Urban Development Directorate (UDD)
Ministry of Housing and Public Works
The People's Republic of Bangladesh
82 Shegunbagicha, Dhaka-1000

Final Survey Report (6th Report)

on

Providing Consultancy Services for "Physical Feature Survey Work with RTK GPS, Total Station & Using 3D Image and Other Survey for Area of "Preparation of Development Plan for Benapole-Jessore Highway Corridor Project""

February 2016

Consultant: Joint Venture of

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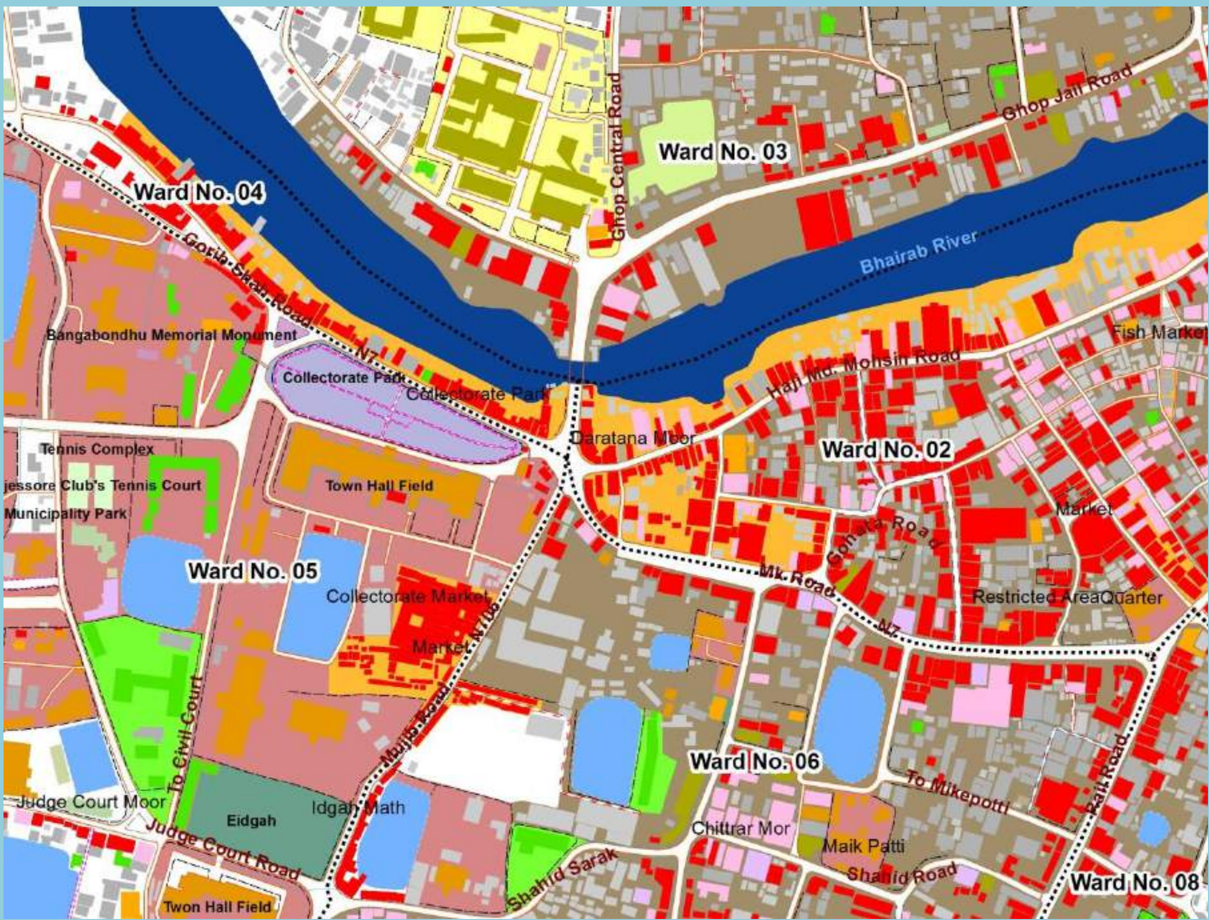
Ward No. 04
Ward No. 03
Ghop Central Road
Ghop Jail Road
Bhairab River
Gorib Shah Road
Bangabondhu Memorial Monument
N7
Collectorate Park
Collectorate Park
Haji Md. Mohsin Road
Fish Market
Daratana Moor
Ward No. 02
Tennis Complex
jessore Club's Tennis Court
Municipality Park
Town Hall Field
Market
Ward No. 05
Collectorate Market
Market
Mk Road
N7
Restricted AreaQuarter
To Civil Court
Ward No. 06
Judge Court Moor
Eidgah
Idgah Math
Judge Court Road
Chittrar Mor
Maik Patti
To Mikepotti
Rail Road
Shahid Sarak
Shahid Road
Ward No. 08
Twon Hall Field

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ABBREVIATION

3D	Three Height
AM/FM	Automated Mapping/Facilities Management
AT	Aerial Triangulation
BARC	Bangladesh Agricultural Research Council
BBS	Bangladesh Bureau of Statistics
BGB	Border Guard of Bangladesh
BLPA	Bangladesh Land Port Authority
BM	Bench Mark
BWDB	Bangladesh Water Development Board
CAD	Computer-aided Design
CAM	Computer-aided Manufacturing
CS	Cadastral Survey
DC	Deputy Commissioner
DEM	Digital Elevation Model
DPHE	Department of Public Health and Engineering
DPW	Digital Photogrammetric Workstation
DTM	Digital Terrain Model
FGD	Focus Group Discussion
GCP	Ground Control Point
GIS	Geographical Information System
GPS	Global Positioning system
GSB	Geological Survey of Bangladesh
IMU	Inertial Measurement Unit
INS	Inertial Navigation System
IT	Information Technology
ITES	Information Technology Enable Service
JV	Joint Venture
LGED	Local Government Engineering Department
LIS	Legislative Information System
MIS	Management Information System
PD	Project Director
PM	Project Manager
RCC	Reinforce Concrete Column
RFP	Request for Proposal
RHD	Roads and Highway
RS	Revised Survey
RTK	Real time kinematic
SAARC	South Asian Association for Regional Cooperation
SOB	Survey of Bangladesh
SRTM	Shuttle Radar Topography Mission
TIN	Triangular Irregular Network
TMC	Technical Management Committee
ToR	Terms of Reference
UDD	Urban Development Directorate

EXECUTIVE SUMMARY

Final Survey Report is the sixth official report for providing consultancy services for "Physical Feature survey work with RTK GPS, Total Station & using 3D image and other Survey for area of "Preparation of Development plan for Benapole-Jessore Highway Corridor project"". The project comprises the large tract of Jessore, Benapole, Jhikargachha Pourashava and Benapole-Jessore highway corridor.

Under the sub-regional cooperation between four nations, India-Bhutan-Nepal-Bangladesh, the working activities of Mongla Port will be many folds and subsequent work-load of Benapole Land Port will be increased exponentially. Thus, it is very much necessary to extend the present existing land port facilities at Benapole Land Port and the proper planning for accommodating the future growth scenario of said development within the project area and surroundings.

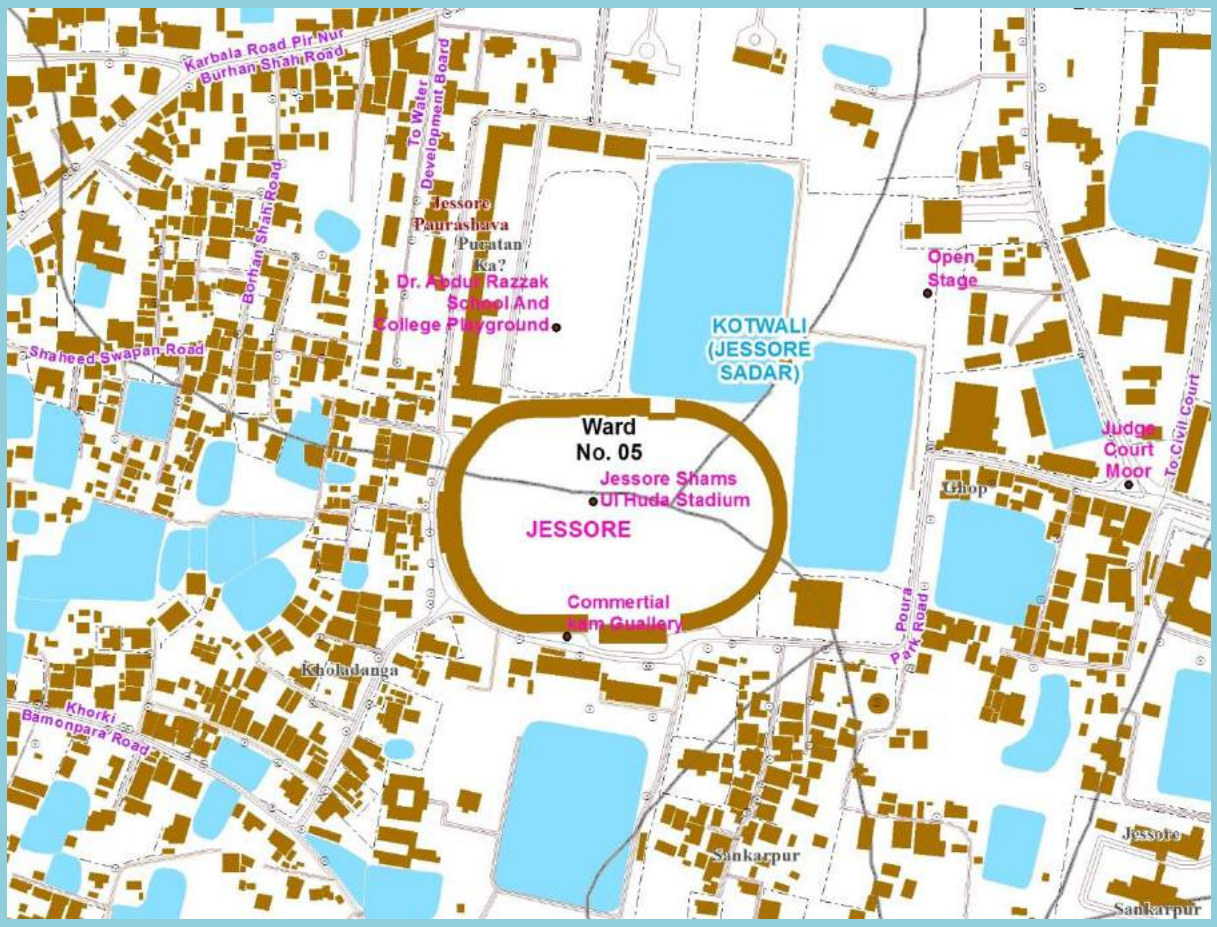
The broad objectives of the survey work are collection of 3D stereo model satellite image and using of photogrammetric method for preparation of the physical feature map and Digital Elevation Model (DEM). Digital Photogrammetric work station with latest software and technology is used in the project. Formal consultation meeting with the client and consultant also has been held about the progress of work at Urban Development Directorate (UDD) and will continue from time to time in future.

The second chapter of the Final Survey report focuses on the Topographical Survey & Physical Feature Survey. Survey methodology is mentioned in detail. Attribute Data Collection, Update Methodology, Field Check etc. was elaborately described. Generalized landuse for the project area and for three upazilas information has also been inserted. There are 172 km river and canal, 1690 km of road, 829 bridges and culverts. 31 sq.km of water body is there. There are few important large water bodies like baor and lake exists which has significant role in natural water drainage, ecology. Agriculture is the main dominant feature here. 56% of total land is used for agriculture, 12% used for green area which is filled up with trees, 14% us used as residential area and 9% occupied as water body. Average land height is 5.08 meter from the mean sea level.

The third chapter is focused on socio economic survey, other survey and different studies. This report is part of the project activities and progress of work. This will guide the project activities including field survey data collection and analysis reports and maps. The project area profile is based on initial survey and data collection and will be useful in understanding the characterization of the project area. Housing status, religious status, educational status, main occupation, sex, monthly income etc. different information is there with tables and charts. Highest household size 2-4 person and then 4-6 people in the study area. 92 % people lives in their own house and rented is 6% Traffic survey and OD survey information are also added with maps and with methodology. Formal and informal survey and their methodology, recreational open space, health facilities, educational facilities, agricultural study and land demarcation survey, archaeological studies, water logging different kinds of study are discussed here. Physical environment of the project area including climate, temperature, rail fall, water quality, air quality, flooding etc. is discussed here.

Chapter 01

Introduction



CHAPTER 01

1.1 Introduction

Physical planning comprises of spatial arrangement relating to physical resources to achieve functional efficiency, public safety and aesthetic quality. Physical/struc3ture planning is primarily concerned with good management and development of land. Strategic Planning provides the mechanism for making comprehensive decision about the use of land and resources. It is an approach that intertwines all segments related to social, economic, physical and environmental dimensions. Many countries, like third world countries have rapidly urbanized and developed in an unplanned manner. Many continue to do so in an unprecedented rate. This has generated the conversion of forest lands, agricultural lands, wetlands, and aquifer recharge areas to industrial and urban uses. This trend has enormous impacts on productive agricultural lands and ecological resources and ecosystems. Industrial and urban development has likewise led to the segregation of land uses, e.g. separation of residential houses, shopping centers, and employment centers. Such land use development patterns have impacts on energy and resource consumption, which have turned out to be unsustainable for humanity, i.e. emergence of global warming and climate change.

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

Urban Development Directorate (UDD) is the only government organization at the apex for preparing land use plan in Bangladesh. Since its creation, UDD has prepared land use master plan for 50 district towns and 392 Upazila towns from 1984 to 1996. In the recent past UDD has prepared land use master plan for 26 Upazila town / Pourashava / District town by employing its own man power. Besides, UDD has prepared *Structure Plan, Master plan and Detailed Area Plan* for *Sylhet* and *Barisal* Divisional Towns and Preparation of Development Plan of *Cox's Bazar* Town and Sea Beach up to *Teknaf*.

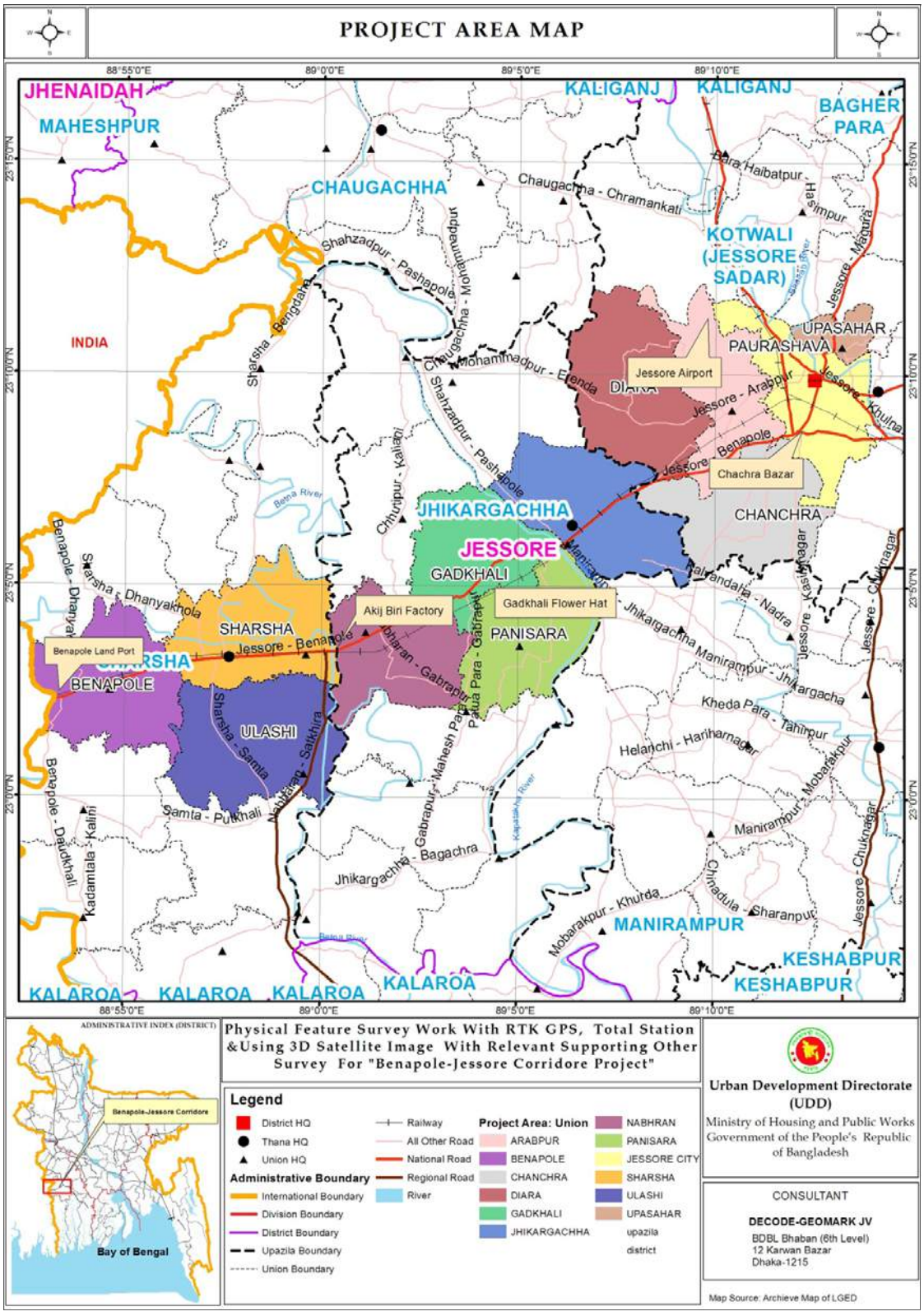


Figure 1 Benapole-Jessore Project Area Map

1.2 Existing Scenario:

1.2.1 Regional Setting:

***Jessore* district** is located in the *Khulna* division of southwestern Bangladesh. It is bounded by *Jhenaidaha* district and *Magura* district on the north, Satkhira district and *Khulna* district on the south, *Narail* district and *Khulna* district on the east and *West Bengal* of India on the West.

Major Rivers of *Jessore*: Rivers that flow through this region are the *Bhairab River, Mukteshori River, Kopothakho River and Betna River.*

Annual Average Temperature of *Jessore*: Annual average maximum temperature in Jessore is 37.1°C and minimum temperature is 11.2°C. Annual rainfall is 1537 mm.

