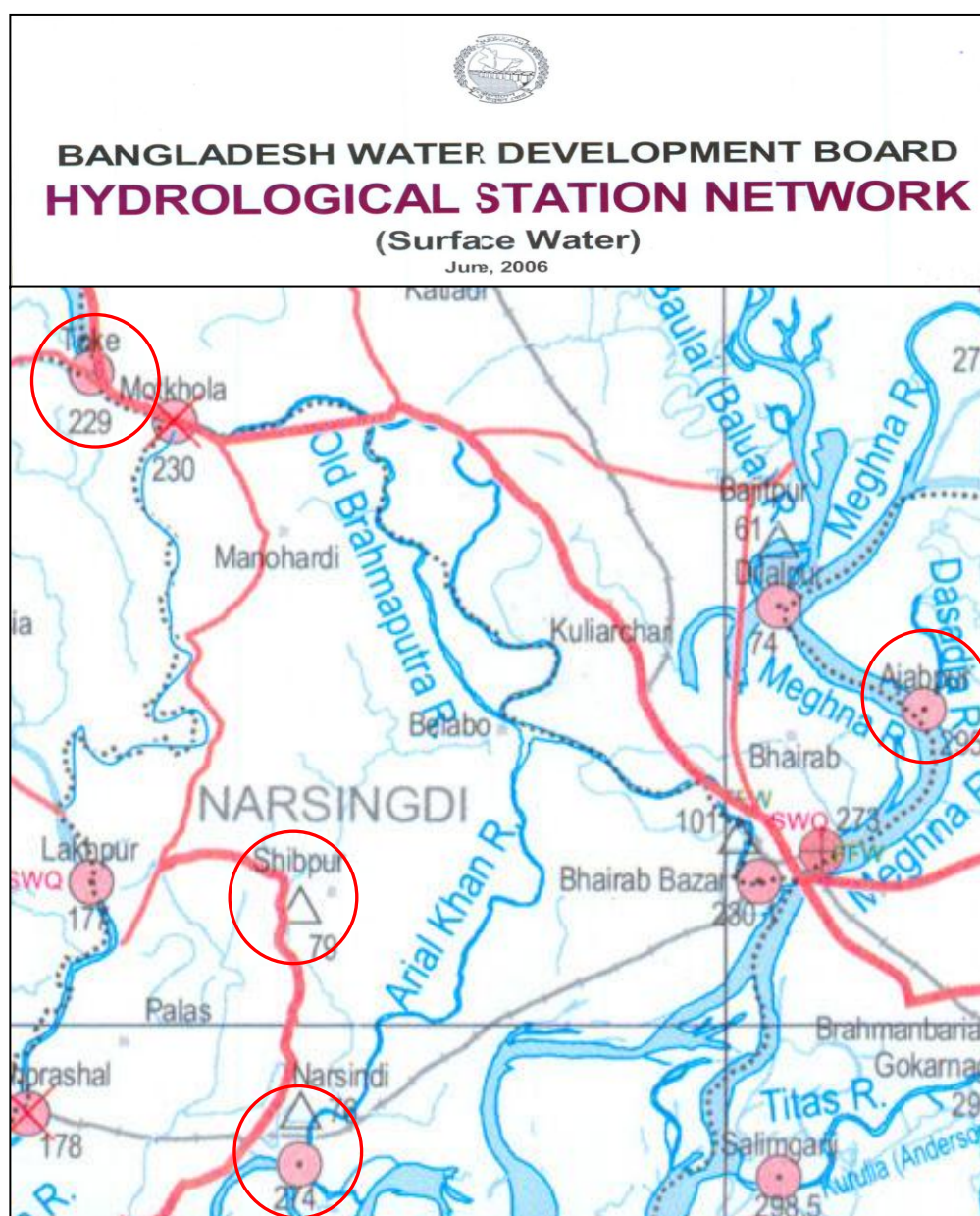
Map-2: Map showing the main drainage channels as identified at Shibpur Paurashava under Narshingdi District.

3.3 Survey of the Existing Drainage Systems

Information of existing drains at Shibpur regarding depth and width, RL and GPS locations at different junction points, starting points and ending points are obtained. Names of roads alongside the drains are also collected. Lining conditions (Lined or Unlined) of the existing drains have been identified during the survey. This information would be used to prepare a drainage inventory to assess the capacity of the existing drainage system and with a view to that; a drainage improvement plan will be prepared.

3.4 Samples of Collected Data

The BWDB Water Level, Discharge and Rainfall gauge stations of which the data has been collected are shown on Map-3. The sample data are charted from **Table – 3.1 to 3.4**



Map-3: Locations of BWDB Water Level, Discharge and Rainfall gauge stations at and around Shibpur, Narshingdi, of which the data has been collected (SW 40, SW 200, CL 316, CL 317, CL 322).

Table 3.1: Sample of Collected Rainfall data of BWDB station CL 76 & CL 79

District	StationID	StationName	DateTime	Rainfall	District	StationID	StationName	DateTime	Rainfall
Narsingdi	CL76	Narsindi	01-Jan-81	0	Narsingdi	CL79	Shibpur	1-Jan-81	0
Narsingdi	CL76	Narsindi	02-Jan-81	0	Narsingdi	CL79	Shibpur	2-Jan-81	0
Narsingdi	CL76	Narsindi	03-Jan-81	0	Narsingdi	CL79	Shibpur	3-Jan-81	0
Narsingdi	CL76	Narsindi	04-Jan-81	0	Narsingdi	CL79	Shibpur	4-Jan-81	0
Narsingdi	CL76	Narsindi	05-Jan-81	0	Narsingdi	CL79	Shibpur	5-Jan-81	0
Narsingdi	CL76	Narsindi	06-Jan-81	0	Narsingdi	CL79	Shibpur	6-Jan-81	0
Narsingdi	CL76	Narsindi	07-Jan-81	0	Narsingdi	CL79	Shibpur	7-Jan-81	0
Narsingdi	CL76	Narsindi	08-Jan-81	1.8	Narsingdi	CL79	Shibpur	8-Jan-81	0
Narsingdi	CL76	Narsindi	09-Jan-81	0	Narsingdi	CL79	Shibpur	9-Jan-81	0
Narsingdi	CL76	Narsindi	10-Jan-81	0	Narsingdi	CL79	Shibpur	10-Jan-81	0
Narsingdi	CL76	Narsindi	11-Jan-81	0	Narsingdi	CL79	Shibpur	11-Jan-81	0
Narsingdi	CL76	Narsindi	12-Jan-81	1.3	Narsingdi	CL79	Shibpur	12-Jan-81	0.5
Narsingdi	CL76	Narsindi	13-Jan-81	0	Narsingdi	CL79	Shibpur	13-Jan-81	0
Narsingdi	CL76	Narsindi	14-Jan-81	0	Narsingdi	CL79	Shibpur	14-Jan-81	0
Narsingdi	CL76	Narsindi	15-Jan-81	0	Narsingdi	CL79	Shibpur	15-Jan-81	0
Narsingdi	CL76	Narsindi	16-Jan-81	0	Narsingdi	CL79	Shibpur	16-Jan-81	0
Narsingdi	CL76	Narsindi	17-Jan-81	0	Narsingdi	CL79	Shibpur	17-Jan-81	0
Narsingdi	CL76	Narsindi	18-Jan-81	0	Narsingdi	CL79	Shibpur	18-Jan-81	0
Narsingdi	CL76	Narsindi	19-Jan-81	0	Narsingdi	CL79	Shibpur	19-Jan-81	0
Narsingdi	CL76	Narsindi	20-Jan-81	0	Narsingdi	CL79	Shibpur	20-Jan-81	0
Narsingdi	CL76	Narsindi	21-Jan-81	0	Narsingdi	CL79	Shibpur	21-Jan-81	0
Narsingdi	CL76	Narsindi	22-Jan-81	0	Narsingdi	CL79	Shibpur	22-Jan-81	0
Narsingdi	CL76	Narsindi	23-Jan-81	0	Narsingdi	CL79	Shibpur	23-Jan-81	0
Narsingdi	CL76	Narsindi	24-Jan-81	0	Narsingdi	CL79	Shibpur	24-Jan-81	0
Narsingdi	CL76	Narsindi	25-Jan-81	0	Narsingdi	CL79	Shibpur	25-Jan-81	0
Narsingdi	CL76	Narsindi	26-Jan-81	0	Narsingdi	CL79	Shibpur	26-Jan-81	0
Narsingdi	CL76	Narsindi	27-Jan-81	0	Narsingdi	CL79	Shibpur	27-Jan-81	0
Narsingdi	CL76	Narsindi	28-Jan-81	0	Narsingdi	CL79	Shibpur	28-Jan-81	0
Narsingdi	CL76	Narsindi	29-Jan-81	0	Narsingdi	CL79	Shibpur	29-Jan-81	0
Narsingdi	CL76	Narsindi	30-Jan-81	0	Narsingdi	CL79	Shibpur	30-Jan-81	0

Table 3.2: Sample of Collected Water level Data of BWDB Station SW 177 & SW 229

RiverName	StationName	StationID	DateTime	HighTide	LowTide	RiverName	StationName	StationID	DateTime	HighTide	LowTide
Lakhya	Lakhpur	SW177	01-04-1983	2.18	1.83	Old Brahmaputra	Toke	SW229	01-04-1981	1.36	1.05
Lakhya	Lakhpur	SW177	02-04-1983	2.13	1.78	Old Brahmaputra	Toke	SW229	02-04-1981	1.48	1.30
Lakhya	Lakhpur	SW177	03-04-1983	2.05	1.73	Old Brahmaputra	Toke	SW229	03-04-1981	1.66	1.45
Lakhya	Lakhpur	SW177	04-04-1983	1.93	1.58	Old Brahmaputra	Toke	SW229	04-04-1981	1.91	1.60
Lakhya	Lakhpur	SW177	05-04-1983	1.83	1.48	Old Brahmaputra	Toke	SW229	05-04-1981	2.12	1.78
Lakhya	Lakhpur	SW177	06-04-1983	1.78	1.43	Old Brahmaputra	Toke	SW229	06-04-1981	2.33	2.03
Lakhya	Lakhpur	SW177	07-04-1983	1.73	1.38	Old Brahmaputra	Toke	SW229	07-04-1981	2.36	2.12
Lakhya	Lakhpur	SW177	08-04-1983	1.73	1.38	Old Brahmaputra	Toke	SW229	08-04-1981	2.24	1.94
Lakhya	Lakhpur	SW177	09-04-1983	1.78	1.48	Old Brahmaputra	Toke	SW229	09-04-1981	2.12	1.88
Lakhya	Lakhpur	SW177	10-04-1983	1.91	1.53	Old Brahmaputra	Toke	SW229	10-04-1981	1.97	1.75
Lakhya	Lakhpur	SW177	11-04-1983	1.98	1.58	Old Brahmaputra	Toke	SW229	11-04-1981	1.97	1.69
Lakhya	Lakhpur	SW177	12-04-1983	2.13	1.68	Old Brahmaputra	Toke	SW229	12-04-1981	1.91	1.66
Lakhya	Lakhpur	SW177	13-04-1983	2.18	1.71	Old Brahmaputra	Toke	SW229	13-04-1981	1.94	1.75
Lakhya	Lakhpur	SW177	14-04-1983	2.28	1.78	Old Brahmaputra	Toke	SW229	14-04-1981	2.09	1.78
Lakhya	Lakhpur	SW177	15-04-1983	2.38	1.83	Old Brahmaputra	Toke	SW229	15-04-1981	2.12	1.99
Lakhya	Lakhpur	SW177	16-04-1983	2.13	1.83	Old Brahmaputra	Toke	SW229	16-04-1981	2.24	1.94
Lakhya	Lakhpur	SW177	17-04-1983	1.98	1.73	Old Brahmaputra	Toke	SW229	17-04-1981	2.48	2.18
Lakhya	Lakhpur	SW177	18-04-1983	1.93	1.63	Old Brahmaputra	Toke	SW229	18-04-1981	2.67	2.30
Lakhya	Lakhpur	SW177	19-04-1983	1.83	1.53	Old Brahmaputra	Toke	SW229	19-04-1981	2.76	2.61
Lakhya	Lakhpur	SW177	20-04-1983	1.78	1.48	Old Brahmaputra	Toke	SW229	20-04-1981	2.76	2.70
Lakhya	Lakhpur	SW177	21-04-1983	1.73	1.43	Old Brahmaputra	Toke	SW229	21-04-1981	2.79	2.70
Lakhya	Lakhpur	SW177	22-04-1983	1.78	1.43	Old Brahmaputra	Toke	SW229	22-04-1981	2.76	2.67
Lakhya	Lakhpur	SW177	23-04-1983	1.73	1.63	Old Brahmaputra	Toke	SW229	23-04-1981	2.70	2.58
Lakhya	Lakhpur	SW177	24-04-1983	2.08	1.68	Old Brahmaputra	Toke	SW229	24-04-1981	2.61	2.42
Lakhya	Lakhpur	SW177	25-04-1983	2.28	1.73	Old Brahmaputra	Toke	SW229	25-04-1981	2.45	2.27
Lakhya	Lakhpur	SW177	26-04-1983	2.33	1.83	Old Brahmaputra	Toke	SW229	26-04-1981	2.36	2.15
Lakhya	Lakhpur	SW177	27-04-1983	2.46	1.88	Old Brahmaputra	Toke	SW229	27-04-1981	2.27	2.03
Lakhya	Lakhpur	SW177	28-04-1983	2.48	1.98	Old Brahmaputra	Toke	SW229	28-04-1981	2.15	1.94
Lakhya	Lakhpur	SW177	29-04-1983	2.63	1.98	Old Brahmaputra	Toke	SW229	29-04-1981	2.15	1.83
Lakhya	Lakhpur	SW177	30-04-1983	2.68	2.03	Old Brahmaputra	Toke	SW229	30-04-1981	2.04	1.83
Lakhya	Lakhpur	SW177	01-05-1983	2.76	2.03	Old Brahmaputra	Toke	SW229	01-05-1981	2.01	1.80
Lakhya	Lakhpur	SW177	02-05-1983	2.86	2.08	Old Brahmaputra	Toke	SW229	02-05-1981	2.29	2.01

Table 3.2: Sample of Collected Water level Data of BWDB Station SW 274 & SW 295

RiverName	StationName	StationID	DateTime	HighTide	LowTide	RiverName	StationName	StationID	DateTime	HighTide	LowTide
Surma-Meghna	Narsingdi	SW274	01-04-1981	1.13	0.98	Titas	Ajabpur	SW295	01-04-1981	1.50	1.34
Surma-Meghna	Narsingdi	SW274	02-04-1981	1.44	1.07	Titas	Ajabpur	SW295	02-04-1981	1.68	1.40
Surma-Meghna	Narsingdi	SW274	03-04-1981	1.50	1.09	Titas	Ajabpur	SW295	03-04-1981	1.98	1.57
Surma-Meghna	Narsingdi	SW274	04-04-1981	1.71	1.22	Titas	Ajabpur	SW295	04-04-1981	2.11	1.77
Surma-Meghna	Narsingdi	SW274	05-04-1981	1.92	1.47	Titas	Ajabpur	SW295	05-04-1981	2.27	2.01
Surma-Meghna	Narsingdi	SW274	06-04-1981	2.14	1.65	Titas	Ajabpur	SW295	06-04-1981	2.46	2.21
Surma-Meghna	Narsingdi	SW274	07-04-1981	2.23	1.80	Titas	Ajabpur	SW295	07-04-1981	2.47	2.32
Surma-Meghna	Narsingdi	SW274	08-04-1981	2.23	1.83	Titas	Ajabpur	SW295	08-04-1981	2.43	2.29
Surma-Meghna	Narsingdi	SW274	09-04-1981	2.27	1.86	Titas	Ajabpur	SW295	09-04-1981	2.36	2.23
Surma-Meghna	Narsingdi	SW274	10-04-1981	2.11	1.80	Titas	Ajabpur	SW295	10-04-1981	2.32	2.18
Surma-Meghna	Narsingdi	SW274	11-04-1981	1.98	1.71	Titas	Ajabpur	SW295	11-04-1981	2.27	2.12
Surma-Meghna	Narsingdi	SW274	12-04-1981	1.89	1.68	Titas	Ajabpur	SW295	12-04-1981	2.24	2.11
Surma-Meghna	Narsingdi	SW274	13-04-1981	1.80	1.66	Titas	Ajabpur	SW295	13-04-1981	2.20	2.11
Surma-Meghna	Narsingdi	SW274	14-04-1981	1.80	1.65	Titas	Ajabpur	SW295	14-04-1981	2.24	2.11
Surma-Meghna	Narsingdi	SW274	15-04-1981	1.82	1.71	Titas	Ajabpur	SW295	15-04-1981	2.30	2.17
Surma-Meghna	Narsingdi	SW274	16-04-1981	2.23	1.95	Titas	Ajabpur	SW295	16-04-1981	2.38	2.27
Surma-Meghna	Narsingdi	SW274	17-04-1981	2.47	2.14	Titas	Ajabpur	SW295	17-04-1981	2.49	2.36
Surma-Meghna	Narsingdi	SW274	18-04-1981	2.55	2.17	Titas	Ajabpur	SW295	18-04-1981	2.70	2.52
Surma-Meghna	Narsingdi	SW274	19-04-1981	2.50	2.20	Titas	Ajabpur	SW295	19-04-1981	2.79	2.67
Surma-Meghna	Narsingdi	SW274	20-04-1981	2.50	2.24	Titas	Ajabpur	SW295	20-04-1981	2.88	2.79
Surma-Meghna	Narsingdi	SW274	21-04-1981	2.49	1.71	Titas	Ajabpur	SW295	21-04-1981	2.85	2.78
Surma-Meghna	Narsingdi	SW274	22-04-1981	2.44	1.68	Titas	Ajabpur	SW295	22-04-1981	2.81	2.75
Surma-Meghna	Narsingdi	SW274	23-04-1981	2.41	1.66	Titas	Ajabpur	SW295	23-04-1981	2.78	2.73
Surma-Meghna	Narsingdi	SW274	24-04-1981	2.41	1.65	Titas	Ajabpur	SW295	24-04-1981	2.73	2.64
Surma-Meghna	Narsingdi	SW274	25-04-1981	2.23	1.71	Titas	Ajabpur	SW295	25-04-1981	2.67	2.62
Surma-Meghna	Narsingdi	SW274	26-04-1981	2.17	1.95	Titas	Ajabpur	SW295	26-04-1981	2.59	2.49
Surma-Meghna	Narsingdi	SW274	27-04-1981	2.15	1.94	Titas	Ajabpur	SW295	27-04-1981	2.43	2.36
Surma-Meghna	Narsingdi	SW274	28-04-1981	2.04	1.92	Titas	Ajabpur	SW295	28-04-1981	2.39	2.27
Surma-Meghna	Narsingdi	SW274	29-04-1981	1.98	1.89	Titas	Ajabpur	SW295	29-04-1981	2.30	2.23
Surma-Meghna	Narsingdi	SW274	30-04-1981	2.08	1.89	Titas	Ajabpur	SW295	30-04-1981	2.36	2.21
Surma-Meghna	Narsingdi	SW274	01-05-1981	2.09	1.89	Titas	Ajabpur	SW295	01-05-1981	2.39	2.21
Surma-Meghna	Narsingdi	SW274	02-05-1981	2.17	1.82	Titas	Ajabpur	SW295	02-05-1981	2.48	2.29

CHAPTER 4 HYDROLOGIC DATA ANALYSIS

4.0 Analysis of Hydrological Data

4.1 Estimation of Design Discharge and Water Level

Estimation of both flood discharges and high water levels are necessary for bank protection design. Careful estimation of discharge and water level is important for all sites with erodible banks. This section describes the methods of assessing flood discharge and water level at the site under consideration. The design discharge and water level are determined for selected probability of exceedance or return period.

The design discharge and water level arising from floods should be selected after due consideration of the following:

- The maximum historical discharge as recorded at the site, or as calculated on the basis of recorded water level at the site, or as calculated on the basis of measured discharge at other points on the river from which corresponding site discharge can reasonably be inferred.
- The discharge derived from a frequency analysis using a probability of exceedance or return period which is appropriate to the importance and value of the protection work.
- The maximum historical water level as recorded at the site, or as inferred from observed or recorded water level at other points on the river from which level can reasonably be transferred to the site in question.
- The water level derived from a frequency analysis using a probability of exceedance or return period which is appropriate to the importance and value of the protection work.

In estimating high flows, primary reliance should be placed on careful field investigations, local enquiries and searches of historical records. Data so obtained should be compared with recorded data for hydrometric stations, and supplemented by analytical procedure using stage-discharge curves. At most hydrometric gauging stations reasonably stable relationship exists between water level and discharge. At some sites, however, the stage discharge curve may be quite unstable because of aggradation or degradation at channel bed or backwater effect from downstream, and may change drastically during major floods. A persistent trend of rising or lowering of curve indicates progressive channel aggradation or degradation. The stage corresponding to design flood which exceeds any recorded flow obtained by extrapolating the stage-discharge relationships.

The most commonly used method for estimating design discharge and water level examines the observed discharge and water level to arrive at suitable estimates. The method, known as frequency analysis, is founded on statistical analyses of discharge and water level records. For locations where records of stream flows are available, or where flows from another basin can be transported to the design location, design flood magnitude and water level can be estimated directly from those records by means of frequency analysis.

4.2 Frequency Analysis

Frequency of a hydrological event, such as the annual peak flow is the probability that a value will be equaled or exceeded in any year. This is more appropriately called the exceedance probability, $P(F)$. The reciprocal of the exceedance probability is the return period T in years, that is, $T = 1/P(F)$. The length of record should be sufficient to justify extrapolating the frequency relationship. For example, it might be reasonable to estimate a 50-year flood on the basis of a 30-year record, but to estimate a 100-year flood on the basis of a 10-year record would normally be absurd (Neill 1973)⁽¹⁾. Viessman and Lewis (1996)⁽²⁾ noted that as a general rule, frequency analysis is cautioned when working with shorter records and estimating frequencies of hydrological events greater than twice the record length.

Frequency analysis can be conducted in two ways: one is the analytical approach and the other is the graphical technique in which flood magnitudes are usually plotted against probability of exceedance.

Here in the following sections, procedures are given mostly for discharge frequency analysis; the similar procedures can also be followed for water level frequency analysis.

4.3 Analytical Frequency Analysis

Analytical frequency analysis is based on fitting theoretical probability distributions to given data. Numerous distributions have been suggested on the basis of their ability to 'fit' the plotted data from streams (Linsley et al. 1982)⁽³⁾. The Log-Pearson Type III (LP3) has been adopted for use in the United States Federal Agencies for flood analysis. The first asymptotic distribution of extreme values (EV1), commonly called Gumbel Distribution has been widely used and is recommended in the United Kingdom. For this project, all the collected data will be analyzed using Normal distribution, Log-Normal distribution, Log-Pearson III distribution and Extreme Variable Distribution and the best fit distribution will be adopted for analysis.

4.3.1 Extreme Value Distributions:

Distributions of the extreme values selected from sets of samples of any probability distribution converge to any one of three forms of Extreme Value Distributions, called Type I, II, and III, respectively, when the number of selected extreme values is large. The three limiting forms are special cases of a single distribution called Generalized Extreme Value (GEV) Distribution (Chow et al. 1988)⁽⁴⁾. The cumulative distribution function for the GEV is:

$$F(x) = \exp \left[- \left(1 - \kappa \frac{x-u}{\alpha} \right)^{1/\kappa} \right] \quad (1)$$

Here κ , u , and α are parameters to be determined. For EVI Distribution x is unbounded, while for EVII, x is bounded from below, and for EVIII, x is bounded from above. The EVI and EVII Distributions are also known as the Gumbel and Frechet Distributions, respectively.

The Extreme Value Type I (EVI) cumulative distribution function is:

$$F(x) = \exp \left[- \exp \left(- \frac{x-u}{\alpha} \right) \right] \quad -\infty \leq x \leq \infty \quad (2)$$

The parameters are estimated by

$$\alpha = \frac{\sqrt{6}}{\pi} s \quad \text{and} \quad u = \bar{x} - 0.5772\alpha \quad (3)$$

Eq (2) can be expressed as

$$F(x) = e^{-e^{-y}} \quad (4)$$

Where y is the reduced variate defined as

$$y = \frac{x - u}{\alpha} \quad (5)$$

Solving Eq (4) for y:

$$y = -\ln \left[\ln \left(\frac{1}{F(x)} \right) \right] \quad (6)$$

Noting that the probability of occurrence of an event $x \geq x_T$ is the inverse of its return period T, we can write

$$\frac{1}{T} = P(x \geq x_T) = 1 - P(x \leq x_T) = 1 - F(x_T)$$

So,

$$F(x_T) = 1 - \frac{1}{T}$$

Substituting for $F(x_T)$ into Eq (6)

$$y_T = -\ln \left[\ln \left(\frac{T}{T-1} \right) \right] \quad (7)$$

For a given return period x_T is related to y_T by Eq (5), or

$$x_T = u + \alpha y_T \quad (8)$$

4.3.2 Frequency Analysis using Frequency Factors

Calculating the magnitudes of extreme events by the method outlined in the above example requires that the probability distribution function be invertible, that is, given a value of T or $F(x_T) = 1 - \frac{1}{T}$, the corresponding value of x_T can be determined. Some probability distribution functions are not readily invertible, like the Normal and Pearson Type III Distributions. Thus an alternative method based on frequency factor is used for calculating the magnitudes of extreme events. Chow (1951)⁽⁵⁾ has shown that most frequency functions can be generalized to

$$x_T = \bar{x} + K_T s \quad (9)$$

where x_T is a flood of specified probability or return period T, \bar{x} is the mean of the flood series, s is the standard deviation of the series; and K_T is the frequency factor and is a function of return period and type of probability distribution, as well as coefficient of skewness for skewed distributions, such as LP3.

In the event that the variable analyzed is $y = \log x$, for example as in Lognormal and LP3 Distributions, the same method is applied to the statistics for the logarithms of data using $y_T = \bar{y} + K_T s_y$, and the required value of x_T is found taking antilog of y_T .

Chow (1951) ⁽⁵⁾ proposed the frequency factor as in Eq (9), and it is applicable to many probability distributions used in hydrological frequency analysis. The K-T relationship can be expressed in mathematical terms or by a table.

Normal Distribution: From Eq (9) the frequency factor can be expressed as

$$K_T = \frac{x_T - \bar{x}}{s} = z \quad (10)$$

Thus, for Normal Distribution K_T is the same as the standard normal variable z . The value of z and hence K_T can be obtained from Table 1 in ANNEXURE – I(a).

Lognormal Distribution: The recommended procedure for use of the Lognormal Distribution is to convert the data series to logarithms and compute:

- 1) $y_i = \log x_i$
- 2) Compute the mean, \bar{y} and standard deviation s_y
- 3) Compute $y_T = \bar{y} + K_T s_y$

$$K_T = \frac{y_T - \bar{y}}{s_y} = z$$

So, K_T can be taken from Table 1 in ANNEXURE – I(a).

- 4) Finally compute $x_T = \text{anti log } y_T$

Log-Pearson Type III (LP3) Distribution: The recommended procedure for use of the LP3 Distribution is to convert the data series to logarithms and compute:

- 1) $y_i = \log x_i$
- 2) Compute the mean, \bar{y} and standard deviation s_y
- 3) Compute coefficient of skewness

$$C_s = \frac{n \sum (y_i - \bar{y})^3}{(n-1)(n-2)s_y^3}$$

- 4) Compute $y_T = \bar{y} + K_T s_y$ (11)

Where K_T is taken from Table 2 in ANNEXURE – I(a)..

- 5) Finally compute $x_T = \text{anti log } y_T$

Table 3 in ANNEXURE – I(a) gives values of the frequency factors for the LP3 Distribution for various values of return period and coefficient of skewness, C_s . When $C_s = 0$, the frequency factor is equal to the standard normal variable z (Table 1 in ANNEXURE – I(a)).

Extreme Value I (EVI) Distribution: Chow (1951) ⁽⁵⁾ derived the following expression for frequency factor for the EVI Distribution

$$K_T = -\frac{\sqrt{6}}{\pi} \left[0.5772 + \ln \left\{ \ln \left(\frac{T}{T-1} \right) \right\} \right] \quad (12)$$

When $x_T = \mu$, Eq (9) (in population term) gives $K_T = 0$ and Eq (12) gives $T=2.33$ years. This is the return period of the mean of the EVI Distribution.

Table of frequency factors for the EVI Distribution, given in Table 3 in ANNEXURE – I(a), is taken from Haan (1977) ⁽⁶⁾. The values computed from the above equation are equivalent to an infinite sample size in Table 3.

4.3.3 Goodness of Fit Test

The goodness of fit of a probability distribution can be tested by comparing the theoretical and sample values of the relative frequency or the cumulative frequency function. In the case of the relative frequency function, the χ^2 – test is used and with cumulative frequency function the Kolmogorov-Smirnov test is used.

Chi-Square Test: The test statistic is given by

$$\chi^2 = \sum_{i=1}^k \frac{n[f_s(x_i) - p(x_i)]^2}{p(x_i)} \quad (13)$$

Where, k is the number of intervals; the sample value of the relative frequency of interval i is, $f_s(x_i) = n_i/n$; the theoretical value of the relative frequency function (also called incremental probability function) is $p(x_i) = F(x_i) - F(x_{i-1})$. It may be noted that $nf_s(x_i) = n_i$, the observed number of occurrences in interval i , and $np(x_i)$ is the corresponding expected number of occurrences in interval i .

To describe the χ^2 test, the χ^2 probability distribution must be defined. A χ^2 distribution with $u = k-l-1$ degrees of freedom (l is the number of parameters used in fitting the proposed distribution) is the distribution for the sum of squares of u independent standard normal random variables z_i . The critical χ^2 distribution function is tabulated (in Table 4 in ANNEXURE – I(a)) from Haan (1977) ⁽⁶⁾. A confidence level is chosen for the test; it is often expressed as $1-\alpha$, where α is termed the significance level.

Kolmogorov-Smirnov Test: The theoretical and sample values of the cumulative frequency are compared with the Kolmogorov-Smirnov (S-K) test. The test statistic D , which is based on deviations of the sample distribution function $P(x)$ from the completely specified continuous hypothetical distribution function $P_o(x)$, such that:

$$D = \max |P(x) - P_o(x)|$$

Developed by Kolmogorov (Kite 1988) ⁽⁷⁾ in 1933, the test requires that the value of D computed from the sample distribution be less than the tabulated value of D (Table 5) at the required confidence level. Kolmogorov-Smirnov test for Gumbel's Extremal Distribution gives better result in Bangladesh.

4.4 Disaggregation of Daily Rainfall Data

4.4.1 Rainfall Cascade Disaggregation Model

Cascade level refers to the time series at a certain resolution. The transition from one cascade level to the higher one, corresponding to a doubling of resolution, is called *modulation*. A time interval at an arbitrary cascade level (i.e. time scale) is termed a *box*, which is characterized by an associated precipitation amount (0 if dry, >0 if wet). The

break-up of a wet box into two equally sized sub-boxes is denoted *branching*. In one branching, the total amount is redistributed according to two multiplicative weights, $0 \leq W_1 \leq 1$ and $0 \leq W_2 \leq 1$ ($W_1 + W_2 = 1$). The model is a multiplicative random cascade of branching number 2 with exact conservation of mass (micro canonical property as opposed to canonical cascades where the volume is only approximately conserved). The model divides daily precipitation into non overlapping time intervals. If the precipitation in a day is P_d , $P_1 = P_d W_1$ is the precipitation amount assigned to the first half of the day, and $P_2 = P_d W_2$ the amount assigned to the second half. Similarly, each half is then branched to a doubled resolution, and so on. The implementation of cascade – based model allows the conversion of daily amount into 12-hourly (1 steps), 6-hourly (2 steps), and 3-hourly (3 steps) values. The short-time intensity disaggregation model (Connolly et al. 1998) ⁽⁸⁾, is used to have three fine-resolution time interval that are 1-hour, 1/2-hour and 10-minutes. A single Poisson distribution parameter represents the number of events, N , on a rainy day. The density function of the Poisson distribution (adjusted so that $N \geq 1$) has the form:

$$f(N) = \frac{\eta^{N-1} \cdot e^{-\eta}}{(N-1)!} \quad (14)$$

Where η is a fitted coefficient. Mean (μ_N) and variance (σ_N^2) are given as:

$$\mu_N = \eta + 1 \quad (15)$$

$$\sigma_N^2 = \eta \quad (16)$$

The simulated number of event N is the lowest integer to satisfy:

$$\sum_{i=1}^N \frac{\eta^{i-1} \cdot e^{-\eta}}{(i-1)!} \geq U \quad N \geq 1 \quad (17)$$

Where U is a uniform random number in the range 0–1.

The duration of each event, D , is represented with a gamma distribution. The scale parameter of the gamma distribution, α , has to be estimated and the shape parameter, β , is set held at 2. It results the following density function:

$$f(D) = \alpha^2 \cdot D \cdot e^{-\alpha \cdot D} \quad (18)$$

A uniform random number in the range 0–1, U , is generated and the event duration is simulated by solving the cumulative density function of the gamma distribution using Newton's method:

$$1 - (1 + \alpha \cdot D) \cdot e^{-\alpha \cdot D} = U \quad (19)$$

With these estimated point (10'-30'-1 h, 3 h, 6 h, 12 h and 24 h) following the procedures for the frequency distribution, it is possible to define the rainfall probability curves.

Using the above equations, daily and monthly basis analysis of water level data have been prepared which is shown in **ANNEXURE -I (b)**.

CHAPTER 5 DESIGNING STORM SEWER

5.0 Capacity Estimate and Designing Drain Sections (Prismatic)

5.1 Manning's Formula

The Manning's formula is a widely used formula around the world to estimate capacity of an open channel or design required section. The formula is also known as Gauckler-Manning-Strickler formula. It is an empirical formula to estimate the average velocity of water flowing through an open channel. The Manning's equation is as follows:

$$V = \frac{K_n}{n} R^{\frac{2}{3}} s^{\frac{1}{2}} \quad (20)$$

Where, V = average velocity of flow (SI unit: m/s; Imperial: ft/s)

K_n = Unit conversion factor (1.00 for SI unit and 1.49 for Imperial unit)

R = Hydraulic Radius = $\frac{P}{A}$ (SI unit: m, Imperial: ft)

Here, P = Wetted Perimeter (SI unit: m, Imperial: ft)

A = Cross-sectional area of flow (SI unit: m², Imperial: ft²)

s = hydraulic gradient of flow (SI unit: m/m, Imperial: ft/ft)

n = Manning's dimensionless roughness coefficient

Manning's roughness coefficient may be selected using the following **Table-5.1**.

Table-5.1: Manning's n for Channels (Chow (1951))⁽⁵⁾.

Type of Channel and Description	Minimum	Normal	Maximum
Natural streams - minor streams (top width at floodstage < 100 ft)			
1. Main Channels			
a. clean, straight, full stage, no rifts or deep pools	0.025	0.03	0.033
b. same as above, but more stones and weeds	0.03	0.035	0.04
c. clean, winding, some pools and shoals	0.033	0.04	0.045
d. same as above, but some weeds and stones	0.035	0.045	0.05
e. same as above, lower stages, more ineffective slopes and sections	0.04	0.048	0.055
f. same as "d" with more stones	0.045	0.05	0.06
g. sluggish reaches, weedy, deep pools	0.05	0.07	0.08
h. very weedy reaches, deep pools, or floodways with heavy stand of timber and underbrush	0.075	0.1	0.15
2. Mountain streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high stages			

Table-5.1: Manning's n for Channels (Chow (1951)) ⁽⁵⁾.

Type of Channel and Description	Minimum	Normal	Maximum
a. bottom: gravels, cobbles, and few boulders	0.03	0.04	0.05
b. bottom: cobbles with large boulders	0.04	0.05	0.07
3. Floodplains			
a. Pasture, no brush			
1. short grass	0.025	0.03	0.035
2. high grass	0.03	0.035	0.05
b. Cultivated areas			
1. no crop	0.02	0.03	0.04
2. mature row crops	0.025	0.035	0.045
3. mature field crops	0.03	0.04	0.05
c. Brush			
1. scattered brush, heavy weeds	0.035	0.05	0.07
2. light brush and trees, in winter	0.035	0.05	0.06
3. light brush and trees, in summer	0.04	0.06	0.08
4. medium to dense brush, in winter	0.045	0.07	0.11
5. medium to dense brush, in summer	0.07	0.1	0.16
d. Trees			
1. dense willows, summer, straight	0.11	0.15	0.2
2. cleared land with tree stumps, no sprouts	0.03	0.04	0.05
3. same as above, but with heavy growth of sprouts	0.05	0.06	0.08
4. heavy stand of timber, a few down trees, little undergrowth, flood stage below branches	0.08	0.1	0.12
5. Same as 4. with flood stage reaching branches	0.1	0.12	0.16
4. Excavated or Dredged Channels			
a. Earth, straight, and uniform			
1. clean, recently completed	0.016	0.018	0.02
2. clean, after weathering	0.018	0.022	0.025
3. gravel, uniform section, clean	0.022	0.025	0.03
4. with short grass, few weeds	0.022	0.027	0.033
b. Earth winding and sluggish			
1. no vegetation	0.023	0.025	0.03
2. grass, some weeds	0.025	0.03	0.033
3. dense weeds or aquatic plants in deep channels	0.03	0.035	0.04
4. earth bottom and rubble sides	0.028	0.03	0.035
5. stony bottom and weedy banks	0.025	0.035	0.04
6. cobble bottom and clean sides	0.03	0.04	0.05
c. Dragline-excavated or dredged			
1. no vegetation	0.025	0.028	0.033
2. light brush on banks	0.035	0.05	0.06

Table-5.1: Manning's n for Channels (Chow (1951)) ⁽⁵⁾.

Type of Channel and Description	Minimum	Normal	Maximum
d. Rock cuts			
1. smooth and uniform	0.025	0.035	0.04
2. jagged and irregular	0.035	0.04	0.05
e. Channels not maintained, weeds and brush uncut			
1. dense weeds, high as flow depth	0.05	0.08	0.12
2. clean bottom, brush on sides	0.04	0.05	0.08
3. same as above, highest stage of flow	0.045	0.07	0.11
4. dense brush, high stage	0.08	0.1	0.14
5. Lined or Constructed Channels			
a. Cement			
1. neat surface	0.01	0.011	0.013
2. mortar	0.011	0.013	0.015
b. Wood			
1. planed, untreated	0.01	0.012	0.014
2. planed, creosoted	0.011	0.012	0.015
3. un-planed	0.011	0.013	0.015
4. plank with battens	0.012	0.015	0.018
5. lined with roofing paper	0.01	0.014	0.017
c. Concrete			
1. trowel finish	0.011	0.013	0.015
2. float finish	0.013	0.015	0.016
3. finished, with gravel on bottom	0.015	0.017	0.02
4. unfinished	0.014	0.017	0.02
5. gunite, good section	0.016	0.019	0.023
6. gunite, wavy section	0.018	0.022	0.025
7. on good excavated rock	0.017	0.02	
8. on irregular excavated rock	0.022	0.027	
d. Concrete bottom float finish with sides of:			
1. dressed stone in mortar	0.015	0.017	0.02
2. random stone in mortar	0.017	0.02	0.024
3. cement rubble masonry, plastered	0.016	0.02	0.024
4. cement rubble masonry	0.02	0.025	0.03
5. dry rubble or riprap	0.02	0.03	0.035
e. Gravel bottom with sides of:			
1. formed concrete	0.017	0.02	0.025
2. random stone mortar	0.02	0.023	0.026
3. dry rubble or riprap	0.023	0.033	0.036
f. Brick			
1. glazed	0.011	0.013	0.015
2. in cement mortar	0.012	0.015	0.018

Table-5.1: Manning's n for Channels (Chow (1951)) ⁽⁵⁾.

Type of Channel and Description	Minimum	Normal	Maximum
g. Masonry			
1. cemented rubble	0.017	0.025	0.03
2. dry rubble	0.023	0.032	0.035
h. Dressed ashlar/stone paving	0.013	0.015	0.017
i. Asphalt			
1. smooth	0.013	0.013	
2. rough	0.016	0.016	
j. Vegetal lining	0.03		0.5

Estimation of capacity of the existing drains and drainage channels will be estimated using Manning's formula. Design sections of the proposed sections will also be calculated using this formula.

CHAPTER 6 CONCLUSION

6.0 Conclusion

The findings and the collected data during the survey works will be used in the subsequent planning stage of the project, "Preparation of Development Plan for Fourteen Upazilas". The prepared DEM will be used for Delineation of Catchment area and preparing contours of the project area. The collected water level, rainfall and discharge data will be analyzed and tested for fitness with observed data and successively used to predict the respective data for different time periods. These are going to be incorporated in the final planning report. The results should assist in preparing a development plan that will be sustainable from the hydrologic point of view. The surveyed cross sections, drainage inventories and list of the road name along the drains will be updated after accumulation and processing of physical feature data.

References:

1. O'Neill ADJ and Gray DM; Proceedings of Banff Symposium on Role of snow and Ice in Hydrology; 1973.
2. Warren Viessman and Garry L. Lewis; Introduction to Hydrology^{ed/4}, Harper Collins (1996).
3. Linsley, R. K., M. A. Kohler and J. L. H. Paulhus; Hydrology for engineers^{ed/3}, McGraw-Hill (1982).
4. Ven Te Chow, David Maidment, and Larry Hays; Applied Hydrology^{ed/1}, McGraw-Hill (1988).
5. VT Chow; Open-Channel Hydraulics, McGraw-Hill, New York (1959)
6. Charles T Haan; Statistical Methods in Hydrology, The Iowa State University Press (1977).
7. Khaled Hamed, A. Ramachandro. Rao; Flood Frequency Analysis, CRC press.
8. Stephan Pauleit, Adrien Coly, Sandra Fohlmeister, Paolo Gasparini, Gertrud Jørgensen, Sigrun Kabisch, Wilbard J. Kombe, Sarah Lindley, Ingo Simonis, Kumelachew Yeshitela; Urban Vulnerability and Climate Change in Africa: A Multidisciplinary Approach, Springer.

TABLES

Table 1: Cumulative probability of the Standard Normal Distribution

Cumulative probability of the standard normal distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Source: Grant, E. L., and R. S. Leavenworth, *Statistical Quality and Control*, Table A, p.643, McGraw-Hill, New York, 1972. Used with permission.

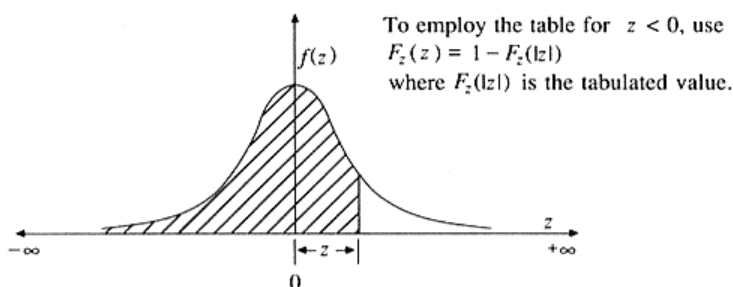


Table 2: Frequency factors for Pearson Type III Distribution

 K_T values for Pearson Type III distribution (positive skew)

Skew coefficient C_s or C_w	Return period in years						
	2	5	10	25	50	100	200
	Exceedence probability						
	0.50	0.20	0.10	0.04	0.02	0.01	0.005
3.0	-0.396	0.420	1.180	2.278	3.152	4.051	4.970
2.9	-0.390	0.440	1.195	2.277	3.134	4.013	4.909
2.8	-0.384	0.460	1.210	2.275	3.114	3.973	4.847
2.7	-0.376	0.479	1.224	2.272	3.093	3.932	4.783
2.6	-0.368	0.499	1.238	2.267	3.071	3.889	4.718
2.5	-0.360	0.518	1.250	2.262	3.048	3.845	4.652
2.4	-0.351	0.537	1.262	2.256	3.023	3.800	4.584
2.3	-0.341	0.555	1.274	2.248	2.997	3.753	4.515
2.2	-0.330	0.574	1.284	2.240	2.970	3.705	4.444
2.1	-0.319	0.592	1.294	2.230	2.942	3.656	4.372
2.0	-0.307	0.609	1.302	2.219	2.912	3.605	4.298
1.9	-0.294	0.627	1.310	2.207	2.881	3.553	4.223
1.8	-0.282	0.643	1.318	2.193	2.848	3.499	4.147
1.7	-0.268	0.660	1.324	2.179	2.815	3.444	4.069
1.6	-0.254	0.675	1.329	2.163	2.780	3.388	3.990
1.5	-0.240	0.690	1.333	2.146	2.743	3.330	3.910
1.4	-0.225	0.705	1.337	2.128	2.706	3.271	3.828
1.3	-0.210	0.719	1.339	2.108	2.666	3.211	3.745
1.2	-0.195	0.732	1.340	2.087	2.626	3.149	3.661
1.1	-0.180	0.745	1.341	2.066	2.585	3.087	3.575
1.0	-0.164	0.758	1.340	2.043	2.542	3.022	3.489
0.9	-0.148	0.769	1.339	2.018	2.498	2.957	3.401
0.8	-0.132	0.780	1.336	1.993	2.453	2.891	3.312
0.7	-0.116	0.790	1.333	1.967	2.407	2.824	3.223
0.6	-0.099	0.800	1.328	1.939	2.359	2.755	3.132
0.5	-0.083	0.808	1.323	1.910	2.311	2.686	3.041
0.4	-0.066	0.816	1.317	1.880	2.261	2.615	2.949
0.3	-0.050	0.824	1.309	1.849	2.211	2.544	2.856
0.2	-0.033	0.830	1.301	1.818	2.159	2.472	2.763
0.1	-0.017	0.836	1.292	1.785	2.107	2.400	2.670
0.0	0	0.842	1.282	1.751	2.054	2.326	2.576

Cont....

Table 2 Continued

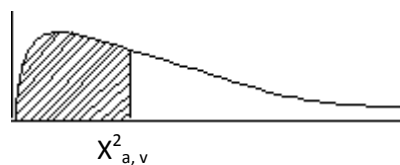
K_T values for Pearson Type III distribution (negative skew)							
Skew coefficient C_s or C_w	Return period in years						
	2	5	10	25	50	100	200
	Exceedence probability						
	0.50	0.20	0.10	0.04	0.02	0.01	0.005
-0.1	0.017	0.846	1.270	1.716	2.000	2.252	2.482
-0.2	0.033	0.850	1.258	1.680	1.945	2.178	2.388
-0.3	0.050	0.853	1.245	1.643	1.890	2.104	2.294
-0.4	0.066	0.855	1.231	1.606	1.834	2.029	2.201
-0.5	0.083	0.856	1.216	1.567	1.777	1.955	2.108
-0.6	0.099	0.857	1.200	1.528	1.720	1.880	2.016
-0.7	0.116	0.857	1.183	1.488	1.663	1.806	1.926
-0.8	0.132	0.856	1.166	1.448	1.606	1.733	1.837
-0.9	0.148	0.854	1.147	1.407	1.549	1.660	1.749
-1.0	0.164	0.852	1.128	1.366	1.492	1.588	1.664
-1.1	0.180	0.848	1.107	1.324	1.435	1.518	1.581
-1.2	0.195	0.844	1.086	1.282	1.379	1.449	1.501
-1.3	0.210	0.838	1.064	1.240	1.324	1.383	1.424
-1.4	0.225	0.832	1.041	1.198	1.270	1.318	1.351
-1.5	0.240	0.825	1.018	1.157	1.217	1.256	1.282
-1.6	0.254	0.817	0.994	1.116	1.166	1.197	1.216
-1.7	0.268	0.808	0.970	1.075	1.116	1.140	1.155
-1.8	0.282	0.799	0.945	1.035	1.069	1.087	1.097
-1.9	0.294	0.788	0.920	0.996	1.023	1.037	1.044
-2.0	0.307	0.777	0.895	0.959	0.980	0.990	0.995
-2.1	0.319	0.765	0.869	0.923	0.939	0.946	0.949
-2.2	0.330	0.752	0.844	0.888	0.900	0.905	0.907
-2.3	0.341	0.739	0.819	0.855	0.864	0.867	0.869
-2.4	0.351	0.725	0.795	0.823	0.830	0.832	0.833
-2.5	0.360	0.711	0.771	0.793	0.798	0.799	0.800
-2.6	0.368	0.696	0.747	0.764	0.768	0.769	0.769
-2.7	0.376	0.681	0.724	0.738	0.740	0.740	0.741
-2.8	0.384	0.666	0.702	0.712	0.714	0.714	0.714
-2.9	0.390	0.651	0.681	0.683	0.689	0.690	0.690
-3.0	0.396	0.636	0.666	0.666	0.666	0.667	0.667

Source: U. S. Water Resources Council (1981).

Table 3: Frequency factors for Pearson Type III Distribution

Sample	Return Period								
	5	10	15	20	25	50	75	100	1000
15	0.967	1.703	2.117	2.410	2.632	3.321	3.721	4.005	6.265
20	0.919	1.625	2.023	2.302	2.517	3.179	3.563	3.836	6.006
25	0.888	1.575	1.963	2.235	2.444	3.088	3.463	3.729	5.842
30	0.866	1.541	1.922	2.188	2.393	3.026	3.393	3.653	5.727
35	0.851	1.516	1.891	2.152	2.354	2.979	3.341	3.598	
40	0.838	1.495	1.866	2.126	2.326	2.943	3.301	3.554	5.576
45	0.829	1.478	1.847	2.104	2.303	2.913	3.268	3.520	
50	0.820	1.466	1.831	2.086	2.283	2.889	3.241	3.491	5.478
55	0.813	1.455	1.818	2.071	2.267	2.869	3.219	3.467	
60	0.807	1.446	1.806	2.059	2.253	2.852	3.200	3.446	
65	0.801	1.437	1.796	2.048	2.241	2.837	3.183	3.429	
70	0.797	1.430	1.788	2.038	2.230	2.824	3.169	3.413	5.359
75	0.972	1.423	1.780	2.029	2.220	2.812	3.155	3.400	
80	0.788	1.417	1.773	2.020	2.212	2.802	3.145	3.387	
85	0.785	1.413	1.767	2.013	2.205	2.793	3.135	3.376	
90	0.782	1.409	1.762	2.007	2.198	2.785	3.125	3.367	
95	0.780	1.405	1.757	2.002	2.193	2.777	3.116	3.357	
100	0.779	1.401	1.752	1.998	2.187	2.770	3.109	3.349	5.261
α	0.719	1.305	1.635	1.866	2.044	2.592	2.911	3.137	4.936

Source: Journal American Statistical Association 47:425-441, 1952.Z.W. Birnbaum.

Table 4: χ^2 Distribution

DOF v	$\chi^2_{.995}$	$\chi^2_{.99}$	$\chi^2_{.975}$	$\chi^2_{.95}$	$\chi^2_{.90}$	$\chi^2_{.75}$	$\chi^2_{.50}$	$\chi^2_{.25}$	$\chi^2_{.10}$	$\chi^2_{.05}$	$\chi^2_{.025}$	$\chi^2_{.01}$	$\chi^2_{.005}$
1	7.88	6.63	5.02	3.84	2.71	1.32	0.455	0.102	0.0158	0.0039	0.0010	0.0002	0.0000
2	10.6	9.21	7.38	5.99	4.61	2.77	1.39	0.575	.211	.103	.0506	.0201	.0100
3	12.8	11.3	9.35	7.81	6.25	4.11	2.37	1.21	.584	.352	.216	.115	.072
4	14.9	13.3	11.1	9.49	7.78	5.39	3.36	1.92	1.06	.711	.484	.297	.207
5	16.7	15.1	12.8	11.1	9.24	6.63	4.35	2.67	1.61	1.15	.831	.554	.412
6	18.5	16.8	14.4	12.6	10.6	7.84	5.35	3.45	2.20	1.64	1.24	.872	.676
7	20.3	18.5	16.0	14.1	12.0	9.04	6.35	4.25	2.83	2.17	1.69	1.24	.989
8	22.0	20.1	17.5	15.5	13.4	10.2	7.34	5.07	3.49	2.73	2.18	1.65	1.34
9	23.6	21.7	19.0	16.9	14.7	11.4	8.34	5.90	4.17	3.33	2.70	2.09	1.73
10	25.2	23.2	20.5	18.3	16.0	12.5	9.34	6.74	4.87	3.94	3.25	2.56	2.16
11	26.8	24.7	21.9	19.7	17.3	13.7	10.3	7.58	5.58	4.57	3.82	3.05	2.60
12	28.3	26.2	23.3	21.0	18.5	14.8	11.3	8.44	6.30	5.23	4.40	3.57	3.07
13	29.8	27.7	24.7	22.4	19.8	16.0	12.3	9.30	7.04	5.89	5.01	4.11	3.57
14	31.3	29.1	26.1	23.7	21.1	17.1	13.3	10.2	7.79	6.57	5.63	4.66	4.07
15	32.8	30.6	27.5	25.0	22.3	18.2	14.3	11.0	8.55	7.26	6.26	5.23	4.60
16	34.3	32.0	28.8	26.3	23.5	19.4	15.3	11.9	9.31	7.96	6.91	5.81	5.14
17	35.7	33.4	30.2	27.6	24.8	20.5	16.3	12.8	10.1	8.67	7.56	6.41	5.70
18	37.2	34.8	31.5	28.9	26.0	21.6	17.3	13.7	10.9	9.39	8.23	7.01	6.26
19	38.6	36.2	32.9	30.1	27.2	22.7	18.3	14.6	11.7	10.1	8.91	7.63	6.84
20	40.0	37.6	34.2	31.4	28.4	23.8	19.3	15.5	12.4	10.9	9.59	8.26	7.43
21	41.4	38.9	35.5	32.7	29.6	24.9	20.3	16.3	13.2	11.6	10.3	8.90	8.03
22	42.8	40.3	36.8	33.9	30.8	26.0	21.3	17.2	14.0	12.3	11.0	9.54	8.64

ANNEXURE - 1

23	44.2	41.6	38.1	35.2	32.0	27.1	22.3	18.1	14.8	13.1	11.7	10.2	9.26
24	45.6	43.0	39.4	36.4	33.2	28.2	23.3	19.0	15.7	13.8	12.4	10.9	9.89
25	46.9	44.3	40.6	37.7	34.4	29.3	24.3	19.9	16.5	14.6	13.1	11.5	10.5
26	48.3	45.6	41.9	38.9	35.6	30.4	25.3	20.8	17.3	15.4	13.8	12.2	11.2
27	49.6	47.0	43.2	40.1	36.7	31.5	26.3	21.7	18.1	16.2	14.6	12.9	11.8
28	51.0	48.3	44.5	41.3	37.9	32.6	27.3	22.7	18.9	16.9	15.3	13.6	12.5
29	52.3	49.6	45.7	42.6	39.1	33.7	28.3	23.6	19.8	17.7	16.0	14.3	13.1
30	53.7	50.9	47.0	43.8	40.3	34.8	29.3	24.5	20.6	18.5	16.8	15.0	13.8
40	66.8	63.7	59.3	55.8	51.8	45.6	39.3	33.7	29.1	26.5	24.4	22.2	20.7
50	79.5	76.2	71.4	67.5	63.2	56.3	49.3	42.9	37.7	34.8	32.4	29.7	28.0
60	92.0	88.4	83.3	79.1	74.4	67.0	59.3	52.3	46.5	43.2	40.5	37.5	35.5
70	104. 2	100. 4	95.0	90.5	85.5	77.6	69.3	61.7	55.3	51.7	48.8	45.4	43.3
80	116. 3	112. 3	106. 6	101. 9	96.6	88.1	79.3	71.1	64.3	60.4	57.2	53.5	51.2
90	128. 3	124. 1	118. 1	113. 1	107. 6	98.6	89.3	80.6	73.3	69.1	65.6	61.8	59.2
100	140. 2	135. 8	129. 6	124. 3	118. 5	109. 1	99.3	90.1	82.4	77.9	74.2	70.1	67.3

Source: Catherine M. Thompson, Table of percentage points of the χ^2 distribution, Biometrika, Vol. 32 (1941), by permission of the author and publisher.

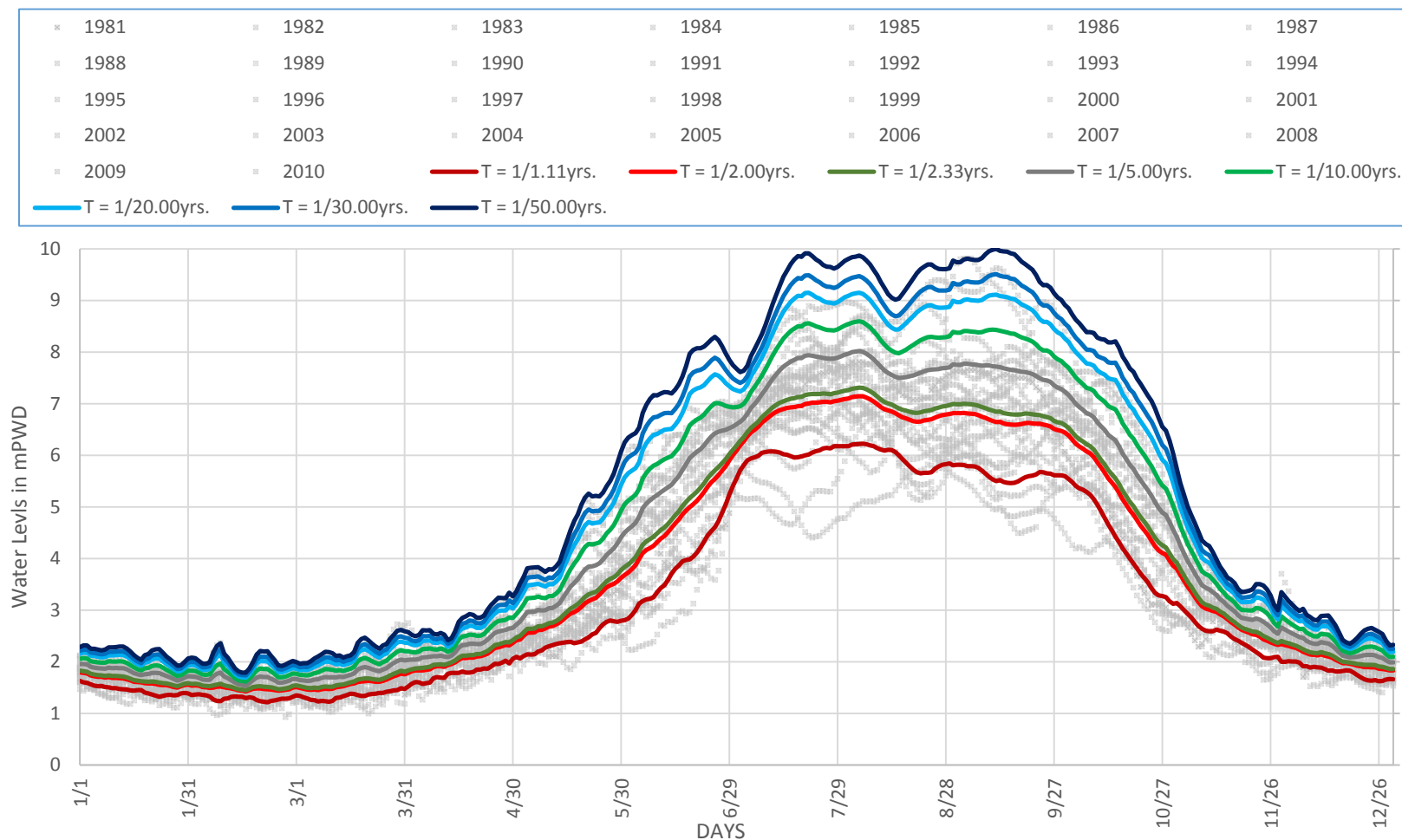
Table 5: Kolmogorov-Smirnov Distribution

Sample	Significance Level				
size (n)	.20	0.15	0.10	0.05	0.01
1	.900	.925	.950	.975	.995
2	.684	.726	.776	.842	.929
3	.565	.597	.642	.708	.829
4	.494	.725	.564	.624	.734
5	.446	.474	.510	.563	.669
6	.410	.436	.470	.521	.618
7	.381	.405	.438	.486	.577
8	.358	.381	.411	.457	.543
9	.339	.360	.388	.432	.514
10	.322	.342	.368	.409	.486
11	.307	.326	.352	.391	.468
12	.295	.313	.338	.375	.450
13	.284	.302	.325	.361	.433
14	.274	.292	.314	.349	.418
15	.266	.283	.304	.338	.404
16	.258	.274	.295	.328	.391
17	.250	.266	.286	.318	.380
18	.244	.259	.278	.309	.370
19	.237	.252	.272	.301	.361
20	.231	.246	.264	.294	.352
25	.21	.22	.24	.264	.32
30	.19	.20	.22	.242	.29
35	.18	.19	.21	.23	.27
40				.21	.25
50				.19	.23
60				.17	.21
70				.16	.19
80				.15	.18
90				.14	
100				.14	
Asymptotic	1.70	1.14	1.22	1.36	1.63
Formula	$\frac{1.70}{\sqrt{n}}$	$\frac{1.14}{\sqrt{n}}$	$\frac{1.22}{\sqrt{n}}$	$\frac{1.36}{\sqrt{n}}$	$\frac{1.63}{\sqrt{n}}$

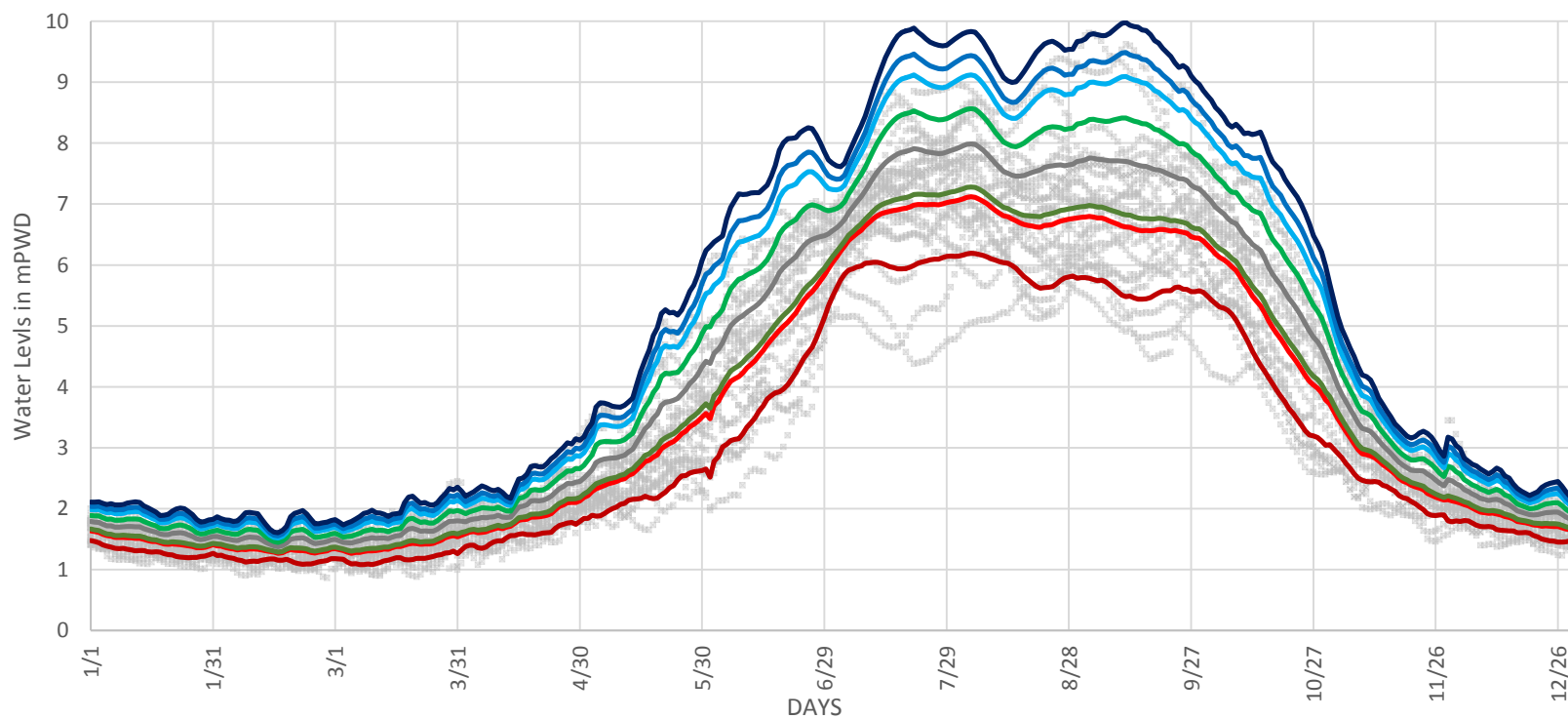
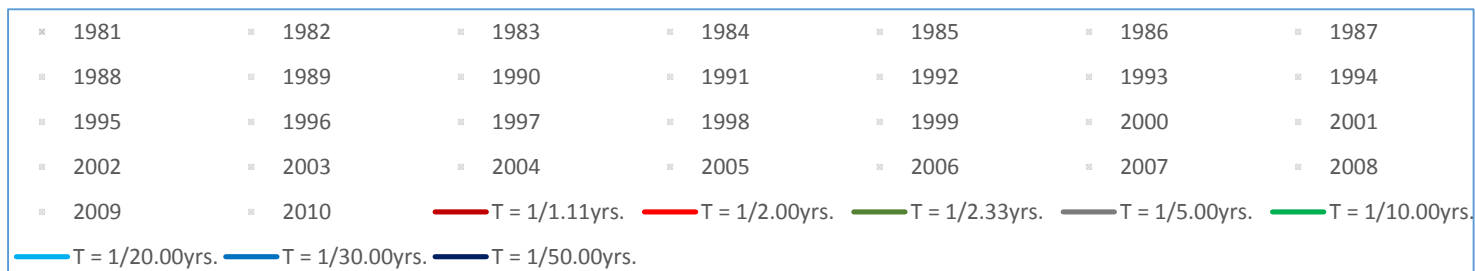
Source: Journal American Statistical Association 47:425-441, 1952.Z.W. Birnbaum.

A.1b.1 ANALYSED RESULTS OF BWDB WATER LEVEL GAUGE STATION SW 229 ON THE OLD BRAHMAPUTRA RIVER

DAILY BASIS HIGH TIDE LEVEL ANALYSIS OF BWDB WATER LEVEL STATION SW229 AT TOKE, KISHOREGANJ (EV I - DISTRIBUTION)



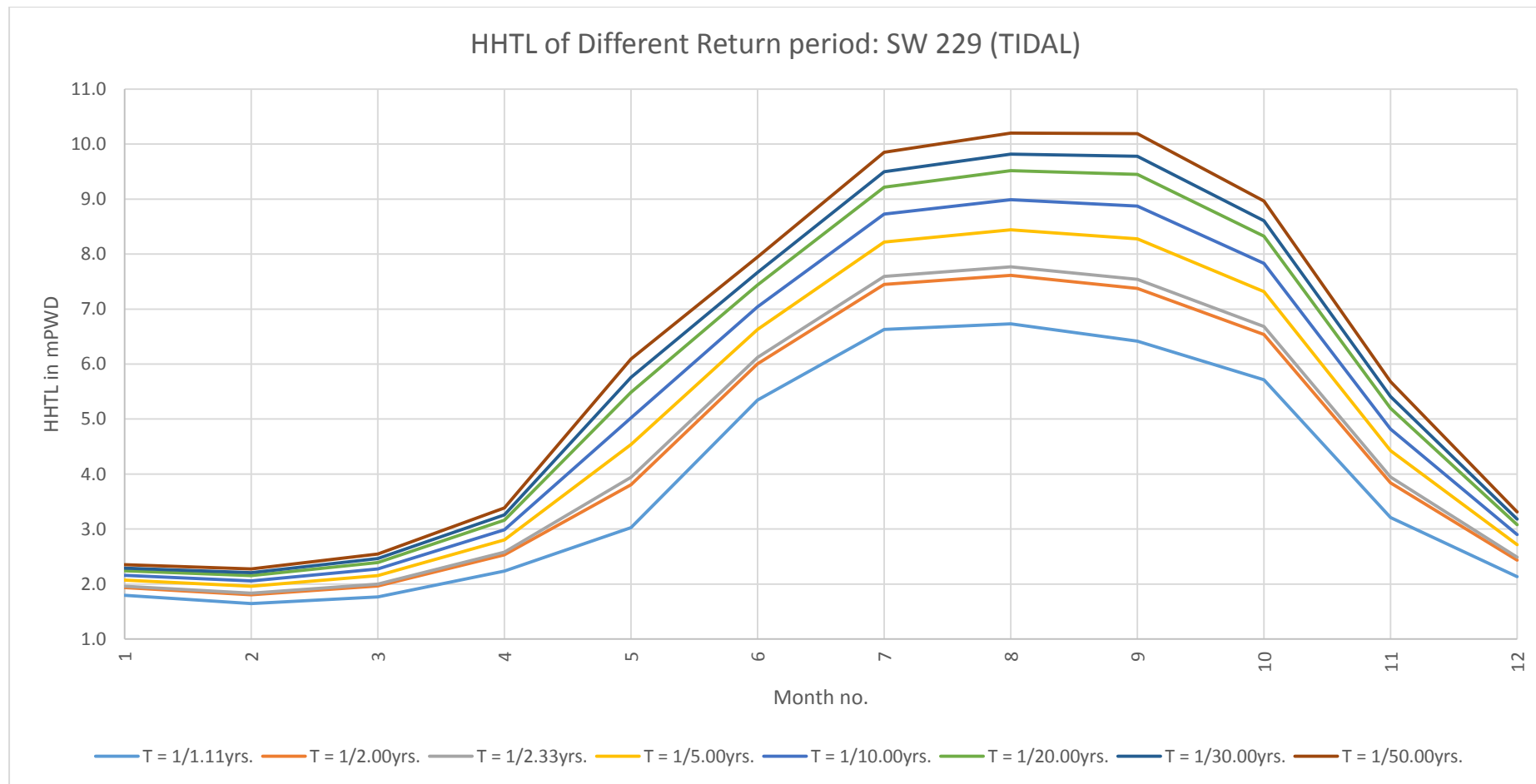
DAILY BASIS LOW TIDE LEVEL ANALYSIS OF BWDB WATER LEVEL STATION SW229 AT TOKE, KISHOREGANJ (EV I - DISTRIBUTION)



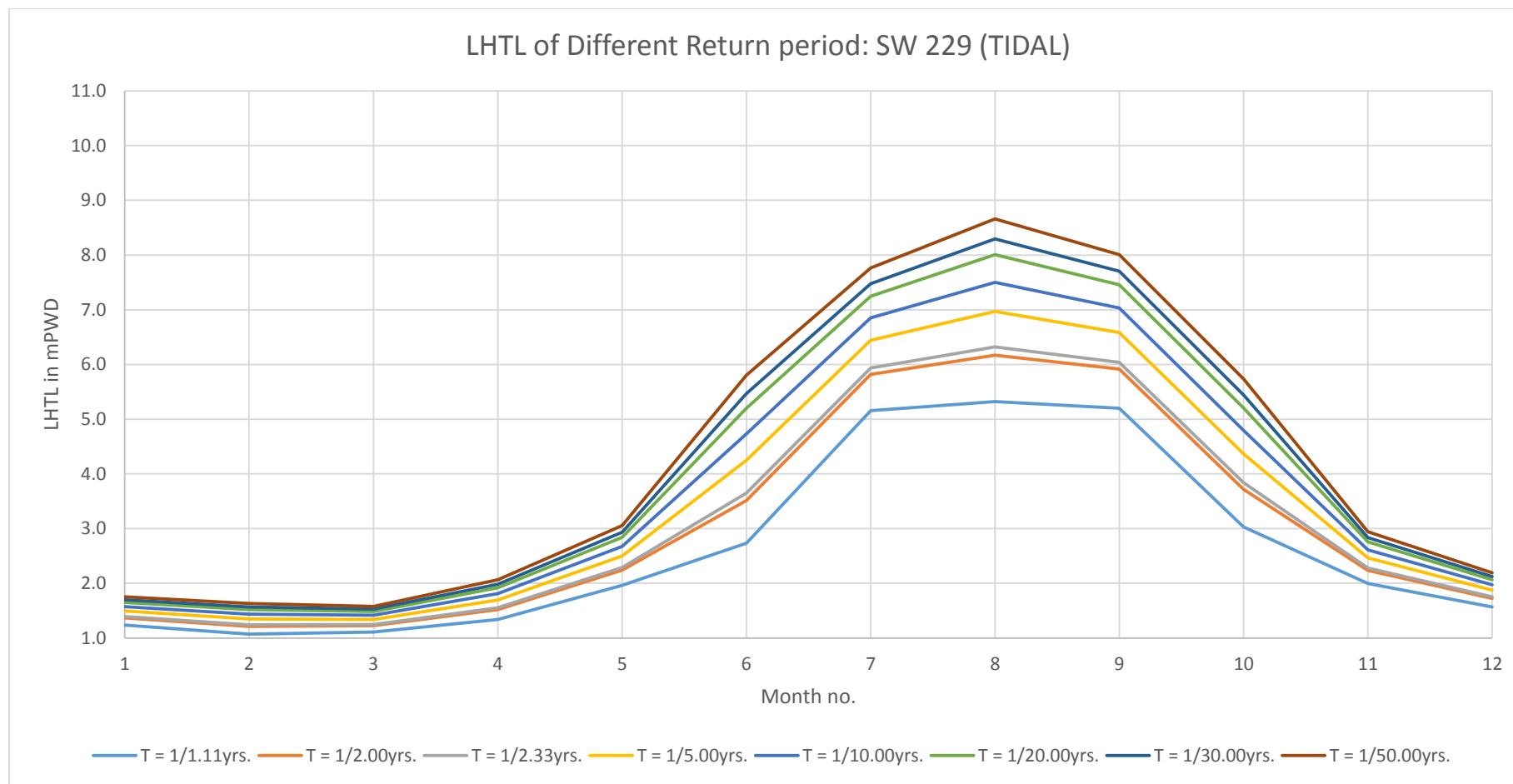
MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 229 (HTL)

Monthly Data					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WL					Monthly Maximum HTL (mPWD)												Monthly Minimum HTL (mPWD)											
	</																											

MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 229 (HTL)