1.2.2 Short Description of the Project Area:

The project area has five urban centers: *(a) Jessore Town, (b) Benapole Land Port, (c) Benapole Pourashava, (d) Sharsha Upazila Town and (e) Jhikargachha Pourashava*. Total 60 Km National Highway is there but average length of the project area is 40 km and minimum width is 3 km and maximum width is 15 km.

Jessore is a district located in the Khulna Division of southwestern Bangladesh. It is bordered by India to the west. The district produces a variety of crops year-round. Date-sugar, called Patali, is made from the sap of locally grown date trees. Patali is mainly produced in Khajura, but also produce in Keshabpur and Monirampur areas.

Jessore is also famous for fish hatchery and a major supplier of all kind of fish fries all over the country. There is a wide scale activity in handicrafts specially embroidery quilt in Jessore which has earned fame at home and abroad. Jessore district was established in 1781 and encompasses 2578.20 km². It consists of 4 municipalities, 36 wards, 8 upazilas, 92 unions, 1329 mouzas, and 1434 villages. The names of the upazilas are Abhaynagar Upazila, Bagherpara Upazila, Chaugachha Upazila, Jessorekotwali Upazila, Jhikargachha Upazila, Keshabpur Upazila, Manirampur Upazila, and Sharsha Upazila. Jessore town stands on the river Bhairab, consists of 9 wards and 73 mahallas. Jessore municipality was established in 1864. The area of the town is 25.72 km2. The town has a population of 117, 8273; male 52.97%, female 47.03%. The Literacy rate among the town people is 56.57%.

Jessore town which stands on the river Bhairab consists of nine (9) wards and seventy three (73) mahallas. Jessore municipality was established in 1864. The area of the town is 25.72 square kilometer. The town has population of 1,178,273 persons.

Jessore district was established in 1781. It consists of eight (8) municipalities, eight (8) Upazilas, ninety two (91) unions parishads, one thousand three hundred twenty nine (1329) mouzas, one thousands four hundred and thirty four (1434) villages, and one hundred twenty (120) mahallas.

1.3 Objectives:

Land use survey, physical feature survey, topographic survey (including housing and including squatter settlements survey, investment and employment survey, population and migration study etc.) Urban and rural economy survey, social infrastructure survey, hydrological survey, formal and informal industrial survey and other survey (health facilities, educational facilities, agricultural land demarcation, archaeological, environmental survey etc.)

Survey works shall be conducted on Mouza map R.S/CS or any latest version. All survey data will be 3D data and all feature vertexes must have Z value.

Survey firm have to collect spot level data at minimum 5 m in town areas, 10 meter in rural area on the whole project area in respect to SOB's benchmark and prepare to spot level and contour map from the 3D satellite image.

1.4 Scope of Works:

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

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

Preparation of Base Map through Satellite Image Processing by using Photogrammetric Method:

Base map shall be prepared with the help of photogrammetric system by using 3D satellite image (four bands) with resolution 0.5m accuracy by the survey firm.

The Topographic database shall be obtained from geo-referenced 3D (four bands) image and further cross-checked and ground truthing by using RTK-GPS and Total Station.

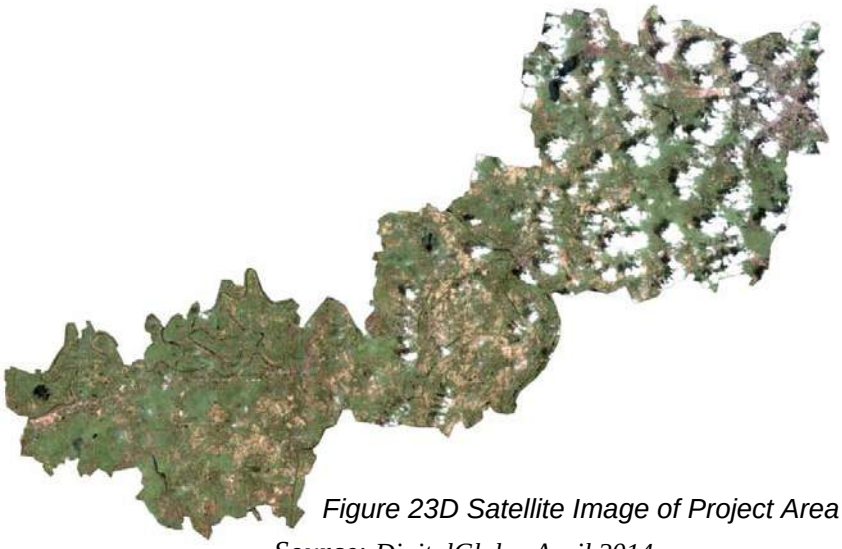


Figure 23D Satellite Image of Project Area
Source: DigitalGlobe, April 2014

Existing Land Use Survey:

The land use survey (both attribute and Spatial) will indicate the use of each plot of land and each building in the rural area and rural-urban fringe area. The output of this survey will be one or more maps showing existing gross agricultural use, residential, commercial, administrative and cultural zones, nature or rural urban area, water courses and water bodies etc. the survey should be conducted on maps of RF 1:3960 scale.

Physical Feature Surveys:

Physical feature survey will have to be conducted for the whole project area. Location and dimension (s, y, z value) of all existing structures including building type, height, floor type, and use of each floor, homestead boundary, all water control structures including khal (Natural and man-made), embankments, dykes, box culvert, sluice gate etc., vegetation cover, flood plain, railway line, roads etc.

Topographic Survey:

The Topographic database shall be obtained from geo-referenced 3-D (four band) image and further cross-checked and ground trothing, alignment of all data obtained from physical feature survey including roads, flood embankments and other drainage divides, spot heights or land level at roughly 10m intervals for the whole project area and close interval as and when required.

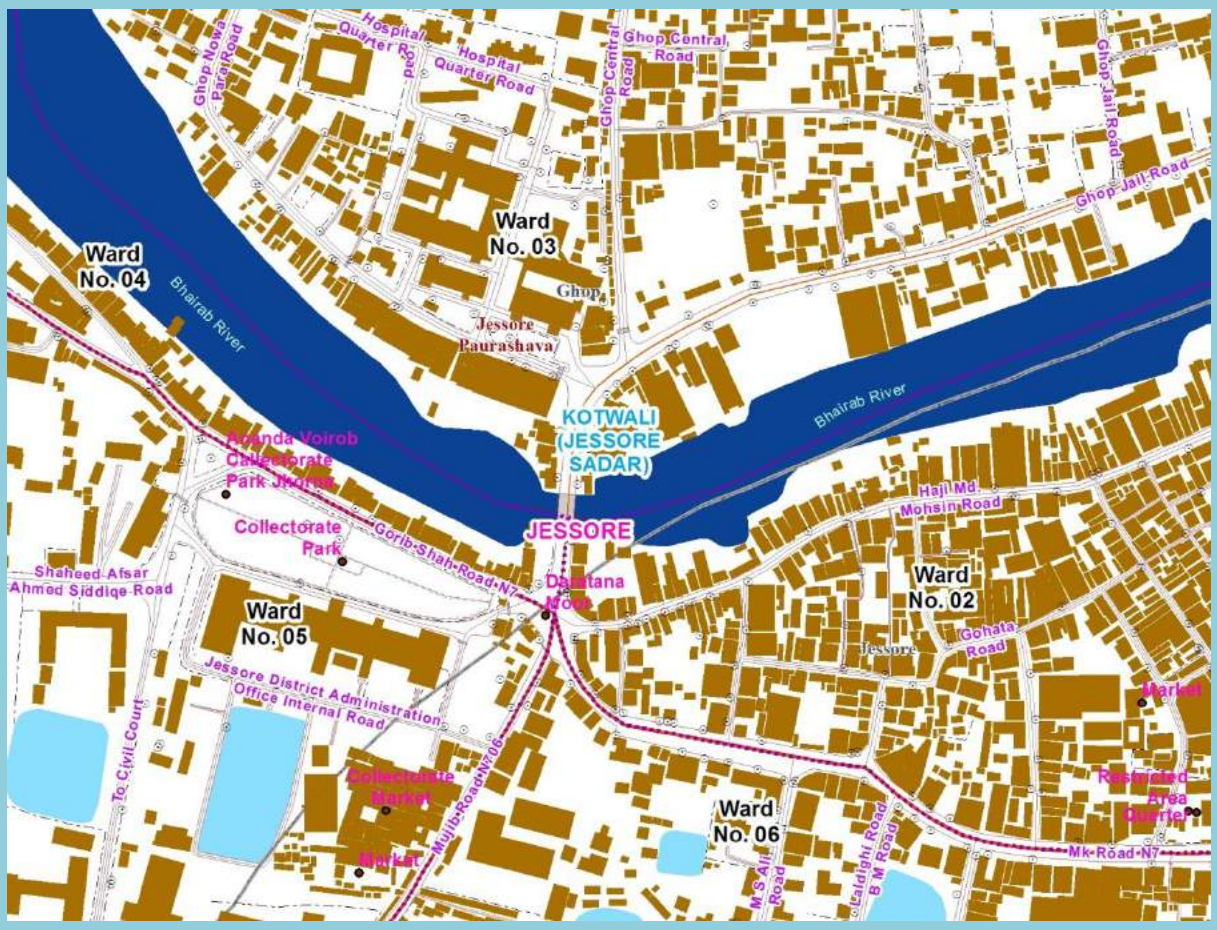
Other survey:

Socio-Economic Survey: Preparation of socio-economic questionnaire in SPSS and other compatible format, editing, piloting, finalization and printing of questionnaire by the survey firm. Questionnaire survey shall be conducted both in urban and rural areas.

Study of urban and rural economy, study of social infrastructure- Educational, religious, sports, recreation, community and socio0clultural services, traffic survey, hydrological study, formal and informal industrial survey, recreational open space, health facilities, agricultural land demarcation survey etc. will also be conducted.

Chapter 02

Topographic, Physical Features and Land Use Survey



CHAPTER 02

2. Topographical, Physical Feature and Land Use Survey

2.1 Methodology

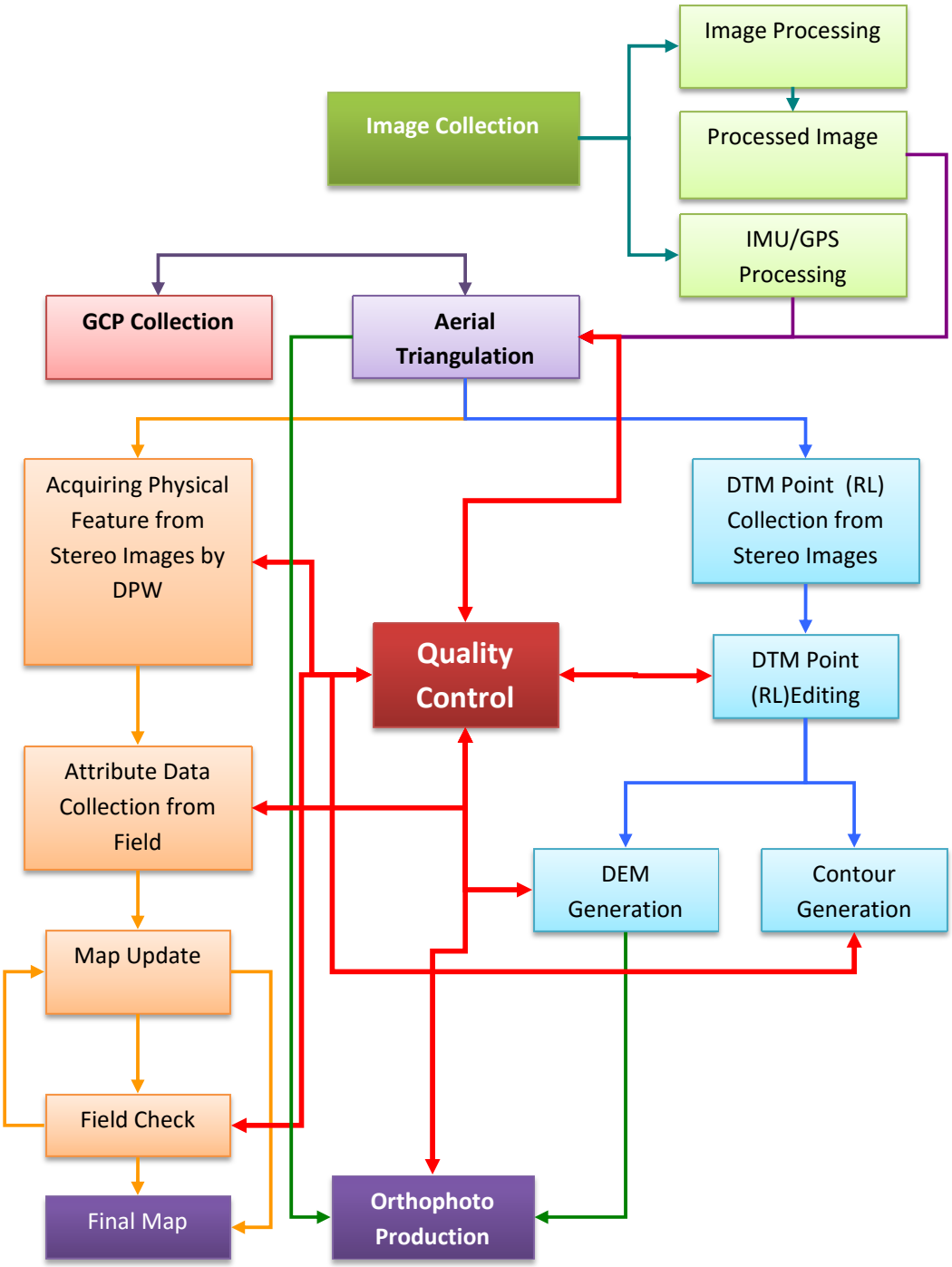
It is understood that development organizations in Bangladesh needs accurate and informative data about the topography to implement its development program. Different techniques have been evolved to determine the shape or relief of the part of the Earth's surface and the location of natural and artificial objects thereon. Among them Transit and Plane Table surveying methods and instruments were standard for direct surveying followed by Total Stations. Traditionally these surveying procedures have used analog methods of recording data and are rarely used now. Although Total Station is rather modern survey equipment and introduced digital data collection, it is only suitable for detailed mapping over small area which must be easily accessible.

Digital Photogrammetry, the digital approach of today's mapping solution, is one of the most reliable technologies for mapping, mosaicking of orthophotos and DEM generation. It is also one of the most important input sources of 3D geospatial data, and has been greatly utilized for geographic object interpretation and object measurement. The high precision 3D spatial data acquired through photogrammetric technique provides strong platform for decision making. Automated procedures for photogrammetric image processing and Digital Elevation Models (DEM) extraction yield high precision terrain models in a short time, reducing manual editing.

The proposed assignment comprises of the following three major objectives:

- Topographic Survey
- Land Use Survey
- Other Related Survey

Figure 3 Flow Chart of Methodology for Topographical, Physical Feature and Landuse Survey



2.2 Physical Feature Survey:

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

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

Feature registration was done considering and measuring the 3D position of the object under its accuracy level. The Summit Evolution & Stereo Plotter of DAT/EM was used for identifying and registration of the objects and Arc GIS 9.3 of ESRI was used for vector data storing and editing.

Figure 4 Photograph of Digital Photogrammetric Workstation

We digitized Building Roof foot print with MSL height, bridge/culvert, road, river, khal, pond, lake, ditch, marsh/swam, drain line, electric pole in town area, High voltage electric line, boundary wall etc.. All features was digitize in 3 dimension (X,Y,Z). Deep tube well, overhead tank also digitized/identified.

During field survey and field verification we collected various attribute data and update all the physical features. Based on attributes of physical features we created a landuse map where commercial, residential, mixed use, government service, health facilities etc. was identified as per ToR.

2.2.1 Attribute Data Collection and Field Verification

After digitization complete we prepared field sheet for attribute data collection and filed checking. A3 Size field sheet and log sheet was prepared for field work.

Figure 5 Field Sheet after Digitization, Sheet No. N128

2.2.2 Map Updating

Attribute data and missing map object was collected from the field and was incorporated into the features in this stage. All A3 field sheet was scanned, georeferenced and updated. All building got a unique ID as per field sheets.