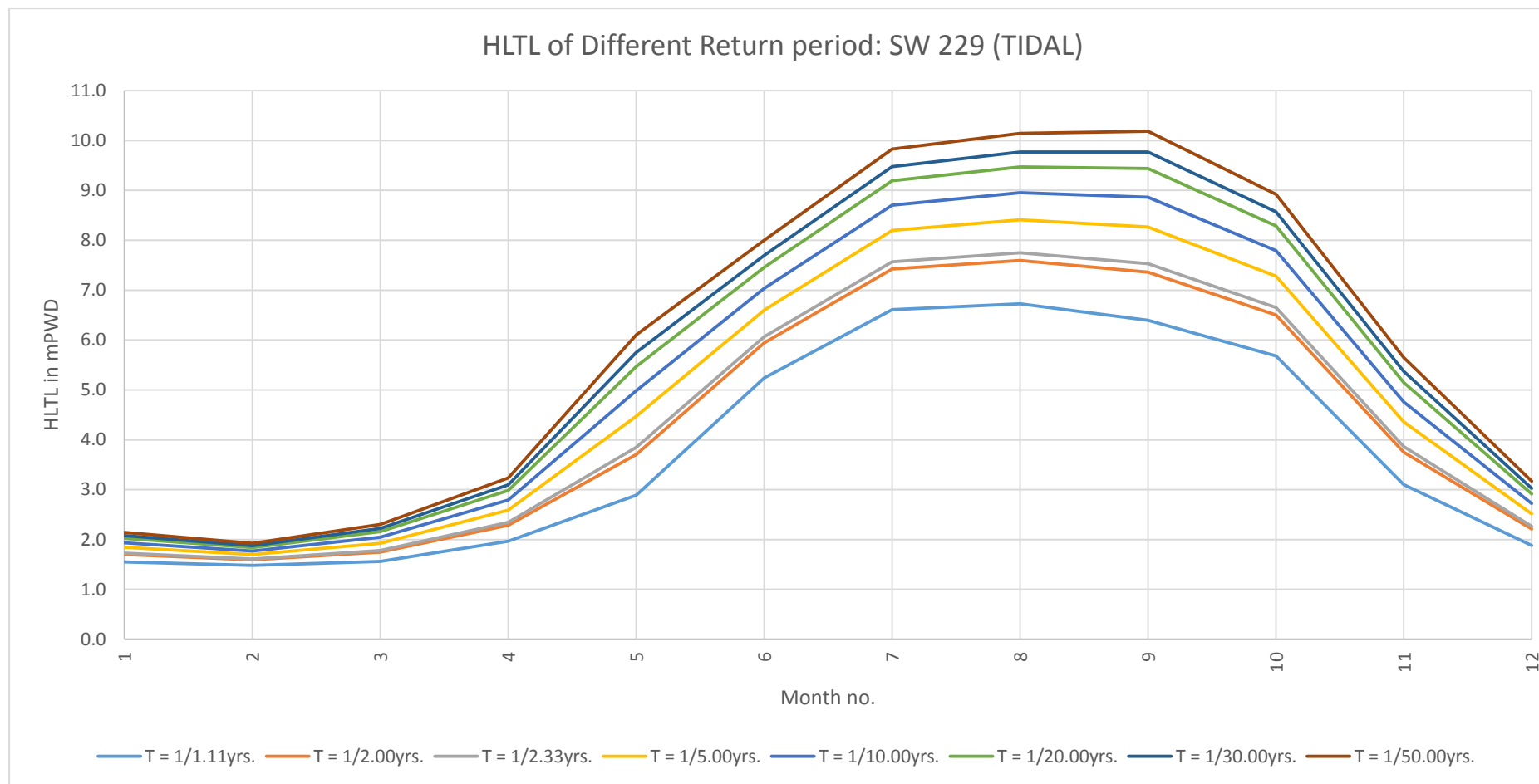
MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 229 (HTL)



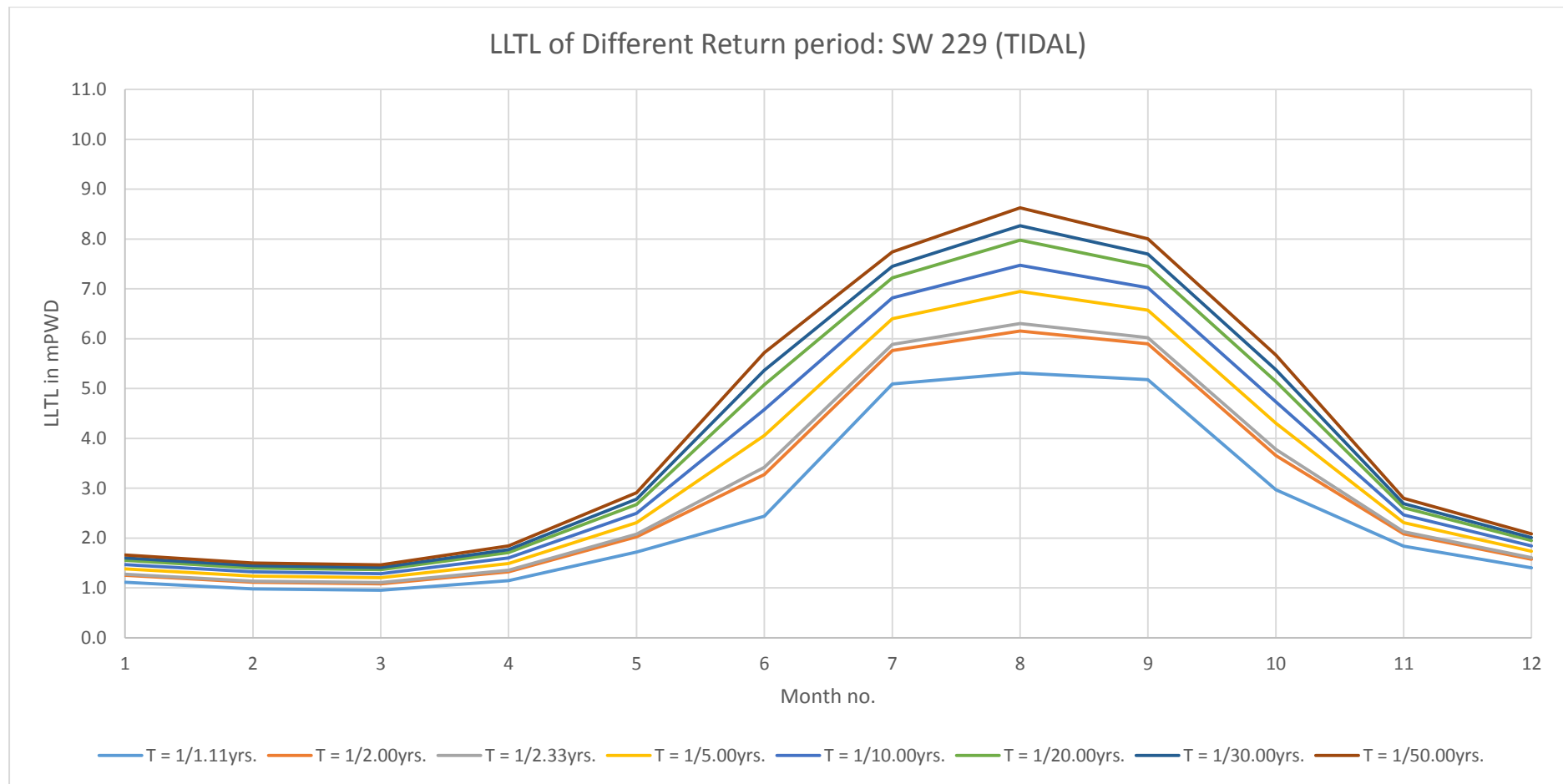
MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 229 (LTL)

Monthly Data			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WL		Year	Monthly Maximum LTL (mPWD)													Monthly Minimum LTL (mPWD)											
		1981				02.70	03.35	04.76	07.68	07.77	07.65	06.01	02.74	02.47					01.05	01.80	03.57	05.12	07.07	06.16	02.80	01.98	01.40
		1982	01.52	01.40	01.49	02.35	03.75	06.82	07.29	08.01	07.12	06.55	02.64	01.72		01.10	01.01	00.98	01.55	02.04	02.56	06.88	05.84	05.75	02.56	01.46	01.23
		1983	01.46	01.46	01.97	02.43	03.83	05.65	06.91	07.75	07.97	07.49	04.14	02.05		01.05	00.90	01.04	01.32	02.05	03.40	05.71	06.17	07.09	04.39	02.03	01.48
		1984	01.65	01.54	01.72	02.27	05.01	06.76	08.17	08.70	08.95	08.32	04.32	02.06		01.21	00.86	01.01	01.17	02.06	04.58	05.99	06.29	06.28	04.51	02.08	01.43
		1985	01.47	01.49	01.87	02.61	03.32	06.43	08.11	08.37	07.43	06.72	03.73	02.16		01.14	01.02	01.19	01.42	02.22	02.96	06.22	06.22	06.52	03.84	02.18	01.61
		1986	01.76	01.58	01.59	02.54	02.76	04.96	06.81	06.81	07.28	07.38	04.12	02.25		01.27	01.00	00.88	01.08	02.13	02.02	05.41	05.12	06.12	04.30	02.13	01.46
		1987	01.63	01.52	01.53	02.28	02.47	05.10	07.86	08.91	07.83	07.67	03.93	02.18		01.13	01.01	00.92	01.23	01.95	02.26	05.27	07.95	07.48	04.14	02.14	01.60
		1988	01.68	01.58	01.82	02.19	05.71	07.04	08.66	09.28	09.81	06.45	04.01	03.45		01.16	01.16	01.21	01.44	01.93	04.86	06.38	07.05	06.31	04.26	02.30	01.71
		1989	01.74	01.74	01.67	02.00	04.36	06.06	07.54	06.98	07.05	06.90	04.19	02.03		01.29	01.23	01.02	01.00	01.96	04.60	05.07	05.91	05.95	04.36	02.06	01.38
		1990	01.53	01.52	01.75	02.64	04.12	06.53	07.51	07.59	06.83	07.42	04.10	02.25		01.14	00.98	00.97	01.28	02.34	04.29	06.38	05.90	05.53	04.27	02.02	01.66
		1991	01.98	01.71	01.56	01.96	05.18	06.90	08.24	07.46	08.10	07.55	04.80	02.36		01.26	01.18	00.90	01.30	01.79	05.02	06.57	06.74	07.03	04.98	02.20	01.72
		1992	01.84	01.82	01.92	02.19	03.40	05.49	06.79	06.39	06.00	05.69	03.37	02.04		01.38	01.24	01.30	01.56	02.15	02.89	05.81	05.17	05.12	03.53	02.08	01.53
		1993	01.73	01.82	01.77	01.98	04.52	06.87	08.08	07.91	08.26	06.54	03.66	02.28		01.27	01.15	01.14	01.22	02.00	03.66	06.66	07.25	05.84	03.74	02.14	01.59
		1994	01.84	01.66	02.43	02.45	02.85	05.60	05.67	05.82	05.54	04.42	02.70	01.95		01.26	01.16	01.16	01.75	01.79	02.55	04.38	04.78	04.53	02.62	01.62	01.37
		1995	01.54	01.46	01.62	01.97	04.35	06.81	08.84	08.21	07.41	07.13	03.59	02.36		01.01	01.00	00.90	01.32	01.70	03.64	06.78	06.34	05.85	03.31	02.41	01.71
		1996	01.68	01.68	01.81	02.07	04.48	04.91	07.86	07.58	06.90	05.42	04.65	02.28		01.28	01.20	01.16	01.61	02.13	03.55	05.26	06.21	05.34	03.50	02.34	01.81
		1997	01.94	01.73	01.73	01.96	02.70	05.63	07.59	06.76	06.86	06.78	02.84	01.97		01.38	01.29	01.22	01.45	01.65	02.80	05.41	05.65	05.74	02.84	01.88	01.64
		1998	01.79	01.63	01.91	02.54	03.94	06.43	08.93	09.39	09.62	06.56	04.89	02.72		01.37	01.17	01.14	01.45	02.03	04.10	06.46	08.50	06.68	04.08	02.62	01.91
		1999	02.01	01.64	01.72	02.15	03.23	06.05	07.30	07.49	07.82	06.00	04.77	02.29		01.46	01.34	01.28	01.30	02.20	03.36	06.43	06.09	06.03	04.98	02.36	01.87
		2000	01.81	01.67	01.95	03.10	04.60	06.73	06.96	07.81	07.60	07.17	04.09	02.23		01.49	01.28	01.26	01.48	02.77	01.97	06.10	06.13	06.87	03.49	02.22	01.83
		2001	01.82	01.75	01.70	02.10	03.00	05.33	05.63	06.78	06.93	06.28	03.86	02.51		01.51	01.33	01.24	01.34	01.94	03.19	04.64	05.42	05.78	03.83	02.36	01.75
		2002	01.89	01.59	01.95	03.12	03.73	06.53	08.07	08.64	06.66	05.82				01.43	01.23	01.20	01.49	03.04	03.37	06.47	06.82	04.46	02.77		
		2003	01.72	01.48	01.72											01.48	01.26	01.22									
		2004																									
		2005																									
		2006																									
		2007																									
		2008																									
		2009																									
		2010																									
		2011																									
		2012																									
		2013																									
		2014																									
		2015																									
		MAX	02.01	01.82	02.43	03.12	05.71	07.04	08.93	09.39	09.81	08.32	04.89	03.45		01.51	01.34	01.30	01.75	03.04	05.02	06.88	08.50	07.48	04.98	02.62	01.91
		MIN	01.46	01.40	01.49	01.96	02.47	04.76	05.63	05.82	05.54	04.42	02.64	01.72		01.01	00.86	00.88	01.00	01.65	01.97	04.38	04.78	04.46	02.56	01.46	01.23
		N	22	22	22	22	22	22	22	22	22	22	21	21		22	22	22	22	22	22	22	22	22	22	21	21
		AVE.	01.73	01.61	01.78	02.35	03.85	06.06	07.57	07.75	07.53	06.65	03.86	02.27		01.28	01.14	01.11	01.36	02.08	03.42	05.88	06.30	06.02	03.78	02.12	01.60
		σ	00.16	00.12	00.20	00.34	00.87	00.75	00.87	00.92	01.02	00.88	00.69	00.35		00.15	00.14	00.14	00.19	00.32	00.89	00.72	00.90	00.77	00.73	00.26	00.18
ANALYSED DATA:																											
T = 1/1.11yrs.	K _{1.11}	=	-1.10	01.55	01.48	01.56	01.97	02.89	05.24	06.61	06.73	06.40	05.68	03.10	01.88	01.11	00.98	00.95	01.15	01.72	02.44	05.09	05.31	05.18	02.97	01.84	01.40
T = 1/2.00yrs.	K _{2.00}	=	-0.16	01.70	01.59	01.75	02.29	03.71	05.94	07.43	07.59	07.36	06.50	03.75	02.21	01.25	01.11	01.08	01.32	02.02	03.27	05.76	06.15	05.89	03.66	02.08	01.57
T = 1/2.33yrs.	K _{2.33}	=	0.00	01.73	01.61	01.78	02.35	03.85	06.06	07.57	07.75	07.53	06.65	03.86	02.27	01.28	01.14	01.11	01.36	02.08	03.42	05.88	06.30	06.02	03.78	02.12	01.60
T = 1/5.00yrs.	K _{5.00}	=	0.72	01.84	01.70	01.93	02.59	04.47	06.60	08.20	08.41	08.27	07.28	04.36	02.52	01.38	01.24	01.21	01.49	02.31	04.06	06.40	06.95	06.57	04.30	02.31	01.74
T = 1/10.00yrs.	K _{10.00}	=	1.30	01.94	01.77	02.04	02.79	04.98	07.04	08.71	08.95	08.87	07.79	04.76	02.72	01.47	01.32	01.29	01.60	02.50	04.58	06.82	07.47	07.02	04.73	02.46	01.84
T = 1/20.00yrs.	K _{20.00}	=	1.87	02.03	01.84	02.16	02.98	05.47	07.46	09.20	09.47	09.44	08.29	05.15	02.92	01.55	01.40	01.36	01.71	02.68	05.08	07.22	07.97	07.45	05.14	02.61	01.95
T = 1/30.00yrs.	K _{30.00}	=	2.19	02.08	01.88	02.22	03.10	05.75	07.70	09.48	09.77	09.77	08.57	05.37	03.03	01.60	01.44	01.41	01.77	02.78	05.36	07.45	08.26	07.70	05.38	02.69	02.01
T = 1/50.00yrs.	K _{50.00}	=	2.59	02.14	01.92	02.30	03.23	06.10	08.00	09.83	10.14	10.19	08.92	05.65	03.17	01.66											

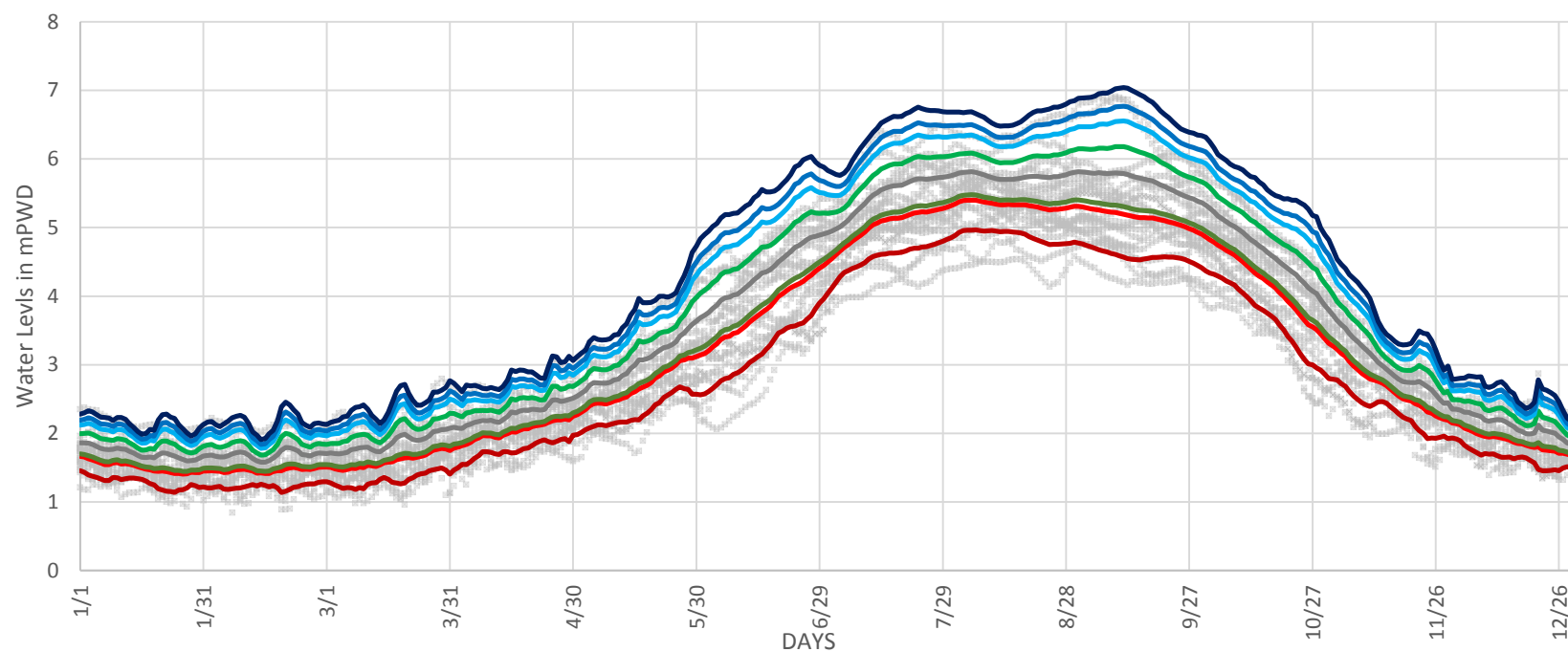
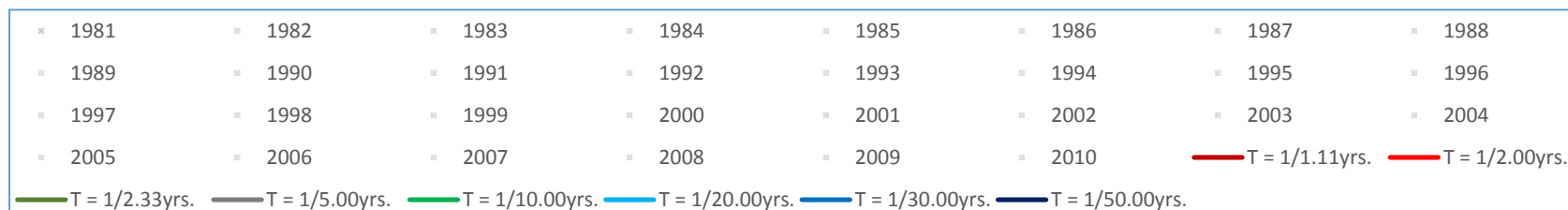
MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 229 (LTL)



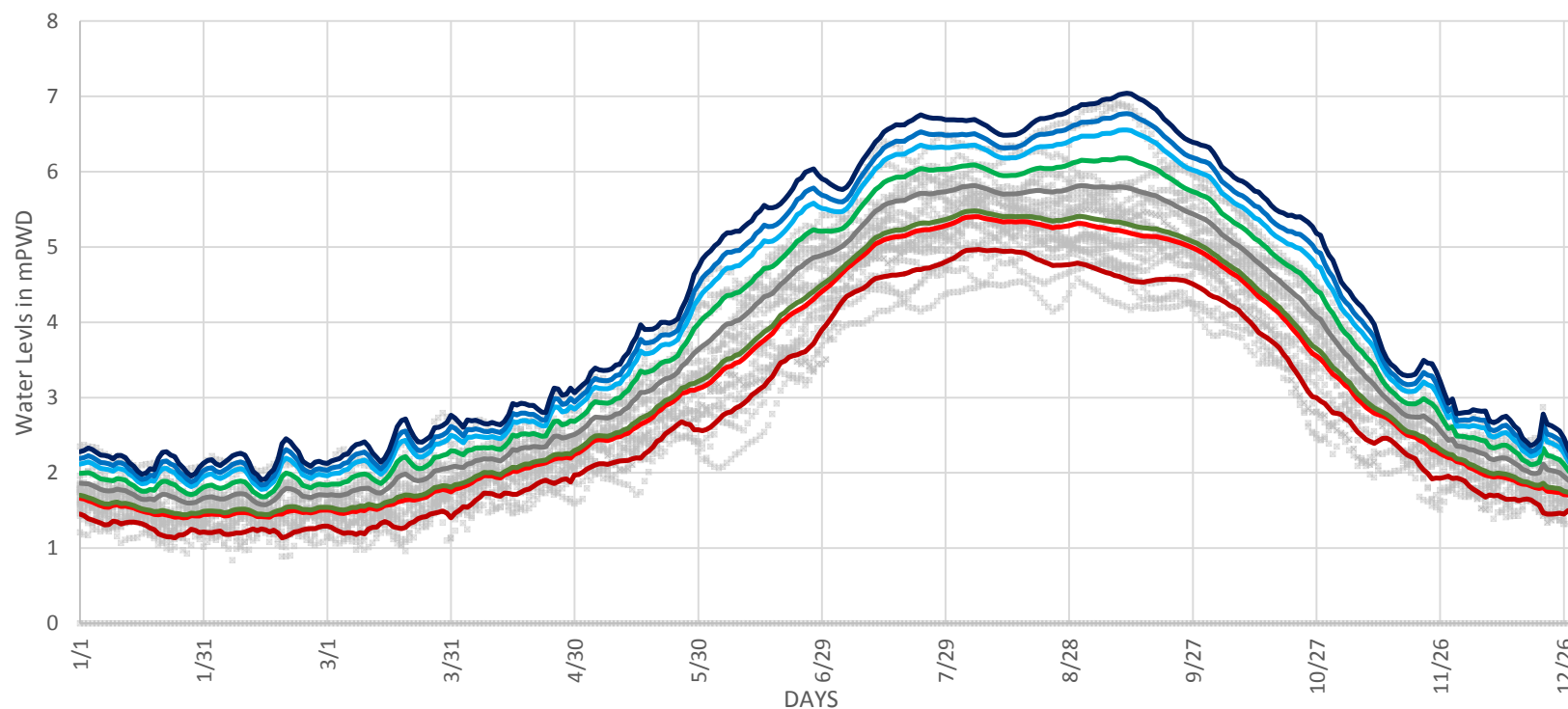
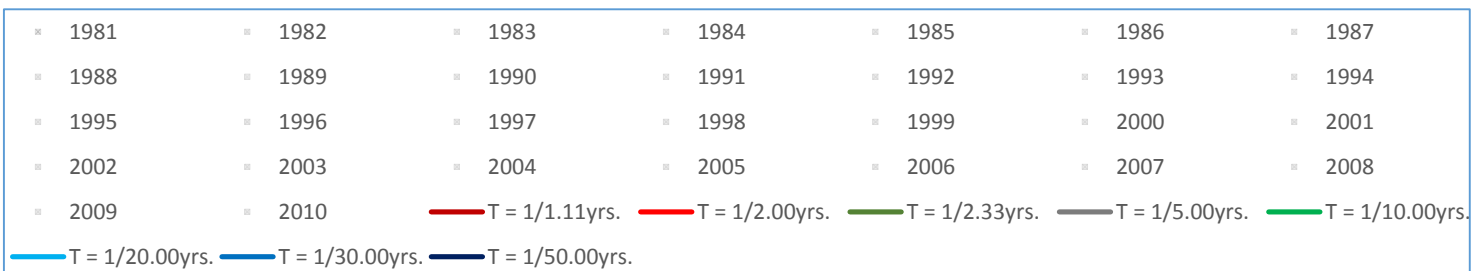
MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 229 (LTL)



A.1b.2 ANALYSED RESULTS OF BWDB WATER LEVEL GAUGE STATION SW 274 ON THE MEGHNA RIVER

DAILY BASIS HIGH TIDE LEVEL ANALYSIS OF BWDB WATER LEVEL STATION SW274 AT NARSHINGDI
SADAR, NARSHINGDI (EV I - DISTRIBUTION)

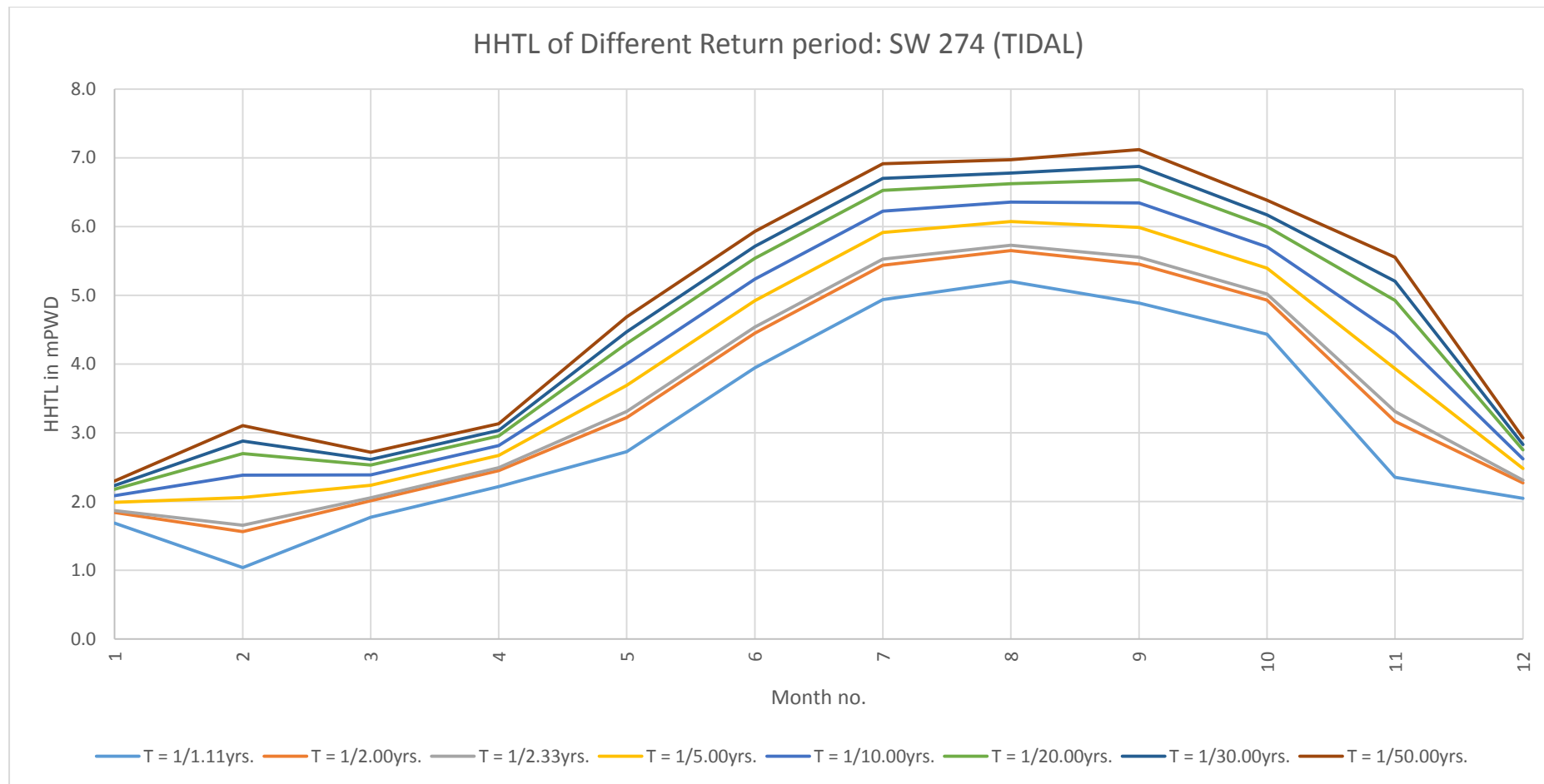
DAILY BASIS LOW TIDE LEVEL ANALYSIS OF BWDB WATER LEVEL STATION SW274 AT NARSHINGDI
SADAR, NARSHINGDI (EV I - DISTRIBUTION)



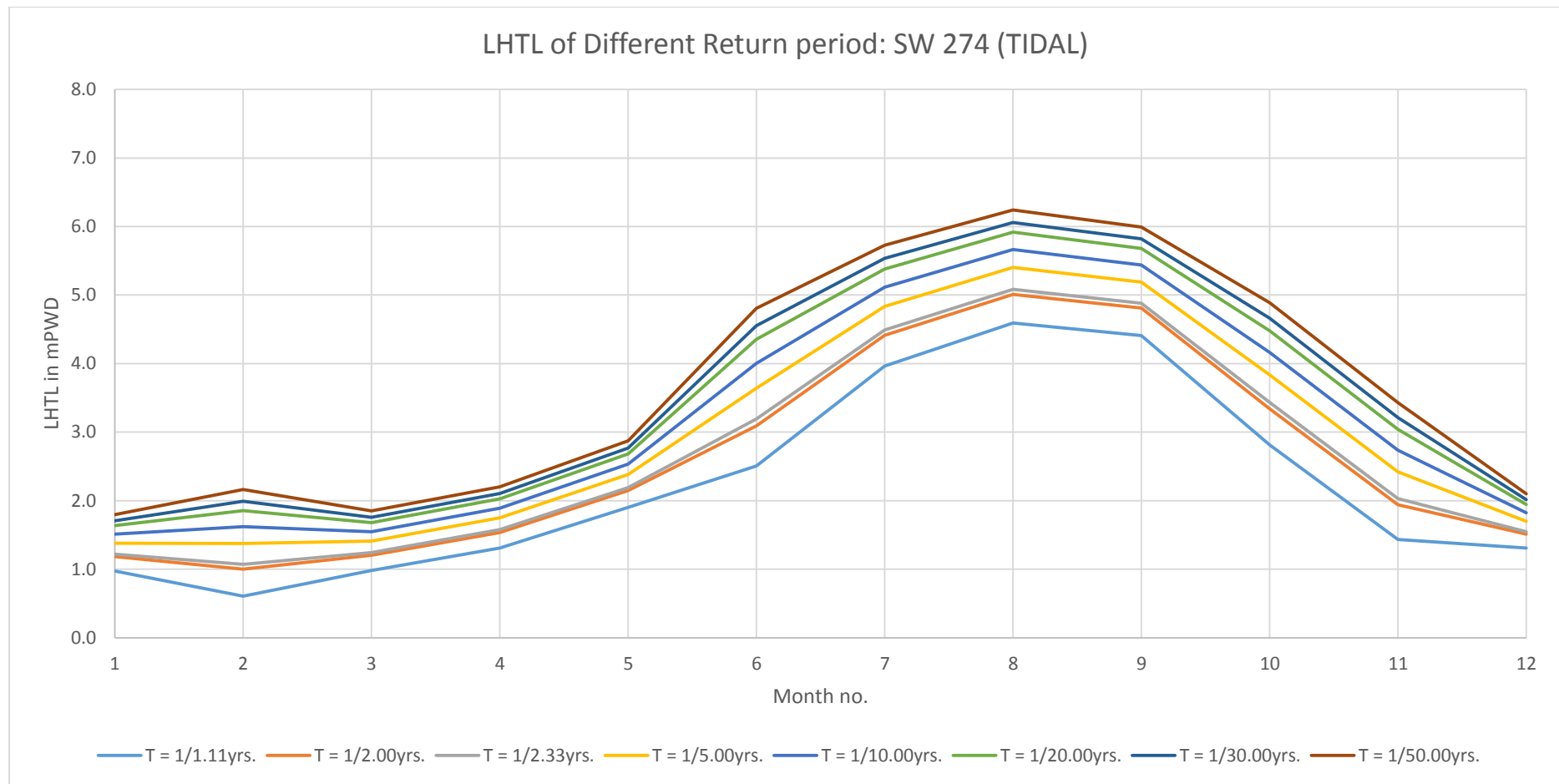
MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 274 (HTL)