Figure 6 : Field Sheet after Field Survey, Sheet No. N128

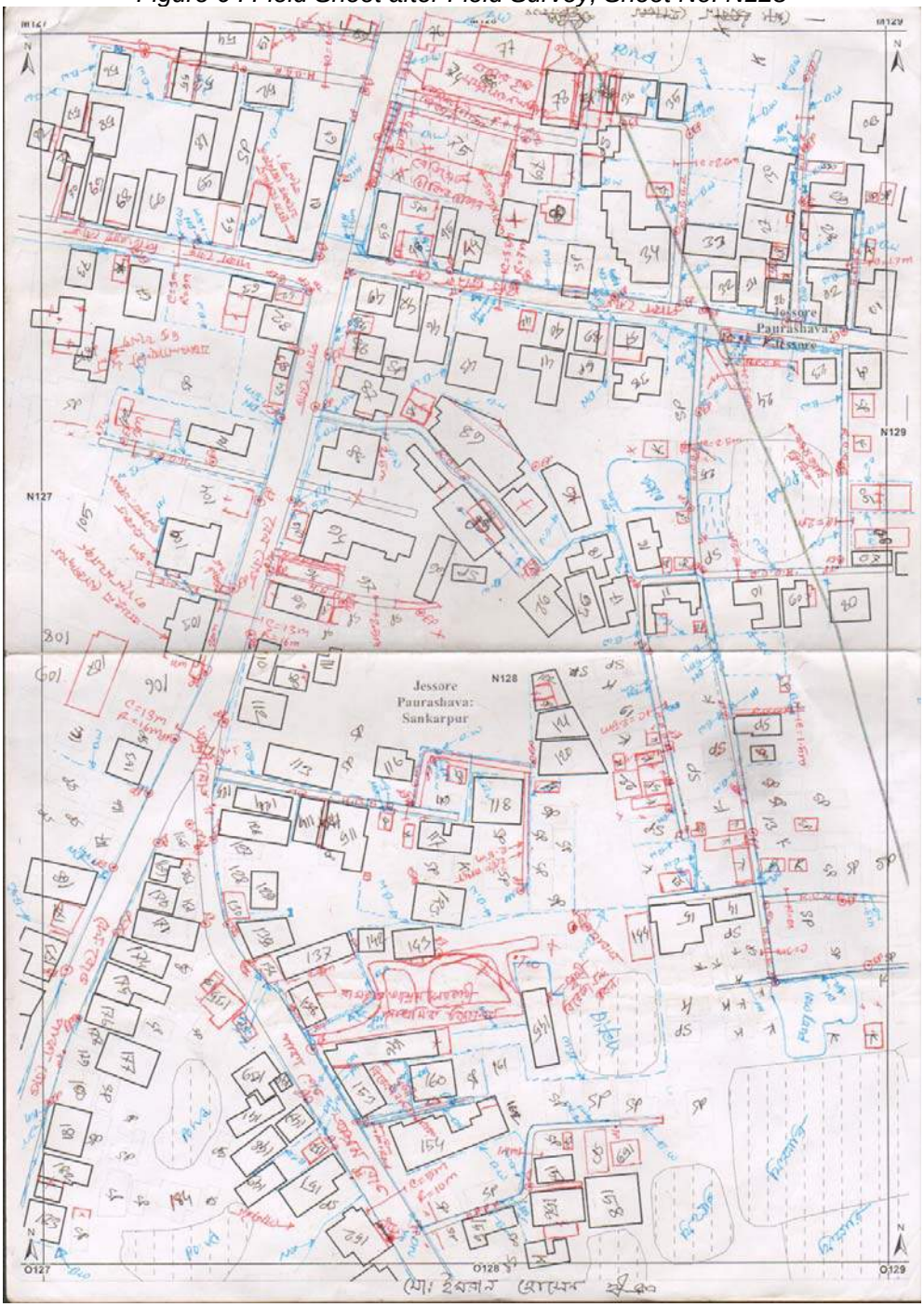
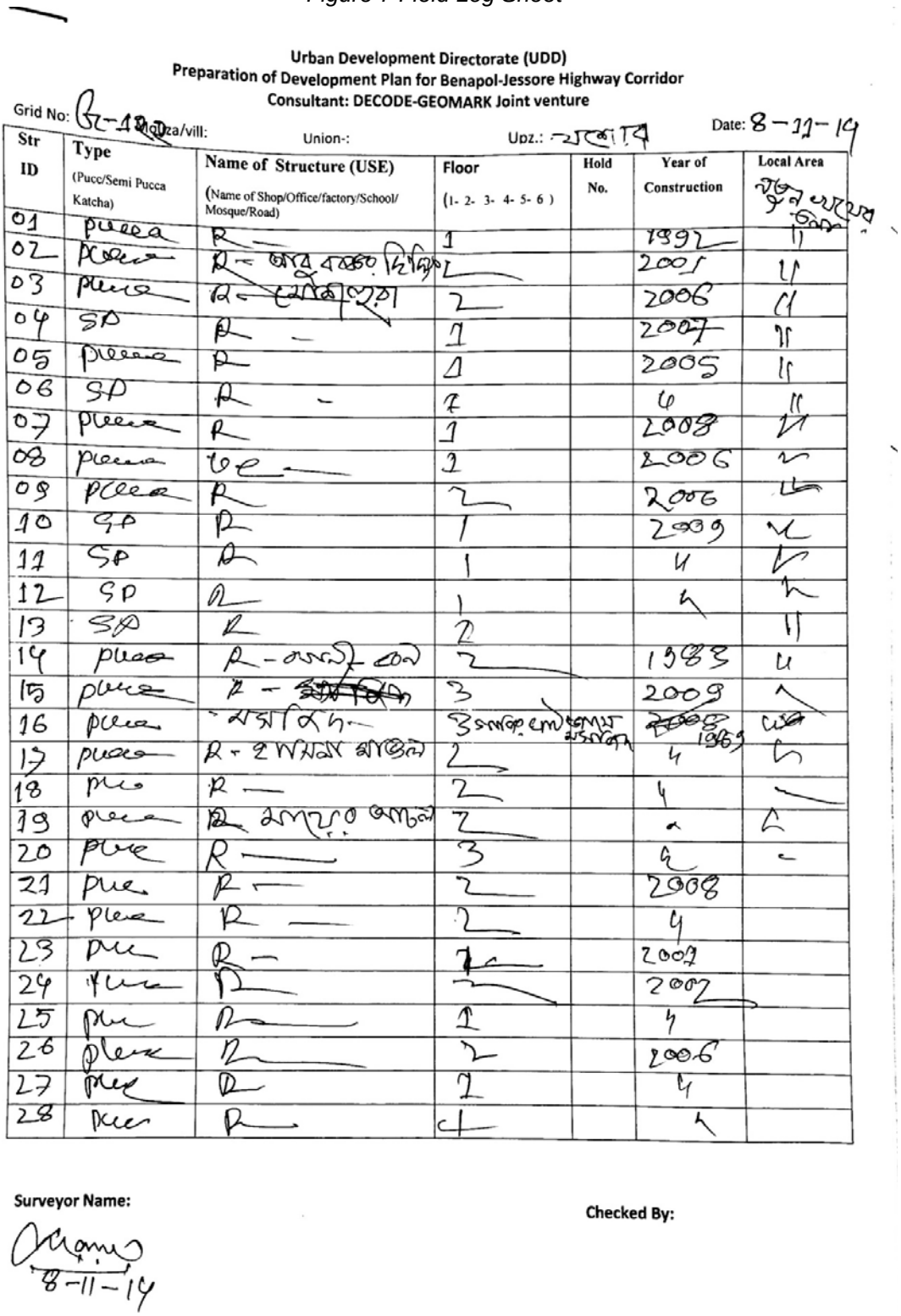


Figure 7 Field Log Sheet



Urban Development Directorate (UDD)
Preparation of Development Plan for Benapol-Jessore Highway Corridor
Consultant: DECODE-GEOMARK Joint venture

Grid No: BL-18 Mouza/vill: Union-: Upz.: Date: 8-11-14

Str ID	Type (Pucc/Semi Pucca Katcha)	Name of Structure (USE) (Name of Shop/Office/factory/School/ Mosque/Road)	Floor (1- 2- 3- 4- 5- 6)	Hold No.	Year of Construction	Local Area
01	pucca	R	1		1992	
02	pucca	R	1		2005	
03	pucca	R	2		2006	
04	SP	R	1		2007	
05	pucca	R	1		2005	
06	SP	R	1		4	
07	pucca	R	1		2008	
08	pucca	R	1		2006	
09	pucca	R	2		2006	
10	SP	R	1		2009	
11	SP	R	1		4	
12	SP	R	1		4	
13	SP	R	2			
14	pucca	R	2		1983	
15	pucca	R	3		2009	
16	pucca	R	3		1983	
17	pucca	R	2		4	
18	puc	R	2		4	
19	pucca	R	2		4	
20	puc	R	3		4	
21	puc	R	2		2008	
22	pucca	R	2		4	
23	puc	R	2		2007	
24	puc	R	2		2007	
25	puc	R	1		4	
26	pucca	R	2		2006	
27	puc	R	2		4	
28	puc	R	1		4	

Surveyor Name:

8-11-14

Checked By:

2.2.3 Field Check

All digital map data was delivered to UDD. If any important feature i.e. office, educational institute, religious feature, industrial etc. found missing then we will update it on printed maps according to map scale using measuring tape. It will be faster way to complete project within given time. Later it will be update on main database.
After field update we have found the following major topography features.

Table 1 Major Map data statistics

Feature Class	Statistics (information)
Building (Structure)	Total no.: 199258 Maximum Build Height From MSL: Max: 40.264 m Min: 7.83m Average: 15.59m
River & Khal	Total Length: 173 Km
Pond/Lake/Ditch	Total No: 12339
Marsh Land and Baor	Total No: 82 (Marsh Land-31, Baor-51)
Railway Tracks	Total Length: 52.23 Km
Drain	Total Length: 183.992 Km
Embankment	Total Length: 2.978Km
Boundary Wall	Total Length: 320.75 Km
Cross Dam	Total No: 439

Source: Topographic Map Data, 2015

Road / Culvert

We have found total 829 different types of bridge / culvert and total 1690.31 kilometer of road.

Table 2 Road Statistics

Road Category	Length (Km)
Local Road and Others	1619.41
National Highway	60.26
Regional Highway	10.64
Total	**1690.31**

Topographic Map Data, 2015

Table 3 Bridge / Culvert Statistics

Type	Total
Bridge	159
Culvert Box	569
Culvert Pipe	74
Culvert Slab	5
Railway Bridge	20
Railway Over-Bridge	1
Foot Over Bridge	1
Total	**829**

Topographic Map Data, 2015

Figure 8 Road and Bridge/Culvert of Jessore Sadar Upazila

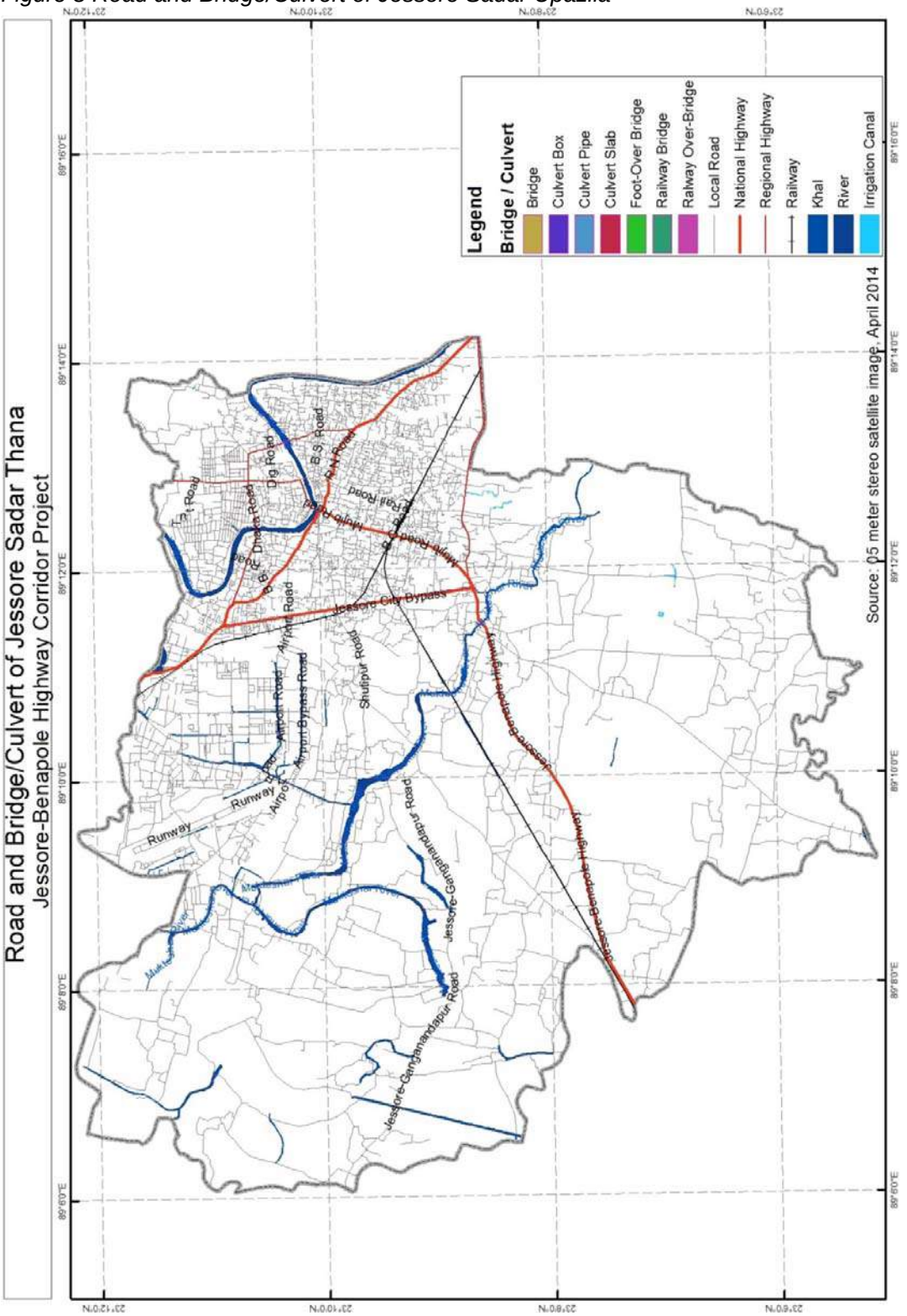


Figure 9 Road and Bridge/Culvert of Jhikargachha Upazila

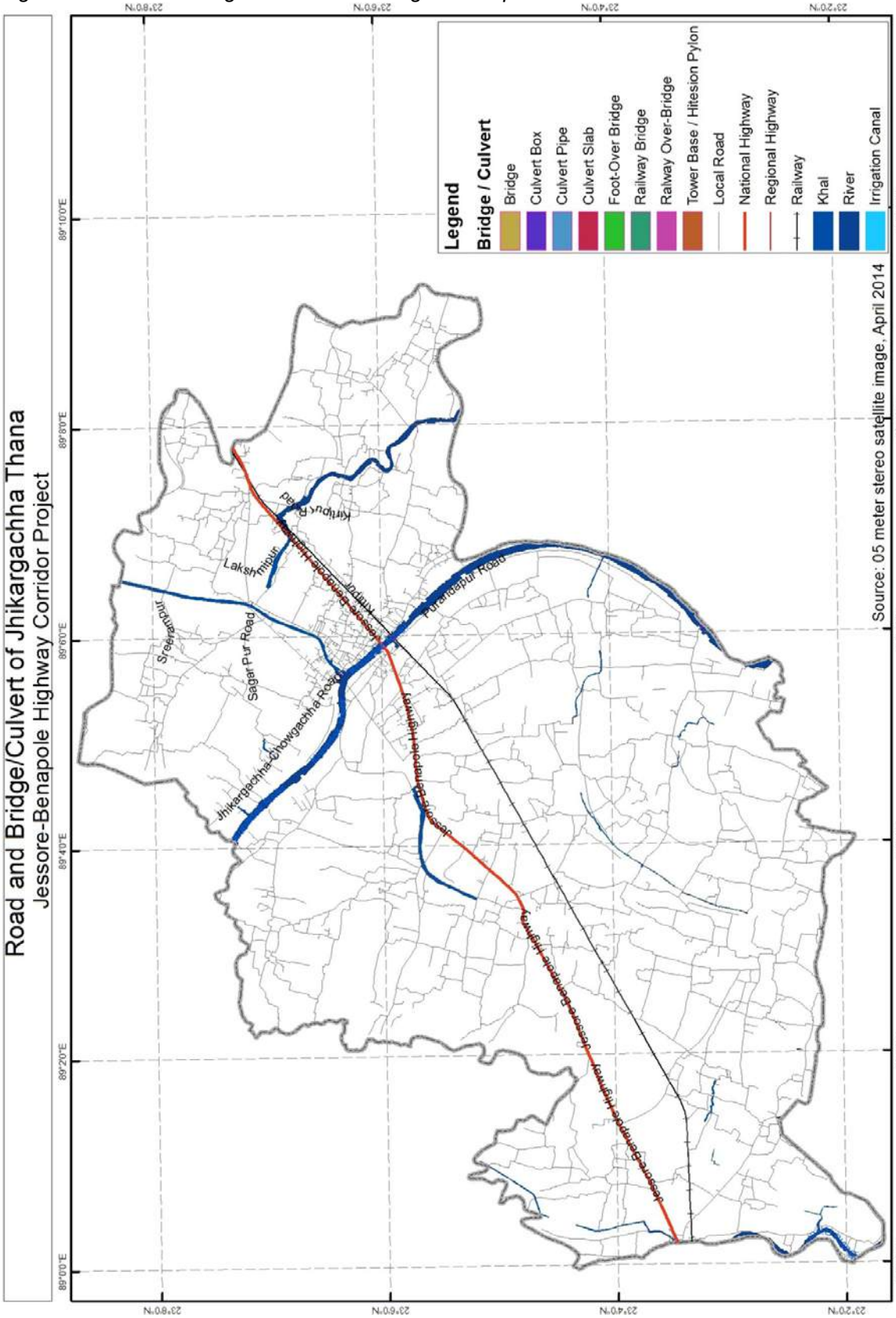


Figure 10 Road and Bridge/Culvert of Sharsha Upazila

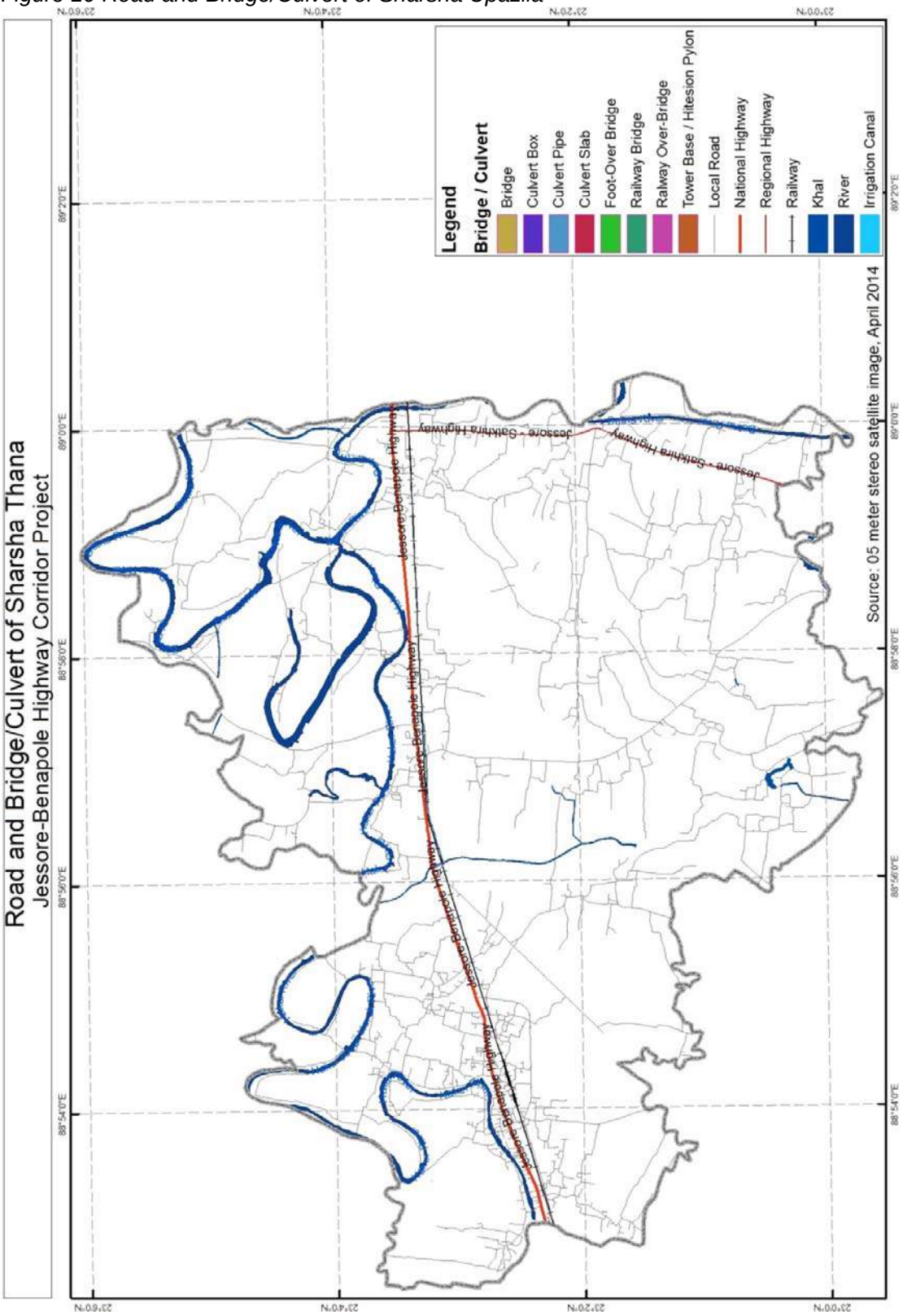
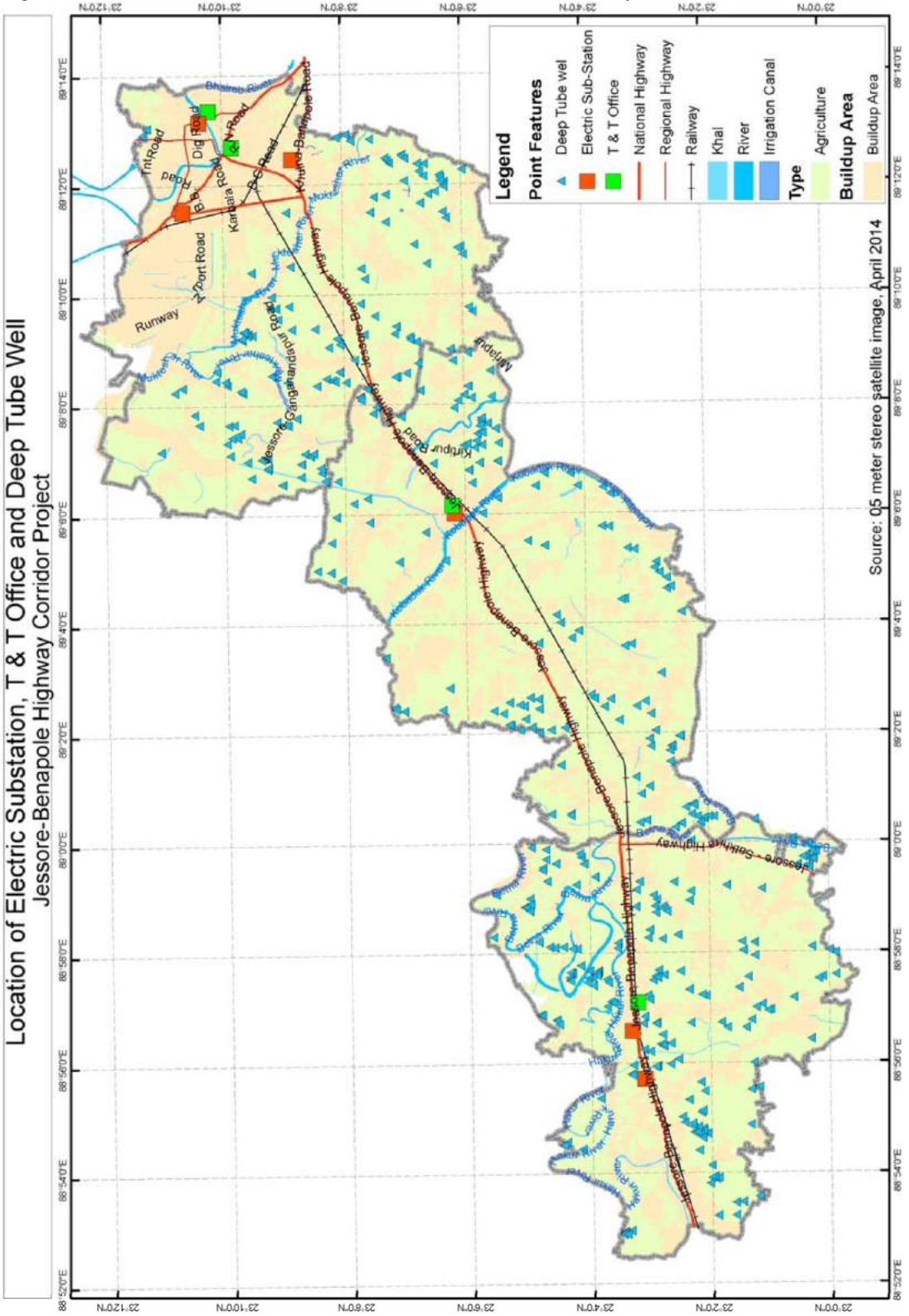


Figure 11 Location of Electric Substation, T&T Office and Deep Tube Well



2.3 Land Use Survey Updating

After updating the physical features we updated the land use data and found the following status of the project area. We found that generally agriculture is the most dominant used within the whole project area. Agriculture, vegetation, residential area and water bodies is the most dominant use.

Table 4 Generalize Land Use Information of the Project Area

Sl	Type	Area (Acares)	Area (Sk.km)	%
1	Agriculture	46,229.35	187.08	56.81
2	Circulation Network	1,449.17	5.86	1.78
3	Commercial	210.08	0.85	0.26
4	Community Service	2.53	0.01	0.00
5	Education and Research	273.78	1.11	0.34
6	Government Services	459.95	1.86	0.57
7	Group of Trees / Forest	9,809.54	39.70	12.05
8	Health Services	16.93	0.07	0.02
9	Manufacturing and Processing Activities	478.55	1.94	0.59
10	Miscellaneous	1.08	0.00	0.00
11	Mixed Use	725.07	2.93	0.89
12	Non-Governmental Services	9.55	0.04	0.01
13	Recreational Facilities	51.56	0.21	0.06
14	Religious	46.55	0.19	0.06
15	Residential	11,911.94	48.21	14.64
16	Restricted Area	1,915.49	7.75	2.35
17	Service Activity	14.64	0.06	0.02
18	Transport and Communication	35.50	0.14	0.04
19	Vacant Land	92.44	0.37	0.11
20	Water Body	7,647.28	30.95	9.40
21	Total	81381	329.34	100.00

Figure 12 Generalize Land Use Information of the Project Area

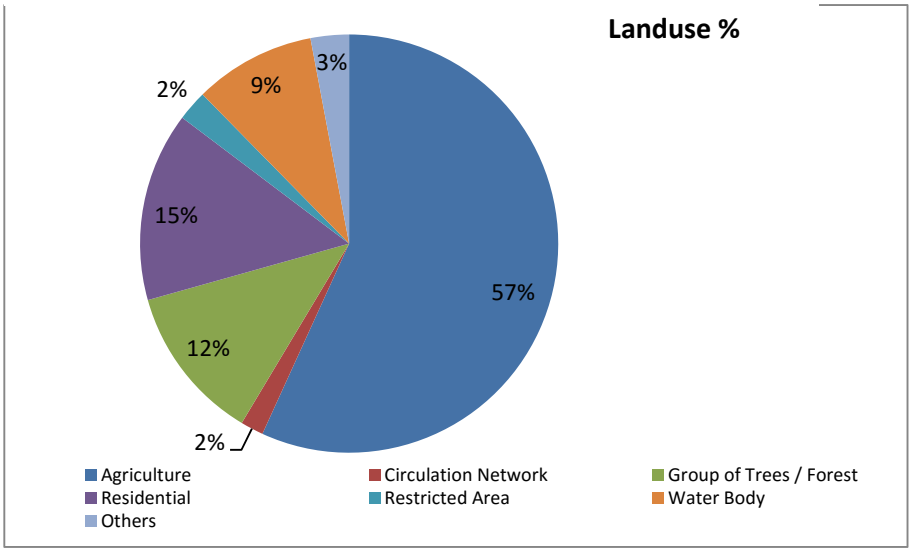


Figure 13 Generalize Landuse Map of the Project Area

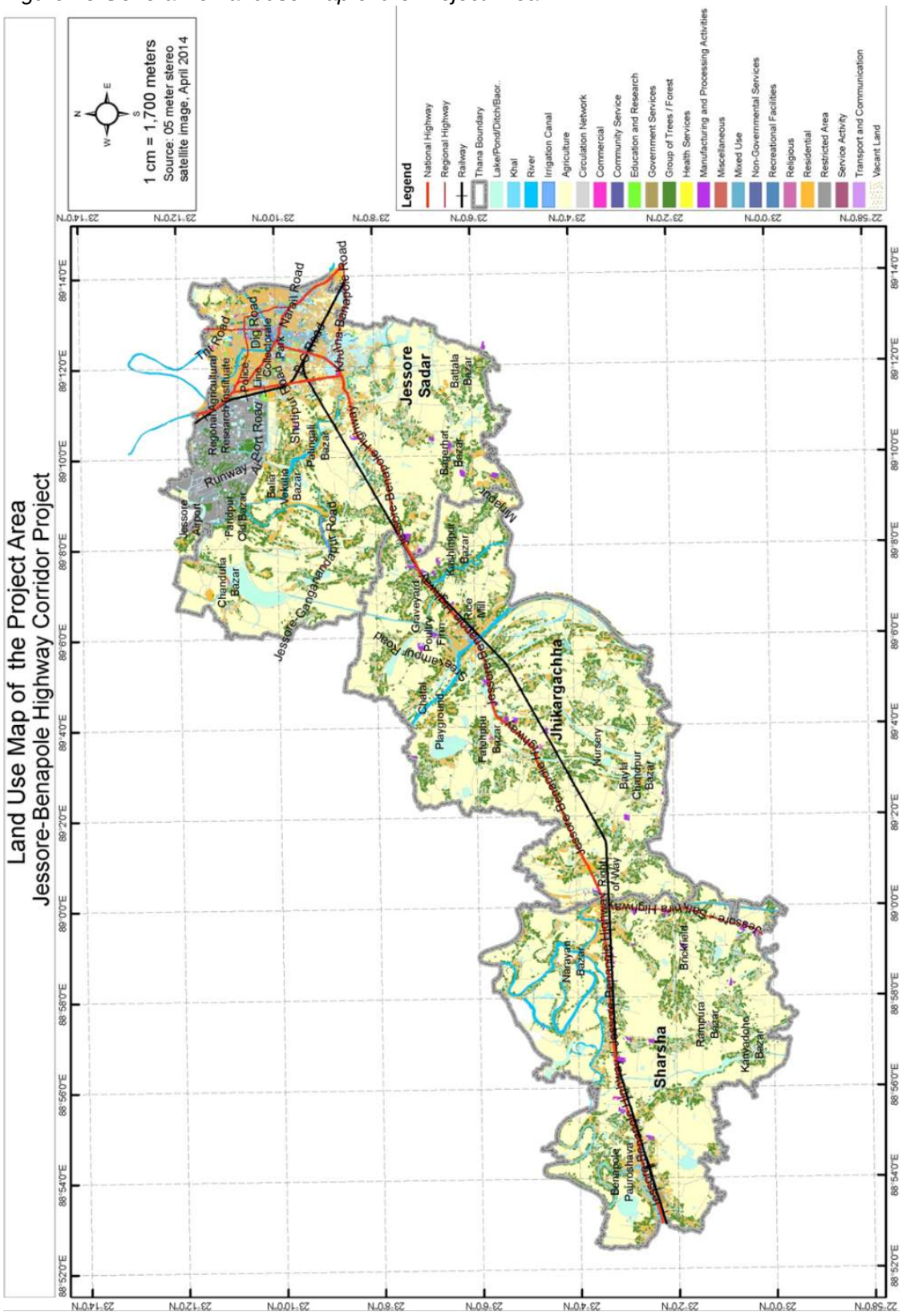


Table 5 Generalize Land Use Information of Jessore Sadar Thana

Sl	Type	Area(Acares)	Area(Sk.km)	%
1	Agriculture	13720.953	55.527	47.485
2	Circulation Network	719.515	2.912	2.490
3	Commercial	88.928	0.360	0.308
4	Community Service	1.768	0.007	0.006
5	Education and Research	172.838	0.699	0.598
6	Government Services	335.798	1.359	1.162
7	Group of Trees / Forest	2975.312	12.041	10.297
8	Health Services	8.055	0.033	0.028
9	Manufacturing and Processing Activities	106.231	0.430	0.368
10	Miscellaneous	1.067	0.004	0.004
11	Mixed Use	596.738	2.415	2.065
12	Non-Governmental Services	5.123	0.021	0.018
13	Recreational Facilities	38.640	0.156	0.134
14	Religious	33.907	0.137	0.117
15	Residential	5227.933	21.157	18.093
16	Restricted Area	1895.195	7.670	6.559
17	Service Activity	8.303	0.034	0.029
18	Transport and Communication	21.184	0.086	0.073
19	Vacant Land	55.055	0.223	0.191
20	Water Body	2882.860	11.667	9.977
Total		**28895.402**	**116.936**	**100.000**

Source: Survey Map Data, 2014-2015

Figure 14 Generalize Land Use Information of Jessore Sadar Thana

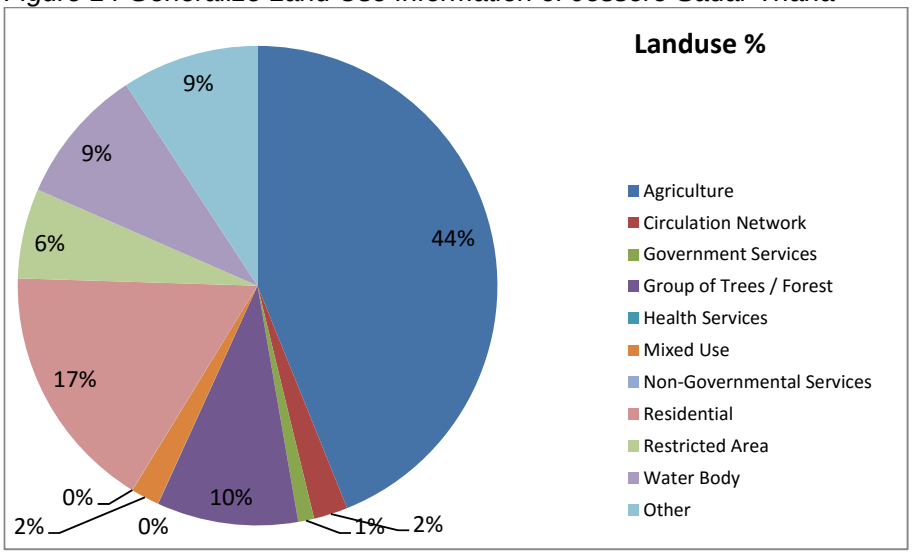


Figure 15 Land Use Map of Jessore Sadar Upazila

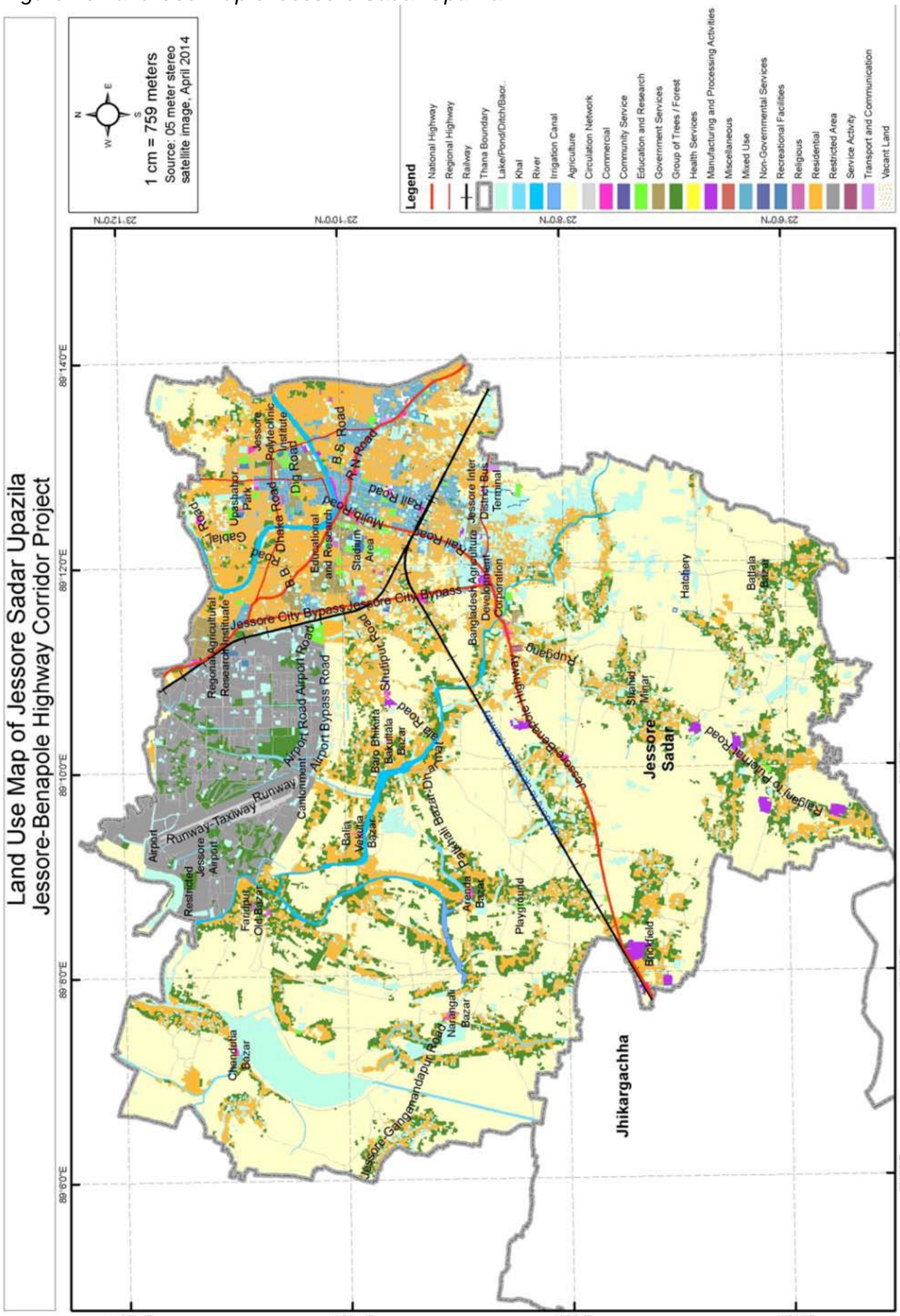


Table 6 Generalize Land Use Information of Jhikargachha Thana

SI	Type	Area(Acares)	Area(Sk.km)	%
1	Agriculture	16809.431	68.025	61.493
2	Circulation Network	372.227	1.506	1.362
3	Commercial	48.873	0.198	0.179
4	Education and Research	61.482	0.249	0.225
5	Government Services	26.091	0.106	0.095
6	Group of Trees / Forest	3946.408	15.971	14.437
7	Health Services	4.116	0.017	0.015
8	Manufacturing and Processing Activities	182.545	0.739	0.668
9	Miscellaneous	0.016	0.000	0.000
10	Mixed Use	52.888	0.214	0.193
11	Non-Governmental Services	4.425	0.018	0.016
12	Recreational Facilities	5.925	0.024	0.022
13	Religious	10.463	0.042	0.038
14	Residential	3470.123	14.043	12.695
15	Service Activity	4.135	0.017	0.015
16	Transport and Communication	5.180	0.021	0.019
17	Vacant Land	4.924	0.020	0.018
18	Water Body	2326.319	9.414	8.510
Total		27335.574	110.623	100.000