Monthly Data			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
WL		Year	Monthly Maximum HTL (mPWD)												Monthly Minimum HTL (mPWD)												
		1981				02.55	02.97	03.60	05.38	05.70	05.50	04.85	02.90	02.38				01.13	02.04	02.87	03.51	05.32	04.94	02.65	02.11	01.34	
		1982	01.65	01.60	01.78	02.40	02.46	04.53	05.15	05.62	05.14	04.69	02.81	01.99	01.04	01.07	01.04	01.75	02.24	02.20	04.55	04.99	04.73	02.43	01.51	01.37	
		1983	01.75	01.79	02.42	02.84	03.18	04.18	05.09	05.79	06.04	05.89	04.04	02.23	01.15	00.84	01.18	01.74	02.45	03.09	04.19	05.13	05.69	04.09	02.09	01.54	
		1984	02.01	01.82	02.08	02.69	04.16	04.98	06.08	06.21	06.11	05.78	03.52	02.06	01.32	01.04	01.19	01.54	02.29	04.19	04.84	04.95	05.12	03.58	01.77	01.41	
		1985	01.67	01.84	02.20	02.47	03.02	04.50	05.48	05.67	05.16	04.74	03.63	02.31	01.02	01.08	01.24	01.68	02.17	03.02	04.55	04.97	04.72	03.67	02.14	01.46	
		1986	01.83	01.63	01.88	02.72	02.86	03.69	04.83	05.15	04.99	04.86	03.91	02.35	01.09	00.89	00.96	01.25	02.15	02.06	03.75	04.51	04.68	03.94	02.30	01.36	
		1987	01.83	01.80	01.86	02.54	02.50	04.06	05.59	06.27	05.90	05.78	03.54	02.31	01.13	01.14	00.98	01.50	02.06	02.40	04.18	05.69	05.58	03.54	02.07	01.62	
		1988	01.91	01.90	02.12	02.61	04.34	05.01	06.40	06.70	06.90	05.20	03.60	02.55	01.17	01.24	01.24	01.71	02.04	04.26	05.03	05.39	05.20	03.74	02.48	01.44	
		1989	01.79	01.98	01.94	02.30	03.24	04.68	05.48	05.58	05.10	05.02	03.98	02.32	01.21	01.15	01.06	01.14	02.06	03.26	04.31	05.05	05.02	04.04	02.08	01.42	
		1990	01.76	01.84	02.15	03.08	03.64	04.75	05.27	05.32	04.95	05.41	03.74	02.41	01.19	01.01	01.28	01.55	02.41	03.64	04.66	04.97	04.51	03.84	02.08	01.49	
		1991	02.02	01.67	01.88	02.29	04.21	05.15	05.46	05.27	05.72	05.48	03.95	02.87	01.09	01.08	01.10	01.65	02.46	04.23	05.02	04.95	05.10	03.98	02.27	01.43	
		1992	01.88	01.87	02.05	02.45	02.79	03.83	04.82	04.71	04.53	04.14	03.28	02.03	01.18	01.19	01.24	01.79	02.02	02.56	03.87	04.14	04.16	03.40	02.13	01.57	
		1993	01.83	02.13	01.97	02.18	03.56	05.28	06.07	05.90	05.67	05.02	03.26	02.38	01.25	01.11	01.36	01.38	02.26	03.47	05.22	05.51	04.86	03.28	02.07	01.53	
		1994	01.86	01.82	02.79	02.74	02.96	04.35	04.53	05.11	04.95	03.94	02.86	02.16	00.98	01.13	01.31	02.09	02.24	02.77	04.14	04.40	04.03	02.62	01.60	01.32	
		1995	01.72	01.54	01.78	02.08	03.75	05.14	06.10	05.97	05.79	05.23	03.19	02.41	00.93	00.97	00.98	01.43	01.91	03.05	05.13	05.08	04.86	03.05	02.45	01.58	
		1996	01.93	01.76	02.15	02.41	03.39	03.83	05.94	05.76	05.60	04.61	03.44	02.24	01.24	01.16	01.08	01.95	02.43	03.36	04.10	05.20	04.67	03.25	02.28	01.72	
		1997	01.95	01.62	01.92	02.05	02.84	04.06	05.69	05.45	05.10	05.06	02.53	01.89	01.16	01.25	01.23	01.47	01.59	02.77	04.03	04.85	04.72	02.39	01.62	01.40	
		1998	01.84	00.00	02.12	02.50	03.32	04.83	06.49	06.65	06.91	04.97	03.59	02.74	01.12	00.00	01.12	01.73	02.00	03.35	04.83	06.29	05.07	03.48	02.55	01.73	
		1999	02.08	01.86	01.85	02.45	03.12	04.51	05.70	05.94	05.95	05.27	04.26	02.42	01.37	01.39	01.40	01.47	02.46	03.18	04.76	05.30	05.30	04.37	02.44	01.80	
		2000	02.00	01.84	02.26	02.72	04.00	05.42	05.43	05.86	05.75	05.55	00.00	02.05	01.36	01.38	01.50	01.80	02.83	04.05	04.95	04.95	05.44	03.38	00.00	01.63	
		2001	01.80	01.86	01.92	02.30	03.20	04.50	04.75	05.49	05.16	04.70	03.79	02.20	01.47	01.42	01.42	01.45	01.85	03.20	04.37	04.86	04.74	03.87	02.10	01.55	
		2002	01.62	00.00	01.68	02.44	03.32	04.96	05.90	05.95	05.29	04.20	03.00	02.53	01.33	00.00	01.33	01.47	02.25	03.28	04.80	05.36	04.24	02.92	02.54	02.30	
		2003	02.37	02.24	02.40										02.02	02.02	02.05										
		2004																									
		2005																									
		2006																									
		2007																									
		2008																									
		2009																									
		2010																									
		2011																									
		2012																									
		2013																									
		2014																									
		2015																									
		MAX	02.37	02.24	02.79	03.08	04.34	05.42	06.49	06.70	06.91	05.89	04.26	02.87	02.02	02.02	02.05	02.09	02.83	04.26	05.22	06.29	05.69	04.37	02.55	02.30	
		MIN	01.62	00.00	01.68	02.05	02.46	03.60	04.53	04.71	04.53	03.94	00.00	01.89	00.93	00.00	00.96	01.13	01.59	02.06	03.51	04.14	04.03	02.39	00.00	01.32	
		N	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	
		AVE.	01.87	01.66	02.05	02.49	03.31	04.54	05.53	05.73	05.56	05.02	03.31	02.31	01.22	01.07	01.24	01.58	02.19	03.19	04.49	05.08	04.88	03.43	02.03	01.55	
		σ	00.17	00.56	00.26	00.25	00.53	00.54	00.54	00.48	00.60	00.53	00.87	00.24	00.22	00.42	00.24	00.24	00.26	00.62	00.48	00.45	00.43	00.56	00.54	00.21	
ANALYSED DATA:																											
T = 1/1.11yrs.	K _{1.11}	=	-1.10	01.68	01.04	01.77	02.22	02.72	03.95	04.94	05.20	04.89	04.44	02.35	02.05	00.97	00.61	00.98	01.31	01.90	02.51	03.96	04.59	04.41	02.81	01.43	01.31
T = 1/2.00yrs.	K _{2.00}	=	-0.16	01.84	01.56	02.01	02.45	03.22	04.45	05.44	05.65	05.46	04.93	03.17	02.27	01.18	01.00	01.20	01.54	02.15	03.09	04.41	05.01	04.81	03.34	01.94	01.51
T = 1/2.33yrs.	K _{2.33}	=	0.00	01.87	01.66	02.05	02.49	03.31	04.54	05.53	05.73	05.56	05.02	03.31	02.31	01.22	01.07	01.24	01.58	02.19	03.19	04.49	05.08	04.88	03.43	02.03	01.55
T = 1/5.00yrs.	K _{5.00}	=	0.72	01.99	02.06	02.24	02.67	03.69	04.92	05.91	06.08	05.99	05.40	03.93	02.48	01.38	01.37	01.41	01.75	02.38	03.64	04.83	05.41	05.19	03.84	02.42	01.70
T = 1/10.00yrs.	K _{10.00}	=	1.30	02.08	02.38	02.39	02.81	04.00	05.24	06.23	06.36	06.34	05.70	04.44	02.62	01.51	01.62	01.55	01.89	02.53	04.00	05.11	05.67	05.44	04.16	02.74	01.83
T = 1/20.00yrs.	K _{20.00}	=	1.87	02.18	02.70	02.53	02.95	04.30	05.54	06.53	06.62	06.68	06.00	04.93	02.75	01.64	01.86	01.68	02.03	02.68	04.35	05.38	05.92	05.68	04.48	03.04	01.95
T = 1/30.00yrs.	K _{30.00}	=	2.19	02.23	02.88	02.61	03.03	04.47	05.71	06.70	06.78	06.88	06.17	05.21	02.83	01.71	01.99	01.76	02.11	02.77	04.55	05.54	06.06	05.82	04.66	03.21	02.01
T = 1/50.00yrs.	K _{50.00}	=	2.59	02.30	03.10	02.72	03.13	04.69	05.93	06.92	06.97	07.12	06.38	05.55	02.93	01.80	02.16	01.85	02.20	02.87	04.81	05.73	06.24	05.99	04.89	03.43	02.10

MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 274 (HTL)



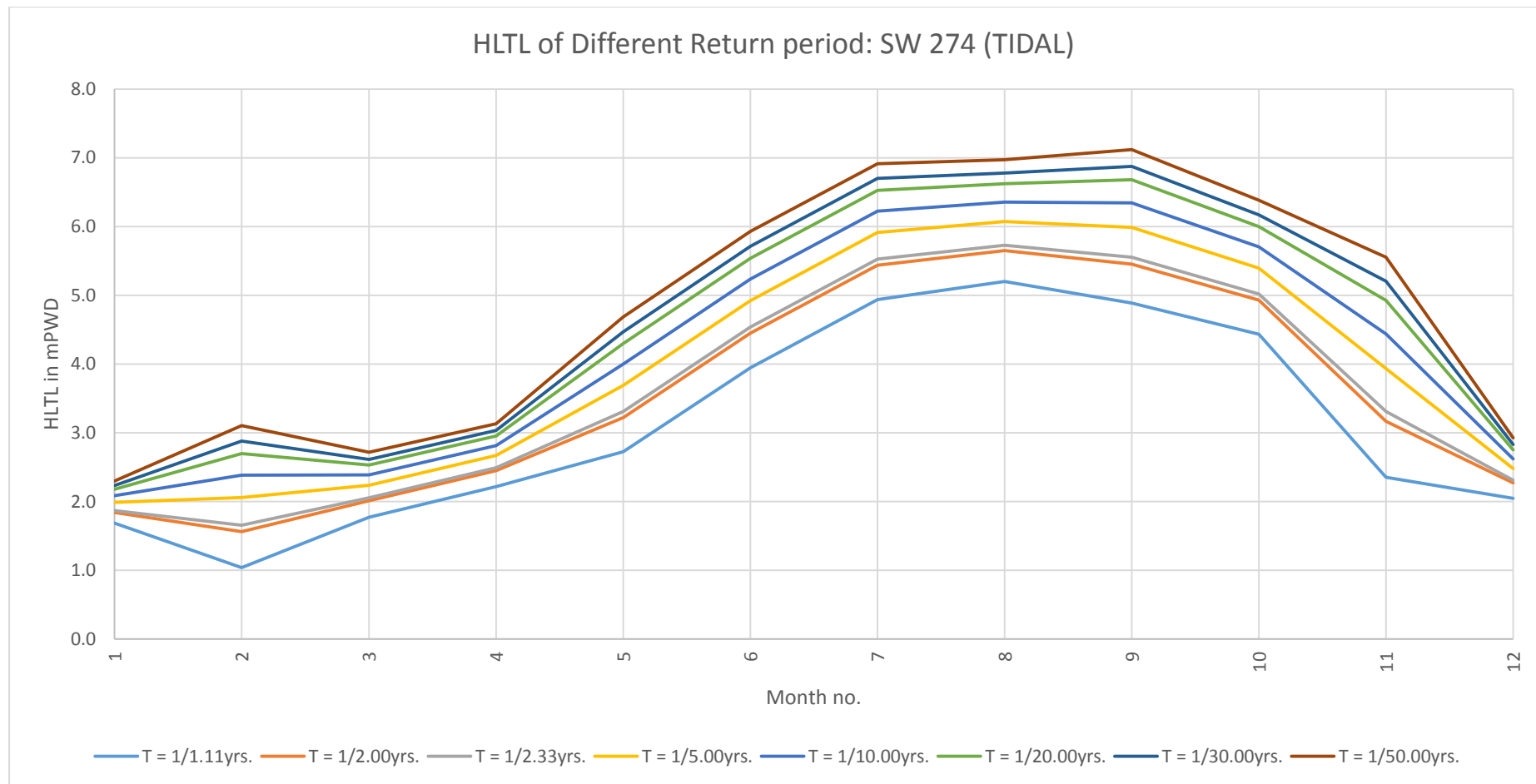
MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 274 (HTL)



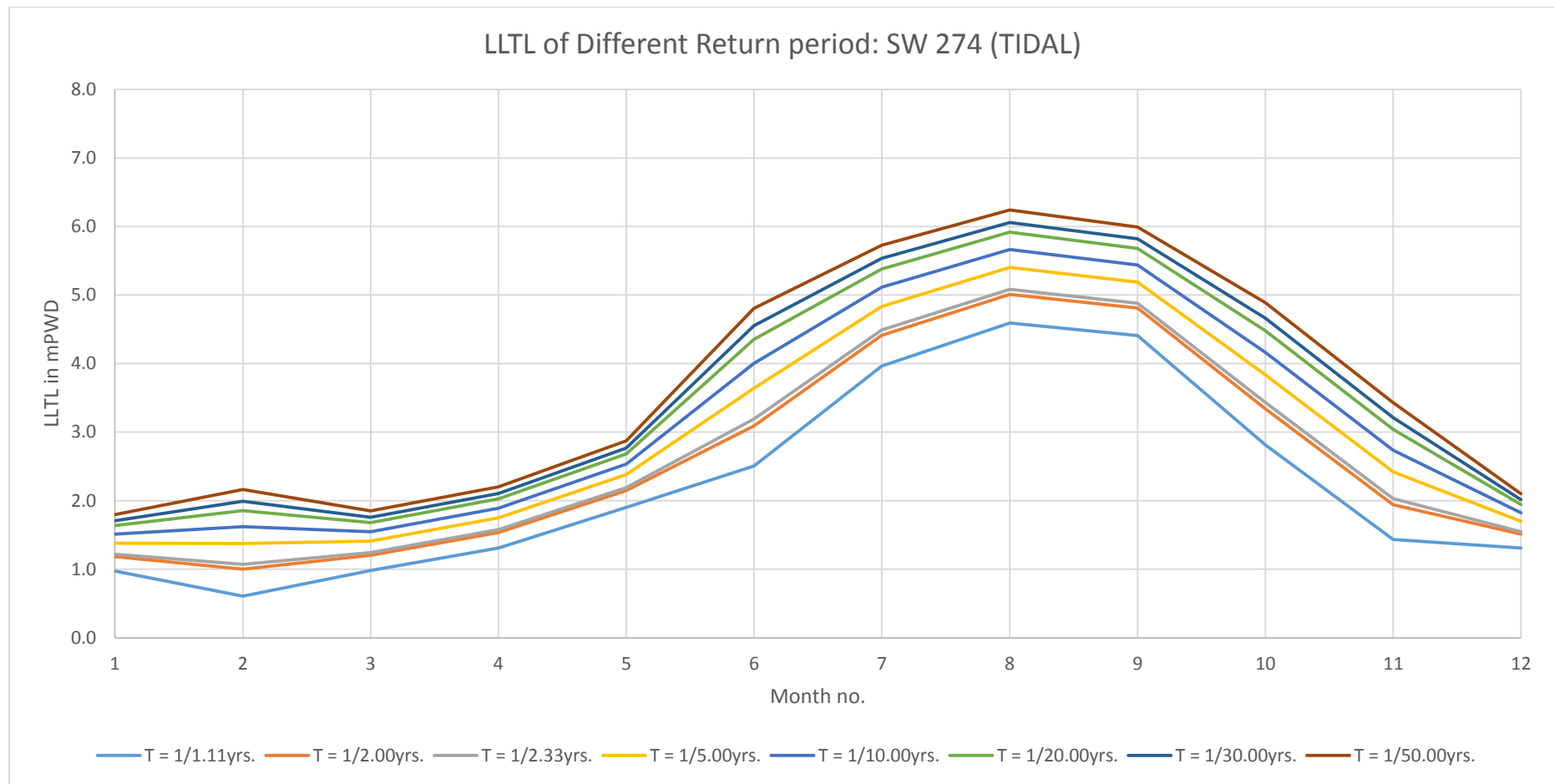
MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 274 (LTL)

Monthly Data			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
WL		Year	Monthly Maximum LTL (mPWD)													Monthly Minimum LTL (mPWD)													
		1981				02.55	02.97	03.60	05.38	05.70	05.50	04.85	02.90	02.38					01.13	02.04	02.87	03.51	05.32	04.94	02.65	02.11	01.34		
		1982	01.65	01.60	01.78	02.40	02.46	04.53	05.15	05.62	05.14	04.69	02.81	01.99		01.04	01.07	01.04	01.75	02.24	02.20	04.55	04.99	04.73	02.43	01.51	01.37		
		1983	01.75	01.79	02.42	02.84	03.18	04.18	05.09	05.79	06.04	05.89	04.04	02.23		01.15	00.84	01.18	01.74	02.45	03.09	04.19	05.13	05.69	04.09	02.09	01.54		
		1984	02.01	01.82	02.08	02.69	04.16	04.98	06.08	06.21	06.11	05.78	03.52	02.06		01.32	01.04	01.19	01.54	02.29	04.19	04.84	04.95	05.12	03.58	01.77	01.41		
		1985	01.67	01.84	02.20	02.47	03.02	04.50	05.48	05.67	05.16	04.74	03.63	02.31		01.02	01.08	01.24	01.68	02.17	03.02	04.55	04.97	04.72	03.67	02.14	01.46		
		1986	01.83	01.63	01.88	02.72	02.86	03.69	04.83	05.15	04.99	04.86	03.91	02.35		01.09	00.89	00.96	01.25	02.15	02.06	03.75	04.51	04.68	03.94	02.30	01.36		
		1987	01.83	01.80	01.86	02.54	02.50	04.06	05.59	06.27	05.90	05.78	03.54	02.31		01.13	01.14	00.98	01.50	02.06	02.40	04.18	05.69	05.58	03.54	02.07	01.62		
		1988	01.91	01.90	02.12	02.61	04.34	05.01	06.40	06.70	06.90	05.20	03.60	02.55		01.17	01.24	01.24	01.71	02.04	04.26	05.03	05.39	05.20	03.74	02.48	01.44		
		1989	01.79	01.98	01.94	02.30	03.24	04.68	05.48	05.58	05.10	05.02	03.98	02.32		01.21	01.15	01.06	01.14	02.06	03.26	04.31	05.05	05.02	04.04	02.08	01.42		
		1990	01.76	01.84	02.15	03.08	03.64	04.75	05.27	05.32	04.95	05.41	03.74	02.41		01.19	01.01	01.28	01.55	02.41	03.64	04.66	04.97	04.51	03.84	02.08	01.49		
		1991	02.02	01.67	01.88	02.29	04.21	05.15	05.46	05.27	05.72	05.48	03.95	02.87		01.09	01.08	01.10	01.65	02.46	04.23	05.02	04.95	05.10	03.98	02.27	01.43		
		1992	01.88	01.87	02.05	02.45	02.79	03.83	04.82	04.71	04.53	04.14	03.28	02.03		01.18	01.19	01.24	01.79	02.02	02.56	03.87	04.14	04.16	03.40	02.13	01.57		
		1993	01.83	02.13	01.97	02.18	03.56	05.28	06.07	05.90	05.67	05.02	03.26	02.38		01.25	01.11	01.36	01.38	02.26	03.47	05.22	05.51	04.86	03.28	02.07	01.53		
		1994	01.86	01.82	02.79	02.74	02.96	04.35	04.53	05.11	04.95	03.94	02.86	02.16		00.98	01.13	01.31	02.09	02.24	02.77	04.14	04.40	04.03	02.62	01.60	01.32		
		1995	01.72	01.54	01.78	02.08	03.75	05.14	06.10	05.97	05.79	05.23	03.19	02.41		00.93	00.97	00.98	01.43	01.91	03.05	05.13	05.08	04.86	03.05	02.45	01.58		
		1996	01.93	01.76	02.15	02.41	03.39	03.83	05.94	05.76	05.60	04.61	03.44	02.24		01.24	01.16	01.08	01.95	02.43	03.36	04.10	05.20	04.67	03.25	02.28	01.72		
		1997	01.95	01.62	01.92	02.05	02.84	04.06	05.69	05.45	05.10	05.06	02.53	01.89		01.16	01.25	01.23	01.47	01.59	02.77	04.03	04.85	04.72	02.39	01.62	01.40		
		1998	01.84	00.00	02.12	02.50	03.32	04.83	06.49	06.65	06.91	04.97	03.59	02.74		01.12	00.00	01.12	01.73	02.00	03.35	04.83	06.29	05.07	03.48	02.55	01.73		
		1999	02.08	01.86	01.85	02.45	03.12	04.51	05.70	05.94	05.95	05.27	04.26	02.42		01.37	01.39	01.40	01.47	02.46	03.18	04.76	05.30	05.30	04.37	02.44	01.80		
		2000	02.00	01.84	02.26	02.72	04.00	05.42	05.43	05.86	05.75	05.55	00.00	02.05		01.36	01.38	01.50	01.80	02.83	04.05	04.95	04.95	05.44	03.38	00.00	01.63		
		2001	01.80	01.86	01.92	02.30	03.20	04.50	04.75	05.49	05.16	04.70	03.79	02.20		01.47	01.42	01.42	01.45	01.85	03.20	04.37	04.86	04.74	03.87	02.10	01.55		
		2002	01.62	00.00	01.68	02.44	03.32	04.96	05.90	05.95	05.29	04.20	03.00	02.53		01.33	00.00	01.33	01.47	02.25	03.28	04.80	05.36	04.24	02.92	02.54	02.30		
		2003	02.37	02.24	02.40											02.02	02.02	02.05											
		2004																											
		2005																											
		2006																											
		2007																											
		2008																											
		2009																											
		2010																											
		2011																											
		2012																											
		2013																											
		2014																											
		2015																											
		MAX	02.37	02.24	02.79	03.08	04.34	05.42	06.49	06.70	06.91	05.89	04.26	02.87		02.02	02.02	02.05	02.09	02.83	04.26	05.22	06.29	05.69	04.37	02.55	02.30		
		MIN	01.62	00.00	01.68	02.05	02.46	03.60	04.53	04.71	04.53	03.94	00.00	01.89		00.93	00.00	00.96	01.13	01.59	02.06	03.51	04.14	04.03	02.39	00.00	01.32		
		N	22	22	22	22	22	22	22	22	22	22	22	22		22	22	22	22	22	22	22	22	22	22	22	22		
		AVE.	01.87	01.66	02.05	02.49	03.31	04.54	05.53	05.73	05.56	05.02	03.31	02.31		01.22	01.07	01.24	01.58	02.19	03.19	04.49	05.08	04.88	03.43	02.03	01.55		
		σ	00.17	00.56	00.26	00.25	00.53	00.54	00.54	00.48	00.60	00.53	00.87	00.24		00.22	00.42	00.24	00.24	00.26	00.62	00.48	00.45	00.43	00.56	00.54	00.21		
ANALYSED DATA:																													
		T = 1/1.11yrs.	K _{1.11}	=	-1.10	01.68	01.04	01.77	02.22	02.72	03.95	04.94	05.20	04.89	04.44	02.35	02.05	00.97	00.61	00.98	01.31	01.90	02.51	03.96	04.59	04.41	02.81	01.43	01.31
		T = 1/2.00yrs.	K _{2.00}	=	-0.16	01.84	01.56	02.01	02.45	03.22	04.45	05.44	05.65	05.46	04.93	03.17	02.27	01.18	01.00	01.20	01.54	02.15	03.09	04.41	05.01	04.81	03.34	01.94	01.51
		T = 1/2.33yrs.	K _{2.33}	=	0.00	01.87	01.66	02.05	02.49	03.31	04.54	05.53	05.73	05.56	05.02	03.31	02.31	01.22	01.07	01.24	01.58	02.19	03.19	04.49	05.08	04.88	03.43	02.03	01.55
		T = 1/5.00yrs.	K _{5.00}	=	0.72	01.99	02.06	02.24	02.67	03.69	04.92	05.91	06.08	05.99	05.40	03.93	02.48	01.38	01.37	01.41	01.75	02.38	03.64	04.83	05.41	05.19	03.84	02.42	01.70
		T = 1/10.00yrs.	K _{10.00}	=	1.30	02.08	02.38	02.39	02.81	04.00	05.24	06.23	06.36	06.34	05.70	04.44	02.62	01.51	01.62	01.55	01.89	02.53	04.00	05.11	05.67	05.44	04.16	02.74	01.83
		T = 1/20.00yrs.	K _{20.00}	=	1.87	02.18	02.70	02.53	02.95	04.30	05.54	06.53	06.62	06.68	06.00	04.93	02.75	01.64	01.86	01.68	02.03	02.68	04.35	05.38	05.92	05.68	04.48	03.04	01.95
		T = 1/30.00yrs.	K _{30.00}	=	2.19	02.23	02.88	02.61	03.03	04.47	05.71	06.70	06.78	06.88	06.17	05.21	02.83	01.71	01.99	01.76	02.11	02.77	04.55	05.54	06.06	05.82	04		

MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 274 (LTL)

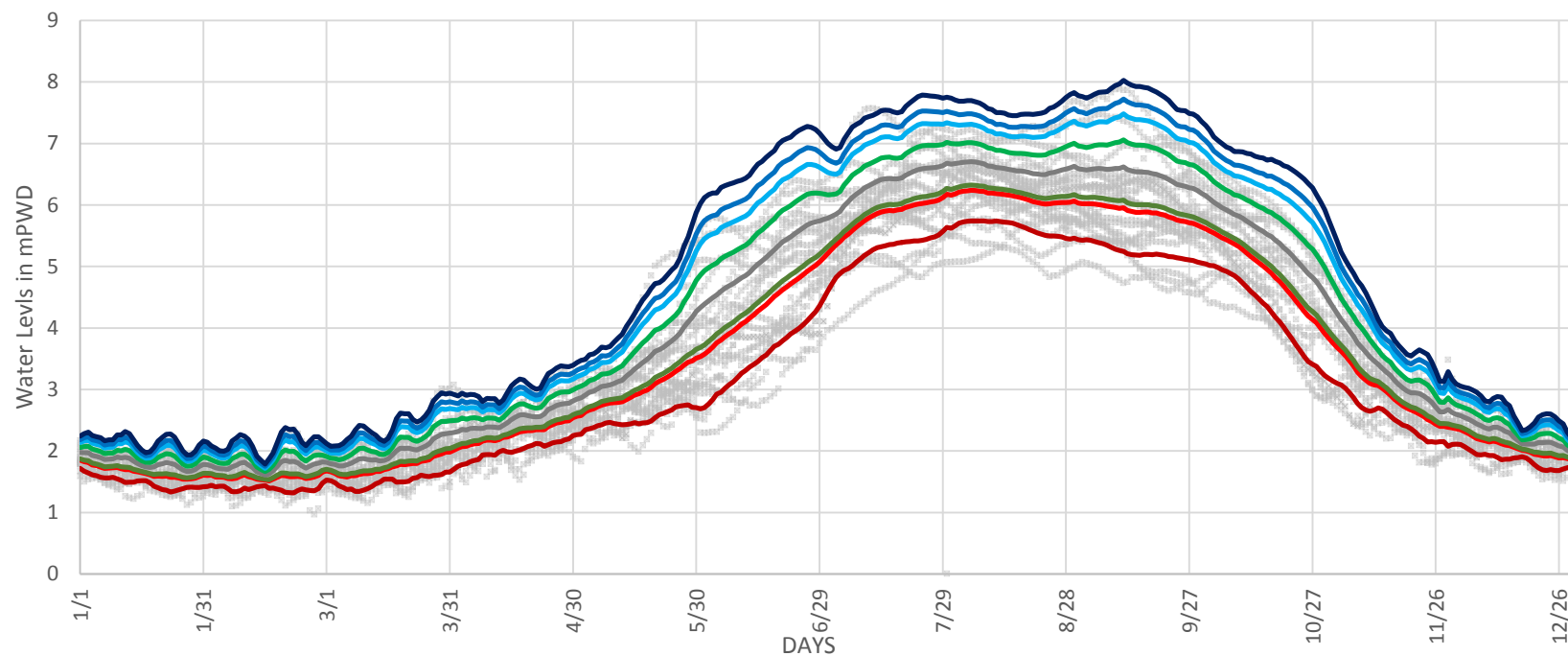
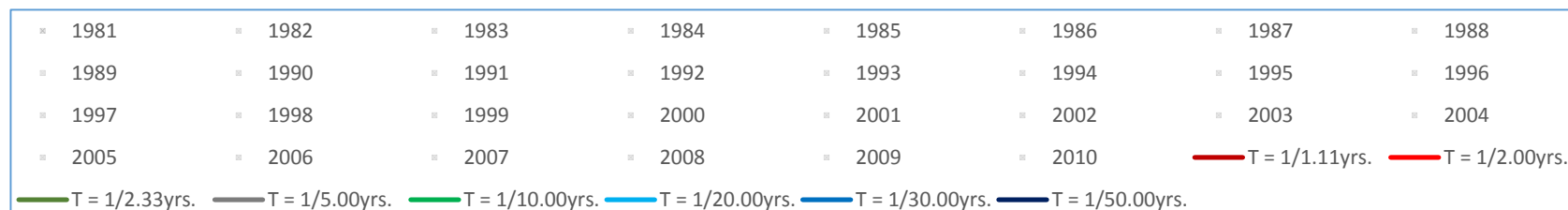


MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 274 (LTL)

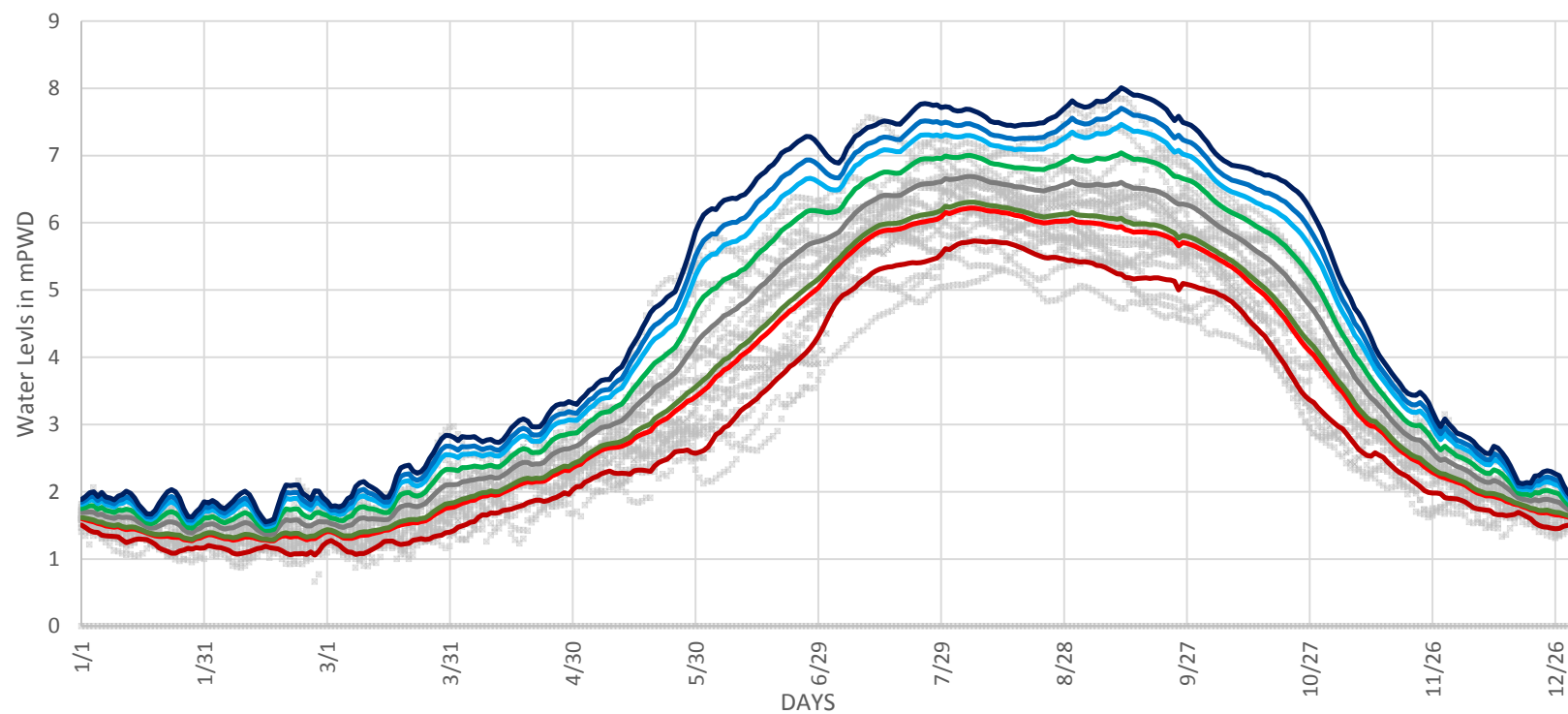
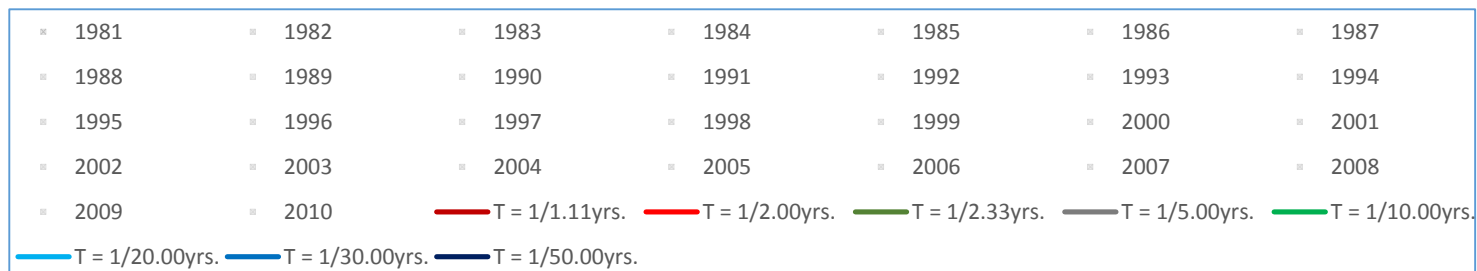


A.1b.3 ANALYSED RESULTS OF BWDB WATER LEVEL GAUGE STATION SW 295 ON THE MEGHNA RIVER

DAILY BASIS HIGH TIDE LEVEL ANALYSIS OF BWDB WATER LEVEL STATION SW295 AT AJABPUR,
BRAHMANBARIA (EV I - DISTRIBUTION)



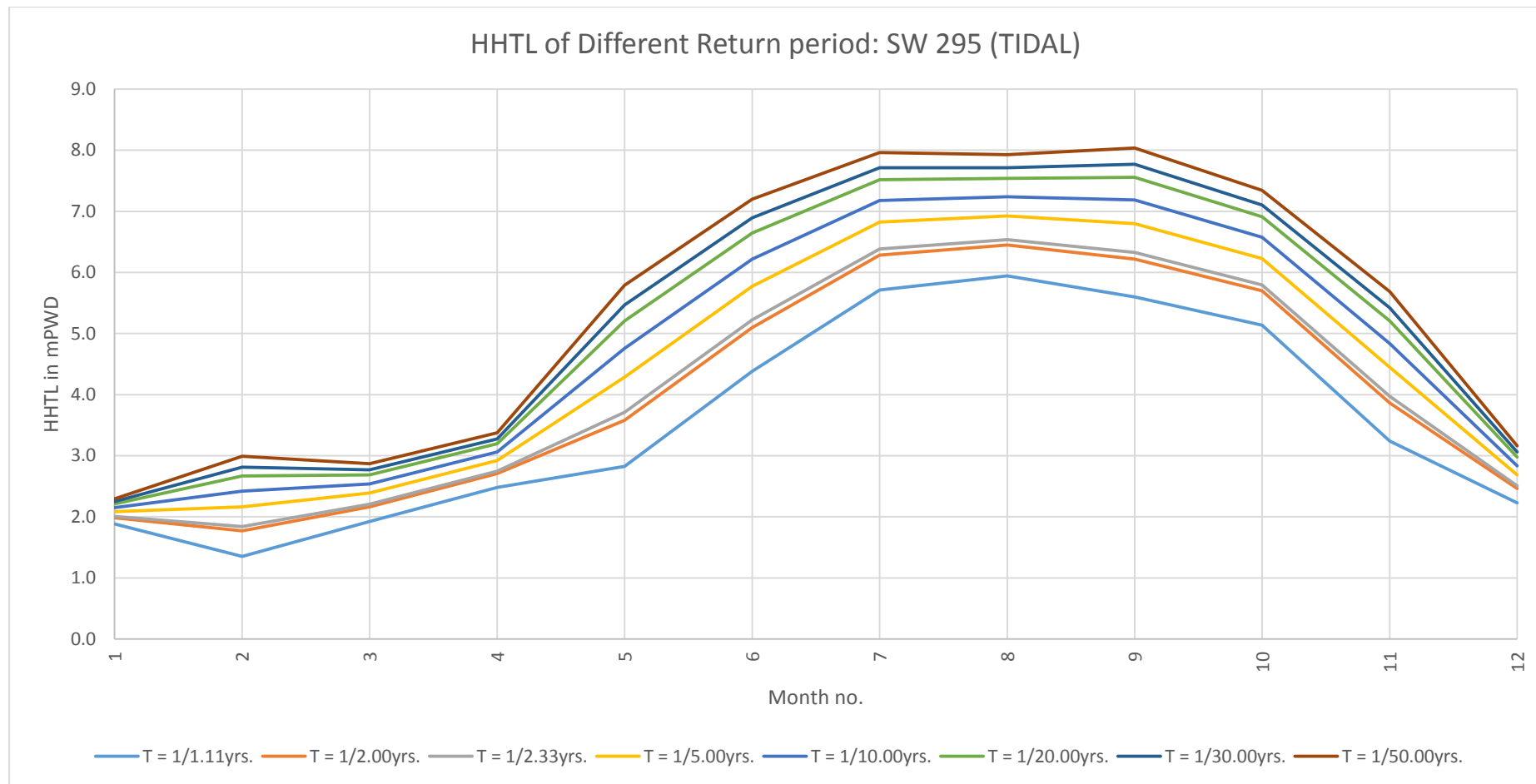
DAILY BASIS LOW TIDE LEVEL ANALYSIS OF BWDB WATER LEVEL STATION SW295 AT AJABPUR,
BRAHMANBARIA (EV I - DISTRIBUTION)