Source: Survey Map Data, 2014-2015

Figure 16 Generalize Land Use Information of Jhikargachha Thana

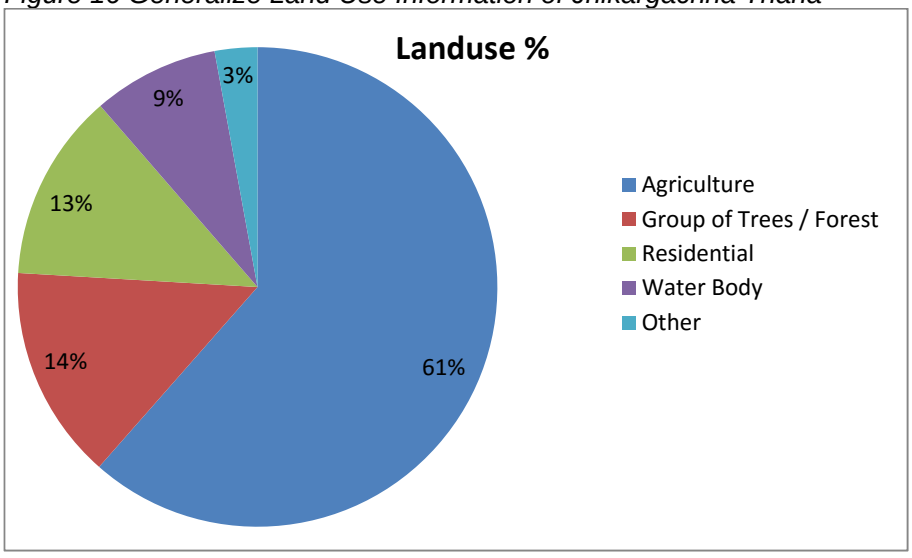


Figure 17 Land Use Map of Jhikargachha Upazila

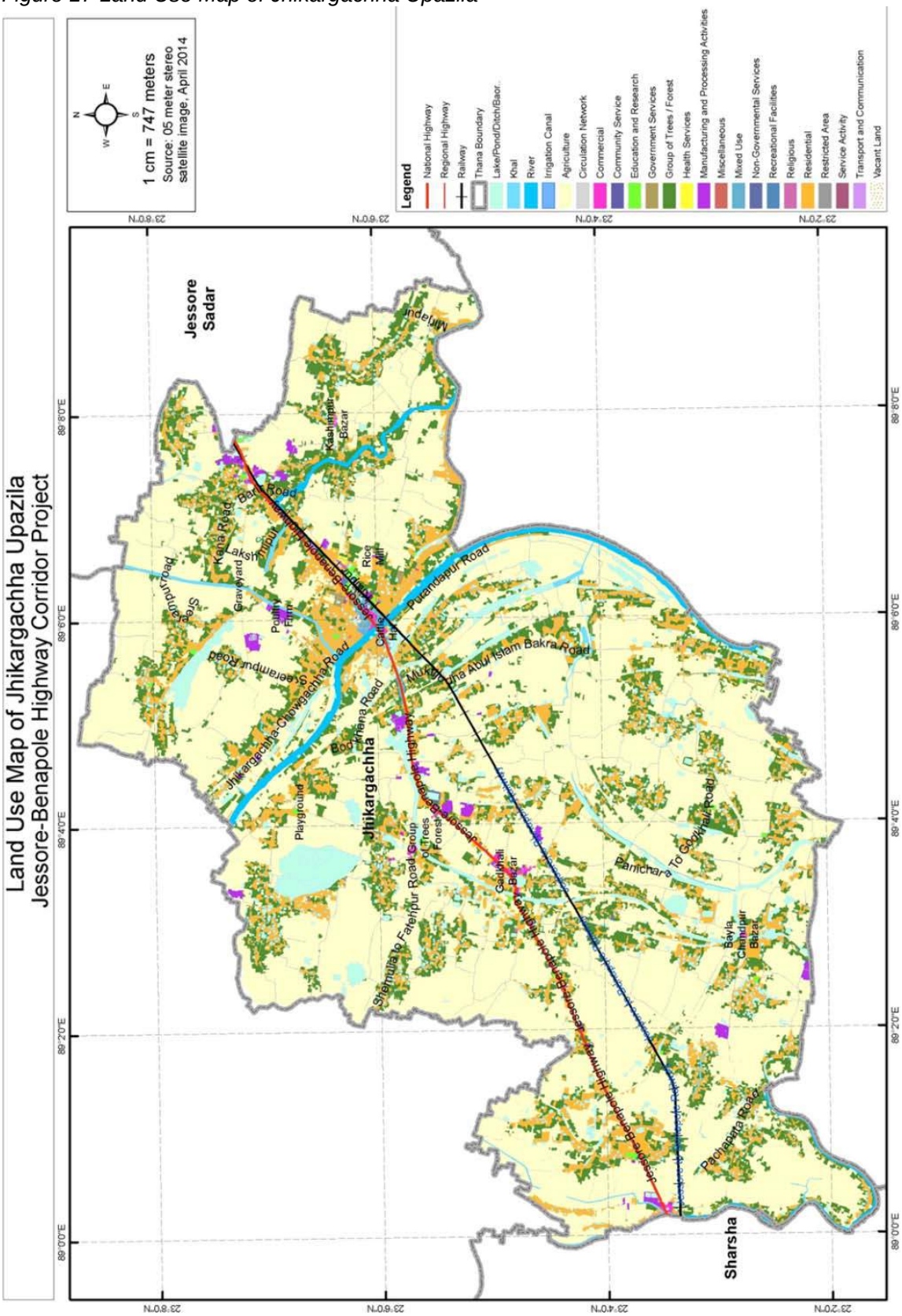


Table 7 Generalize Land Use Information of Sharsha Thana

SI	Type	Area(Acares)	Area(Sk.km)	%
1	Agriculture	14952.251	60.510	63.718
2	Circulation Network	331.633	1.342	1.413
3	Commercial	71.518	0.289	0.305
4	Community Service	0.761	0.003	0.003
5	Education and Research	38.032	0.154	0.162
6	Government Services	95.819	0.388	0.408
7	Group of Trees / Forest	2617.525	10.593	11.154
8	Health Services	4.755	0.019	0.020
9	Manufacturing and Processing Activities	169.185	0.685	0.721
10	Mixed Use	72.138	0.292	0.307
11	Recreational Facilities	6.994	0.028	0.030
12	Religious	2.185	0.009	0.009
13	Residential	2865.445	11.596	12.211
14	Service Activity	2.197	0.009	0.009
15	Transport and Communication	9.001	0.036	0.038
16	Vacant Land	22.388	0.091	0.095
17	Water Body	2204.285	8.920	9.393
Total		23466.112	94.964	100.000

Source: Survey Map Data, 2014-2015

Figure 18 Generalize Land Use Information of Sharsha Thana

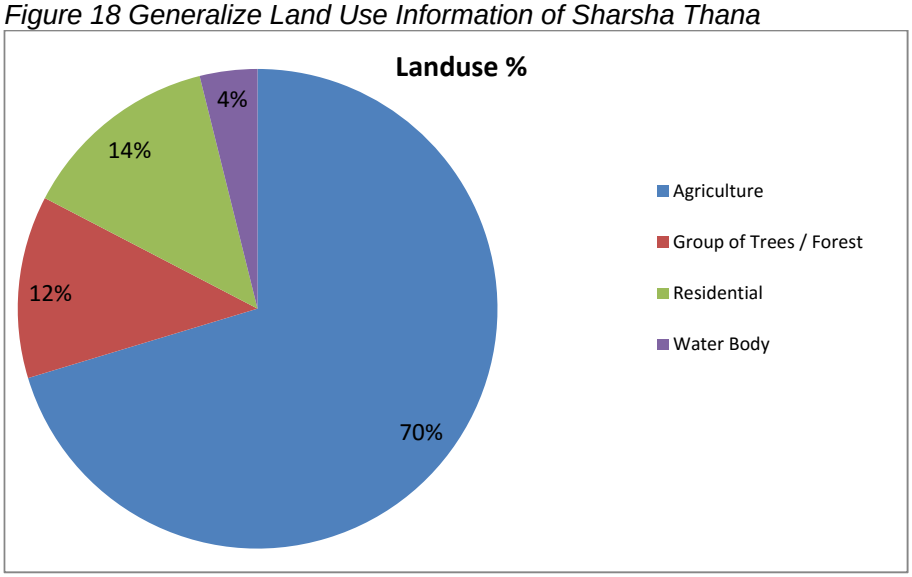
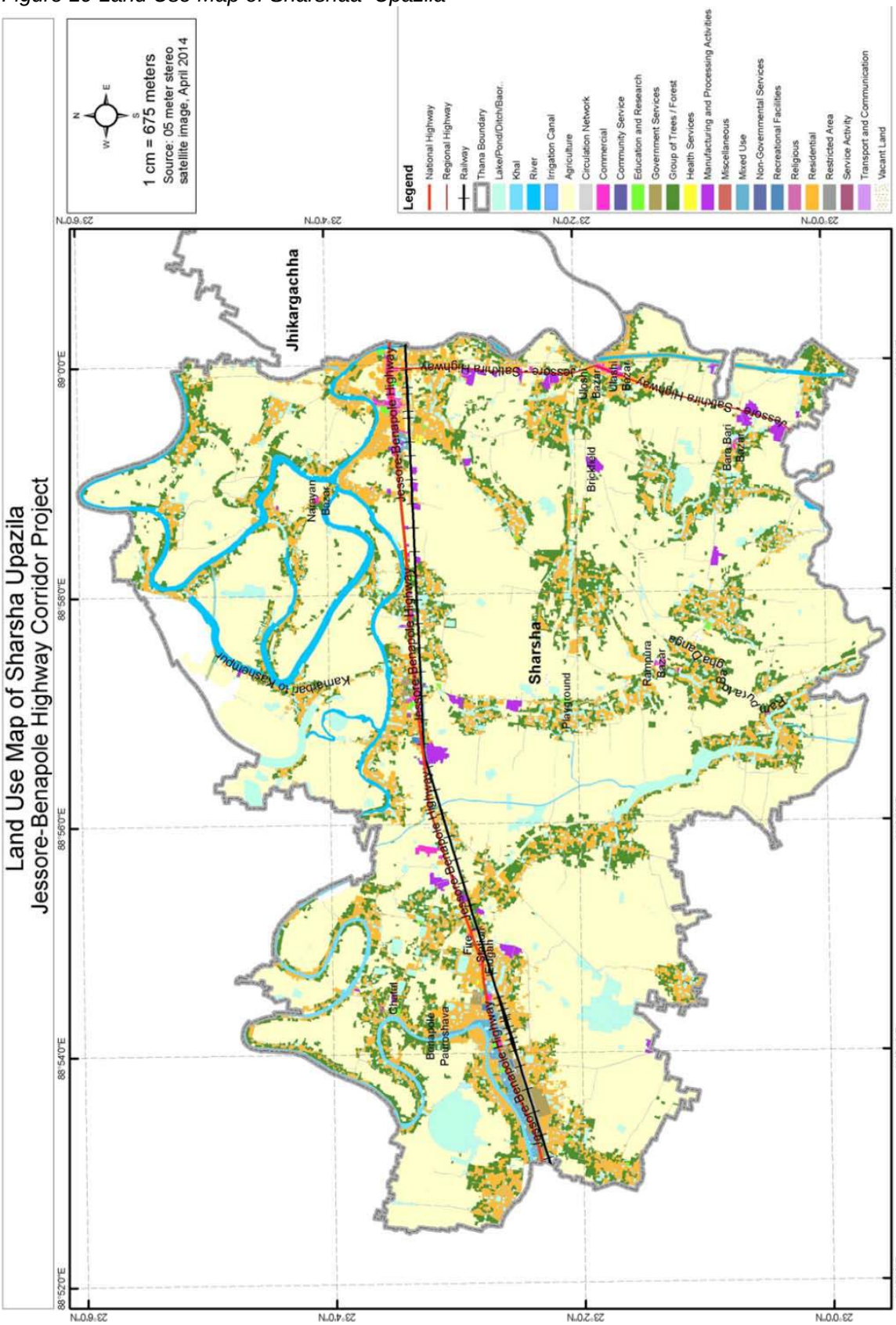


Figure 19 Land Use Map of Sharshaa Upazila



2.4 Topographical Survey

Digital photogrammetry is able to acquire 3D points for high spatial resolution DEM generation through semi-automatic procedures from stereo satellite image. We use RTK GPS for GCP collection to correct the satellite image.

In this approach, DTM Points was generated from Stereo Pair images by the software, and editing of the software generated DTM points was checked and edited by the comparing them with stereo model in photogrammetric workstation. Creating and editing of Break lines was done after this stage.

After creating DTM Points, Contour lines were produced with 0.3 meter contour interval. The contour lines were delivered for the project area.

Using DTM Points DEM was generated at a resolution of 10 for the project area. The maximum, minimum and average height is below

Table 8 General Height Information

Total Project Area	Total Points	Maximum Height (Meter)	Average Height (Meter)	Minimum Height (Meter)
324 Sq.km	32,44,043	18.848	5.08	-1.649

Figure 20 Digital Elevation Model & Spot Height at 10x10 Meter Grid

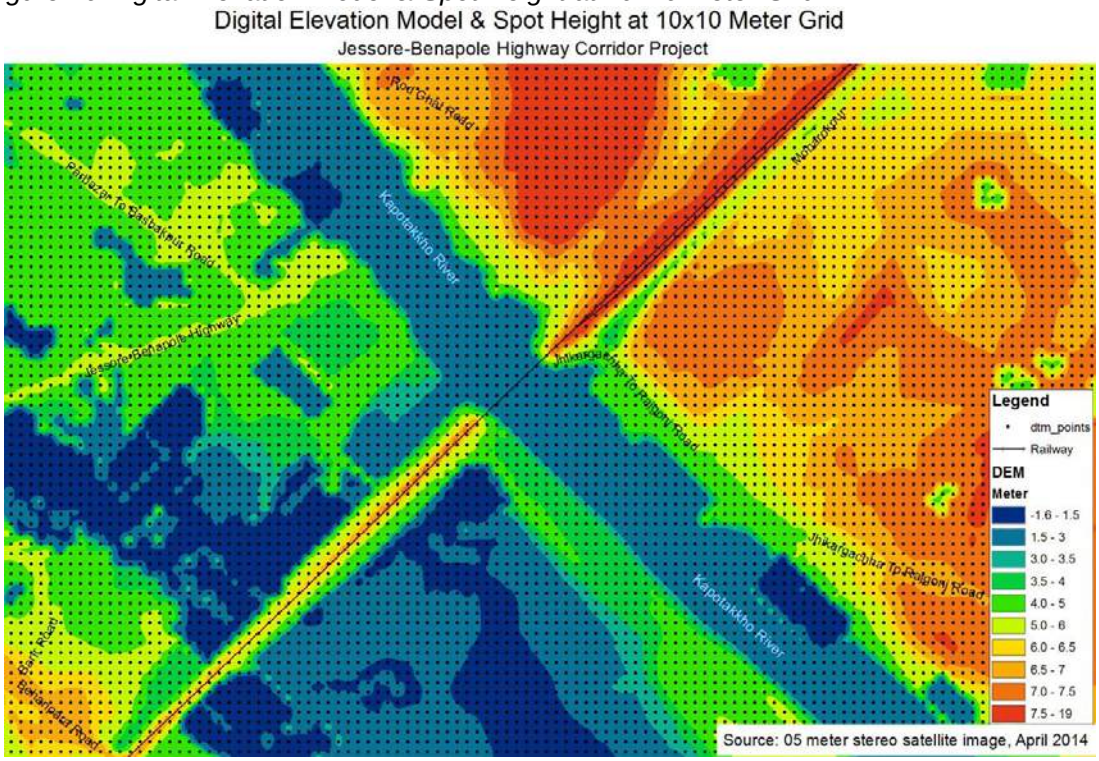
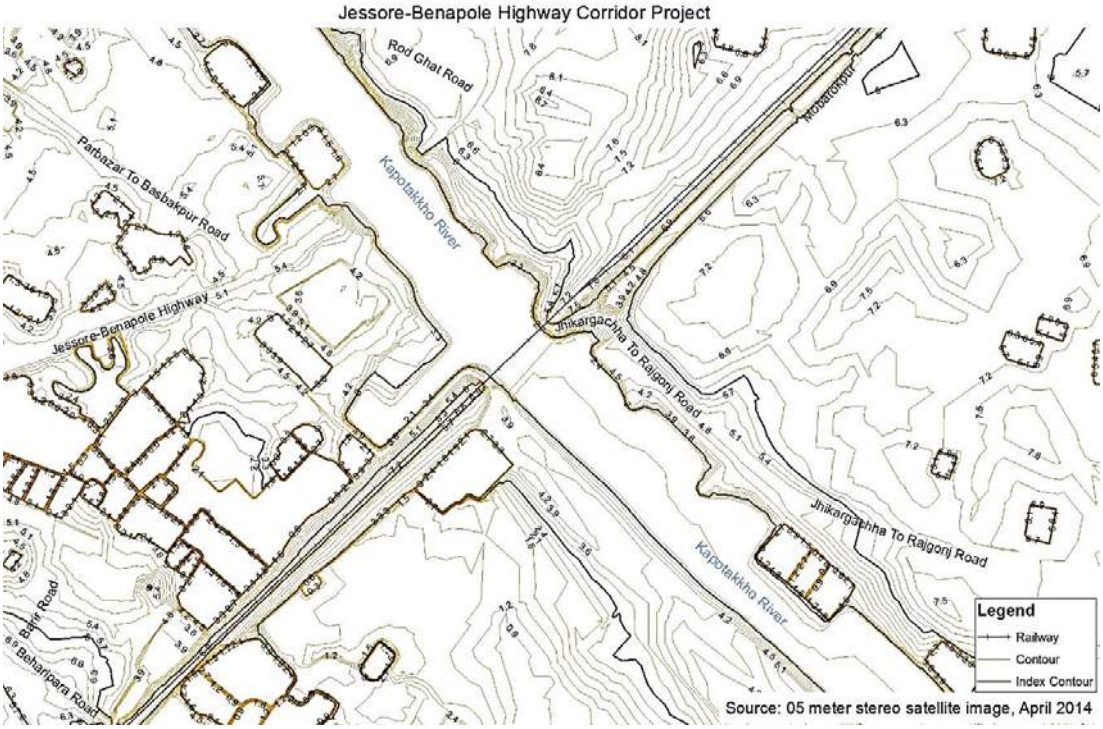
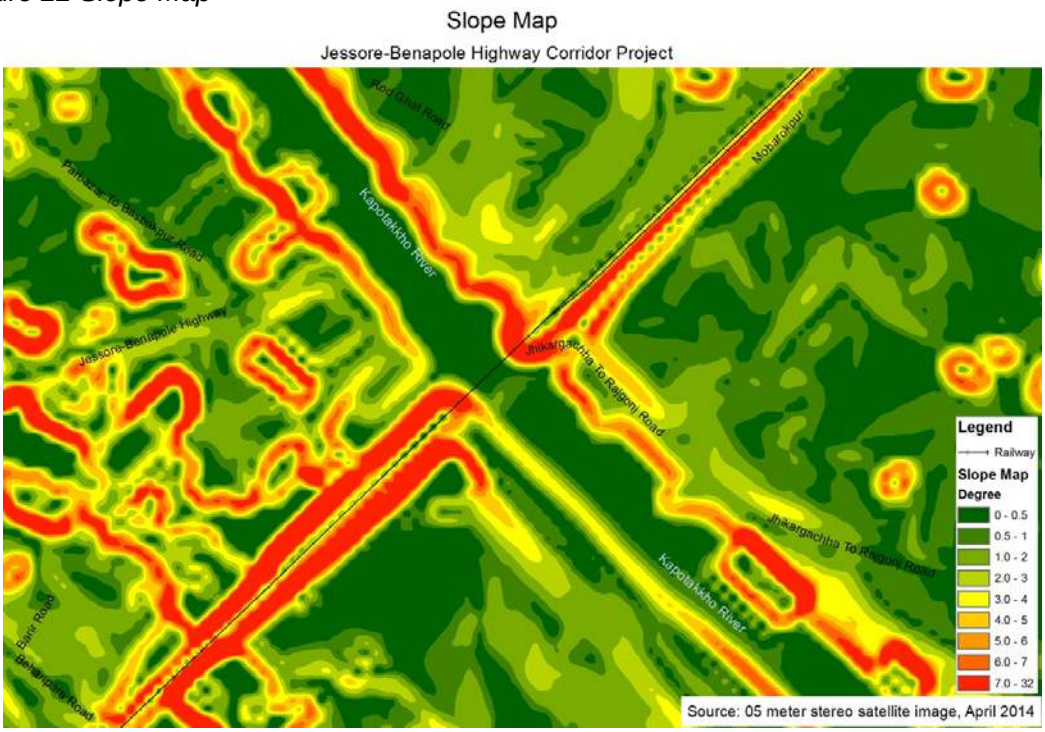


Figure 21 Contour Map of 0.3 Meter Interval



Using DTM Points TIN was created and delivered for the project area. DEM was used for calculating slope using ArcGIS.

Figure 22 Slope Map



TIN was used for calculating road, embankment dyke's crest level, any place within project area etc. With this TIN data we can view the profile of road, embankment, river etc. at any place. We can generate profile at any distance 10/20/30 meter.