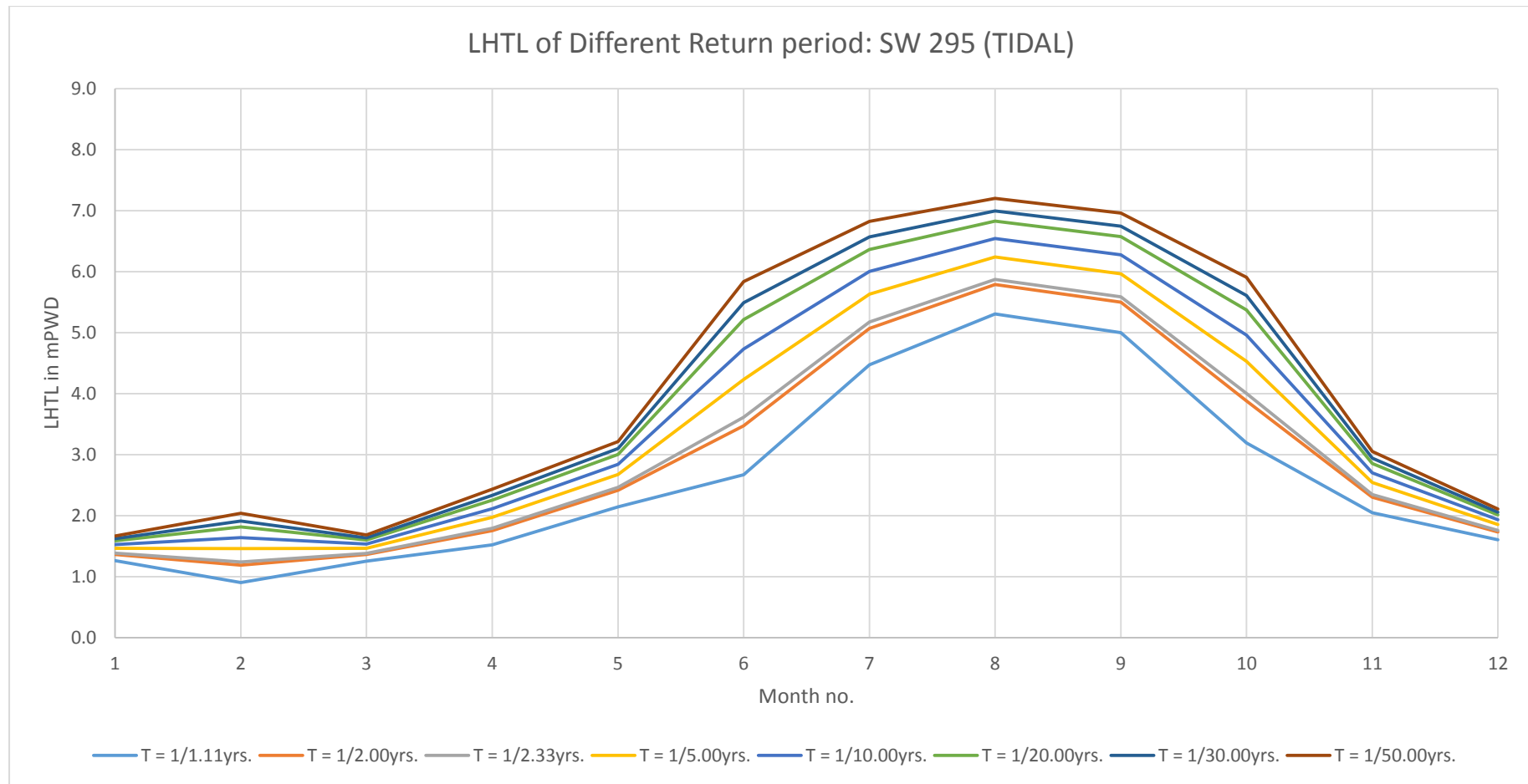
MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 295 (HTL)

Monthly Data				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
WL		Year	Monthly Maximum HTL (mPWD)												Monthly Minimum HTL (mPWD)														
		1981				02.88	03.60	04.02	06.25	06.60	06.42	05.67	03.05	02.71					01.50	02.21	03.45	04.11	06.10	05.72	03.13	02.29	01.69		
		1982	01.91	01.77	01.97	02.77	03.01	05.39	06.14	06.60	05.84	05.55	02.93	02.17	01.33	01.31	01.28	01.84	02.40	02.51	05.44	05.77	05.44	02.85	01.78	01.53			
		1983	01.90	01.95	02.67	02.99	03.69	04.76	06.06	06.80	06.97	06.70	04.92	02.53	01.27	01.10	01.36	02.00	02.93	03.54	04.79	06.13	06.65	05.02	02.45	01.78			
		1984	02.08	01.85	02.12	02.79	05.07	05.77	07.09	07.06	07.10	06.62	03.96	02.21	01.49	00.97	01.33	01.67	02.47	04.97	05.53	05.77	05.77	04.06	02.10	01.61			
		1985	01.78	01.91	02.39	02.83	03.09	05.43	06.51	06.54	05.91	05.51	03.86	02.48	01.35	01.29	01.58	01.94	02.41	03.29	05.46	05.83	05.50	03.95	02.39	01.76			
		1986	01.96	01.76	02.09	02.95	02.94	03.75	05.51	05.78	05.61	05.77	04.75	02.77	01.29	01.11	01.25	01.49	02.47	02.29	03.85	05.17	05.37	04.84	02.69	01.67			
		1987	01.98	01.84	01.96	02.70	02.71	04.76	06.54	07.11	06.70	06.69	04.02	02.53	01.37	01.35	01.23	01.78	02.29	02.62	04.94	06.71	06.12	04.17	02.35	01.83			
		1988	01.99	01.95	02.20	02.68	05.43	06.24	07.57	07.69	07.89	06.23	04.39	03.17	01.24	01.36	01.48	01.88	02.28	05.08	06.20	06.24	06.29	04.51	02.68	01.85			
		1989	02.00	02.08	02.08	02.63	03.57	05.12	06.52	06.62	06.08	05.84	04.86	02.40	01.51	01.36	01.38	01.41	02.67	03.54	04.98	05.99	05.84	04.96	02.48	01.72			
		1990	01.99	02.01	02.41	03.30	03.96	05.63	06.15	06.25	05.94	06.24	04.45	02.59	01.39	01.34	01.41	01.84	02.96	04.08	05.62	05.98	05.30	04.61	02.30	01.85			
		1991	02.27	01.99	02.08	02.65	05.39	06.27	06.33	06.06	06.56	06.40	04.80	02.40	01.40	01.41	01.38	02.07	02.61	05.43	05.82	05.73	05.68	04.88	02.33	01.82			
		1992	02.03	02.01	02.18	02.56	03.05	04.30	05.74	05.49	05.07	04.88	03.91	02.27	01.42	01.32	01.47	01.99	02.17	02.77	04.49	04.83	04.73	04.01	02.31	01.75			
		1993	01.99	02.35	02.19	02.35	04.09	06.40	07.20	06.91	06.49	05.80	03.68	02.48	01.43	01.29	01.59	01.70	02.41	04.03	06.26	06.33	05.57	03.77	02.28	01.67			
		1994	02.09	01.90	03.01	03.07	03.04	04.89	05.17	05.80	05.68	04.55	03.08	02.33	01.30	01.33	01.45	02.38	02.33	02.93	04.83	05.07	04.64	03.00	01.86	01.51			
		1995	01.86	01.78	01.95										01.12	01.26	01.15												
		1996				02.66	03.67	04.37	06.63	06.47	06.30	05.28	03.96	02.47				02.18	02.62	03.68	04.51	05.89	05.34	03.67	02.59	02.00			
		1997	02.15	01.97	02.10	02.25	03.10	04.67	06.37	06.00	05.85	05.77	02.83	02.03	01.39	01.37	01.36	01.60	01.83	03.05	04.70	05.54	05.36	02.81	01.81	01.54			
		1998	01.90	01.76	02.27	02.68	03.51	05.56	07.26	07.34	07.48	05.83	03.86	02.85	01.25	01.23	01.23	01.76	02.12	03.43	05.47	07.00	05.97	03.86	02.73	01.92			
		1999	02.18	02.02	02.06	02.62	03.31	05.10	06.63	06.51	06.53	05.85	04.74	02.47	01.52	01.42	01.56	01.58	02.62	03.44	05.35	06.08	05.89	04.88	02.51	01.90			
		2000	02.05	01.89	02.19	02.79	04.48	06.20	06.25	06.64	06.45	06.30	03.91	02.45	01.49	01.38	01.36	01.86	02.98	04.60	05.53	05.50	06.15	03.88	02.41	01.94			
		2001	02.02	02.06	02.00	02.53	03.12	05.22	05.46	06.24	05.83	05.35	04.22	02.73	01.53	01.43	01.38	01.53	02.29	03.14	05.03	05.49	05.42	04.26	02.57	01.80			
		2002	02.03	00.00	02.19	03.03	04.10	05.87	06.71	06.77	06.14	04.89	03.21	02.59	01.47	00.00	01.43	01.67	02.68	04.03	05.75	06.19	04.54	02.93	02.38	01.74			
		2003	01.95	01.84											01.48	01.41	01.34												
		2004																											
		2005																											
		2006																											
		2007																											
		2008																											
		2009																											
		2010																											
		2011																											
		2012																											
		2013																											
		2014																											
		2015																											
		MAX	02.27	02.35	03.01	03.30	05.43	06.40	07.57	07.69	07.89	06.70	04.92	03.17	01.53	01.43	01.59	02.38	02.98	05.43	06.26	07.00	06.65	05.02	02.73	02.00			
		MIN	01.78	00.00	01.95	02.25	02.71	03.75	05.17	05.49	05.07	04.55	02.83	02.03	01.12	00.00	01.15	01.41	01.83	02.29	03.85	04.83	04.54	02.81	01.78	01.51			
		N	21	21	20	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21			
		AVE.	02.00	01.84	02.21	02.75	03.71	05.22	06.39	06.54	06.33	05.80	03.97	02.51	01.38	01.24	01.38	01.79	02.46	03.61	05.17	05.87	05.59	04.00	02.35	01.76			
		σ	00.11	00.44	00.26	00.24	00.80	00.76	00.61	00.54	00.66	00.60	00.66	00.25	00.11	00.31	00.12	00.25	00.29	00.86	00.64	00.51	00.53	00.73	00.27	00.14			
ANALYSED DATA:																													
		T = 1/1.11yrs.	K _{1.11}	=	-1.10	01.88	01.35	01.92	02.48	02.82	04.38	05.71	05.94	05.60	05.14	03.24	02.23	01.26	00.90	01.25	01.52	02.14	02.67	04.47	05.31	05.00	03.19	02.05	01.60
		T = 1/2.00yrs.	K _{2.00}	=	-0.16	01.99	01.77	02.16	02.71	03.58	05.10	06.29	06.45	06.22	05.70	03.86	02.46	01.36	01.19	01.36	01.75	02.42	03.47	05.07	05.79	05.50	03.88	02.30	01.73
		T = 1/2.33yrs.	K _{2.33}	=	0.00	02.00	01.84	02.21	02.75	03.71	05.23	06.39	06.54	06.33	05.80	03.97	02.51	01.38	01.24	01.38	01.79	02.46	03.62	05.17	05.87	05.59	04.00	02.35	01.76
		T = 1/5.00yrs.	K _{5.00}	=	0.72	02.08	02.16	02.39	02.92	04.29	05.77	06.82	06.92	06.80	06.23	04.45	02.69	01.46	01.46	01.46	01.97	02.67	04.23	05.63	06.24	05.97	04.53	02.54	01.85
		T = 1/10.00yrs.	K _{10.00}	=	1.30	02.15	02.42	02.54	03.06	04.76	06.22	07.18	07.24	07.19	06.58	04.83	02.84	01.53	01.64	01.53	02.11	02.84	04.73	06.00	06.54	06.28	04.96	02.70	01.93
		T = 1/20.00yrs.	K _{20.00}	=	1.87	02.21	02.67	02.68	03.20	05.21	06.65	07.52	07.54	07.56	06.91	05.21	02.98	01.59	01.81	01.60	02.25	03.01	05.21	06.36	06.83	06.57	05.37	02.85	02.01
		T = 1/30.00yrs.	K _{30.00}	=	2.19	02.25	02.81	02.77	03.28	05.47	06.89	07.72	07.71	07.77	07.10	05.42	03.06	01.62	01.91	01.64	02.33	03.10	05.49	06.57	07.00	06.74	05.61	02.94	02.05
		T = 1/50.00yrs.	K _{50.00}	=	2.59	02.29	02.99	02.87	03.37	05.79	07.20	07.96	07.93	08.04	07.35	05.69	03.16	01.67	02.04	01.68	02.43	03.22	05.84	06.83	07.20	06.96	05.91	03.05	02.11

MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 295 (HTL)



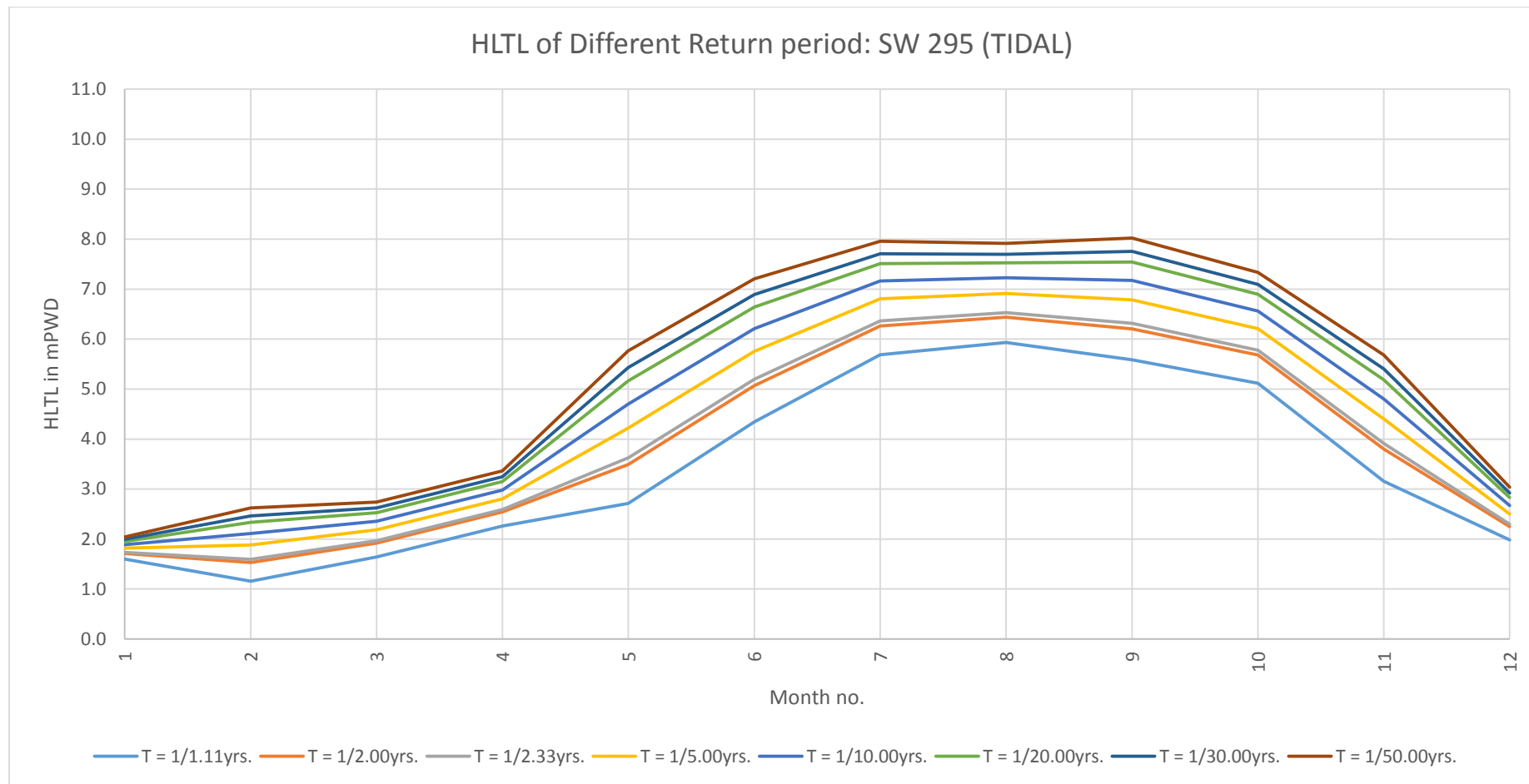
MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 295 (HTL)



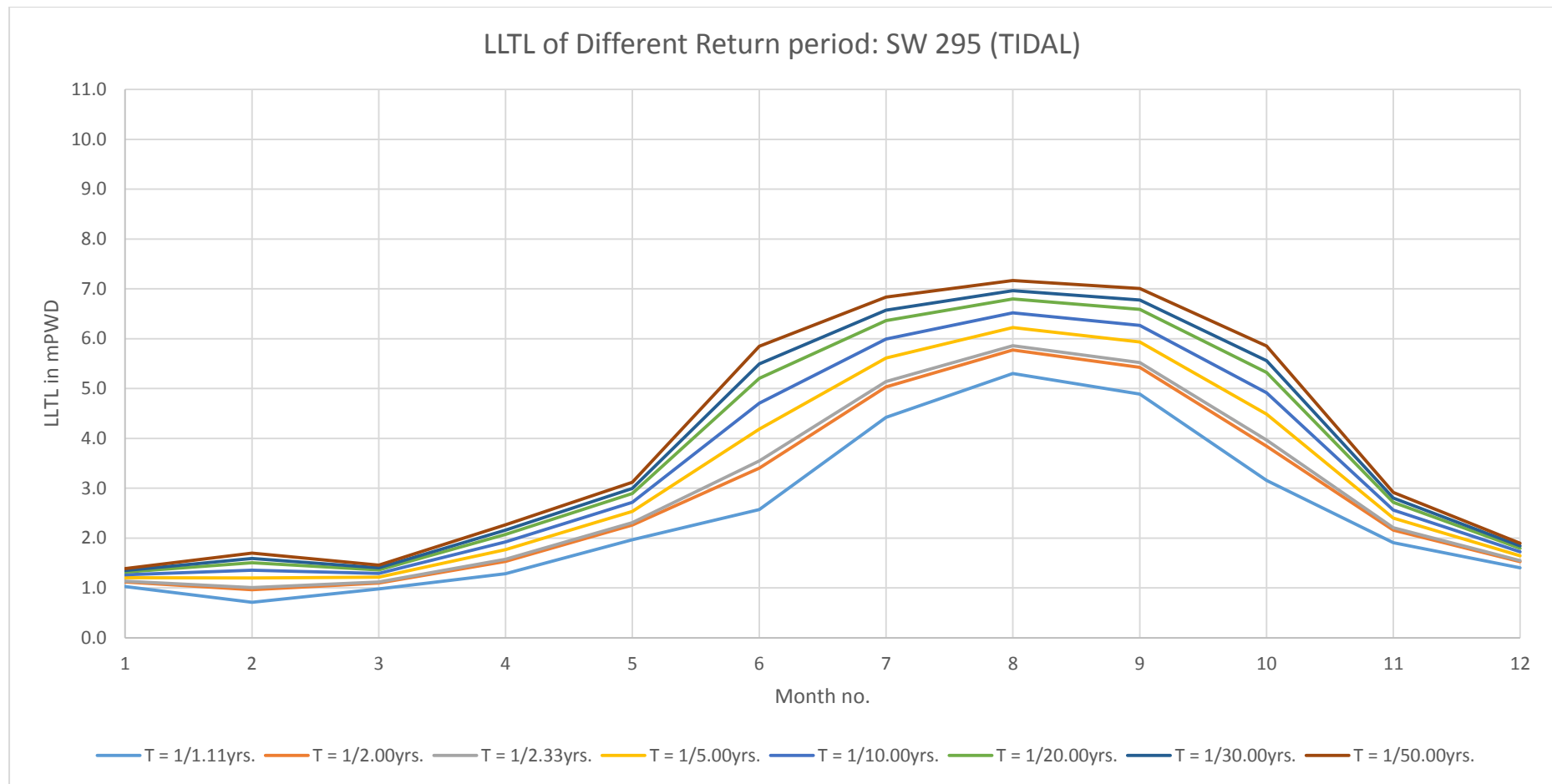
MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 295 (LTL)

Monthly Data			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WL		Year	Monthly Maximum LTL (mPWD)													Monthly Minimum LTL (mPWD)											
		1981				02.79	03.32	04.02	06.25	06.60	06.42	05.67	03.05	02.62					01.34	02.12	03.45	04.11	06.10	05.72	03.13	02.29	01.50
		1982	01.66	01.56	01.86	02.69	02.89	05.39	06.14	06.60	05.84	05.52	02.81	01.94		01.10	01.04	01.05	01.69	02.32	02.51	05.44	05.77	05.44	02.81	01.67	01.34
		1983	01.62	01.64	02.53	02.93	03.66	04.75	06.02	06.79	06.97	06.68	04.87	02.33		01.07	00.87	01.20	01.86	02.89	03.52	04.78	06.09	06.64	04.98	02.36	01.62
		1984	01.89	01.66	01.89	02.56	05.04	05.76	07.08	07.06	07.10	06.60	03.89	02.02		01.26	00.66	01.06	01.46	02.30	04.95	05.53	05.77	05.77	04.00	01.95	01.43
		1985	01.54	01.70	02.26	02.72	02.98	05.40	06.47	06.53	05.89	05.50	03.83	02.27		01.19	01.02	01.35	01.76	02.27	03.11	05.45	05.82	04.59	03.92	02.28	01.52
		1986	01.72	01.56	01.88	02.88	02.83	03.66	05.51	05.77	05.59	05.77	04.72	02.62		01.04	00.92	01.00	01.28	02.33	02.12	03.77	05.15	05.36	04.80	02.60	01.48
		1987	01.73	01.62	01.77	02.56	02.63	04.69	06.45	07.10	06.69	06.69	03.98	02.30		01.13	01.06	00.99	01.59	02.15	02.50	04.83	06.60	06.11	04.11	02.24	01.62
		1988	01.72	01.70	01.96	02.42	05.28	06.22	07.57	07.68	07.85	06.19	04.30	03.06		01.00	01.22	01.26	01.65	02.10	05.07	06.19	06.24	06.27	04.46	02.46	01.65
		1989	01.72	01.83	01.82	02.45	03.46	05.12	06.45	06.60	06.08	05.83	04.81	02.27		01.28	01.26	01.16	01.19	02.51	03.50	04.97	05.98	05.81	04.91	02.33	01.45
		1990	01.74	01.72	02.19	03.24	03.96	05.62	06.14	06.24	05.92	06.23	04.41	02.33		01.15	01.10	01.16	01.62	02.90	03.99	05.61	05.97	05.27	04.56	02.13	01.68
		1991	02.06	01.77	01.75	02.42	05.38	06.25	06.32	06.05	06.53	06.39	04.74	02.17		01.19	01.20	01.15	01.82	02.20	05.40	05.81	05.71	05.66	04.86	02.22	01.71
		1992	01.81	01.83	01.89	02.32	02.91	04.23	05.74	05.49	05.06	04.87	03.86	02.07		01.17	01.07	01.20	01.70	01.98	02.67	04.42	04.83	04.69	03.97	02.13	01.51
		1993	01.69	02.16	01.93	02.17	04.08	06.38	07.19	06.90	06.48	05.80	03.67	02.24		01.18	01.06	01.38	01.47	02.25	04.01	06.25	06.32	05.54	03.73	02.10	01.45
		1994	01.77	01.68	02.92	02.97	02.96	04.89	05.16	05.79	05.66	04.51	02.92	02.04		00.99	01.07	01.15	02.25	02.24	02.84	04.82	05.06	04.60	02.96	01.72	01.33
		1995	01.62	01.52	01.70											00.95	01.00	00.89									
		1996				02.55	03.63	04.36	06.62	06.46	06.29	05.24	03.90	02.34					01.98	02.43	03.64	04.41	05.88	05.31	03.63	02.41	01.75
		1997	01.86	01.66	01.86	02.01	02.95	04.64	06.36	05.99	05.82	05.76	02.73	01.72		01.18	01.12	01.09	01.43	01.63	02.92	04.66	05.52	05.34	02.77	01.62	01.31
		1998	01.58	01.40	02.08	02.52	03.42	05.56	07.25	07.32	07.46	05.75	03.82	02.60		00.97	00.92	00.87	01.53	02.00	03.39	05.46	06.98	05.90	03.84	02.57	01.72
		1999	01.87	01.67	01.72	02.34	03.21	04.96	06.62	06.46	06.52	05.84	04.72	02.32		01.21	01.19	01.16	01.26	02.40	03.33	05.21	06.07	05.88	04.81	02.40	01.70
		2000	01.75	01.59	01.96	02.74	04.42	06.18	06.24	06.63	06.45	06.29	03.85	02.16		01.25	01.08	01.18	01.54	02.81	04.55	05.51	05.49	06.11	03.86	02.23	01.57
		2001	01.65	01.74	01.69	02.24	03.03	05.21	05.35	06.23	05.82	05.35	04.20	02.51		01.20	01.15	01.12	01.23	02.06	03.04	05.01	05.48	05.39	04.23	02.42	01.61
		2002	01.72	00.00	01.90	02.87	04.08	05.86	06.69	06.76	06.13	04.88	03.06	02.32		01.12	00.00	01.10	01.44	02.62	04.01	05.73	06.18	04.53	02.88	02.20	01.57
		2003	01.64	01.52	01.79											01.21	01.11	01.02									
		2004																									
		2005																									
		2006																									
		2007																									
		2008																									
		2009																									
		2010																									
		2011																									
		2012																									
		2013																									
		2014																									
		2015																									
		MAX	02.06	02.16	02.92	03.24	05.38	06.38	07.57	07.68	07.85	06.69	04.87	03.06		01.28	01.26	01.38	02.25	02.90	05.40	06.25	06.98	06.64	04.98	02.60	01.75
		MIN	01.54	00.00	01.69	02.01	02.63	03.66	05.16	05.49	05.06	04.51	02.73	01.72		00.95	00.00	00.87	01.19	01.63	02.12	03.77	04.83	04.53	02.77	01.62	01.31
		N	21	21	21	21	21	21	21	21	21	21	21	21		21	21	21	21	21	21	21	21	21	21	21	21
		AVE.	01.73	01.60	01.97	02.59	03.62	05.20	06.36	06.53	06.31	05.78	03.91	02.30		01.13	01.01	01.12	01.58	02.31	03.55	05.14	05.86	05.52	03.96	02.21	01.55
		σ	00.12	00.40	00.30	00.30	00.83	00.77	00.61	00.54	00.66	00.60	00.68	00.29		00.10	00.27	00.13	00.27	00.31	00.89	00.65	00.50	00.57	00.73	00.27	00.13
ANALYSED DATA:																											
		T = 1/1.11yrs. K _{1.11} = -1.10	01.60	01.16	01.64	02.26	02.71	04.34	05.69	05.93	05.59	05.12	03.16	01.98		01.03	00.71	00.98	01.28	01.97	02.57	04.42	05.30	04.89	03.16	01.90	01.40
		T = 1/2.00yrs. K _{2.00} = -0.16	01.71	01.53	01.92	02.54	03.49	05.07	06.26	06.44	06.20	05.68	03.80	02.25		01.12	00.96	01.10	01.53	02.26	03.40	05.03	05.77	05.43	03.84	02.16	01.53
		T = 1/2.33yrs. K _{2.33} = 0.00	01.73	01.60	01.97	02.59	03.63	05.20	06.36	06.53	06.31	05.78	03.91	02.30		01.13	01.01	01.12	01.58	02.31	03.55	05.14	05.86	05.52	03.96	02.21	01.55
		T = 1/5.00yrs. K _{5.00} = 0.72	01.82	01.88	02.18	02.81	04.22	05.75	06.80	06.91	06.79	06.21	04.40	02.50		01.21	01.20	01.21	01.77	02.53	04.19	05.61	06.22	05.93	04.49	02.40	01.64
		T = 1/10.00yrs. K _{10.00} = 1.30	01.89	02.11	02.36	02.98	04.70	06.21	07.16	07.22	07.17	06.56	04.80	02.67		01.26	01.35	01.29	01.92	02.72	04.71	05.99	06.52	06.27	04.92	02.56	01.72
		T = 1/20.00yrs. K _{20.00} = 1.87	01.95	02.34	02.52	03.15	05.17	06.64	07.51	07.53	07.54	06.90	05.19	02.83		01.32	01.50	01.36	02.07	02.89	05.21	06.36	06.80	06.59	05.32	02.71	01.80
		T = 1/30.00yrs. K _{30.00} = 2.19	01.99	02.46	02.62	03.24	05.43	06.89	07.71	07.70	07.75	07.09	05.41	02.92		01.35	01.59	01.40	02.16	02.99	05.49	06.57	06.96	06.77	05.56	02.80	01.84
		T = 1/50.00yrs. K _{50.00} = 2.59	02.04	02.62	02.74	03.37	05.77	07.20	07.95	07.92	08.02	07.34	05.68	03.04		01.39	01.70	01.45	02.26	03.12	05.85	06.84	07.16	07.00	05.86	02.91	01.89

MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 295 (LTL)



MONTHLY BASIS ANALYSIS OF DATA OF WATER LEVEL GAUGE STATION SW 295 (LTL)



**INSTRUCTIONS TO SURVEYORS:
INFORMATION TO BE COLLECTED DURING BATHYMETRIC SURVEY
AND PHYSICAL FEATURE SURVEY:**

1. During survey works, information regarding water levels should be collected. Information should include: a. Notable highest flood level (HFL) and lowest flood level (LFL) in the past. (ASK LOCALS) b. Notable Highest tide level (HTL) and lowest tide level (LTL) in the past. (ASK LOCALS) c. Present water level (PWL) during survey at the point of surveyed section should be measured.
2. Cross-sections should be collected at entry and exit of a bends of rivers, at centers of riffles of rivers at junctions with tributaries and distributaries and mouths of rivers, near locations of water level gauges and at locations of hydraulic structures.
3. GPS location of the surveyed section should be collected.
4. Local names of the rivers being surveyed and their tributaries (If any) should be collected. (ASK LOCALS)
5. Information regarding hydraulic structures have to be collected consulting with the government agencies like BWDB, BADC, LGED and RHD. Information should include: a. Sill level of regulators, rubber dams, weirs and culverts. b. Opening of the structures. c. Storage level of water retention structures and dams. d. Information of the projects that funded the construction of the structures if possible to collect.
6. Consulting with the local people, information regarding flash flood have to be collected. Information should include: a. Number of incident(s) of flash flood in a year. b. Probable time(s) of flash flood(s) to occur. c. Duration(s) of flash flood(s). d. Areas that are more prone to damage inflicted by flash flood.
7. Information regarding water logging should be collected. Local people should be consulted in this regard. Information should include: a. Name of the areas experiencing frequent water logging problems. b. Duration of water logging. c. Local idea about cause of water logging.
8. Information regarding drains should include: a. Size of drains: (Depth X Width) b. RL of drains at different locations.
 1. c. Construction type of drains: i. Lined / Unlined ii. Man-made / Natural d. Method of connection of households to the drains. e. Location of different point of the drains: i. Starting points ii. Junction points iii. End points f. Name of roads alongside the drains, ward no. / name of village. g. Use of drains: i. Sewer ii. Storm-sewer iii. Mixed
9. Information regarding encroachment of drains and natural channels should be collected.

Table A2.1: Dumpy level reading sheet

[illegible]

Table A2.2: Drainage Inventory

[illegible]

CROSS-SECTIONS OF RIVERS AND CHANNELS AS SURVEYED

Page No.

List of Tables:

Table 3.3: Sample of Collected Water level Data of BWDB Station SW274 & SW295	12
Table-5.1: Manning's n for Channels (Chow (1951))	19

Figures:

Fig-1: An integrated 1D-2D flood model on a flood plain showing flood conditions at different water level and flow time using Mike Flood (DHI)	2
Fig-2: An integrated 1D-2D flood model showing flood conditions in a city area using HEC-RAS	2
Fig-3: Model developed using EPA SWMM simulating undeveloped (left) and Developed (right) conditions to calculate and compare the difference of discharge	3
Fig-4: A Dumpy level establishes a horizontal plane to measure the relative elevation differences throughout a project area. A hand GPS is used to get the location of the base	4

List of Maps:

Map-1: Map showing the main drainage channels as identified at Shibpur Upazila under Narshingdi District.	7
Map-2: Map showing the main drainage channels as identified at Shibpur Paurashava under Narshingdi District.	8
Map-3: Locations of BWDB Water Level, Discharge and Rainfall gauge stations at and around Shibpur, Narshingdi, of which the data has been collected (SW 177, SW 229, SW 274, SW 295, CL 76 and CL 79).	9

List of Plates:

Plate-1: Bridge on Kalagachia Channel (Paharia River) at Shibpur Paurashabha at Narshingdi.	5
Plate-2: Pire of an abandoned Bridge on Kalagachia Channel (Paharia River) at Shibpur Paurashabha at Narshingdi.	5

Annexures:

Annexure-A: Analysis	
Annexure-B: Survey Works	

JV of SCPL-ABL

Preparation of Development Plan for Fourteen Upazilas Project (Package-02)

Ref: SCPL-ABL/UDD/2016/ Agriculture Survey Report/Shibpur Upazila

Date:

To

The Project Director

“Preparation of Development Plan for fourteen Upazilas” Project

Urban Development Directorate

82, Segunbagicha, Dhaka, 1000.

Subject: Submission of the Final Agriculture Survey Report of Shibpur Upazila, Narsingdi.

Dear Sir,

We are pleased to submit herewith the Final Agriculture Survey Report of Shibpur Upazila, Narsingdi for your kind information and further action.

Thanking you and assuring you of our best services.

Your Sincerely,

(Dr. Nurul Islam Nazem)
Team Leader, Package -2

Dr. Santosh Sarker
Agriculture Expert, Package -2

Encl: As stated.

Copy to:

1. Project Manager, Package-2, 14 Upazila Project, UDD
2. Director, Sheltech Consultants Pvt. Limited
3. Chairman, Arc-Bangladesh limited, Dhaka

1/E/2 Paribagh (Mazar Road), Shahbagh, Dhaka-1000, Bangladesh

Phone: +880-2-9611171 Fax: +880-2-9611172

Email: scpl.mail@gmail.com

EXECUTIVE SUMMARY

Shibpur Upazila gets high potentials for its land and agricultural production. This Upazila holds an important arena in Narsingdi District with her natural resources and ecosystem. It is reported that natural disasters like drought, flood, decreasing ground water, heavy rain, early rain, erosion, water logging and hail-storm damage crops of this Upazila. The study is to determine the present scenario of agriculture practices and assessment of the potential sustainable future development of the sector. Both the primary and secondary data were reviewed for preparing the survey report. The proposed Preparation of Development Plan for Fourteen Upazilas, Package 02 is expected to contribute to achieving the objectives of the National Agriculture Policy.

The Agro-ecological zones of the Upazila are: Young Brahmaputra and Jamuna Floodplain (AEZ 8), Old Brahmaputra Floodplain (AEZ-9) and Madhupur tract (AEZ-28). Narsingdi gas field is situated in the Upazila adjacent to the Dhaka-Sylhet highway about 45 km away from Dhaka capital city. Shibpur Upazilla consists of one Municipality and 9 Unions.

The highest percentage is double cropped area (57%) followed by triple cropped area (32%), single crop area (10%) and more than three cropped area 1% under Shibpur Upazila. The cropping intensity of Shibpur Upazila is 208% which is higher than Narsingdi district (207%) and higher than average National cropping Intensities (190%).

The scenario of present cropping pattern under Shibpur Upazila is complex and predominantly Boro and T. Aman Rice, Jute, Vegetables, Oilseeds, Pulses Spices, Fruits Garden and Orchard based. Study finding shows that 13 different cropping pattern are practiced by Shibpur Upazila farmers. Shibpur Upazila present one main cropping pattern area is Boro (HYV/Hybrid) → Fallow→T. Aman (HYV) which is practiced 61.4% of the Net Cultivable Area (NCA). Boro(HYV/Hybrid)→Dhaincha→Fallow which is practiced 2% of the Net Cultivable Area (NCA). Similarly, winter vegetables→Kharif-1 vegetables→Kharif-2 summer vegetables which are practiced about 3% of the Net Cultivable Area (NCA). Mustard→Jute→T. Aman (HYV/LV) is covering about 2 % of the NCA. Banana/Lemon/Zinger is the cropping pattern covering about 4% of the NCA. Fruits Garden is covered about 13% of the Net Cultivable Area. Spices→Jute→Fallow is practiced about 3% Net Cultivable Area

Rice, Jute, winter and summer vegetables, potato, mustard, groundnut and pulses, Banana, Lemon and various fruits crops are grown in 9 Unions under Shibpur Upazila. The present total different cropped area is **27350** ha of which rice cropped area are **19750** ha and the rest **7600** ha is covered by non-rice crops (Jute, Potato, W & S. vegetables, pulses, and oilseeds, Banana, Lemon and Fruits etc.). The rice and non-rice cropped area are about 72% and 28% respectively of the total cropped area. The highest land area was used for Boro (HYV/Hybrid), T. Aman (HYV) rice and Jute cultivation. HYV/Hybrid rice or others crops gives higher yield in compared to local variety crops. Total crop production is **215408.6** metric tons of which rice production is **67428.5** metric tons and non-rice production is **147980.1** metric tons. The highest contributions among the non-rice crops are: Fruits Garden (33%), winter vegetables (24%) followed by Banana/ Lemon (18%), Jute (11%) and summer vegetables respectively.

The main source of water is both surface and ground water. For Rabi crops cultivation ground water conservation and proper utilization in this Upazila is very important. A total of 3377 machine were used for irrigation under 9 Unions in Shibpur Upazila. All 9 DTW has electricity facilities and also 2054 STW and 4LLP has electricity. Different Unions 1296 STW and also 14 LLP has no electricity facilities for irrigation. During Boro season power supply were acute problems under Shibpur Upazila. Farmers wanted nonstop electricity supply during Boro season. Majority of the Farmers (92-100%) reported irrigation drainage system is not pucca which is causes wastage of irrigation water. Farmers wanted pucca drainage system.

Rice production cost of Boro and Aus are Tk.18.65 and Tk.18.64 per kg, and Aman rice production cost is Tk.17.61 per kg which is less than Boro and Aus. The present study was assessed financial profitability of Brinjal, Tomato, Potato and Cabbage/cauliflower vegetables production under Shibpur Upazila. Brinjal cultivation is more profitable (Tk655000/- per ha) followed by tomato (Tk300000/- per ha), Cabbage/Cauliflower (205000/- and potato (Tk180000/- per ha).

The HYV paddy cultivation area 116% was increased and 82% local variety rice was decreased during last ten years. Remarkable significant changed or increased during 10 years was occurred in summer vegetables (77%), winter vegetables (30%), oilseeds (106%), Spices (55%) and Banana/Lemon cultivation (103%) land use. Among the other purposes remarkable significant changed were occurred in poultry farm (742%) and Brick field (316%) and followed by gardening (85%) and Housing (79%) respectively.

Major problems to crop production in 9 Unions and 1 Municipality under Shibpur Upazila are natural disaster such as heavy rain, flood, water logging, drought, and river erosion, electricity power failure during Boro crop season, There is no wholesale market and infrastructure for agriculture product, no cold storage and large vegetables selling center or market under 9 Unions. Produce rice crops market price is less but production cost is high

Road network at local level, agro-processing and marketing infrastructure development, Re-excavation of canals and irrigation facilities need to be improved for mitigating impacts of crop production related vulnerabilities and climate change. Reconstruction of damaged water management infrastructures need to be made. Each Union one wholesale market infrastructure need to be constructed. DAE may arrange joint collaborative soil testing and recommendation and training program for beneficiaries. Financial support needs to be provided to DAE from project.

Agro-based processing center & industries need to be establishment under 9 unions and Municipality. There is a need for construction of infrastructure for some agro-base processing center. There is a need to integrated effort for industrial effluents and waste management.

List of Abbreviations

AEO	Agriculture Extension Officer
AEZ	Agro-Ecological Zone
BARI	Bangladesh Agriculture Research Institute
BCR	Benefit Cost Ratio
BINA	Bangladesh Institute of Nuclear Agriculture
BRRI	Bangladesh Rice Research Institute
BSRI	Bangladesh Sugarcane Research Institute
BBS	Bangladesh Bureau of Statistics
CC	Climate Change
CA	Commercial Area
CDS	Coastal Development Strategy
DAE	Department of Agricultural Extension
DTW-	Deep Tube Well
DS/m	Deci-Siemens/meter
d-Base	Data Base
FAO	Food and Agricultural Organization
GO-	Government Organization
HYV-	High Yielding Variety
HHS	Household Survey
IPM	Integrated Pest Management
IPMP	Integrated Pest Management Plan (IPMP)
ICZMP	Integrated Coastal Zone Management Programme
KII-	Key informant Interview
LIV	Local Improved Variety
LLP	Low Lift Pump
NCA	Net Cultivable Area
NLUP	National Land Use policy
NWP	National Water Policy
NIPM	National Integrated Pest Management
NWMP	National Water Management Policy
p ^H	Negative Logarithm of Hydrogen ion concentration
PRA	Participatory Rapid Appraisal
SAAO	Sub-Assistant Agricultural Officer
SRDI	Soil Resource Development Institute
SPSS	Statistical Package for Social Sciences
STW	Shallow Tube Well

T. Aman	Transplanted Aman
T. Aus	Transplanted Aus
ToT	Training of Trainers
UAO	Upazila Agricultural Officer
WARPO	Water Resources Planning Organization

Table of Contents

	<u>Page No.</u>
Letter of Transmittal	i
Executive Summary	ii
List of Abbreviations	iv
Chapter-01: Introduction	1
1.1 Background of the Study	1
1.2 Objectives of the Study	1
1.3 Approach and Methodology	1
Chapter-02: Agriculture Relevant Policy Framework	3
2.1 National Agriculture Policy, 2013	3
2.2 National Water Management Plan, 2001 (Approved in 2004)	3
2.3 The Ground Water Management Ordinance, 1985 (Ordinance No. xxvii of 1985)	3
2.4 National Land Use Policy (MoL, 2001)	4
2.5 National Water Policy, 1999	4
2.6 National IPM Policy	4
Chapter-03: Present Land Use	6
3.1 Description of the Present Situation	6
3.2 Shibpur Upazila and Union Wise Farm Families	6
3.3 Present Agricultural Land Use	7
3.3.1 Present Upazila Land Use	7
3.4 Union-Wise Present Agriculture Land Use	13
3.4.1 Ayubpur Union Land Use	13
3.4.2 Baghaba Union Land Use	14
3.4.3 Chakradha Union Land Use	15
3.4.4 Dulalpur Union Land Use	16
3.4.5 Josar Union Land Use	18
3.4.6 Joynagar Union Land Use	19
3.4.7 Masimpur Union Land Use	20
3.4.8 Putia Union Land Use	21
3.4.9 Sadharchar Union Land Use	22
Chapter-4: Cropping pattern, cropping Intensities and Production	26
4.1 Cropping Pattern	26
4.2 Cropping Intensity	27
4.3 Present Cropped Area	27
4.4 Present Crop Production	27
4.5 Irrigation System	28
4.6 Rubber Dam	30
4.7 Cultivation Practices	30

Chapter-05: Production Cost of Rice and Vegetables	32
5.1 Cost of Rice production	32
5.2 Cost of Vegetable Production	32
Chapter-06: Growth or Decline of Agricultural Land during Last Ten Years	35
Chapter-07: Major Crop Problems	36
Chapter-08: Policy Framework and Conclusion	37
8.1 Policy Framework	37
8.2 Conclusion	39
References	40

<u>List of Tables</u>	<u>Page No.</u>
Table-1: Union and Category wise Farm Family under Shibpur Upazila	6
Table-2: Shibpur Upazila Present Land Use	7
Table-3: Union-wise Present Agriculture Land Use Information and Identified land of adjoining Shibpur Upazila	8
Table-4: Unions Identified Land Zoning under Shibpur Upazila	11
Table-5: Present Cropping Patterns of Ayubpur Union	13
Table-6: Present Cropping Patterns of Baghaba Union	14
Table-7: Present Cropping Patterns under Chakradha Union	16
Table-8: Present Cropping Patterns under Dulalpur Union	17
Table-9: Present Cropping Patterns under Josar Union	18
Table-10: Present Cropping Patterns under Joynagar Union	19
Table-11: Present Cropping Patterns under Masimpur Union	20
Table-12: Present Cropping Patterns under Putia Union	21
Table-13: Present Cropping Patterns under Sadharchar Union	22
Table-14: Present Land Use under Ayubpur, Baghaba, Chakradha& Dulalpur Unions	24
Table-15: Present Land Use under Josar,Joynagar, Masimpur, Putia& Sadharchar Unions	25
Table-16: Present Cropping Pattern under Shibpur Upazila	26
Table-17: Present cultivated area, yield and production under Shibpur	28
Table-18: Union wise Irrigation Machine under Shibpur Upazila	29
Table 19 Status of Union wise Irrigation and Ground & Surface Water Used area under Shibpur Upazila	29
Table-20: Cost of Rice & Vegetables Production (2014-15)	32
Table- 21: Compare the Financial Profitability of Brinjal Vegetable Production in Different Region	34
Table- 22: Financial Profitability of 4 4 types of vegetables production in Shibpur Upazila	34
Table-23: Growth or Decline Agricultural land use during the last ten year (2005 to 2015)	35

List of Figures

Page No.

Figure-1: Percentage of Category-wise Farm Family under Shibpur Upazila.	6
Figure-2: Percentage of single, double, triple and more than three cropped land Used in Shibpur Upazila	8
Figure-3: Present Agricultural Land Use Map of Shibpur Upazila	12
Figure -4: Percent of Union wise Single, Double, Triple cropped area under Shibpur Upazila	23
Figure- 5: Union wise cropping intensities under Shibpur Upazila	27
Figure- 6: Percentage of Major Types of Production Costs for Vegetables	32

List of Photographs

Page No.

Plate-1: Dhaincha Field (Green Manuring)	31
Plate-2: Lemon Garden	31
Plate-3: Kakrul vegetables Field	31
Plate-4: HYV Brinjal DAE Demonstratioj	31

Appendixes

Annex-1 Key Informant Interview Questionnaire	42
Annex-2: Agriculture Questionnaire for Urban and Rural Economy Study	47

Chapter-01: Introduction

1.1 Background of the Study

Land is an important resource for most human activities including agriculture, industry, forestry, energy production, settlement, recreation, and water catchment and storage. These diversified uses of land have been giving financial benefits in one hand but on the other creating many problems in respect of criteria based uses and conflicts among the users. Shibpur is located at 24.3750°N and 90.7375°E. The Upazila occupies an area of 21780.97 hectare and total area 206.89 km². The Shibpur Upazila is bounded on the north by Manohardi Upazila on the east by Raipura and Belabo Upazilas on the south by Narsingdi Sadar Upazilas and on the west by Palash Upazila and Kapasia and Kaliganj Upazilas of Gazipur District. It is under Narsingdi District. The Agro-ecological zones of the Upazila are: Young Brahmaputra and Jamuna Floodplain (AEZ 8), Old Brahmaputra Floodplain (AEZ-9) and Madhupur tract (AEZ-28). Narsingdi gas field is situated in the Upazila adjacent to the Dhaka-Sylhet highway about 45 km away from Dhaka capital city. Shibpur Upazilla consists of one Municipality and 9 Unions.

Most of the people of this Upazila are directly or indirectly dependent on agriculture. Increased population imposes high pressure on land resources for agricultural production. Additionally, rapid population growth causes conversion of agriculture land into settlement, industrial area and urban zone. It is reported that natural disasters like seasonal flood, drought, water logging, and hail-storm, tornado and land erosion damage crops of this Upazila. However shifting agricultural land to non-agricultural purposes is a common phenomenon in this Upazila. Improper land use causes various forms of land degradation resulting in a reduced agriculture production. Indiscriminate land conversion will impose threat to national food security. Furthermore, improper land uses affect flora and fauna habitat and thus impact ecosystem and biodiversity. To protect agricultural land, to minimize land degradation and introducing modern technology are the basic needs to cope-up with the increasing demand of food for the growing population of this Upazila.

In view of the above mentioned context, a comprehensive study was conducted in all the Unions of Shibpur Upazila to assess present situation of land uses, related problems and potentialities of land for different other uses, and to find out possible coping ways to solve the problems. Therefore, considering all available parameters and characteristics of the area a sustainable land management was considered to develop better crop production.

1.2 Objectives of the Study

The main objective of the study is to assess the present cropping pattern and cropping intensities (single, double and triple crop area), land utilization and flood level. The main study questions are to determine the growth or decline of agricultural land during last ten years (from 2005-2016), and their causes for growth or decline covering a possible quality of existing and future agricultural land for the project area. The study is to determine the present scenario in agriculture practices and assessment of potential sustainable future development of the sector.

1.3 Approach and Methodology

A multi-disciplinary, participatory and interactive method has been followed in carrying out the study. Both primary and secondary data were reviewed. The primary data were collected through KII (Key Informant Interview) and field visit. KII information was collected by used of questionnaire Annex-1.

The secondary data were collected and reviewed on land use from DAE Union and Upazila Office documents. KII information was collected from 34 Sub-Assistant Agriculture Officers under 1 Municipality and 9 Unions through interview. Structured and semi-structured questionnaire was used for data collection (Annex-2). Data collection and consolidation occurred simultaneously. Data consolidation activities, such as editing, coding, classifying and data entry into the computer software for analysis were carried out simultaneously. Frequency tables (one, two or multiple ways) were prepared for interpretations and analyses using SPSS, and d-Base for data analysis.

Chapter-02: Agriculture Relevant Policy Framework

This Chapter presents a review of the national policy, legal, and regulatory framework relevant to the agriculture aspects of the Project.

2.1 National Agriculture Policy, 2013

The National Agriculture Policy, 2013 approved by the Government of Bangladesh focuses on agriculture production, alleviating poverty through generating jobs and ensuring food security. The Policy outlined nine specific objectives. Although the policy does not emphasize the coastal zone separately, all specific objectives are applicable to the development of coastal zone agriculture.

The GoB will pursue programme for agro-ecologically disadvantaged regions in the hilly area, drought-prone area, Barind tract, char land, haor-baor and coastal belt with appropriate technological support.

To increase water productivity and enhance irrigation efficiency through optimal use of available water resources the GoB will facilitate dissemination of water management technology. Modern irrigation, drainage and water application systems will be introduced for expanding irrigation coverage including difficult or disadvantaged areas i.e. in char, hilly areas, Barind Tract, drought-prone and saline areas.

The proposed Preparation of Development Plan for Fourteen Upazilas Package: 02 are expected to contribute to achieving the objectives of the agriculture policy.

2.2 National Water Management Plan, 2001 (Approved in 2004)

The National Water Management Plan (NWMP) 2001, approved by the National Water Resources Council in 2004, envisions establishing an integrated development, management and use of water resources in Bangladesh over a period of 25 years. WARPO has been assigned to monitor the national water management plan. The major programs in the Plan have been organized under eight sub-sectoral clusters: (i) Institutional Development, (ii) Enabling Environment, (iii) Main Rivers, (iv) Towns and Rural Areas, (v) Major Cities; (vi) Disaster Management; (vii) Agriculture and Water Management, and (viii) Environment and Aquatic Resources. Each cluster comprises of a number of individual programs, and a total of 84 sub-sectoral programs have been identified and presented in the investment portfolio. Most of the programs are likely to be implemented in coastal areas.

Preparation of Development Plan for Fourteen Upazilas Package: 02 has been designed in line with this Plan and addresses its key objectives for the water resource management in the Shibpur Upazila Narsingdi district areas.

2.3 The Ground Water Management Ordinance, 1985 (Ordinance No. XXV of 1985)

This is an Ordinance to manage ground water resources for agricultural production. This Act authorizes the Thana Parishad (Police Station) to grant license for installing tube wells under its

jurisdiction. The Thana Parishad may grant the license if the Parishad is satisfied that the installation of the tube well applied for complies with the following points;

- will be beneficial to the areas where it is to be installed, or
- will not have any adverse effect upon the surrounding areas, or is otherwise feasible.

Preparation of Development Plan for Fourteen Upazilas Package 02 has been designed in line with this Plan and addresses its key objectives for the ground water management ordinance for Shibpur Upazila.

2.4 National Land Use Policy (MoL, 2001)

The National Land Use Policy enacted in 2001, aims at managing land use effectively to support trends in accelerated urbanization, industrialization and diversification of development activities. The NLUP urges that increasing the land area of the country may not be possible through artificial land reclamation process, which is cost-effective only in the long run. Therefore, land use planning should be based on the existing and available land resources. The policy suggests establishing land data-banks where, among others, information on accreted reverie and coastal chars will be maintained. Among the 28 policy statements of NLUP, the following are relevant to the Shibpur Upazila under coastal area:

- forests declared by the Ministry of Environment and Forests will remain
- as forest lands;
- reclassification of forest lands will be prevented; and
- effective green belts will be created all along the coast.

Preparation of Development Plan for Fourteen Upazilas Package 02 is designed in accordance with this Policy and will comply with the above listed requirements.

2.5 National Water Policy, 1999

Endorsed by the GoB in 1999, the National Water Policy (NWP) aims to provide guidance to the major players in the water sector for ensuring optimal development and management of water. According to the policy, all agencies and departments entrusted with water resource management responsibilities (regulation, planning, construction, operation, and maintenance) are required to enhance environmental amenities and ensure that environmental resources are protected and restored in executing their tasks.

The proposed Preparation of Development Plan for Fourteen Upazilas Package: 02 are expected to contribute to achieving the objectives of the national water policy.

2.6 National Integrated Pest Management (NIPM) Policy

IPM Action Plan supports a strategy that promotes use of biological or environmental pest control methods and reduces reliance on synthetic chemical pesticides. Agriculture, rural development and health sector projects have to avoid using harmful pesticides. Other pesticides can be used, but only as an element of an Integrated Pest Management Plan (IPMP) that emphasizes environmental and biological controls.

The proposed Preparation of Development Plan for Fourteen Upazilas Package 02 is expected to contribute to achieving the reduces pesticides used in agriculture sector and increases use of other pest control methods under National IPM policy.

Chapter-03: Present Land Used

3.1 Description of the Present Situation

The land of Shibpur Upazila is intensively used for vegetables & fruits and other agriculture crops, housing and settlement, fisheries, poultry and other infrastructural development.

Shibpur Upazila falls into 3 Agro-ecological zones of the Upazila are: (i) Young Brahmaputra and Jamuna Floodplain (AEZ 8), (ii) Old Brahmaputra Floodplain (AEZ-9) and (iii) Madhupur tract (AEZ-28). Narsingdi gas field is situated in the Upazila adjacent to the Dhaka-Sylhet highway about 45 km away from Dhaka capital city. Shibpur Upazilla consists of 9 Unions and 1 Paurashava. Most of the people of this Upazila are directly or indirectly dependent on agriculture. General soil color of Shibpur Upazila is grey to brownish. The top soil is occupied by non-calcareous, permeable loamy soils and some parts are clayey. In Shibpur organic matter contents are low in the high land but moderate in the lower parts. Moisture holding capacity of soil is low to medium. General fertility is relatively poor. The top soil pH level ranges from 4.5-6.7 (SRDI 2003 and UAO 2016).

3.2 Shibpur Upazila and Union Wise Farm Families

Farmers in Shibpur Upazila lead their livelihood from agricultural activities. It is the main source of their employment and income. Shibpur Upazila has 9 Unions. It has 41 agricultural blocks under DAE. Union and category wise farm family under Shibpur Upazila is shown in Table 1. Farm family is categorized according to farmer holding own land. There are five categories of farm family in Bangladesh. These are: landless (0.05-0.50 acre land), marginal (0.51-1.50 acre land), and small (1.51-2.50 acre land), and medium (2.51-7.50 acre land) and larger (above 7.50 acre land). On an average about land less 9534, marginal 22957, small 12303, medium large 4336 farm families and remaining 291 are larger farmers under Shibpur Upazila. The highest percentage of farm families are marginal farmers (46%) followed by Small (25.00%), landless (19%), medium farmers (9%) and remaining are larger farmers (Fig-1).

Table1: Union and Category Wise Farm Family under Shibpur Upazila

Name of Union	Landless (%)	Marginal (%)	Small (%)	Medium (%)	Larger (%)	Total
	(.05-.50 acre)	(.51-1.50 acre)	(1.51-2.50 acre)	(2.51-7.50 acre)	(above 7.50 acre)	
Ayubpur Union	742 (15.27)	2536(52.19)	600(12.35)	971(19.98)	10(0.21)	4859
Baghaba Union	630(13.06)	2126(44.07)	1528(31.67)	511(10.59)	29(0.61)	4824
Chakradha	1185(16.10)	2413(32.78)	3247(44.10)	457(6.21)	60(0.81)	7362
Dulalpur Union	2143(35.52)	2253(37.34)	952(15.78)	661(10.96)	24(0.40)	6033
Josar Union	261(5.29)	2310(46.84)	1718(34.83)	574(11.64)	69 (1.40)	4932
Joynagar Union	469(7.74)	3277(54.05)	1783(29.40)	500(8.25)	34(0.25)	6063
Masimpur Union	869(21.04)	2313(55.99)	772(18.69)	152(3.69)	25(0.60)	4131
Putia Union	2065(29.73)	3357(48.34)	1217(17.52)	286(4.12)	20(0.29)	6945
Sadhar Char Union	1170(27.39)	2372(55.52)	486(11.38)	224(5.24)	20(0.47)	4272
Total	9534(19.29)	22957 (46.45)	12303(24.89)	4336 (8.77)	291 (0.59)	49421

Source: Sub-Assistant Agriculture Officers under ----- Upazia, DAE 2016

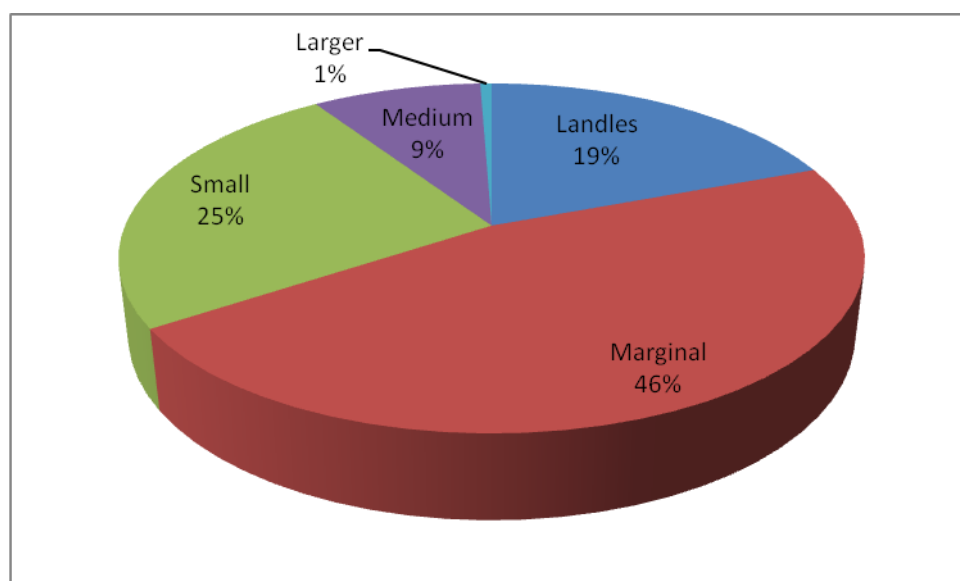


Figure 1: Percentage of Category wise Farm family under Shibpur Upazila

3.3 Present Agricultural Land Use

3.3.1 Present Upazila Land Use

The land of Shibpur Upazila is dominant in agriculture and also intensively used for poultry, fish culture, settlements with homestead forest and other infrastructural activities. Shibpur Upazila gets high potentials for its land and agricultural production. This Upazila holds an important arena in Narsingdi District with her natural resources and ecosystem. The scenario of Shibpur Upazila present different land utilized is shown in Table 2. Types of lands are 6382 ha high land, 7617 ha medium high land, 5145 ha medium low land and 1440 ha low land respectively. Shibpur Upazila covers 16500 ha of net cropped area of which about cultivated area is 37105 ha. The highest land area is 9445 ha is used as double crop and followed by triple crop of 5220 ha and remaining 1595 ha is used as single crops and 240 ha also used as more than three crops under Shibpur Upazila. Other land use: Permanent Fruit Garden 2544 ha, Forest 40 ha and Fish cultivation 165 ha. Percentage of single, double, triple and more than three cropped area used in Shibpur Upazila is shown in Fig 2. The highest percentage is double cropped area (57%) followed by triple cropped area (32%), single crop area (10%) and More than three cropped area 1% under Shibpur Upazila. The cropping intensity of Shibpur Upazila is 208%. Union-wise Present Agriculture Land Use Information and Identified land Zoning of Ishwarganj Upazila are shown in Table 3 and Table 4 and Fig 1.

Table-2: Shibpur Upazila Present Land Use

Sl. No	Upazila Land use	Total Area (ha)
1.	Total Agricultural land	20586
2.	Single cropped area	1595
3.	Double cropped area	9445
4.	Triple cropped area	5220
5.	More than three cropped area	240

6.	Net cropped area	16500
7.	Total crops land	37105
8.	Cropping Intensity	208%
9.	Water land (River, Ponds and others)	165
10.	Forest land	40
11.	Household area	6670
12.	High land	6382
13.	Medium high land	7617
14.	Medium low land	5145
15.	Low land	1440
16.	Permanent Fruit Garden	2544
17.	Road	1623

Source Upazila Agriculture Office Ishwarganj, DAE 2016

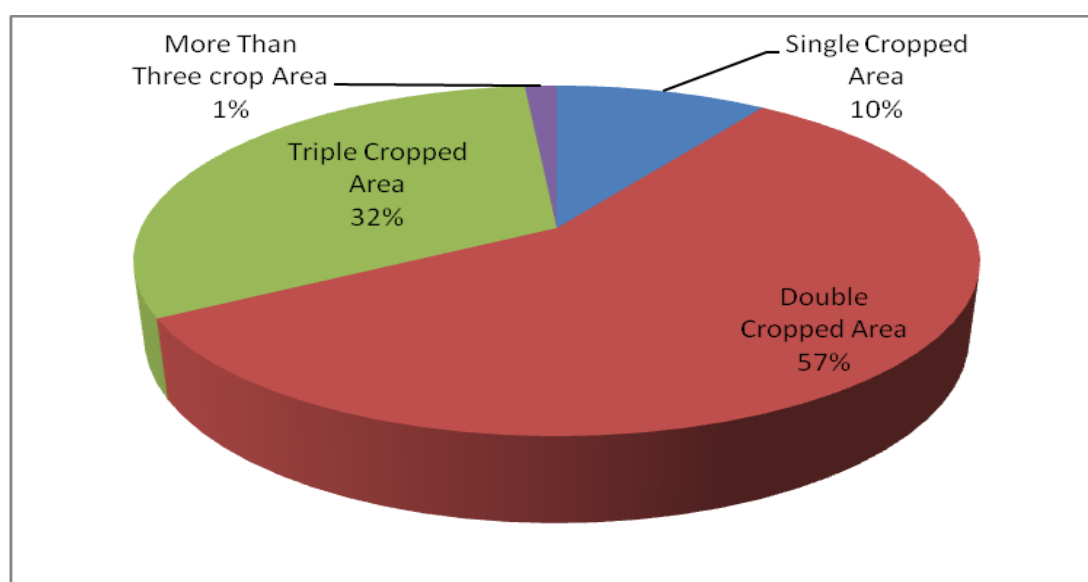


Figure 2. Percentage of single, double, triple and more than three cropped land used in Shibpur Upazila

Table 3: Union-wise Present Agriculture Land Use Information and Identified land of adjoining Shibpur Upazila

Name of Union	Total Area (HA)	NCA (ha)	Land Type (%) NCA	Soil P ^H	Soil Texture	Present land Used (%)	Identified Land Zoning
Ayubpur Union	2588	1211	HL=20 MHL=29 MLL=34 LL =16 VLL =1	5.5-6.0	Loam clay	Agriculture =62.24 Industrial Area=0.04 Road = 1.31 Rural Settlement & HV = 33.56 Water bodies=2.86	Agriculture Zone

Name of Union	Total Area (HA)	NCA (ha)	Land Type (%) NCA	Soil P ^H	Soil Texture	Present land Used (%)	Identified Land Zoning
Baghaba Union	4065	1850	HL=32 MHL=39 MLL=24 LL = 5	5.5-6.5	Clay Loam/ Clay	Agriculture=50.91 Forest =15.25 Industrial Area=0.05 Fruit garden=1.11 Road= 0.78 Rural Settlement &HV = 29.67 Urban Built-up Area =0.05 Water bodies=2.18	Agro-Forest& Fruit Garden Zone
Chakradha	4855	2325	HL=29 MHL=28 MLL=22 LL=21	4.0-6.0	Loam / clay loam	Agriculture=58.53 Road=0.86 Rural Settlement &HV =36.79 Urban Built-up Area =0.03 Water bodies=3.81	Agriculture Zone
Dulalpur Union	4535	2195	HL=15 MHL=50 MLL=23 LL=10 VLL=2	5.0-7.0	Clay loam/Clay	Agriculture =59.01 Road=1.14 Rural Settlement &HV =34.78 Water bodies=5.07	Agro- Fisheries Zone
Josar Union	2855	1395	HL=37 MHL=63	4.5-6.0	Loam / clay loam	Agriculture=24.34 Forest =26.65 Industrial Area=0.08 Fruit Garden=19.04 Road=0.93 Rural Settlement & HV =27.30 Water bodies=1.65	Gas Field- Agro- Forest& Fruit Garden Zone
Joynagar Union	5220	2800	HL=24 MHL=40 MLL=21 LL=15	5.0-7.0	Clay loam/Clay	Agriculture=40.78 Forest =22.40 Industrial Area=0.03 Fruit Garden=4.84 Road=0.43	Agro- Forest& Fruit Garden Zone Zone

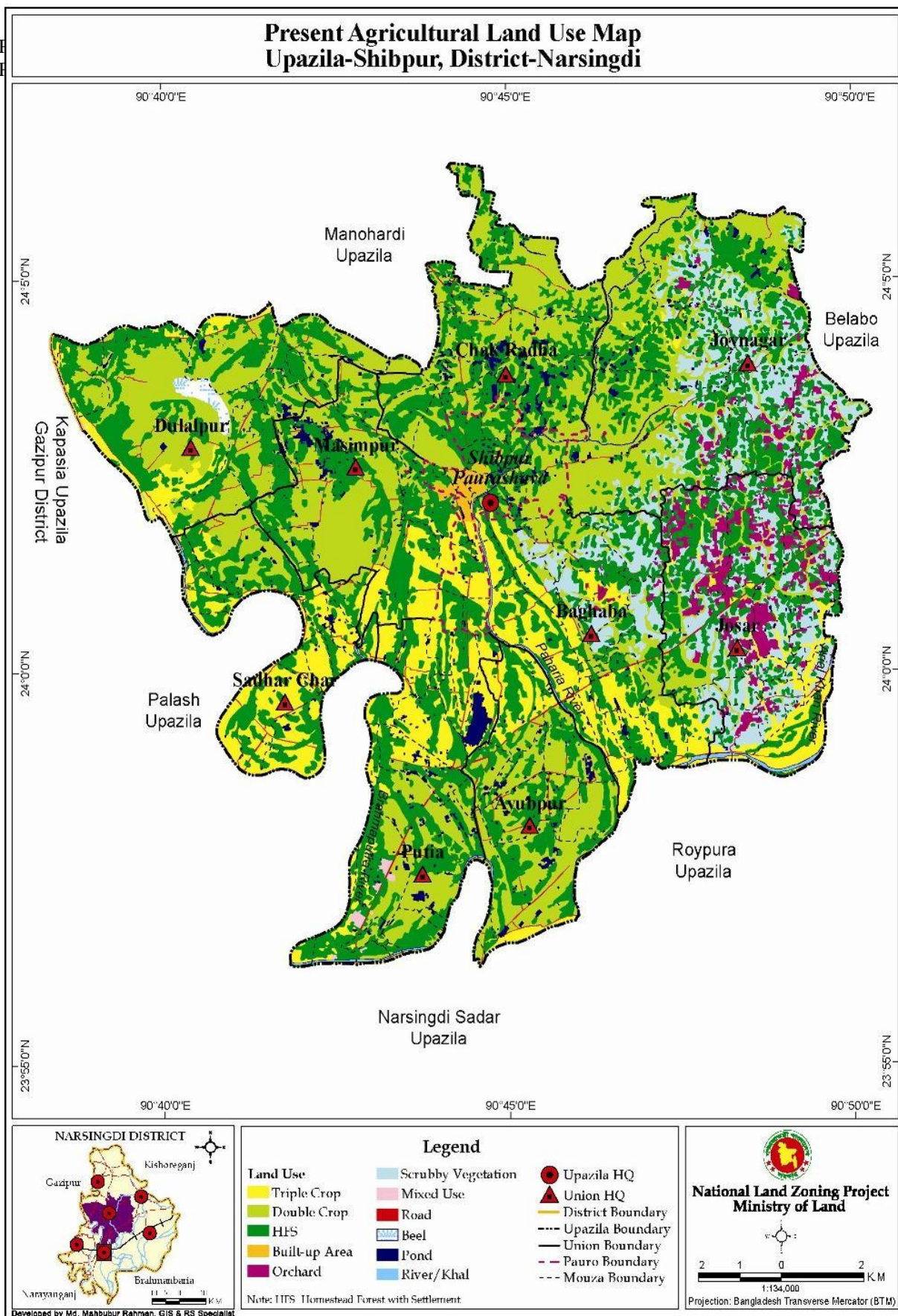
Name of Union	Total Area (HA)	NCA (ha)	Land Type (%) NCA	Soil P ^H	Soil Texture	Present land Used (%)	Identified Land Zoning
						Rural Settlement & HV =29.86 Water bodies=1.66	
Masimpur Union	2106	1038	HL=17 MHL=67 MLL=11 LL=5	5.5-7.5	Clay loam/loam	Agriculture=59.70 Road=1.07 Rural Settlement & HV =36.29 Urban Built-up Area =0.41 Water bodies=2.54	Agriculture Zone
Putia Union	4239	1968	HL=5 MHL=30 MLL=38 L L=21 VLL=6	5.0-7.5	Loam / clay loam	Agriculture=52.04 Industrial Area=1.39 Road=1.41 Rural Settlement & HV =39.34 Urban Built-up Area =0.35 Water bodies=5.47	Agriculture Zone
Sadhar Char Union	2630	1210	HL=25 MHL=49 MLL=16 LL=7	5.6-7.3	Loam clay	Agriculture=60.64 Road=1.43 Rural Settlement & HV =35.21 Water bodies=2.72	Agro-Fisheries Zone
Shibpur Paurashava		878.54	HL=9 MHL=40 MLL=21 LL=29 VLL=1	5.0-7.0	Clay loam/Clay	Agriculture=45.27 Road=1.85 Rural Settlement & HV =42.21 Urban Built-up Area =7.44 Water bodies=3.23	Paurashava area

Source: National Land Zoning Report January 2015 of Shibpur Upazila under Narsingdi district

Table 4: Unions Identified Land Zoning under Shibpur Upazila

Name of Zone	Union	Remarks
1. Agriculture Zone	Ayubpur , Chakradha, Masimpur & Putia	Considering the present agricultural land use, land suitability analysis and as per opinion of local peoples these Unions are identified as agricultural Zone
2. Agro-Fisheries Zone	Dulalpur & Sadhar Char	Some of the area is potential for capture and culture fisheries and high production of fisheries
3. Agro-Forest & Fruits Garden Zone	Baghaba & Joynagar	This Union lies in Agro-Ecological Zone of Modhupur tract and suitable for forest and various fruit garden
4. Narsingdi Gas Field- Agro-Forest and Fruits Garden Zone	Joysar	Narsingdi Gas field is situated in the Upazila adjacent to Dhaka-Sylhet highway
5. Paurashava Area	Shibpur Paurashava	Urban development of plan should be implemented without degrading fertile agricultural land.

Source: National Land Zoning Report January 2015 of Shibpur Upazila under Narsingdi District



Present Agricultural Land Use Map of Shibpur Upazila

Fig 3: Agricultural Land-use Map of Shibpur Upazila

Source: National Land Zoning Report, December, 2014

3.4 Union-Wise Present Agriculture Land Use

Shibpur Upazila has 9 Unions and lands used of all the 9 unions are given below.

3.4.1 Ayubpur Union Land Use

General Description

Land type is the dominant factor guiding choice of crops and cropping patterns of area. Selection of crop largely depends on topographic position of land. Union falls into 3 Agro-ecological zones of the Union are: (i) Young Brahmaputra and Jamuna Floodplain (AEZ 8), (ii) Old Brahmaputra Floodplain (AEZ-9) and (iii) Madhupur tract (AEZ-28). The soil P^H is 5.5-6.0. The agricultural potentiality of these soils is high for field crops and Agro-forestry species (Land Zoning Report, January 2015). Ayubpur Union is comprised of 10 mauzas having an area of 2588ha of land of which cultivable area is 1211 ha. The land types of this union are highland (20%), medium high land (29%), Medium low land (34%) , Low land (16%) and very low land (1%) which indicates lands are free from monsoon flood and suitable for different Rabi crops and Kharif crops Cultivation(SAAO,2016).

Present Agriculture Land Use: Boro(HYV) is the main irrigated crops cultivated by using ground water . There are Seven cropping pattern are practiced in Ayubpur Union which is shown in Table 5. The cropping intensity of this union is 213%. Major crops cultivated in this union are: paddy, Jute, Lemon, Dhaincha and Rabi & Kharif different vegetables.

Table-5: Present Cropping Patterns of Ayubpur Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity(%)	% of NCA	Area (ha)
Ayubpur	1211	Boro(HYV)→Fallow→T.Aman(HYV)	213	77.87	943
		Vegetables→Boro----Fallow		3.80	46
		RC→ Dhaincha→T.Aman(HYV)		4.13	50
		Mustard→Boro→ T.Aman		2.89	35
		Vegetable→Vegetable→Vegetable		6.52	79
		Vegetables→Fallow→T.Aman(HYV)		2.31	28
		Wheat/Maize→Jute→T.Aman		2.48	30
		Total		100	1211

Source: SAAOs of Ayubpur Union 2016

Major Problems on Crop Cultivation

Agriculture is the backbone of Shibpur Upazila and is synonymous to the food security. The major problems in Ayubpur Union crop cultivation are: (i) Flood (ii) Drought (iii) Water logging (iv) Lack of quality seed (v) Decrease of agricultural land (vi) Erosion (vii) Climate change (viii) Changes in rainfall pattern (ix) Temperature fluctuation (x) Adverse weather condition (xi) Power failure (xii) Inadequate drainage facilities (xiii) Increase insect and pest infestation and (xiv) Change in rivers and canals morphology.

Measures to Improve Crop Cultivation

The remedial measures are given below:

- (a) Adapt modern farming techniques, (b) Choose high yields and drought tolerant varieties.
- (c) Information on quality seed, (d) Observe weather conditions and follow weather forecast,
- (e) Follow fertilizer recommendation by soil testing, (f) Select best available seeds from market, (g) Integrated effort for industrial effluents and waste management, (h) Incorporating organic manure in the soil by changing cropping pattern /crop rotation system (i) Grow one leguminous crop (Dhaincha / Pulses/Fodder etc.) between two cereal crops (j) Re-excavation of canals, (k) Reconstruction of damaged water management infrastructures, (l) Develop market infrastructures and road communication at local level and (m) Uninterrupted power supply to irrigation pumps.