Figure 23 Sample Long and Cross Section of a Khal

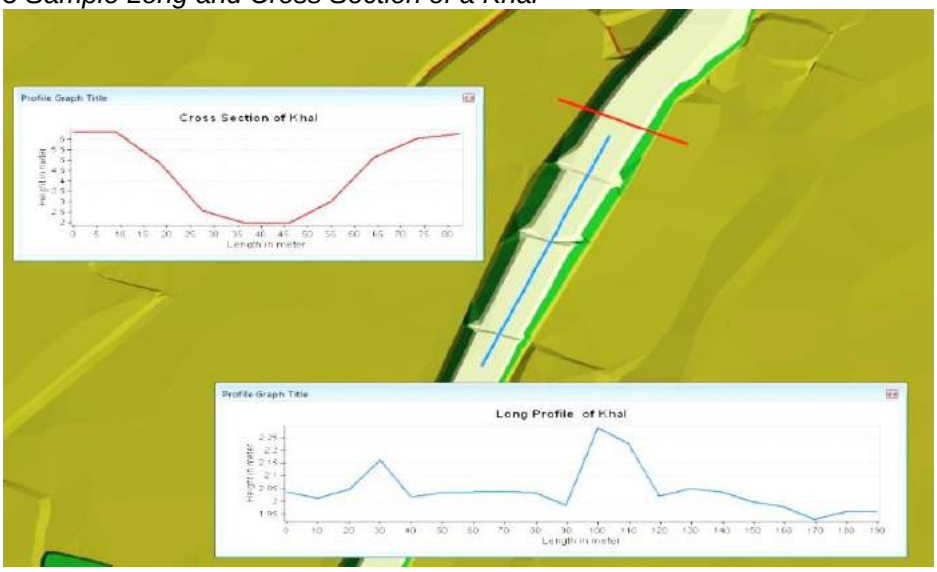


Figure 24 Digital Elevation Model of Project Area

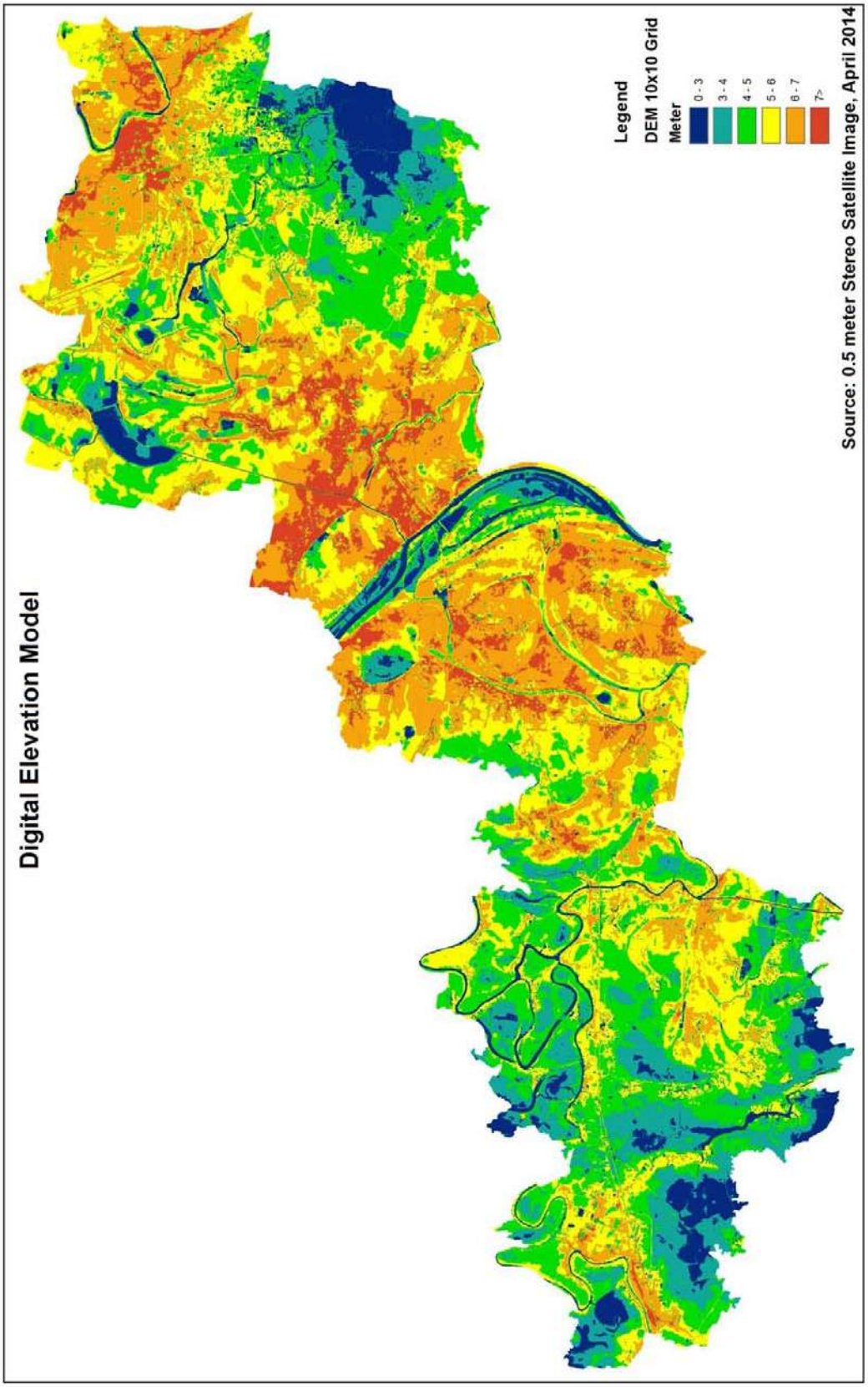


Figure 25 Digital Elevation Model of Jessore Sadar Thana

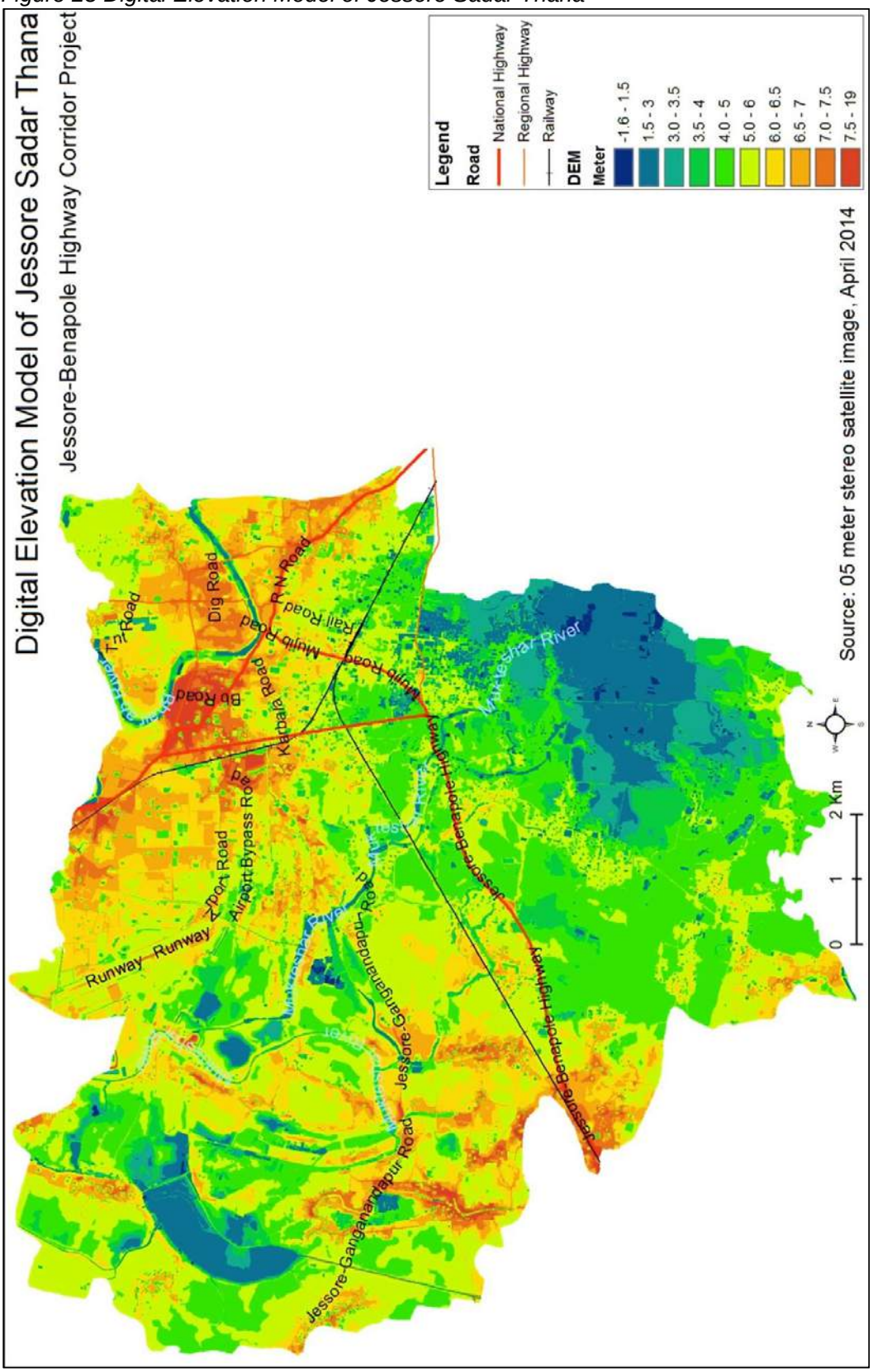


Figure 26 Digital Elevation Model of Jessore Pauroshava

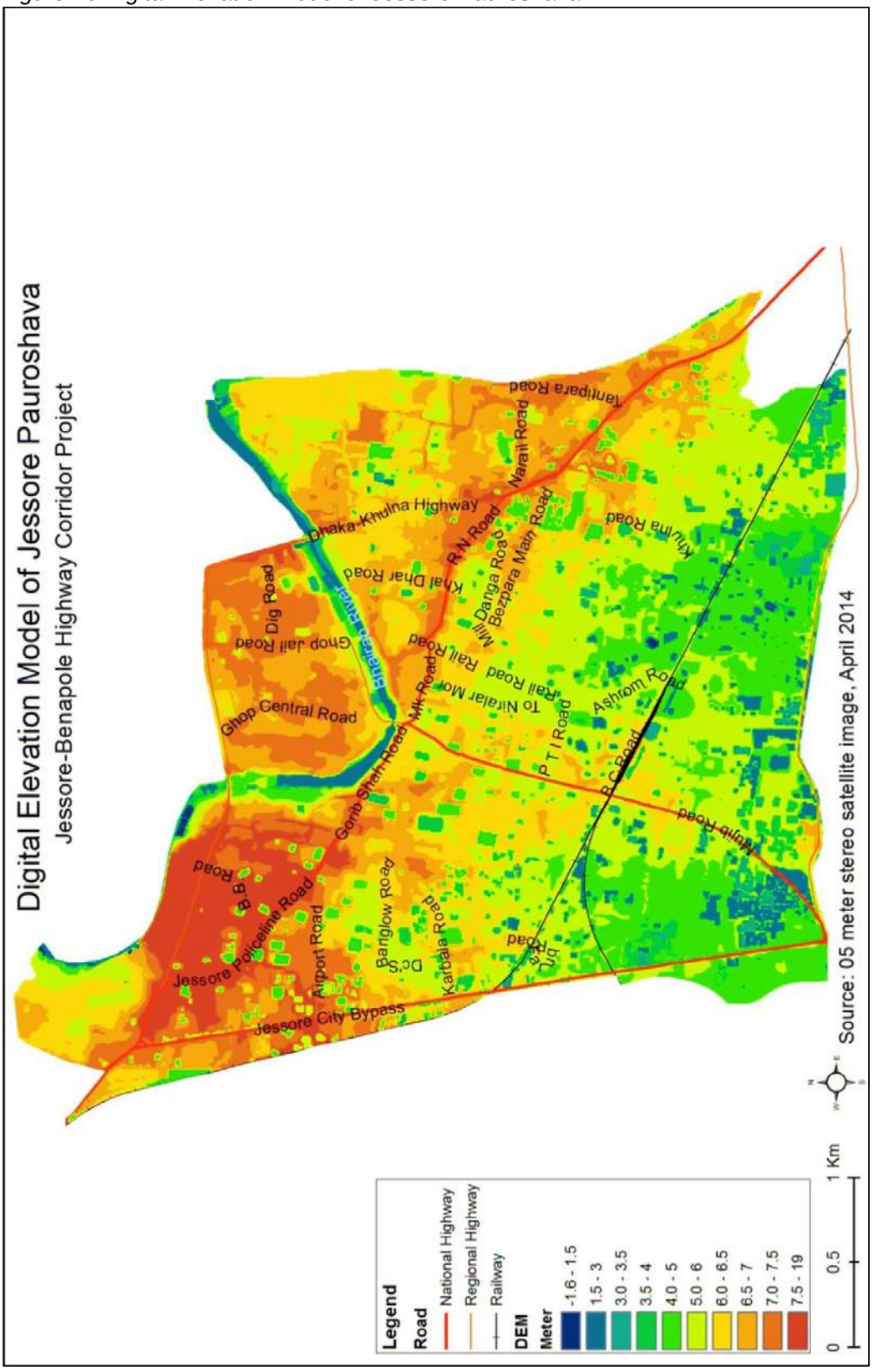


Figure 27 Contour Map of Jessore Pauroshava

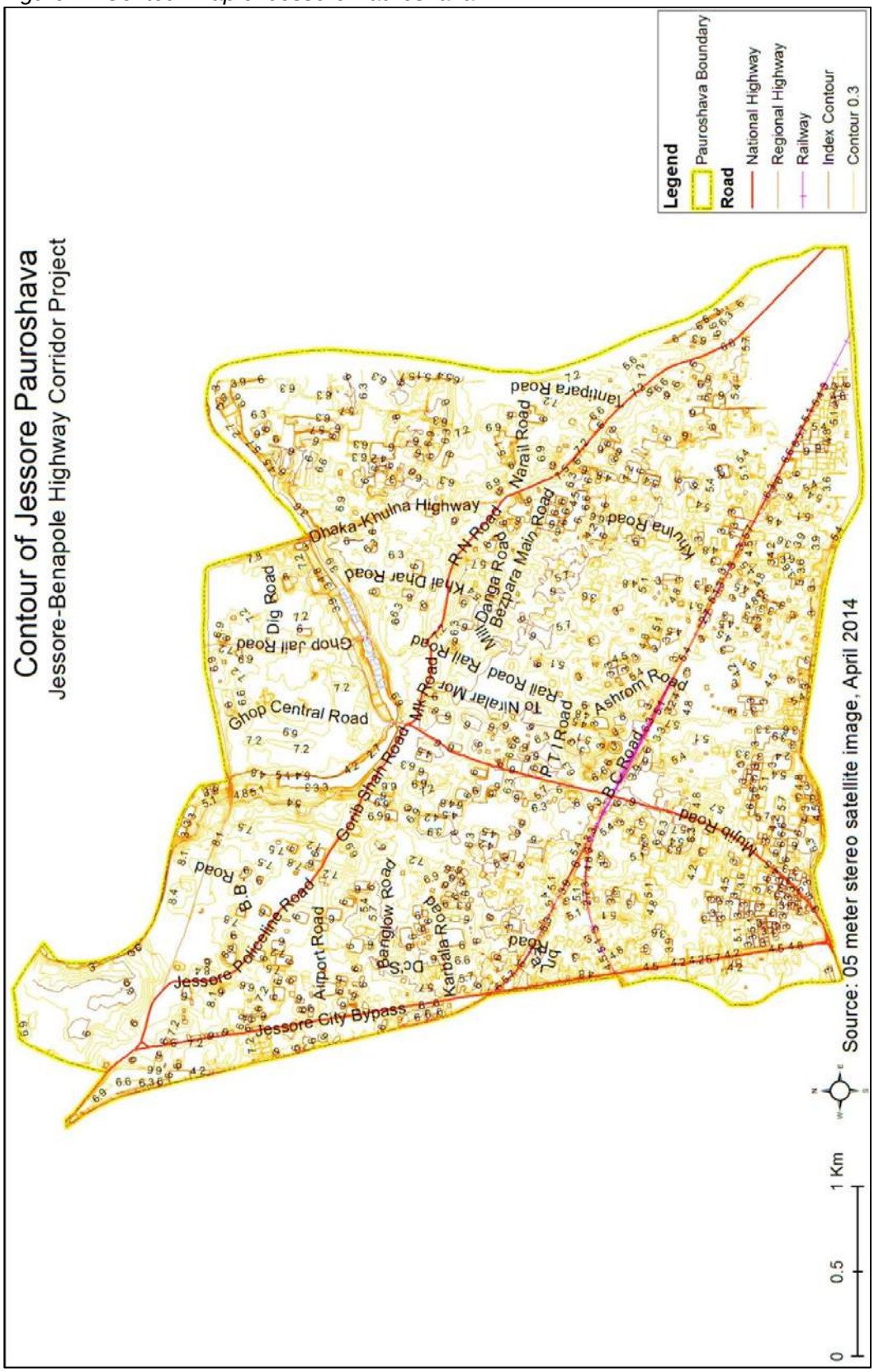


Figure 28 Digital Elevation Model of Jhikargachha Thana

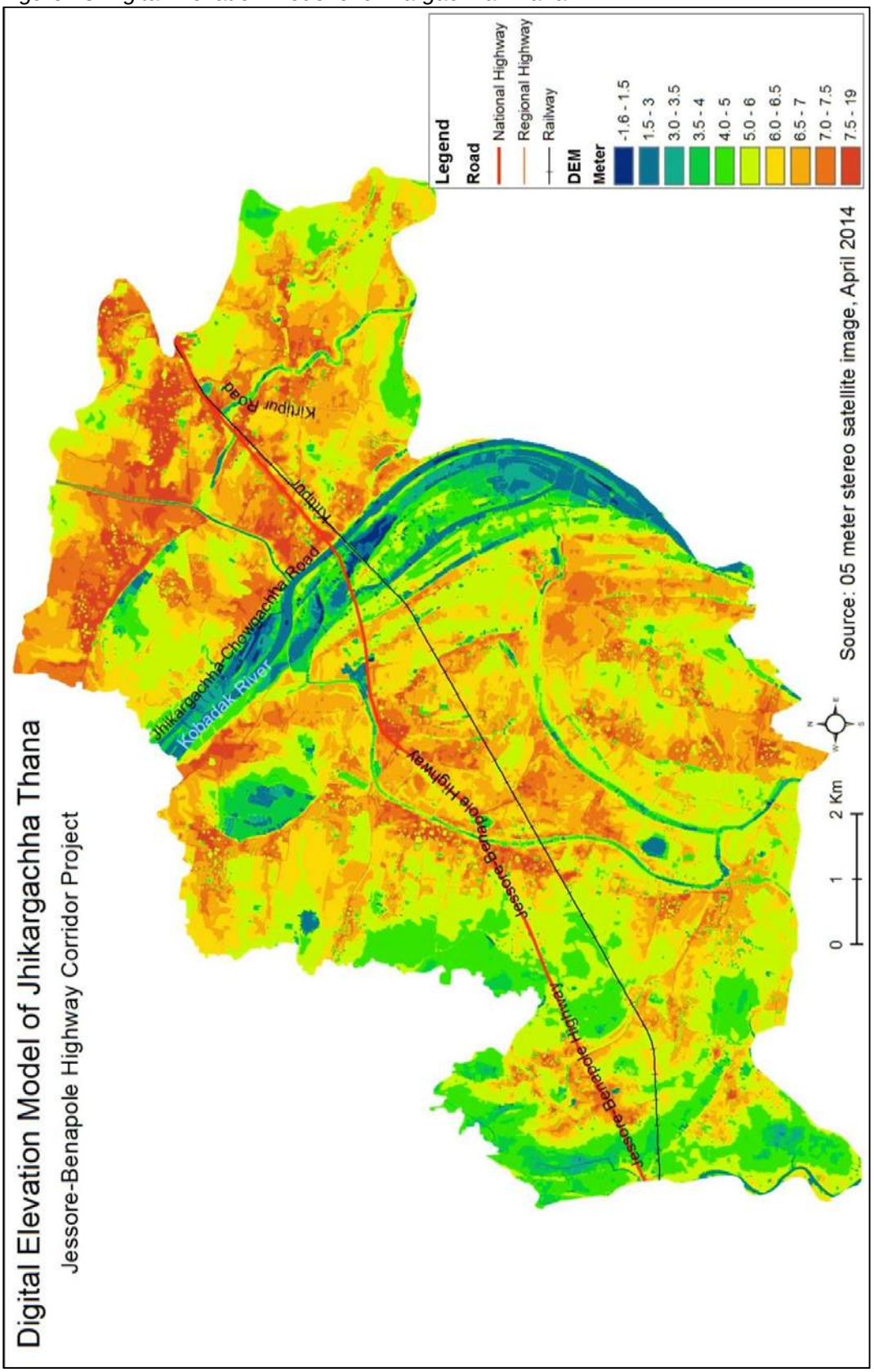


Figure 29 Digital Elevation Model of Jhikargachha Pauroshava

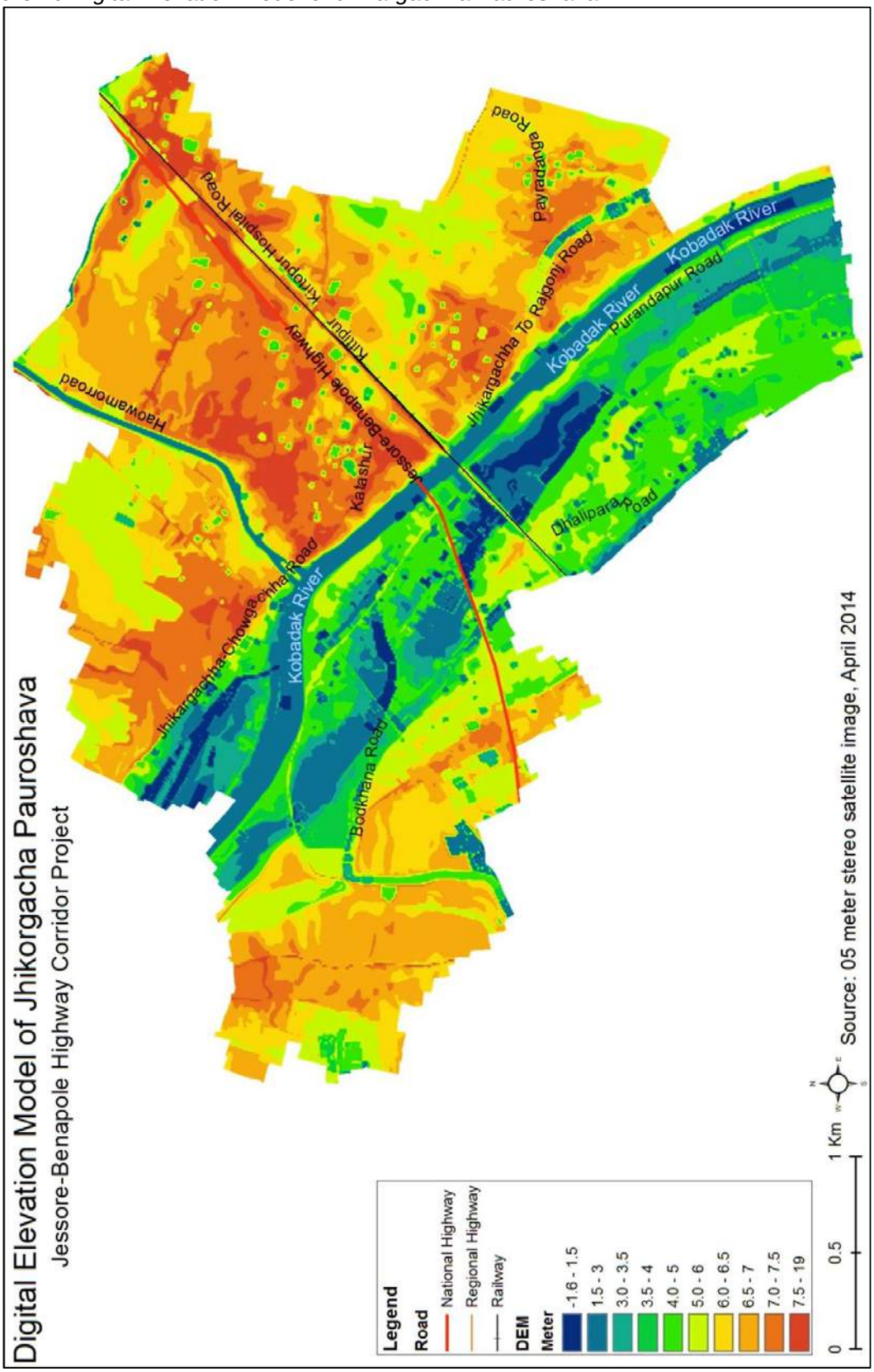


Figure 30 Contour Map of Jhikargachha Pauroshava

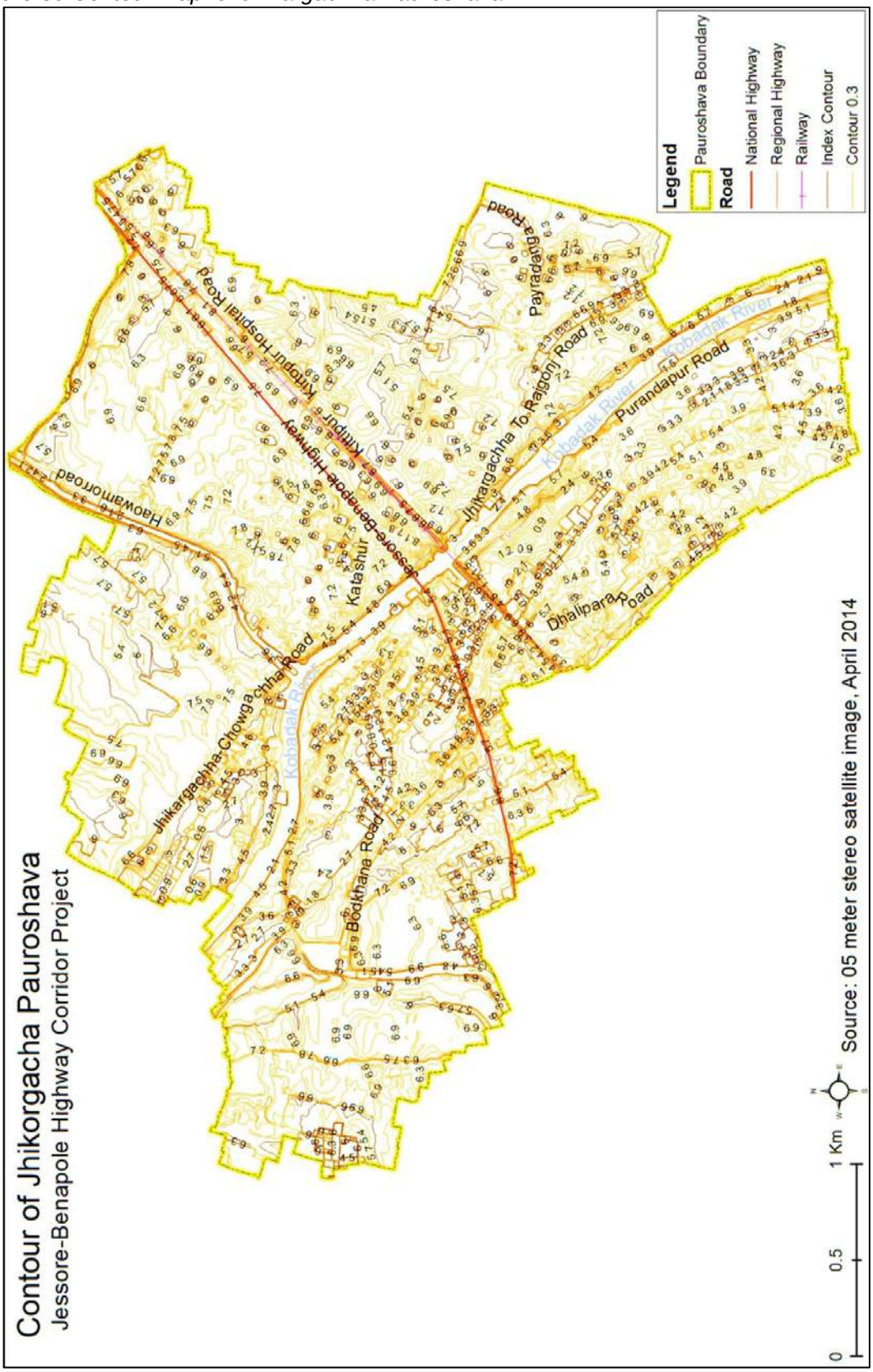


Figure 31 Digital Elevation Model of Sharsha Thana

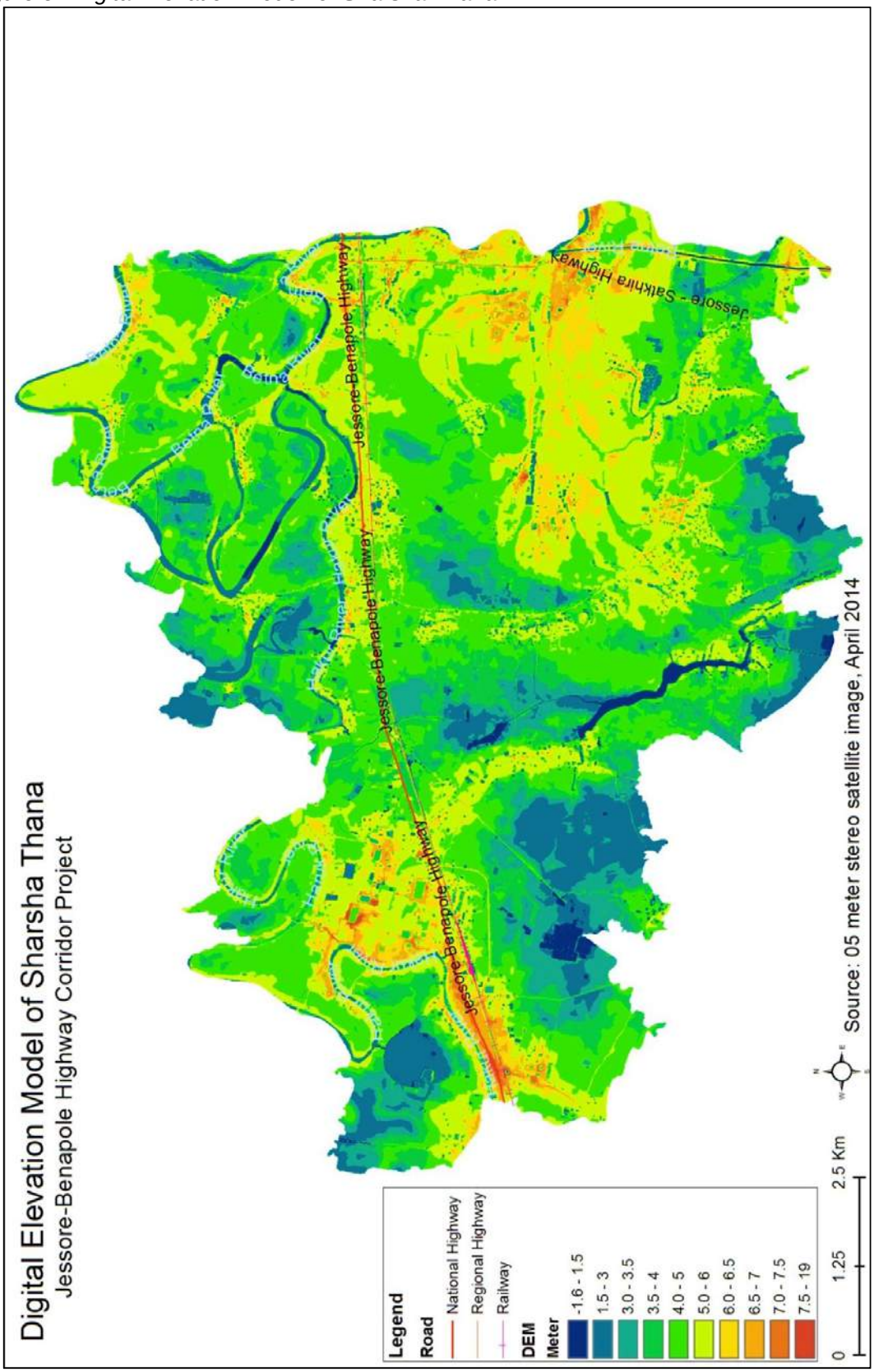


Figure 32 Digital Elevation Model of Benapole Pauroshava

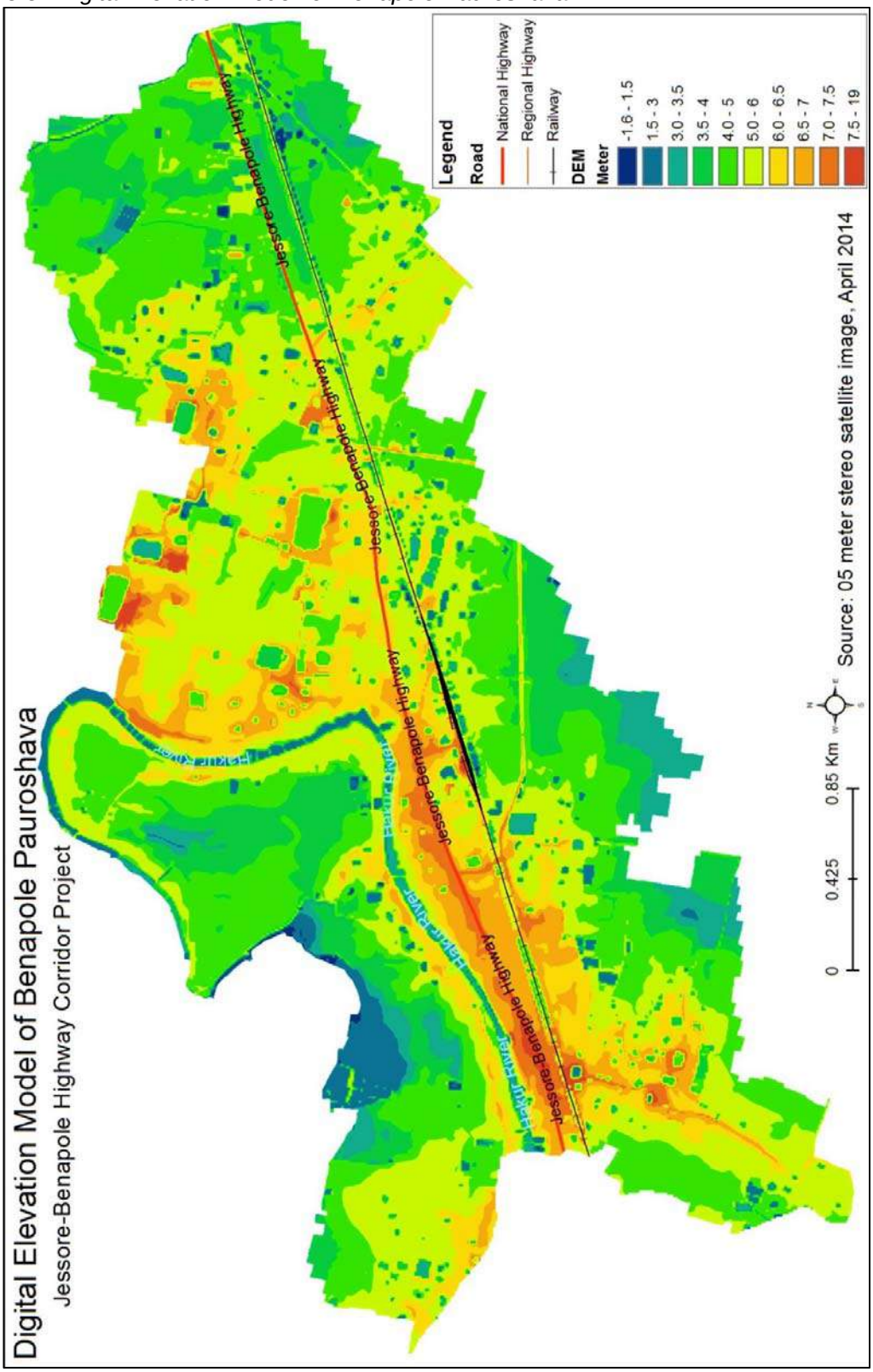
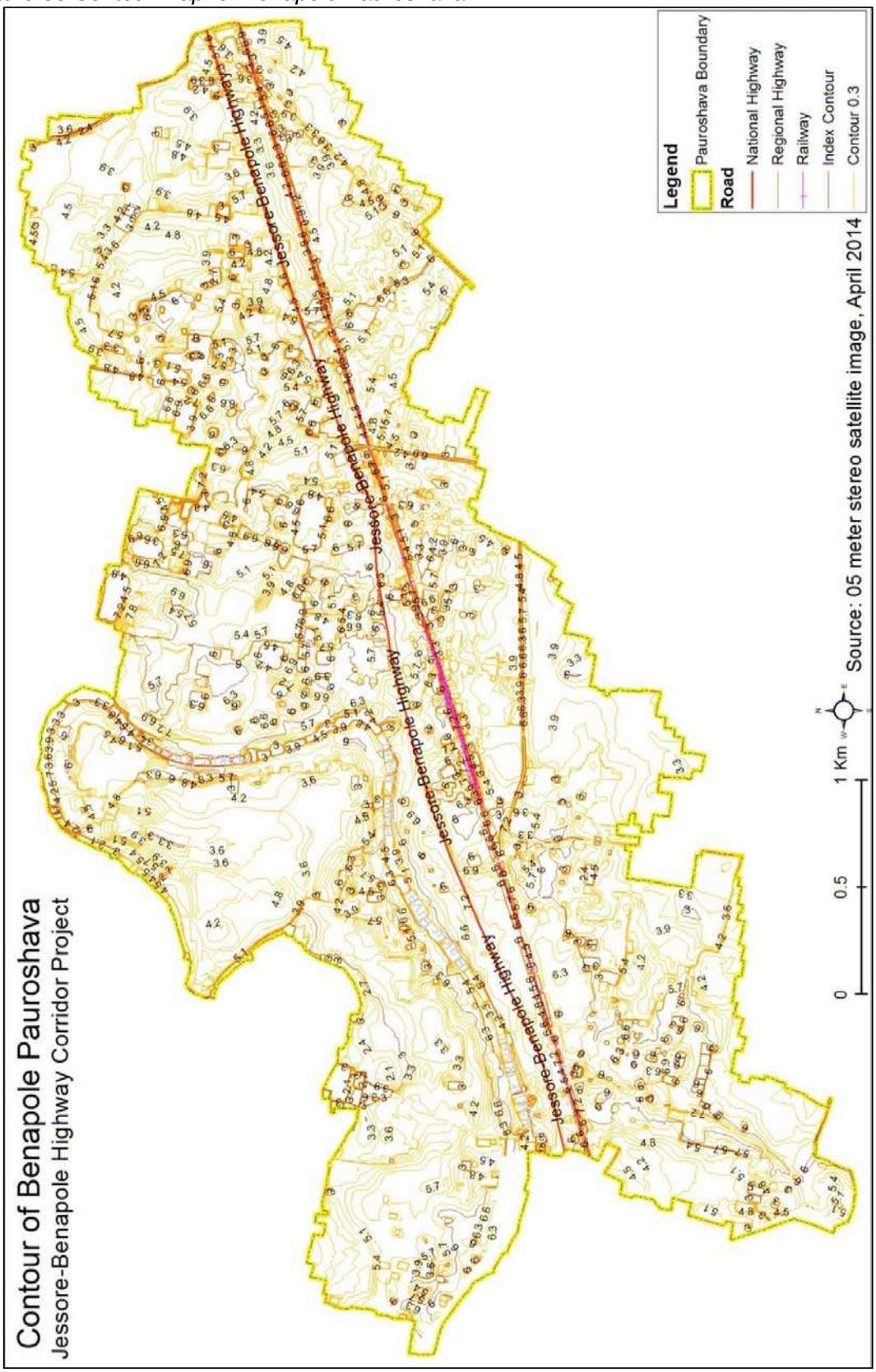


Figure 33 Contour Map of Benapole Pauroshava



2.5 Water Body and Water Control Structure

Bhairab, Kobadak, Mukteshari Betna and Hakur river are the main river in the project area. Total 7572 Acres of water body exist there which is 9.5 % of project area. We have not seen any tidal activity in these rivers. We have found more 463 cross dam on these river which is main cause for blocking the river water.