3.4.2 Baghaba Union Land Use

General Description

Crops and cropping pattern depends on flood depth and lands which above normal inundation level, can provides wide range of opportunities for growing various crops round the year. This union land is suitable for crop cultivation round the year. Baghaba Union is comprised of 19 mauzas and 21 villages having an area of 4065 ha of land of which cultivable area is 1850 ha. The land types of this union are highland (32%), medium high land (39%), Medium low land (24%) , Low land (5%) which indicates lands are free from monsoon flood and suitable for different Rabi crops and Kharif crops Cultivation(SAAO,2016). Union falls into 3 Agro-ecological zones of the Union are: (i) Young Brahmaputra and Jamuna Floodplain (AEZ 8), (ii) Old Brahmaputra Floodplain (AEZ-9) and (iii) Madhupur tract (AEZ-28). Most of the areas of this Union are developed from transformed alluvial deposit by the Brahmaputra and Jamuna rivers. The soil P^H is 5.5-6.5. The agricultural potentiality of these soils is high for field crops and Agro-forestry species (Land Zoning Report, January 2015).

Present Agriculture Land Use: There are six cropping pattern is practiced in Baghaba Union which is shown in Table 6. The cropping intensity of this union is 219%. Baghaba Union dominant land use is agriculture followed by homestead garden. Boro(HYV) is the main irrigated crops cultivated by using ground water. Major crops cultivated in this union are: paddy, Potato, Jute, Lemon, Mustard and different Rabi & Kharif vegetables.

Table-6: Present Cropping Patterns of Baghaba Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity(%)	% of NCA	Area (ha)
Baghaba	1850	Boro(HYV)→Fallow→T.Aman(HYV)	219	47.03	870
		Boro(HYV/Hybrid) → Fallow→Fallow		5.14	95
		Spices→ Fallow→T. Aman(HYV)		11.35	210
		Vegetables → Jute→ T.Aman		6.76	125
		Vegetable→Vegetable→Vegetable		27.03	500
		Banana/Lemon→ Banana/Lemon		2.70	50
		Total		100	1850

Source: SAAOs of Baghaba Union 2016

Major Problems on Crop Cultivation

The major problems in Baghaba Union crop cultivation are: (i) Flood (ii) Drought (iii) Water logging (iv) Lack of quality seed (v) Decrease of agricultural land (vi) Erosion (vii) Climate change (viii) Changes in rainfall pattern (ix) Temperature fluctuation (x) Adverse weather condition (xi) Power failure (xii) Inadequate drainage facilities (xiii) Increase insect and pest infestation and (xiv) Change in rivers and canals morphology.

Measures to Improve Crop Cultivation

The remedial measures are given below:

- (a) Adapt modern farming techniques, (b) Choose high yields and drought tolerant varieties.
- (c) Information on quality seed, (d) Observe weather conditions and follow weather forecast,
- (e) Follow fertilizer recommendation by soil testing, (f) Select best available seeds from market, (g) Integrated effort for industrial effluents and waste management, (h) Incorporating organic manure in the soil by changing cropping pattern / crop rotation system (i) Grow one leguminous crop (Dhaincha / Pulses/Fodder etc.) between two cereal crops (j) Re-excavation of canals, (k) Reconstruction of damaged water management infrastructures, (l) Develop market infrastructures and road communication at local level and (m) Uninterrupted power supply to irrigation pumps.

3.4.3 Chakradha Union Land Use

General Description

This union land is suitable for all types crops round the year. Natural and man-made hazards like flood, heavy rain, and drainage congestion damaging agricultural crops. Union falls into 3 Agro-ecological zones of the Union are: (i) Young Brahmaputra and Jamuna Floodplain (AEZ 8), (ii) Old Brahmaputra Floodplain (AEZ-9) and (iii) Madhupur tract (AEZ-28). The soil P^H is 4.0-6.0. The agricultural potentiality of these soils is high for field crops and Agro-forestry species (Land Zoning Report, January 2015). Chakradha Union is comprised of 12 mauzas and 18 villages having an area of 4855 ha of land of which cultivable area is 2325 ha. The land types of this union are highland (29%), medium high land (28%), Medium low land (22%) , Low land (21%) which indicates lands are free from monsoon flood and suitable for different Rabi crops and Kharif crops Cultivation(SAAO,2016).

Present Agriculture Land Use: Major crops cultivated in this union are: paddy, Potato, Jute, Lemon, Banana, Mustard and different Rabi & Kharif vegetables. Chakradha Boro (HYV) is the main irrigated crops cultivated by using ground water. There are six cropping pattern are practiced in Chakradha Union which is shown in Table 7. The cropping intensity of this union is 209%.

Table-7: Present Cropping Patterns of Chakradha Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	% of NCA	Area (ha)
Chakradha	2325	Boro(HYV)→Fallow→T.Aman(HYV)	209	57.20	1330
		Boro(HYV/Hybrid) → Fallow→Fallow		18.28	425
		Mustard→ →T. Aman(HYV)		1.51	35
		Pulses → Fallow→ T.Aman		1.08	25
		Vegetable→Vegetable→Vegetable		19.57	455
		Banana/Lemon→ Banana/Lemon		2.37	55
		Total		100	2325

Source: SAAOs of Chakradha Union 2016

Major Problems on Crop Cultivation

The major problems in Chakradha Union crop cultivation are: (i) Flood (ii) Drought (iii) Water logging (iv) Lack of quality seed (v) Decrease of agricultural land (vi) Erosion (vii) Climate change (viii) Changes in rainfall pattern (ix) Temperature fluctuation (x) Adverse weather condition (xi) Power failure (xii) Inadequate drainage facilities (xiii) Increase insect and pest infestation and (xiv) Change in rivers and canals morphology.

Measures to Improve Crop Cultivation

The remedial measures are given below:

- (a) Adapt modern farming techniques, (b) Choose high yields and drought tolerant varieties.
- (c) Information on quality seed, (d) Observe weather conditions and follow weather forecast,
- (e) Follow fertilizer recommendation by soil testing, (f) Select best available seeds from market, (g) Integrated effort for industrial effluents and waste management, (h) Incorporating organic manure in the soil by changing cropping pattern /crop rotation system (i) Grow one leguminous crop (Dhaincha / Pulses/Fodder etc.) between two cereal crops (j) Re-excavation of canals, (k) Reconstruction of damaged water management infrastructures, (l) Develop market infrastructures and road communication at local level and (m) Uninterrupted power supply to irrigation pumps.

3.4.4 Dulalpur Union Land Use

General Description

This Union dominant land use is agriculture followed by fisheries and fruits garden. A considerable number of farmers commercially were cultivated vegetables and fruits crops under this Union. Dulalpur Union is comprised of 12 mauzas and 20 villages having an area of 4535 ha of land of which cultivable area is 2195 ha. The land types of this union are highland (15%), medium high land (50%), Medium low land (23%) , Low land (10%) and very low land (2%) which indicates lands are free from monsoon flood and suitable for different Rabi crops and Kharif crops Cultivation(SAAO,2016). Union falls into 3 Agro-ecological zones of the Union are: (i) Young Brahmaputra and Jamuna Floodplain (AEZ 8), (ii) Old Brahmaputra Floodplain (AEZ-9) and (iii)

Madhupur tract (AEZ-28). The soil P^H is 5.0-7.5. The agricultural potentiality of these soils is high for field crops and Agro-forestry species (Land Zoning Report, January 2015).

Present Agriculture Land Use: There are five cropping pattern is practiced in Dulalpur Union which is shown in Table 8. The cropping intensity of this union is 206%. Boro(HYV) is the main irrigated crops cultivated by using ground water. Major crops cultivated in this union are: paddy, Potato, Jute, Lemon, Banana, Mustard and different Rabi & Kharif vegetables.

Table-8: Present Cropping Patterns of Dulalpur Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	% of NCA	Area (ha)
Dulalpur	2195	Boro(HYV)→Fallow→T.Aman(HYV)	206	79.73	1750
		Boro(HYV/Hybrid) → Fallow→Fallow		3.42	75
		Boro →B. Aman(HYV)→T.Aman		9.52	209
		Vegetable→Vegetable→Vegetable		4.60	101
		Banana/Lemon→ Banana/Lemon		2.73	60
		Total		100	2195

Source: SAAOs of Dulalpur Union 2016

Major Problems on Crop Cultivation

The major problems in Dulalpur Union crop cultivation are: (i) Flood (ii) Drought (iii) Water logging (iv) Lack of quality seed (v) Decrease of agricultural land (vi) Erosion (vii) Climate change (viii) Changes in rainfall pattern (ix) Temperature fluctuation (x) Adverse weather condition (xi) Power failure (xii) Inadequate drainage facilities (xiii) Increase insect and pest infestation and (xiv) Change in rivers and canals morphology.

Measures to Improve Crop Cultivation

The remedial measures are given below:

- Adapt modern farming techniques,
- Choose high yields and drought tolerant varieties.
- Information on quality seed,
- Observe weather conditions and follow weather forecast,
- Follow fertilizer recommendation by soil testing,
- Select best available seeds from market,
- Integrated effort for industrial effluents and waste management,
- Incorporating organic manure in the soil by changing cropping pattern /crop rotation system
- Grow one leguminous crop (Dhaincha / Pulses/Fodder etc.) between two cereal crops
- Re-excavation of canals
- Reconstruction of damaged water management infrastructures,
- Develop market infrastructures and road communication at local level and
- Uninterrupted power supply to irrigation pumps.

3.4.5 Josar Union Land Use

General Description

This Union dominant land use is agriculture followed by agro-forest and fruits garden. Union falls into 3 Agro-ecological zones of the Union are: (i) Young Brahmaputra and Jamuna Floodplain (AEZ 8), (ii) Old Brahmaputra Floodplain (AEZ-9) and (iii) Madhupur tract (AEZ-28). Most of the areas of this Union are developed from transformed alluvial deposit by the Brahmaputra and Jamuna rivers. The soil P^H is 4.5-6.0. The agricultural potentiality of these soils is high for field crops and Agro-forestry species (Land Zoning Report, January 2015). Josar Union is comprised of 16 mauzas and 32 villages having an area of 2855ha of land of which cultivable area is 1395 ha. The land types of this union are highland (37%) and medium high land (63%) which indicates lands are free from monsoon flood and suitable for different Rabi crops and Kharif crops cultivation(SAAO,2016).

Present Agriculture Land Use: Major crops cultivated in this union are: paddy, Potato, Jute, Lemon, Banana and different Rabi & Kharif vegetables. Boro (HYV) is the main irrigated crops cultivated by using ground water. There are five cropping pattern are practiced in Josar Union which is shown in Table 9. The cropping intensity of this union is 204%.

Table-9: Present Cropping Patterns of Josar Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	% of NCA	Area (ha)
Josar	1395	Boro(HYV)→Fallow→T.Aman(HYV)	204	46.59	650
		Vegetable→Vegetable→Vegetable		22.22	310
		Fallow → Vegetables→T.Aman		16.49	230
		Spices→Fallow-----T.Aman		5.73	80
		Banana/Lemon→Orchard-→Orchard		8.96	125
		Total		100	1395

Source: SAAOs of Josar Union 2016

Major Problems on Crop Cultivation

The major problems in Josar Union crop cultivation are: (i) Flood (ii) Drought (iii) Water logging (iv) Lack of quality seed (v) Decrease of agricultural land (vi) Erosion (vii) Climate change (viii) Changes in rainfall pattern (ix) Temperature fluctuation (x) Adverse weather condition (xi) Power failure (xii) Inadequate drainage facilities (xiii) Increase insect and pest infestation and (xiv) Change in rivers and canals morphology.

Measures to Improve Crop Cultivation

The remedial measures are given below:

- (a)Adapt modern farming techniques, (b) Choose high yields and drought tolerant varieties.
- (c) Information on quality seed,(d) Observe weather conditions and follow weather forecast,
- (e)Follow fertilizer recommendation by soil testing,(f) Select best available seeds from market,(g) Integrated effort for industrial effluents and waste management,(h) Incorporating organic manure in

the soil by changing cropping pattern /crop rotation system (i) Grow one leguminous crop (Dhaincha / Pulses/Fodder etc.) between two cereal crops (j)Re-excavation of canals,(k) Reconstruction of damaged water management infrastructures,(l) Develop market infrastructures and road communication at local level and(m) Uninterrupted power supply to irrigation pumps.

3.4.6 Joynagar Union Land Use

General Description

Land types are the dominant factor for crop selection and cropping pattern of any area. Land, which above normal inundation level, can provide wide range of opportunities for growing round the year. This facility is available for farmers under Joynagar union. Union falls into 3 Agro-ecological zones of the Union are: (i) Young Brahmaputra and Jamuna Floodplain (AEZ 8), (ii) Old Brahmaputra Floodplain (AEZ-9) and (iii) Madhupur tract (AEZ-28). The soil P^H is 5.0-7.0. The agricultural potentiality of these soils is high for field crops and Agro-forestry species (Land Zoning Report, January 2015).

Joynagar Union is comprised of 7 mauzas and 32 villages having an area of 5220ha of land of which cultivable area is 2800 ha. The land types of this union are highland (24%) and medium high land (40%), Medium low land (21%) , Low land (15%) which indicates lands are free from monsoon flood and suitable for different Rabi crops and Kharif crops cultivation(SAAO,2016).

Present Agriculture Land Use: The cropping intensity of this union is 196%. Boro(HYV) is the main irrigated crops cultivated by using ground water . There are five cropping pattern are practiced in Joynagar Union which is shown in Table 10. Major crops cultivated in this union are: paddy, Potato, Jute, Lemon, Banana, Mustard and different Rabi & Kharif vegetables.

Table-10: Present Cropping Patterns of Joynagar Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	% of NCA	Area(ha)
Joynagar	2800	Boro(HYV)→Fallow→T.Aman(HY V)	186	37.68	1055
		Boro (HYV)→Fallow→Fallow		27.93	782
		Vegetable→Vegetable→Vegetable		12.64	354
		Vegetables → Fallow→T.Aman		14.71	412
		Fruit Garden→ Fruit Garden →		7.04	197
		Total		100	2800

Source: SAAOs of Joynagar Union 2016

Major Problems on Crop Cultivation

The major problems in Joynagar Union crop cultivation are: (i) Flood (ii) Drought (iii) Water logging (iv) Lack of quality seed (v) Decrease of agricultural land (vi) Erosion (vii) Climate change (viii) Changes in rainfall pattern (ix) Temperature fluctuation (x) Adverse weather condition (xi) Power failure (xii) Inadequate drainage facilities (xiii) Increase insect and pest infestation and (xiv) Change in rivers and canals morphology.

Measures to Improve Crop Cultivation

The remedial measures are given below:

(a) Adapt modern farming techniques, (b) Choose high yields and drought tolerant varieties. (c) Information on quality seed, (d) Observe weather conditions and follow weather forecast, (e) Follow fertilizer recommendation by soil testing, (f) Select best available seeds from market, (g) Integrated effort for industrial effluents and waste management, (h) Incorporating organic manure in the soil by changing cropping pattern / crop rotation system (i) Grow one leguminous crop (Dhaincha / Pulses/Fodder etc.) between two cereal crops (j) Re-excavation of canals, (k) Reconstruction of damaged water management infrastructures, (l) Develop market infrastructures and road communication at local level and (m) Uninterrupted power supply to irrigation pumps.

3.4.7 Masimpur Union Land Use

General Description

Most of the areas of this Union are developed from transformed alluvial deposit by the Brahmaputra and Jamuna rivers. Masimpur Union dominant land use is agriculture followed by homestead garden and vegetables production. This Union is comprised of 6 mauzas and 13 villages having an area of 2106 ha of Land of which cultivable area is 1038 ha. The land types of this union are highland (17%) and medium high land (67%), Medium low land (11%) , Low land (5%) which indicates lands are free from monsoon flood and suitable for different Rabi crops and Kharif crops cultivation (SAAO, 2016). Union falls into 3 Agro-ecological zones of the Union are: (i) Young Brahmaputra and Jamuna Floodplain (AEZ 8), (ii) Old Brahmaputra Floodplain (AEZ-9) and (iii) Madhupur tract (AEZ-28). The soil P^H is 5.0-7.5. The agricultural potentiality of these soils is high for field crops and fruit garden species (Land Zoning Report, January 2015).

Present Agriculture Land Use: Major crops cultivated in this union are: paddy, Potato, Jute, Lemon, Banana, Mustard and different Rabi & Kharif vegetables. Boro (HYV) is the main irrigated crops cultivated by using ground water. There are four cropping pattern are practiced in Masimpur Union which is shown in Table 11. The cropping intensity of this union is 203%.

Table-11: Present Cropping Patterns of Masimpur Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	% of NCA	Area (ha)
Masimpur	1038	Boro (HYV) → Fallow → T. Aman (HYV)	203	81.70	848
		Boro (HYV) → Fallow → Fallow		2.41	25
		Vegetable → Vegetable → Vegetable		12.04	125
		Fruit Garden → Fruit Garden →		3.85	40
		Total		100	1038

Source: SAAOs of Masimpur Union 2016

Major Problems on Crop Cultivation

The major problems in Masimpur Union crop cultivation are: (i) Flood (ii) Drought (iii) Water logging (iv) Lack of quality seed (v) Decrease of agricultural land (vi) Erosion (vii) Climate change (viii) Changes in rainfall pattern (ix) Temperature fluctuation (x) Adverse weather condition (xi)

Power failure (xii) Inadequate drainage facilities (xiii) Increase insect and pest infestation and (xiv) Change in rivers and canals morphology.

Measures to Improve Crop Cultivation

The remedial measures are given below:

(a) Adapt modern farming techniques, (b) Choose high yields and drought tolerant varieties. (c) Information on quality seed, (d) Observe weather conditions and follow weather forecast, (e) Follow fertilizer recommendation by soil testing, (f) Select best available seeds from market, (g) Integrated effort for industrial effluents and waste management, (h) Incorporating organic manure in the soil by changing cropping pattern / crop rotation system (i) Grow one leguminous crop (Dhaincha / Pulses/Fodder etc.) between two cereal crops (j) Re-excavation of canals, (k) Reconstruction of damaged water management infrastructures, (l) Develop market infrastructures and road communication at local level and (m) Uninterrupted power supply to irrigation pumps.

3.4.8 Putia Union Land Use

General Description

Land of this union is intensively used for vegetables, Paddy and different fruits crops. Putia Union is comprised of 19 mauzas and 26 villages having an area of 4239 ha of land of which cultivable area is 1968 ha. The land types of this union are highland (5%) and medium high land (30%), Medium low land (38%), Low land (21%) and very low land (6%) which indicates lands are free from monsoon flood and suitable for different Rabi crops and Kharif crops cultivation (SAAO, 2016). Union falls into 3 Agro-ecological zones of the Union are: (i) Young Brahmaputra and Jamuna Floodplain (AEZ 8), (ii) Old Brahmaputra Floodplain (AEZ-9) and (iii) Madhupur tract (AEZ-28). The soil P^H is 5.6-7.3. The agricultural potentiality of these soils is high for field crops and fruit and vegetables production (Land Zoning Report, January 2015).

Present Agriculture Land Use: There are seven cropping pattern are practiced in Putia Union which is shown in Table 12. The cropping intensity of this union is 215%. Boro (HYV) is the main irrigated crops cultivated by using ground water. Major crops cultivated in this union are: paddy, Potato, Jute, Lemon, Banana, Mustard and different Rabi & Kharif vegetables.

Table-12: Present Cropping Patterns of Putia Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	% of NCA	Area (ha)
Putia	1968	Boro (HYV) → Fallow → T. Aman (HYV)	215	73.93	1455
		Boro (HYV) → Fallow → Fallow		10.16	200
		Vegetable → Vegetable → Vegetable		9.96	196
		Mustard → Jute → T. Aman (HYV)		1.17	23
		S. Potato → Fallow → T. Aman (HYV/LV)		1.93	38
		Spices → Fallow → T. Aman		1.02	20
		Fruit Garden → Fruit Garden →		1.83	36
		Total		100	1968

Source: SAAOs of Putia Union 2016

Major Problems on Crop Cultivation

The major problems in Putia Union crop cultivation are: (i) Flood (ii) Drought (iii) Water logging (iv) Lack of quality seed (v) Decrease of agricultural land (vi) Erosion (vii) Climate change (viii) Changes in rainfall pattern (ix) Temperature fluctuation (x) Adverse weather condition (xi) Power failure (xii) Inadequate drainage facilities (xiii) Increase insect and pest infestation and (xiv) Change in rivers and canals morphology.

Measures to Improve Crop Cultivation

The remedial measures are:

(a) Adapt modern farming techniques, (b) Choose high yields and drought tolerant varieties. (c) Information on quality seed, (d) Observe weather conditions and follow weather forecast, (e) Follow fertilizer recommendation by soil testing, (f) Select best available seeds from market, (g) Integrated effort for industrial effluents and waste management, (h) Incorporating organic manure in the soil by changing cropping pattern /crop rotation system (i) Grow one leguminous crop (Dhaincha / Pulses/Fodder etc.) between two cereal crops (j) Re-excavation of canals, (k) Reconstruction of damaged water management infrastructures, (l) Develop market infrastructures and road communication at local level and (m) Uninterrupted power supply to irrigation pumps.

3.4.9 Sadharchar Union Land Use

General Description

This Union dominant land use is agriculture followed by fisheries and vegetables production round the year. Some commercial fruits garden is available under this Union. Union falls into 3 Agro-ecological zones of the Union are: (i) Young Brahmaputra and Jamuna Floodplain (AEZ 8), (ii) Old Brahmaputra Floodplain (AEZ-9) and (iii) Madhupur tract (AEZ-28). Most of the areas of this Union are developed from transformed alluvial deposit by the Brahmaputra and Jamuna rivers. The soil P^H is 5.6-7.3. The agricultural potentiality of these soils is high for field crops and fruit and vegetables production (Land Zoning Report, January 2015).

Sadharchar Union is comprised of 14 mauzas and 15 villages having an area of 2630 ha of land of which cultivable area is 1210 ha. The land types of this union are highland (25%) and medium high land (49%), Medium low land (16%) , Low land (7%) and very low land (1%) which indicates lands are free from monsoon flood and suitable for different Rabi crops and Kharif crops and also fish cultivation (SAAO, 2016).

Present Agriculture Land Use: The cropping intensity of this union is 217%. Boro (HYV) is the main irrigated crops cultivated by using ground water . There are eight cropping pattern are practiced in Sadharchar Union which is shown in Table 13. Major crops cultivated in this union are: paddy, Sweet Potato, Jute, Lemon, Banana, Mustard, Spices and different Rabi & Kharif vegetables.

Table-13: Present Cropping Patterns of Sadharchar Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	% of NCA	Area (ha)
Sadharchar	1210	Boro(HYV)→Fallow→T.Aman(HYV)	217	53.55	648
		Boro (HYV)→Fallow→Fallow		19.83	240

	Boro (HYV)--→Fallow---→ B. Aman	4.13	50
	Vegetable→Vegetable→Vegetable	11.74	142
	Mustard→ Jute→T. Aman (HYV)	2.89	35
	S.Potato→Til→ Fallow	2.64	32
	Spices→Fallow→ T.Aman	3.72	45
	Fruit Garden→ Fruit Garden →	1.49	18
	Total	100	1210

Source: SAAOs of Sadharchar Union 2016

Major Problems on Crop Cultivation

The major problems in Sadharchar Union crop cultivation are: (i) Flood (ii) Drought (iii) Water logging (iv) Lack of quality seed (v) Decrease of agricultural land (vi) Erosion (vii) Climate change (viii) Changes in rainfall pattern (ix) Temperature fluctuation (x) Adverse weather condition (xi) Power failure (xii) Inadequate drainage facilities (xiii) Increase insect and pest infestation and (xiv) Change in rivers and canals morphology.

Measures to Improve Crop Cultivation

The remedial measures are:

(a) Adapt modern farming techniques, (b) Choose high yields and drought tolerant varieties. (c) Information on quality seed, (d) Observe weather conditions and follow weather forecast, (e) Follow fertilizer recommendation by soil testing, (f) Select best available seeds from market, (g) Integrated effort for industrial effluents and waste management, (h) Incorporating organic manure in the soil by changing cropping pattern /crop rotation system (i) Grow one leguminous crop (Dhaincha / Pulses/Fodder etc.) between two cereal crops (j) Re-excavation of canals, (k) Reconstruction of damaged water management infrastructures, (l) Develop market infrastructures and road communication at local level and (m) Uninterrupted power supply to irrigation pumps.

All 9 Unions land used for single, double and triple cropped under Shibpur Upazila are shown in Fig.4

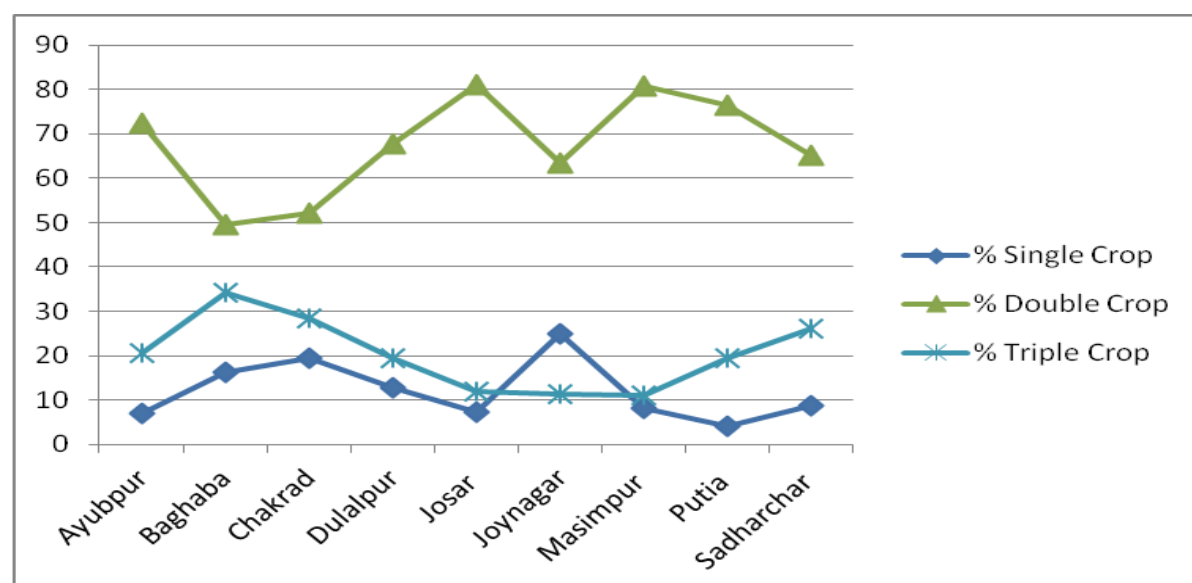


Fig 4 Percent of Union wise Single, Double & Triple cropped area under Shibpur Upazila

The present land use of Ayubpur , Baghaba, Chakradha & Dulalpur Unions under Shibpur Upazila obtained from the field survey is shown in Table 14. The Ayubpur Union covers cultivated cropped area 2588ha of which about net cropped area 1211 ha. The highest percentage is double cropped area (72%) and followed by triple (20%) and single cropped area (7%) under Ayubpur Union. Similarly, the Baghaba Union covers a net cropped area 1850 ha of which about cultivated area 4065 ha. The highest percentage is double cropped area (50%) and followed by triple cropped area (34%) and single crop area (16%) under Baghaba Union. Further, the Chakradha Union covers a net cropped area 2325 ha of which about cultivated area 4855 ha. The highest percentage is double cropped area (52%) and followed by triple cropped area (28%) and single cropped area (20%) under Chakradha Union. Dulalpur Union covers a net cropped area 2195 ha of which about cultivated area 4535 ha. The highest percentage is double cropped area (68%) and followed by triple cropped area (19%) and single cropped area (13%) under Dulalpur Union (Concern Union SAAOs, DAE 2016).

Table-14: Present Land Use under Ayubpur , Baghaba, Chakradha & Dulalpur Unions

Sl. No.	Types of Land use	Present land used in ha (%)			
		Ayubpur	Baghaba	Chakradha	Dulalpur
1	Cultivated area	2588	4065	4855	4535
2	Single cropped area	85(7.02)	300(16.22)	455(19.57)	282(12.85)
3	Double cropped area	875(72.25)	915 (49.46)	1210(52.04)	1485(67.65)
4	Triple Cropped area	251(20.73)	635(34.32)	660(28.39)	428(19.50)
5	Net cropped area	1211	1850	2325	2195
	Cropping Intensity (%)	213.71	219.73	208.8	206.65

Source: Concern 4 Union SAAOs, DAE 2016

The present land use of Joysar, Joynagar, Masimpur, Putia & Sadharchar Unions under Shibpur Upazila obtained from the field survey is shown in Table 15. The Joysar Union covers cultivated cropped area 2855ha of which about net cropped area 1395 ha. The highest percentage is double cropped area (81%) and followed by triple (12%) and single cropped area (7%) under Joysar Union. Similarly, the Joynagar Union covers a net cropped area 2800 ha of which about cultivated area 5220 ha. The highest percentage is double cropped area (64%) and followed by single cropped area (25%) and triple crop area (11%) under Joynagar Union. Further, the Masimpur Union covers a net cropped area 1038 ha of which about cultivated area 2106 ha. The highest percentage is double cropped area (81%) and followed by triple cropped area (11%) and single cropped area (8%) under Masimpur Union. Putia Union covers a net cropped area 1968 ha of which about cultivated area 4239 ha. The highest percentage is double cropped area (76%) and followed by triple cropped area (19%) and single cropped area (4%) under Putia Union. Sadharchar Union covers a net cropped area 1210 ha of which about cultivated area 2630 ha. The highest percentage is double cropped area (65%) and followed by triple cropped area (26%) and single cropped area (9%) under Sadharchar Union. (Concern Union SAAOs, DAE 2016).

Table-15: Present Land Use under Joysar, Joynagar, Masimpur, Putia & Sadharchar Unions

Sl. No.	Types of Land use	Present land used in ha (%)				
		Joysar	Joynagar	Masimpur	Putia	Sadharchar
1	Cultivated area	2855	5220	2106	4239	2630
2	Single cropped area	100(7.18)	700(25.00)	85(8.19)	80(4.07)	105(8.68)
3	Double cropped area	1130(81.00)	1780(63.57)	838(80.73)	1505(76.47)	790(65.29)
4	Triple Cropped area	165(11.82)	320(11.43)	115(11.08)	383(19.47)	315(26.03)
5	Net cropped area	1395	2800	1038	1968	1210
	Cropping Intensity (%)	204.66	186.43	203	215.40	217.36

Source: Concern 5 Union SAAOs, DAE 2016

Chapter-04: Cropping Pattern and Cropping Intensities

4.1 Cropping Pattern

Land type and topographic is the dominant factor for crop selection and cropping patterns in any area. The term 'Cropping pattern' as it applies to the area of reclamation can be defined as the acreage distribution of different crops in any one year in a given farm area such as a water agency, or farm. Thus, a change in a cropping pattern from one year to the next can occur by changing the relative acreage of existing crops, and/or by introducing new crops, and/or by cropping existing crops'. Information that defines a cropping system consists of the number of crops on a given field per year including the accompanying cropping periods from sowing to maturity for each crop cycle and whether each crop is grown under rain fed or irrigated conditions.

Lands which are above normal inundation level can provide farmers wide range of crop cultivation round the year. The scenario of existing cropping pattern under Shibpur Upazila is complex and predominantly Boro and T. Aman Rice, Jute, Vegetables, Oilseeds, Pulses Spices, Fruits Garden and Orchard based. Detailed Upazila cropping patterns by season are presented in Table 16. Study finding shows that 13 different cropping pattern are practiced by Shibpur Upazila farmers. Shibpur Upazila present one main cropping pattern area is Boro (HYV/Hybrid) → Fallow→T. Aman (HYV) which is practiced 61.4% of the Net Cultivable Area (NCA). Boro(HYV/Hybrid)→Dhaincha→Fallow which is practiced 2% of the Net Cultivable Area (NCA). Similarly, winter vegetables→Kharif-1 vegetables→Kharif-2 summer vegetables which are practiced about 3% of the Net Cultivable Area (NCA). Mustard→Jute→T. Aman (HYV/LV) is covering about 2 % of the NCA. Banana/Lemon/Zinger is the cropping pattern covering about 4% of the NCA. Fruits Garden is covered about 13% of the Net Cultivable Area. Spices→Jute→Fallow is practiced about 3% Net Cultivable Area (Table 14). This finding clearly indicated that. Shibpur Upazila soil is very fertile and farmers grown multiple crops such as vegetables, rice, Jute, Spices, Pulses and different fruits production.

Table-16: Present Cropping pattern under Shibpur Upazila

Major Cropping Pattern			Area (ha)	Contribution %
Rabi	Kharif-1	Khari-2		
Boro (HYV/Hybrid)	Fallow	T. Aman (HYV)	10130	61.4
Boro (HYV/Hybrid)	Fallow	Fallow	1030	6.25
Boro(HYV/Hybrid)	Dhaincha	Fallow	250	1.5
Vegetables	Vegetables	Vegetables	470	2.85
Mustard	Jute	T.Aman (HYV/LIV)	250	1.50
Fallow	Jute	T. Aman (HYV/LV)	450	2.72
Vegetables	Jute	T. Aman (HYV/LV)	240	1.45
Mustard	Boro(HYV/Hybrid)	Fallow	150	0.90
Banana/Lemon/Zinger	Banana/Lemon/Zinger	Banana/Lemon/Zinger	630	3.85
Fruits Garden	Fruits Garden	Fruits Garden	2180	13.25
Spices	Jute	Fallow	450	2.72
Vegetables	Jute	Vegetables	200	1.21
Pulses	Vegetables	Vegetables/T. Aman	70	0.4
Total			16500	100

Source: SAAOs and UAO Shibpur Upazila, DAE 2016

4.2 Cropping Intensity

Cropping intensity is an important index of utilization of land. Crop intensity index assesses farmers actual land use in area and time relationship for each crop or group of crops compared to the total available land area and time, including land that is temporarily available for cultivation. It is calculated by summing the product of area and duration of each crop divided by the product of farmers total available cultivated land area and time periods plus the sum of the temporarily available land area. For a specific crop, the cropping intensity is the number of times that crop is grown in one year on the same field. It is distinguish single, double and triple cropping systems respectively. Different cropping pattern are practiced in Shibpur Upazila. Union wise (9 Unions) present cropping intensity is shown in Figure-5. The average cropping intensity under Shibpur Upazila is 208% which is higher than cropping intensity of Unions of Joynagar (186%) & Masimpur (203%),Joysar (204%) and Dulalpur (206%) respectively. Further, Fig 5 shows the highest cropping intensity is under Baghaba Union (219%) which is followed by Sadharchar (217%),Putia(215%) and Ayubpur Unions(213%) respectively . The average cropping intensity under Shibpur Upazila is 208% which is higher than Narsingdi district (207%) and higher than national average cropping intensity (190%) (Krishi Diary 2016).

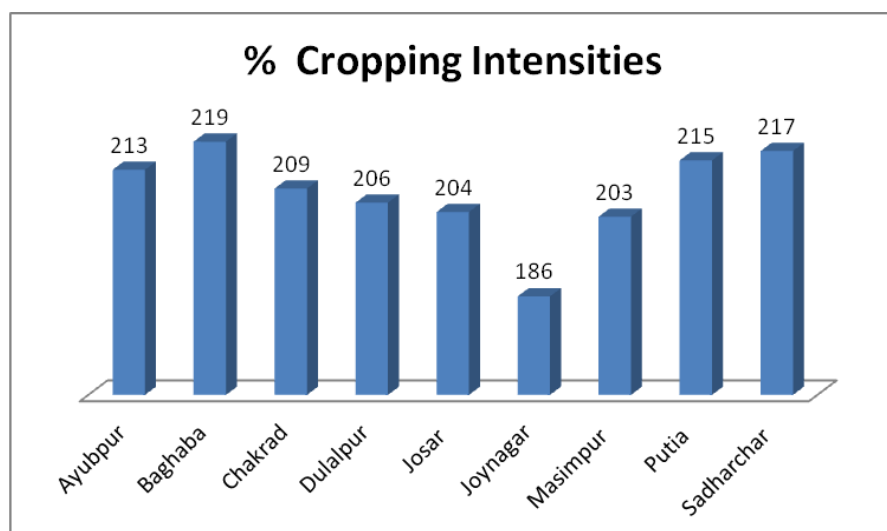


Figure 5: Union wise cropping Intensities under Shibpur Upazila

4.3 Present Cropped Area

Cultivated area depends on land types. High land is suitable for various Rabi, Kharif-1 & kharif-11 season crops cultivation. Rice, Jute, winter and summer vegetables, potato, mustard, groundnut and pulses, Banana, Lemon and various fruits crops are grown in 9 Unions under Shibpur Upazila. Shibpur Upazila present scenario of different cropped area, yield rate and production levels are shown in Table 17. The present total different cropped area is 27350 ha of which rice cropped area are 19750 ha and the rest 7600 ha is covered by non-rice crops (Jute, Potato, W & S. vegetables, pulses, and oilseeds, Banana, Lemon and Fruits etc.). The rice and non-rice cropped area are about 72% and 28% respectively of the total cropped area. The highest land area was used for Boro (HYV/Hybrid), T. Aman (HYV) rice and Jute cultivation.

4.4 Present Crop Production

Crop yield depends on crop variety, soil, fertilizer management and irrigation facilities. HYV/Hybrid rice or others crops gives higher yield in compared to local variety crops. Total crop production is 215408.6 metric tons of which rice production is 67428.5 metric tons and non-rice production is

147980.1 metric tons (Table-17). Among the rice crops the contributions of T. Aman (LV), T. Aman (HYV) and Boro (HYV & Hybrid) are about 6%, 31%, & 62% respectively. The highest contribution among the non-rice crops are Fruits Garden(33%), winter vegetables (24%) followed by Banana/ Lemon (18%),Jute (11%) and summer vegetables respectively (Table-17).

Table-17: Present Cultivated Area, Yield and Production under Shibpur

Crop Grown	Crop area(ha)	Yield/ha (mt)	Production (mt)	Contribution (%)
T. Aman(LV)	2100	1.84	3864	5.73
T. Aman(HYV)	7600	2.79	21204	31.45
Boro (HYV)	9950	4.21	41889.5	62.12
Boro (Hybrid)	100	4.71	471	0.70
Sub Total Rice	19750		67428.5	100.00
S. Vegetables	740	22.1	16354	11.05
W. vegetables	1380	25.9	35742	24.15
Jute	1590	10.25	16297.5	11.01
Potato	150	19.34	2901	1.96
Spices	450	2.58	1161	0.78
Sweet Potato	10	16.5	165	0.11
Oil seeds (Mustard, Til, Groundnut)	400	1.55	620	0.42
Pulses	70	1.28	89.6	0.06
Fruits Garden	2180	22.25	48505	32.78
Banana/Lemon	630	41.5	26145	17.67
Sub-Total	7600		147980.1	100
Total	27350		215408.6	

Source : SAAOs and UAO Office Shibpur Upazila, DAE 2016

4.5 Irrigation Facilities under Different Unions

Irrigation is the lifeline of agriculture, because without irrigation facility crops diversification or HYV /Hybrid cultivation would be impossible. Irrigation facilities assured production of crops in the dry season as well as stabilized production through supplemental irrigation of the rain fed crops and ensured greater productivity. The main source of water is both surface and ground water. For Rabi crops cultivation ground water conservation and proper utilization in this Upazila is very important. This study are assessed the present scenario of irrigation facilities and problems. For irrigation purposes, generally, Deep Tube Wells (DTW), Shallow Tube Well (STW) and Low Lift Pump (LLP) are used. Union wise DTW, STW and LLP under Shibpur Upazila is shown in Table 18. A total of 3377 machine were used for irrigation under Unions in Shibpur Upazila. All 9 DTW has electricity facilities but 2054 STW and 4LLP has electricity. Different Unions 1296 STW and also 14 LLP has no electricity facilities for irrigation (Table 18). Electricity user's farmers reported that failed or disruption of electricity supply during Boro season were acute problems under Shibpur Upazila. Framers wanted nonstop electricity supply during Boro season. Majority of the Farmers (92-100%) reported irrigation drainage system is not pucca which is causes wastage of irrigation water. Farmers wanted pucca drainage system.

Table 18 Union Wise Irrigation Machine under Shibpur Upazila

Name of Union	DTW		STW		LLP		Remarks
	Electricity	Diesel	Electricity	Diesel	Electricity	Diesel	
Ayubpur	0	0	305	55	0	4	100
Baghaba	4	0	335	145	0	0	98
Chakradha	3	0	248	112	3	10	100
Dulalpur	1	0	221	0	1	0	98
Joysar	0	0	114	130	0	0	100
Joynagar,	0	0	54	480	0	0	100
Masimpur	1	0	210	116	0	0	100
Putia	0	0	455	107	0	0	92
Sadharchar	0	0	112	151	0	0	100
Total	9	0	2054	1296	4	14	92-100

Source: SAOs under Shibpur Upazila, DAE 2016

For crop cultivation ground water conservation and utilization in Shibpur upazila is important. In rabi season irrigation can help to increase agricultural production and crop diversification. Status of Union wise percent of irrigated and non- irrigated area and covered by irrigation water under LLP, STW and DTW are shown in Table 34. In rabi season 71-100% cultivated area are covered by irrigation water under different unions (Table 19). This indicates that farmers have access to irrigation water that facilitated ground water lifting cause an adverse impact both in agricultural production and surrounding environment. There is a need to regular monitoring ground water level.

Table 19: Union wise Irrigation and Ground water used under Shibpur Upazila

Union	Irrigated Area (%)	Non Irrigated Area (%)			Irrigated Area				Availability of Surface Water	Drought Prone Area (in ha)	Waterlogged Area (in ha)	Remarks
			Surface Water		Ground Water							
			LLP		STW		DTW					
			No	Area (%)	No	Area (%)	No	Area (%)				
Ayubpur	88	12	1	1	390	98	1	1	√	120	9	-Supplemental Irrigation -Industrial waste /pollution
Baghaba	93	7	3	2	500	93	3	5	√	130	2	
Chakradha	71	29	0	0	416	99	1	1	-	0	0	
Dulalpur	88	12	2	1	499	99	0	0	√	0	0	
Josar	71	29	2	1	280	99	0	0	√	0	0	
Joynagar	80	20	0	0	535	100	0	0	-	0	0	
Masimpur	100	0	0	0	390	100	0	0	-	0	0	
Putia	92	8	0	0	540	100	0	0	-	1000	50	
Sadharchar	90	10	0	0	340	990	0	0	-	0	0	
Shibpur Paurashava	99	1	5	8	137	85	2	7	√	286	20	

Source: National Land Zoning Project Report, January 2015

4.6 Cultivation Practices

All the Unions are dominated by agriculture crops are: Boro HYV/Hybrid variety of rice and Transplanted Aman rice, potato, Jute, and different kinds of winter and summer vegetables, spices, pulses which are cultivated under both rain fed and irrigation condition. Banana and Lemon cultivation are very famous in Shibpur Upazila. Farmers are cultivated different vegetables such as Brinjal, Potato, and Cabbage etc. All the SAAOs and UAO reported that about 98-100% farmers used power tiller and tractor during land preparation. Boro and T. Aman rice seedlings grown in seedbed are uprooted when they are about 30-45 days old and transplanted in the main fields. They transplanted Boro and T. Aman rice practiced line sowing. Generally in rice field weeding is done once, about a month after transplanting and this exercise is closely followed by top dressing with urea. Majority of the farmers did not use balance dose of chemical fertilizers due to lack of knowledge. Farmers reported pests are acute problems for crop production. Farmers used pesticides over and under dose as preventive and curative measures for controlling different pests because of lack of knowledge.

4.7 Major Types of Crops Cultivated

Main crops: Rice is a primary crop and a staple food of this area. Here the growth of rice production is much faster. Paddy (Boro rice (HYV/Hybrid), and T. Aman (HYV/LIV), Jute, Wheat, Maize, Vegetables, Mustard, Groundnut, Felon and Pulses etc. Jute is a primary and one of the main cash crops of this Upazila. It is an eco-friendly fiber. Jute cultivation requires less labor and less input. Despite the relative decline in importance of jute in agriculture, potential still exists for the fiber to increase its contribution to the economy through productivity increases and diversification. Yield increase, availability of better quality seeds, and improved provision of extension and credit support to grower's for this crop. Jute leaf is a common and favorable vegetable item to the farmer.

Mustard: Mustard is popularly cultivated in Shibpur. Mustard as an oilseed crops takes first place in respect of cultivated area in Bangladesh. Farmers of Shibpur generally cultivate mustard in between T. aman and Boro cultivation. Mustard oilcake is a nutritious food for cattle. This oilcake also used as organic fertilizer and the dry mustard plants can use as fuel.

Vegetables: Potato, Tomato, Sweet potato, Brinjal,, Radish, Cauliflower, Cabbage, Bean, Chili, Lalshakh, Loncho, Kolmi, Peas, Kochu, Bitter gourd, Pumpkins, Gourd, Rai Shakh, Ladies finger, Palong, Spinach, Cucumber etc. Potato is a tuber crop which cooked and eaten as a vegetable. Encouraging homestead level vegetables cultivation could be alternative source of household income generation It is widely cultivated in winter with huge potential in Shibpur area. The soil and climate conditions of this Shibpur area are favorable for multiple vegetables production. But unavailability of quality inputs (seeds, fertilizer and pesticide), lack of knowledge on proper cultivation techniques and finally low investment capacity of the farmers are some of the major challenges in vegetables farming.

Turmeric: Cultivation of turmeric, a kind of ground spice, has gained popularity in Shibpur and adjoining upazilas due to its high price. Farmers' cultivate turmeric on the abandoned land, surrounding their homesteads and paddy field. Besides, using as spice, turmeric are also useful for human health as medicine, according to herbal science.

Spices: Chili, Turmeric, Ginger, Onion & Garlic etc.

Fruits: Mango, Jackfruit, Litchi, Banana, Wood Apple, Coconut, Betel Nut, Country Goose Berry, GolapJum. Guava, Plum, Kul, Pineapple & Papaya etc.

Conversion of Agriculture Land to Non-Agriculture

Agricultural land is the main resource in agriculture. Many high value crop vegetables are grown in this Upazila. There is wide opportunity to lotkon and lemon, vegetables as commercial basis to export. The Upazila is considered as potential for agriculture. “Non-agricultural land” means such land which is used for different purposes and is not connected with agriculture. Such kind of land can be called non-agricultural land, if any developmental activity is carried over on the land and makes land unfit for crop production. In Shibpur a substantial amount of agricultural land had been shifted to a non-agricultural one viz construction of houses, brickfield, industries, sawmill, road, market and other infrastructures. Absence of proper planning and land zoning convert the arable land to other uses rapidly. The major component for agricultural land converted into non- agricultural are: (i) Non agricultural development on agricultural land. (ii) New or existing urban development and expansion (iii)Construction of industries and new settlements in agricultural land & (iv) Acquisition of agricultural land for non-agricultural purpose



Plate 1: Dhaincha Field (Green Manuring)



Plate2. Lemon Garden



Plate 3: Kakrul Vegetables Field



Plate 4. HYV Brinjal DAE Demonstration

Chapter 05: Production Cost of Rice and Vegetables

5.1 Cost of Rice production

The production cost of paddy varies depending on crop season, variety (HYV/Hybrid/LV), land preparation (Power tiller/Tractor/Bullock), seeds and seedlings, manure and fertilizer, irrigation (complete irrigated (Boro Rice) and rain fed or provided supplementary irrigation), pesticide and labor. To assess farmers cost of rice production, Agriculture Economic Division of BRRI (2014-15) were conducted survey all over the country in three rice seasons (Boro, Aus and Aman paddy). BRRI study findings shows that Boro and Aus farmers per kg rice production cost is Tk 18.65 and Tk.18.64 and Aman rice production cost is Tk17.61 which is less than Boro and Aus (Table 20). Department of Agriculture Marketing was estimated production cost for Boro rice Tk.18.08per kg, Aman Rice Tk.18.20 per kg and Wheat Tk.23.50 per kg in the year 2015-16. On this basis Government has declared buying rate of Boro rice Tk.20.70, Aman rice Tk18.50 per kg and Wheat 27.02 per kg respectively. Shibpur upazila farmers and DAE SAAOs reported that Boro rice per kg or per ha production cost is higher than T. Aman rice because T. Aman rice is cultivated by natural water or rain water. There is no need for supplementary irrigation for Aman rice production. Fertilizers and pesticides are needed more in Boro rice production in compared to Aman rice.

Table-20: Cost of Rice Production (2014-15)

Name of Rice	Average per kg rice production cost (TK)	Crop season
Boro	18.65	Rabi
Aus	18.64	Kharif-1
Aman	17.61	Kharif-11

Source: Agriculture Economic Division, BRRI 2016

5.2 Cost of Vegetable Production

The production cost of vegetables varies depending on crop, variety, time, place, and season. During the survey, farmers were asked to identify the major types of production costs on which they usually spend. According to the respondents, the production cost of vegetables can be categorized into eight major categories: land preparation, seeds and seedlings, manure and fertilizer, irrigation, pesticide, labor, lease/rent of land, and other expenses like fencing, shedding, mulching etc.

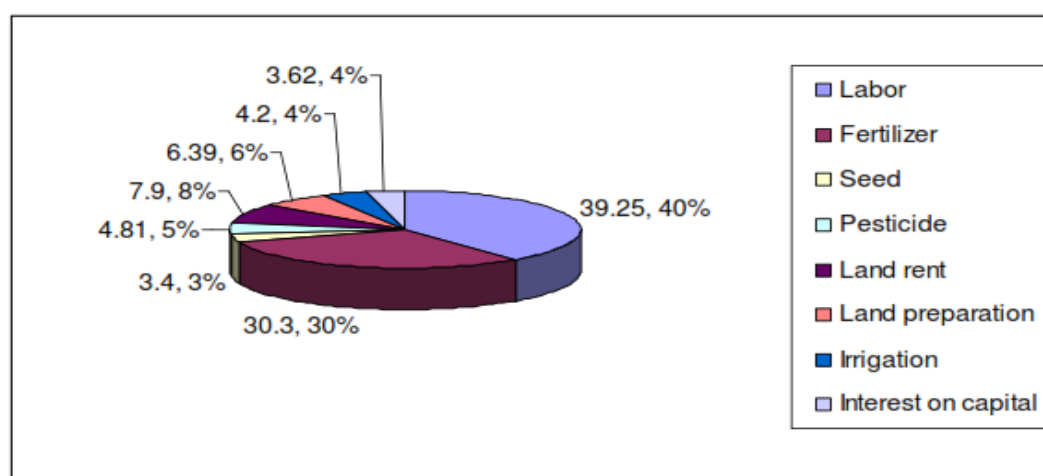


Fig 6: Percentage of Major Types of Production Costs for Vegetables

(Source: ASA University Review, Vol. 4 No. 1, January–June, 2010)

Monsura Zaman, Rokhsan-Ara-Hemel and Tahmina Ferdous (2010) assess the cost of production of four winter vegetables namely cauliflower, cabbage, tomato and brinjal in five villages under Dhaka district. The study finding shows that 39.2% of the total cost was devoted to labor, 30.3% to fertilizer, 3.4% to seed, 4.8% to pesticides, 7.9 % land rent, 6.3% to land preparation, 4.2% to irrigation and 3.6% to interest on capital, whereas, the result estimated by AVRDC (2001) shows that 48.4% of the total cost was devoted to labor, 24.2% to fertilizer, 6.1% to irrigation, pesticides and 3.7% to seeds. Fig.6) Cost of per kg and per 40kg was found approximately the highest for tomato and the lowest for cabbage and cauliflower.

Farmers of Shibpur Upazila reported that major cultivation occurred in land preparation (Power tiller/tractor cost), irrigation, pesticides, fertilizers and labor. Farmers reported that per ha cultivation cost is Tk. 8500-9000/- (*Upazila Agriculture Office, Shibpur*). Generally, supplementary irrigation provided potatoes, Chili and winter vegetables. Supplementary irrigation cost is 2000-3000 taka or more depends on crops and number of application. The highest supplementary irrigation provided in winter and summer vegetables crop field. Farmers did not practice supplementary irrigation T. Aman crops. The highest pesticides used in T. Aman and Boro rice fields (Tk.5000-6000/-) and W & S. vegetables fields (Taka 2000-3500/ha). Labor cost day by day increased and per day labor cost more or less Tk. 450-500 depends on crop season.

Brinjal is one of the most popular and important vegetable in Shibpur Upazila. Farmers are cultivated this vegetables throughout year. Many farmers' brinjal vegetable is cultivated commercial basis in Shibpur Upazila. Compare the financial profitability of brinjal vegetable production in different region in Bangladesh. Several studies were done to estimate the financial profitability of brinjal vegetable production (Table 21). It is evident from the table that productions of brinjal vegetable were increased chronologically. This is due to adoption of farmers for different HYV varieties of brinjal. Price of brinjal vegetable was also increased through time change. Farmers were adjusted their vegetables price due to change the production cost. Now farmers used different insecticide, pesticide and fertilizer to increase production and protect vegetables from disease and pest. For this reason profitability of different vegetables also increased. It is true that total production cost of different vegetables increased but net margin also increased. Farmers were produce different vegetables because vegetables productions were profitable in the present study area which is reflected by high BCR for brinjal vegetable. The previous studies were done several years ago and we can interpret the different return by yield, price and place difference. The prices of brinjal vegetable are high in all over the country. Finally it is clear that productions of vegetables are more profitable in the study area like other vegetables growing areas.

The present study was assessed financial profitability of Brinjal, Tomato, Potato and Cabbage/cauliflower vegetables production under Shibpur Upazila which is shown in Table 22. Finding shows that Brinjal cultivation is more profitable (Tk655000/- per ha) followed by tomato (Tk300000/- per ha), Cabbage/Cauliflower (205000/- and potato (Tk180000/- per ha).

Table 21: Compare the Financial Profitability of Brinjal Vegetable Production in Different Region

Cultivation year	Study Area	Yield (kg/ha)	Price (Tk/kg)	Gross Return (Tk/ha)	Total Cost (Tk/ha)	Net Return (Tk/ha)	BCR	Sources
1997	Bangladesh	11730	6.0	70372	17,343	53,029	4.06	EPC, 1997
1998	Comilla	24,699	2.51	61,994	31,339	30,655	1.98	Miah et al., 1998
2002	Jessore	43,899	7.09	3,10,293	1,77,457	1,32,835	1.75	Rashid et al. 2002
2014	Dhaka	55,691	18.00	10,02,438	269,627	7,32,811	3.72	Hasan et.al 2014
2016	Rangunia	61750	20.00	1235000	306492	9,28,508	4.03	UAO, DAE 2016

Table 22: Financial Profitability of 4 types of Vegetables Production in Shibpur Upazila

Vegetables	Yield (Kg/kg)	Price (Tk/Kg)	Gross Return (Tk/ha)	Total Cost (Tk./ha)	Net Return (Tk/ha)
Brinjal	40000	25	1000000	345000	655000
Tomato	20000	20	400000	100000	300000
Potato	22000	15	330000	150000	180000
Cabbag/Cauliflower	18000	20	360000	155000	205000

Source: SAAOs Shibpur Upazila, DAE 2016

Chapter 06: Growth or Decline of Agricultural Land during Last Ten Years

Quantification of various parameters in relation to land use and farming is really a very difficult task, specially, in Bangladesh where record keeping is poor either by an organization or by individual. Beside this difficulty in mind a sincere attempt has been made to collect land use last ten year data (2005 to 2015) from Upazila Agriculture Office and discussion with 9 Unions and 1 Municipality all Sub-Assistan Agriculture Officers of Shibpur Upazila and review the other documents. The growth or decline of agricultural land use during last ten years under Shibpur Upazila is shown in Table 23. Table 22 finding shows 82% local variety rice was decreased during last ten years. The main reason for decreased local variety rice area due to yield is less in compared to HYV rice and farmers dictated to switchover cultivated HYV rice. The HYV paddy cultivation area 116% was increased. The reason for increased HYV rice cultivated area due to higher yield many farmers were cultivated HYV and Hybrid rice. Remarkable significant changed or increased during 10 years was occurred in Summer vegetables (77%), Winter vegetables (30%), oilseeds (106%), Spices (55%) and Banana/Lemon cultivation (103%) land use. The main reasons for increases are vegetables, fruits market demand and price is high. Table 22 shows, among the other purposes remarkable significant changed were occurred in poultry farm (742%) and Brick field (316%) and followed by gardening (85%) and Housing (79%) respectively. This finding clearly indicated crop land day by day has gradually decreased which will be reflected on crop production.

Table-23: Growth or Decline Agriculture Land Use during the Last 10 Year

Sl. No.	Agricultural land use	Land Use (2005) in ha	Land Use (2015) in ha	% Change
1	Paddy (local varieties)	11590	2100	-81.88
2	Paddy (HYV)	8160	17650	116.3
3	Vegetables (Summer)	568	740	30.28
4	Vegetables (Winter)	778	1380	77.38
5	Tuber crops	135	160	18.52
6	Pulse crops	50	70	40
7	Oilseed crops	194	400	106.19
8	Spice crops	290	450	55.17
10	Jute	1350	1590	17.78
11	Banana/Lemon	310	630	103.23
12	Other purposes			
	-Brick field	12(#5)	50(#23)	316.67
	-Poultry farm	4.05(#100)	34.1 (#842)	741.98
	-Fish/shrimp culture	834.8	1013.21	21.37
	-Gardening	1174	2180	85.69
	-Housing	1506.48	2700.4	79.25

Source: SAAOs, UAO, ULO, UFO and Upazila Statistic Office of Shibpur Upazila

Chapter-07:

Major Problems of Crop Production in Shibpur Upazila (9 Unions and 1 Municipality)

Agriculture survey findings and Participatory Rural Appraisal March 2016 study report findings show farmers some problems are common in different unions under shibpur Upazila such as drought, bad communication and wholesale market and infrastructure. Major problems are:

1. Natural disaster, such as heavy rain, flood, water logging, drought, and river erosion;
2. Electricity power failure during Boro crop season
3. Shortage of irrigation water and Ground water level declining
4. Inadequate drainage facilities
5. Conversion of agricultural land to non agricultural use
6. Bad communications due to many roads are damaged flood or rain.
7. About 100% irrigation canals are kutchha which is increase the wastage of irrigation water and crop area is not possible to increase.
5. There is no wholesale market and infrastructure for agriculture product under 9 Unions.
6. No cold storage and large vegetables selling center or market in Unions
7. Produce rice crops market price is less but production cost is high
8. Agricultural labor is not available in crop seasons.
9. Farmers did not interest to invest recommended doses of inputs (fertilizer and seeds) in crop production.
10. Lack of quality crop production inputs (seeds, fertilizers, pesticides, power tiller) and are partly available and price is high.
11. Insects, diseases, rodents and weeds are acute problem causes 30% damage every year. Farmers were applied pesticides over and under dose haphazardly for controlled pests due to lack of technological knowledge.
12. Farmer's lack of knowledge on modern crop production technology.
13. There is no agro processing center and industries under Unions.
14. Agriculture is very important to local communities in Shibpur Upazila. They are losing agricultural lands and farming opportunities at an alarming rate. This dramatically alters the traditional landscape. It is creating a growing dependence on imported food products. Fallow and grazing land has been converted into Banana, Papaya, orchard and vegetable cultivation.
15. Farmers are facing increasing pressures of infrastructural development that may encumber agricultural practices. Change in land morphology and Negative impact on food security.

Chapter-08:

Policy Framework and Conclusion

8.1 Policy Framework

As per Sub-Assistant Agriculture Officers, Farmers and District, Upazila level different organizational Officers opinions and field visit following recommendations are made which will help for proper planning and adoption of appropriate crop production measure in future to different Unions beneficiaries under Shibpur Upazila.

1. **Developing Infrastructural Facilities:** Road network at local level, agro-processing and marketing infrastructure development, Re-excavation of canals and irrigation facilities need to be improved for mitigating impacts of crop production related vulnerabilities and climate change. Reconstruction of damaged water management infrastructures need to be made. Each Union one wholesale market infrastructure need to be constructed.
2. **To Reduce the Irrigation water Wastage,** proper utilization and increase the irrigated command crop area the DTW, STW and, LLP kutchra drain need to be converted into pucca drainage system or introduce underground pipe irrigation system. Uninterrupted power supply to irrigation pumps.
3. **Farming and Adaptation Practices:** Adapt modern farming techniques and Choose high yields and drought tolerant varieties. There is need for conducting, strengthening and expanding crop demonstrations and block farming based on adaptation practices. Introduction of risk resistant crop varieties in agriculture with emphasis on crop diversification should be an integral part of the TOT, farmers training and demonstrations.
4. **Vegetables Production:** Different types of winter and summer vegetables are grown under 9 unions and Municipality area. All the Unions are excellent suitable for vegetables cultivation round the year. There is no cold storage and large vegetable selling center (market) under 9 Unions. As results farmers could not get good price for their produced products. There is a need for establishment of cold storage each Union and development of market infrastructure.
5. **Crop Production Inputs Availability:** Ensure availability of quality HYV and Hybrid crop seeds, fertilizer, pesticides and cultivation equipments. Information on quality seed need to be provided up to block level.
6. **Availability of Crop Seeds:** Drought and submergence tolerant variety of different quality HYV/Hybrid crop seeds. BRRI, BARI, BSRI and BINA have recommended drought tolerant rice, wheat, maize, potato, pulses and oilseeds. These are BRRI Dhan-71,-72, 55, -57,-66,-67 and BINA Dhan -8, BARI Wheat-25, BARI-28,29,30 Mustard-11,14,17 BARI potato-21,22, 50, widely introduce and encouraged to cultivated farmers.
7. **Fertilizer Management and Soil Health:** Chemical fertilizers application in HYV varieties crops trend increasing but decreasing inorganic fertilizer (Green manure, cow dung). As a result, soil nutritional

health will be alarming situation which is in future serious affected on yield. There is a need for soil health improving program for Union farmers. DAE may arrange joint collaborative soil testing and recommendation and training program for beneficiaries. Financial support need to be provided to DAE from project. Grow one leguminous crop (Dhaincha / Pulses/Fodder etc.) between two cereal crops. Incorporating organic manure in the soil by changing cropping pattern /crop rotation system.

8. Pest Management: Insects, rats, weeds and diseases are a chronic problems which causes considerable damage of crops every season and increase the farmers cultivation cost. For control this pests farmers were applied pesticides under or over dose. Judicious use of pesticides needs to be developing and implement pest surveillance, monitoring and forecasting system. Farmers also need to increase knowledge on Integrated Pest Management (IPM) technology through practical oriented program and DAE joint collaborative crop production training. Farmers training budget need to be provided to DAE from project.
9. Agro-based Industries: Establishment of Agro-based processing center & industries in 9 unions and Municipality. There is a need for construction of infrastructure for some agro-base processing center. There is a need to integrated effort for industrial effluents and waste management.
10. Zoning of land: As per its present used and potentialities and the proper implementation of “preparation of Development Plan for Fourteen Upazilas” Package 02 (Ishwarganj, Shibpur and Raipura Upazila) as to ensure sustainable management of land resources in the area as well as improvement of agriculture sector.
11. The following additional systems may be adapted in an innovated way for Sustainable crop production and environmental conditions of Shibpur Upazila:
 - Biodynamic/eco-friendly agriculture.
 - Rice and non-rice crops integrated farming.
 - Grow vegetables predominantly.
 - Fruit tree based Agro-forestry system.
 - Integrated pest management.
 - Natural disasters adaptive, rain fed and resilience farming.
 - Minimize conversion of agricultural land to non agricultural use and increase awareness among the people and land users for conservation of land.

Ensuring planned and economic use of agriculture land, minimize agricultural land degradation and introducing regulatory measure like adopting land zoning law are necessary to protect the agriculture land.

8.2 Conclusion

Soil and weather conditions are suitable for different vegetables and other high value crops cultivation round the year in Shibpur Upazila. There is a need to develop vegetables wholesale market and improvement of communication system different Unions to Upazila. Farmers need modern crop production technological training which will be helpful for crop diversification and proper utilization land and increase crop production. For improvement of irrigation facilities kutchra drain are to be made lined channel which will reduced irrigation water wastage and increase crop production. Integrated pest management need to implement for Banana, Papaya, orchard and vegetable cultivation and reduce the pesticide use. Electricity power supply should be ensured during Boro crop season. Increase agriculture production through optimum use of land. Many high value crop vegetables are grown in this Upazila. There is wide opportunity to lotkon and lemon, vegetables as commercial basis to export.

References

1. Anonymous (2016). Krishi Diary 2016: Agriculture Information Services, DAE, Khamar Bari, Dhaka.
2. Anonymous (2016). Report on Participatory Rural Appraisal (PRA) “Preparation of Development Plan for Fourteen Upazilas, Package 02, Ishwarganj Upazila, Shibpur and Raipura Upazila”, March, 2016.
3. Anonymous (2016). Shibpur Upazila Crop Production Plan 2015-16: Upazila Agriculture Office, Shibpur Upazila.
4. Anonymous (2003). Soil Resource Development Institute, 2003, Land and Soil Use Guide (New addition) Shibpur Upazila, Narsingdi District.
5. Anonymous (2015) : National Land Zoning Report January 2015 of Shibpur Upzila under Narsingdi district, National Land Zoning Project (2nd Phase), Ministry of land.
6. Anonymous (2016): Report on production cost of Boro & Aman Rice and Wheat (2015-16), Department of Agriculture Marketing, Khamarbari, Dhaka
7. BBS (2011). District Statistics 2011 Narsingdi, Statistics and Information Division, Ministry of planning, Dhaka
8. BRRI (2016). Agriculture Economic Division, Bangladesh Rice Research Institute, Gazipur.
9. EPC.1997. FAO. Horticulture baseline production and marketing survey, Vol.III. Annexure (part 1), Engineering and Planning Consultants Ltd., 43 Dilkusha C/A, Dhaka-1000.
10. Hasan, M. R., Bai2, H and Islam, M. A. 2014. Profitability of important summer vegetables in Keranigonj upazilla of Bangladesh, J. Bangladesh Agril. Univ.12(1):111– 118, 2014 ISSN 1810-3030
11. Miah, M A M., Rahman, A.K.M,M.,Haque, A KMH and Jabbar, M.A. 1998. Economics of some winter vegetables production and their farm level marketing in five villages of Comilla district. Bangladesh J. Agril. Res. 23(2):361-376.
12. MoA, 2013: National Agricultural Policy, Ministry of Agriculture, Government of the People's Republic of Bangladesh.
13. MoWR, 1999: National Water Policy, Ministry of Water Resources, Government of the People's Republic of Bangladesh.
14. MoWR, 2005: Coastal Zone Policy, Ministry of Water Resources, Government of the People's Republic of Bangladesh.
15. Monsura Zaman, Rokhsan-Ara-Hemel and Tahmina Ferdous (2010) – Comparative Profitability of Winter Vegetable in a Selected Area of Dhaka District, ASA University Review, Vol. 4, No. 1, January-June, 2010).

- 16 Rashid, M.A., Rouf, F.M.A. and Alam, S.N. 2002. Economics of brinjal cultivation at Jessore region in Bangladesh. Economic Affairs, 47(Qr.4): 215-221.
17. WARPO, 2006: Coastal Development Strategy. Water Resources Planning Organization (WARPO), Dhaka, February, 2006.

Annex-1 Questionnaire for KII

Name----- Designation----- Department-----

Upazila-----District-----Mobile No.----- Date-----

1. Category wise distribution of farm families

Sl No .	Category	No of farm family	%
1.	Land less (.05-.50 acre)		
2.	Marginal (.51-1.50 acre)		
3.	Small (1.51 -2.50 acre)		
4.	Medium (2.51-7.50 acre)		
5.	Larger (above 7.50 acre)		
Total			

2. Present Land Use under Union

Sl No .	Type of Land use	Present land used	
		Area (ha)	%
1.	Cultivated Area		
	Single Cropped area		
	Double Cropped area		
	Triple Cropped area		
2.	Net cropped area		
3.	Cropping intensity		

3. Relationship of Land Type and Flood Depth with Area Cultivated

Sl No .	Land type and Flood Depth. (cm)	Present	
		NCA (ha)	%
1.	High land (0-30 cm) F0		
2.	Medium high land (30-90 cm) F1		
3.	Medium low land (90-180 cm) F2		
4.	Low land (180-360 cm) F3		
5.	Very low land above (360 cm) F4		
Total			

Source: CEIP field data and Upazila Agriculture Office, DAE

4. Major crops/cropping patterns (both improper/exhaustive and sustainable)

Season	Farming Practices
Rabi (Mid October-Mid March)	
Kharif-I (Mid March-Mid July)	
Kharif-II (Mid July-Mid October)	
Irrigated Farming Rabi (Mid-OctoberMid March)	
Kharif-I (Mid March-Mid July)	
Kharif-II (Mid July-Mid	

Season	Farming Practices
October)	
Name major cropping patterns	1. 2. 3. 4.

5. Crop cultivated and variety in polder area

Crop area	Name of crop	Name of variety
Cultivated crops under single crop area=		
Cultivated crops under double crop area=		
Cultivated crops under triple crop area=		
Cultivated crops under irrigated crop area=		
Cultivated crops under non crop area=		
Cultivated crops under homestead garden area=		
Orchard area=		
Seasonal Fallow land =		
How many commercial fruit garden within polder area? Yes ----- No-----	Name of fruits garden Banana: Papaya: Coconuts: Mango: Others:	Number:
In future which crops will be profitable in your polder area:		

6. Present Crop Production and Area under polder/Upazila

Crop Area(ha)	Yield/ha	Total Production(MT)	Crop Area(ha)	Yield/ha	Total Production(MT)
Aus rice= LV = HYV =			Oilseeds=		
Aman rice= LV = HYV = Hybrid =			Mustard=		
Boro Rice= LV = HYV = Hybrid =			Sesame=		
Total Rice=			Sunflower=		
Wheat =			Groundnut=		
Maize =			Others=		
Pulses =			Winter vegetables=		
Khesari =			Summer vegetables=		
Mung bean =			Total vegetables=		
Soybean =			Fruits Watermelon=		
Cowpea =			Species=		
Chickpea=			Chili=		
Others =			Onion=		
Tuber crops=			Garlic=		
Potato=			Jute=		

Crop Area(ha)	Yield/ha	Total Production(MT)	Crop Area(ha)	Yield/ha	Total Production(MT)
Sweet potato=			Sugarcane=		
Bamboo =			Betel nut=		
Betel vine(Pan)=					

7. (a) Short term needs for better crop production under polder

1.-----2-----

3.-----4-----

5.-----6-----

(b) Long term needs for better crop production under ploder

1.-----2-----

3.-----4-----

5.-----6-----

Appendix-2

Agriculture Questionnaire for Urban and Rural Economy Study

Name: _____ Designation: _____

Department: _____ Name of Block: _____

Name of Union: _____ Upazila: _____

District: _____

Mobil No.: _____ Date: _____

1. Category wise distribution of Farm Families in Block

Sl. No.	Category	No. of farm family	%
6.	Land less (.05-.50 acre)		
7.	Marginal (.51-1.50 acre)		
8.	Small (1.51 -2.50 acre)		
9.	Medium (2.51-7.50 acre)		
10.	Larger (above 7.50 acre)		
Total			

2. Agricultural land and land Use in Block

Sl. No.	Description of agricultural land	Area(ha)
1	Total agriculture land area	
	High land	
	Medium high land	
	Medium low land	
	Low land	
2	Permanent fallow land	
3	Current/seasonal fallow land(with fallow period) -Rabi fallow	
4	-Kharif-I fallow -Kharif-II fallow	
5	Net cropped area	
6	Single cropped area	
7	Double cropped area	
8	Triple cropped area	
9	Total cropped area	
10	Cropping intensity (%)	
11	Irrigated land area (%)	

3. Irrigation Facilities

Deep Tube Well (DTW) Yes----- No----- Number-----
Shallow Tube well (STW) Yes-----No----- Number-----
Low Lift Pump (LLP) Yes-----No----- Number-----

Others-----

4. Cultivation Practices

Power tiller-----% Used, Tractor -----% Used
Bullock -----% Used

5. Cropping Pattern

Sl. No.	Cropping Pattern			Area of Land	Percentage (%)
1|					
2|					
3|					
4|					
5|					
6|					
7|					
8|					
9|					
10|					
11|					

6. Cropping type and Present Crop Area & Production under Block

Crop (ha)	Area	Area (ha)	Yield/ha	Crop Area (ha)	Area (ha)	Yield/ha
Aus rice LV HYV				Oilseeds		
Aman rice LV HYV Hybrid				Mustard		
Boro Rice LV HYV Hybrid				Sesame		
Total Rice				Sunflower		
Wheat				Groundnut		
Maize				Others		
Pulses				Winter vegetables		
Khesari				Summer vegetables		
Mung bean				Total vegetables		
Soybean				Fruits Watermelon		

Cowpea			Species		
Chickpea			Chilli		
Others			Onion		
Tuber crops			Garlic		
Potato			Jute		
Sweet potato			Sugarcane		
Bamboo			Betel nut		
Betelvine(Pan)			banana		
Other crops			Mango		
			Papaya		

7. Growth or Decline Agriculture Land During the Last 10 year.

SL No.	Agricultural land use	Land use (2005-06) in ha	Land use (2015-16) in ha	Causes of increase or decline
01	Paddy (local varieties)			
02	Paddy (HYV)			
03	Vegetables (Summer)			
04	Vegetables (Winter)			
05	Tuber crops			
06	Pulse crops			
07	Oilseed crops			
08	Spice crops			
09	Fruit crops			
10	Wheat			
11	Maize			
12	Sugarcane			
13	Jute			
14	Other purposes			
	-Brick field			
	-Poultry farm			
	-Fish/shrimp culture			
	-Gardening/forestry			
	-Industries			
	-Housing			
	-Others			

9. Major problems to Crop Production in Block/Union

1. _____
2. _____
3. _____
4. _____
5. _____

10. Future Need for Sustainable Crop production.

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____

11. Major problems related to crop production system Under Union

- 1.
- 2.
- 3.
- 4.
- 5.

12. Future Need for Sustainable Crop production under Union

- 1.
- 2.
- 3.
- 4.
- 5.

13. Conclusion and Recommendation

- 1.
- 2.
- 3.
- 4.
- 5.

Appendix-3



Plate 1: Meeting with block supervisors of Shibpur Agriculture Office