Bharibar river is also most dead with the project area. The river is full of trees. The same situation is also for the Kabadak and betan river but little better that bhairab river. There are several big baor/ bill still exist but the human invention is remarkable. Pechar bill at Benapole, Srirampur Baor in Jhikargacha is most affected by human intervention. Northerna side of Jessore City there is big lake which known as Jessore Boat Club Lake. These natural lakes, baoar, rivers is part of the natural drainage system which kept this region flood free for long time. But for human activity in the natural drainage system water logging seems very year.

Table 9 Statistics of Water body

TYPE	Total Number	Area (Acare)	%
Baor / Haor	30	807.91	10.67
Borrow Pits	3	1.91	0.03
Ditch	1436	415.71	5.49
Gheer (Fish Cultivation Only)	971	589.47	7.79
Irrigation Canal	5	3.14	0.04
Khal	71	394.44	5.21
Lake	22	67.23	0.89
Marsh Land	13	67.35	0.89
Pond	9865	3,677.12	48.57
River	5	1,547.26	20.44
Total	**12421**	**7,571.53**	**100**

Source: Topographic Survey Map 2015

Figure 34 Water Body of jessore Sadar Upazila

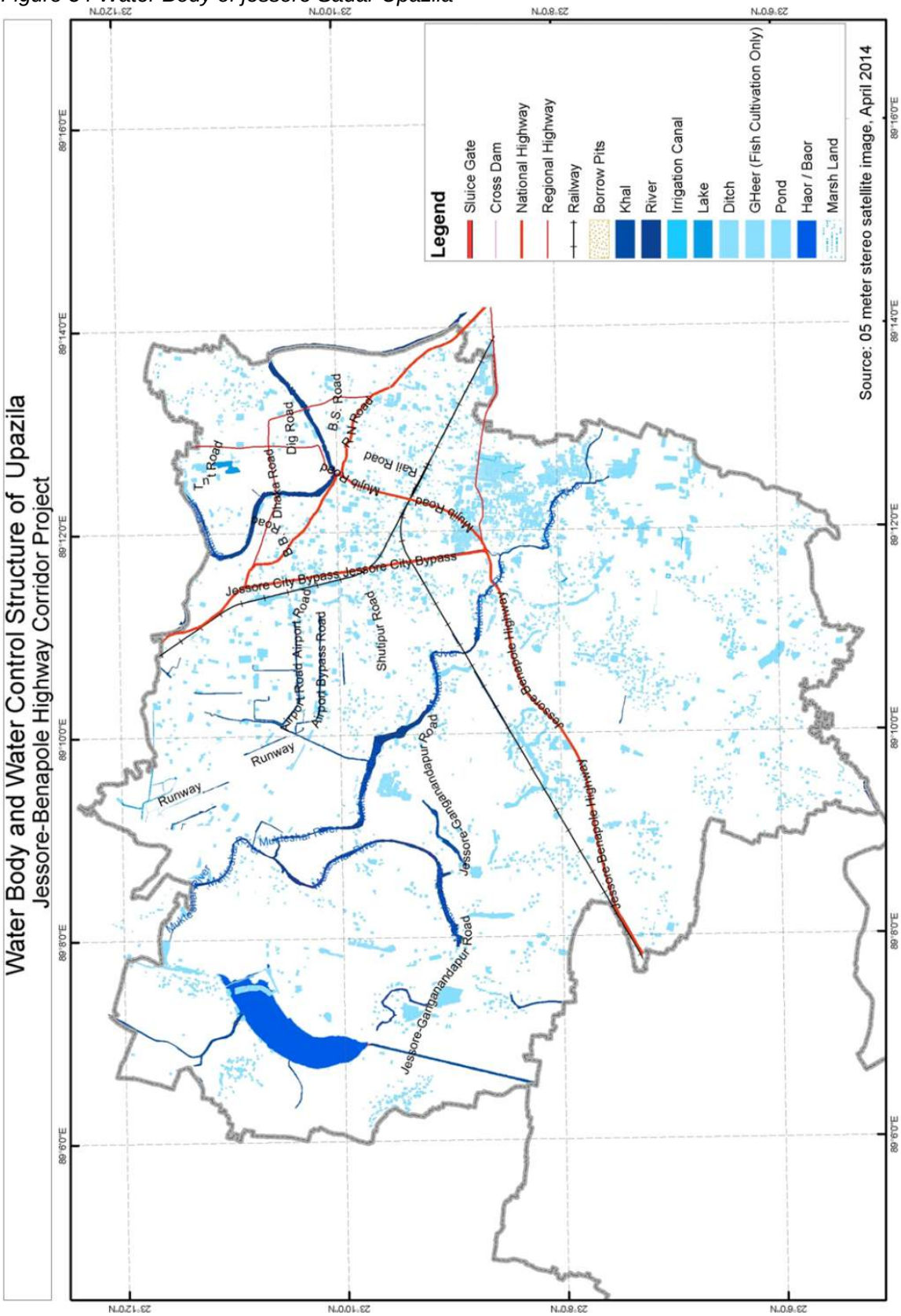


Figure 35 Water Body of Jhikargachha Upazila

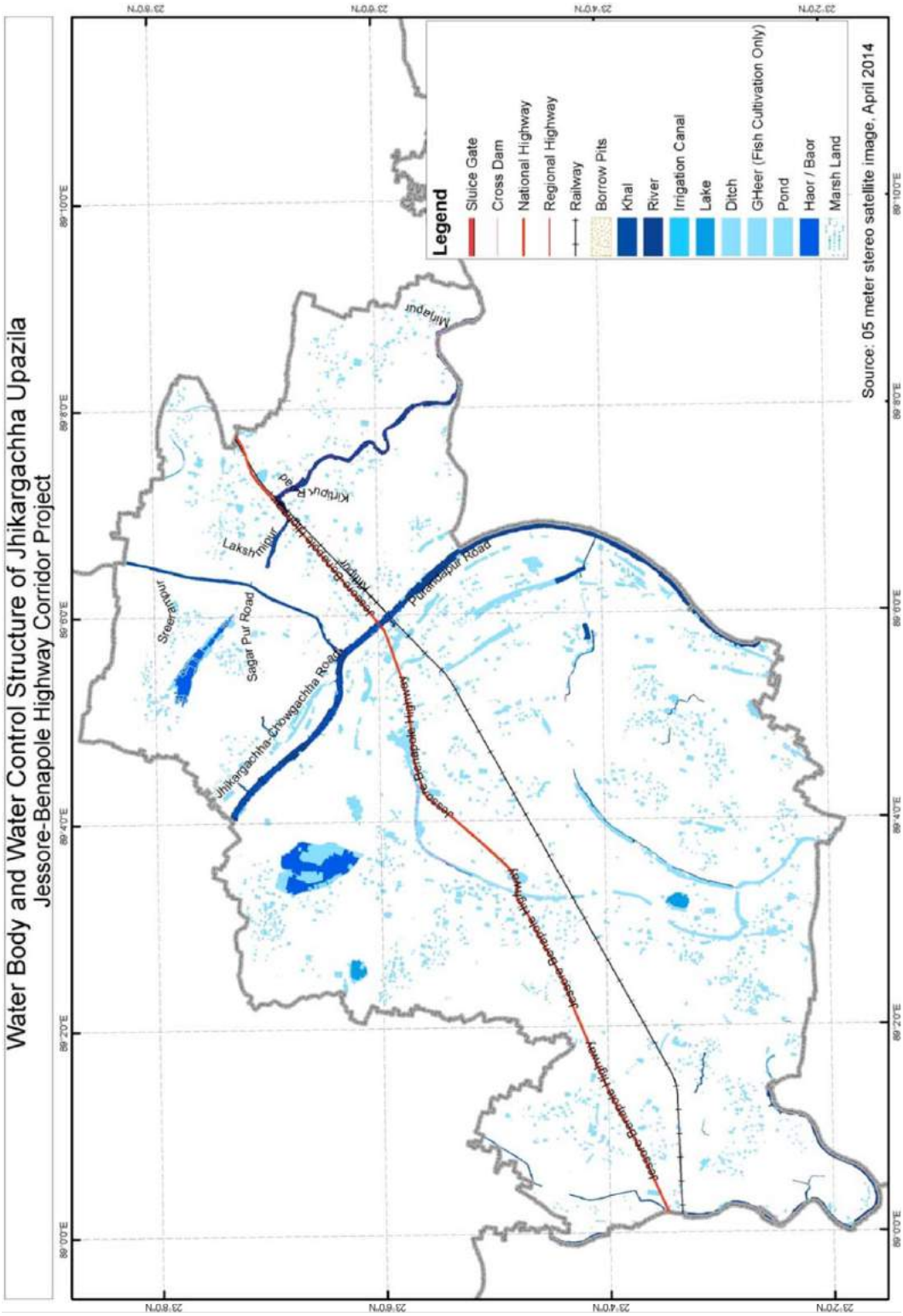
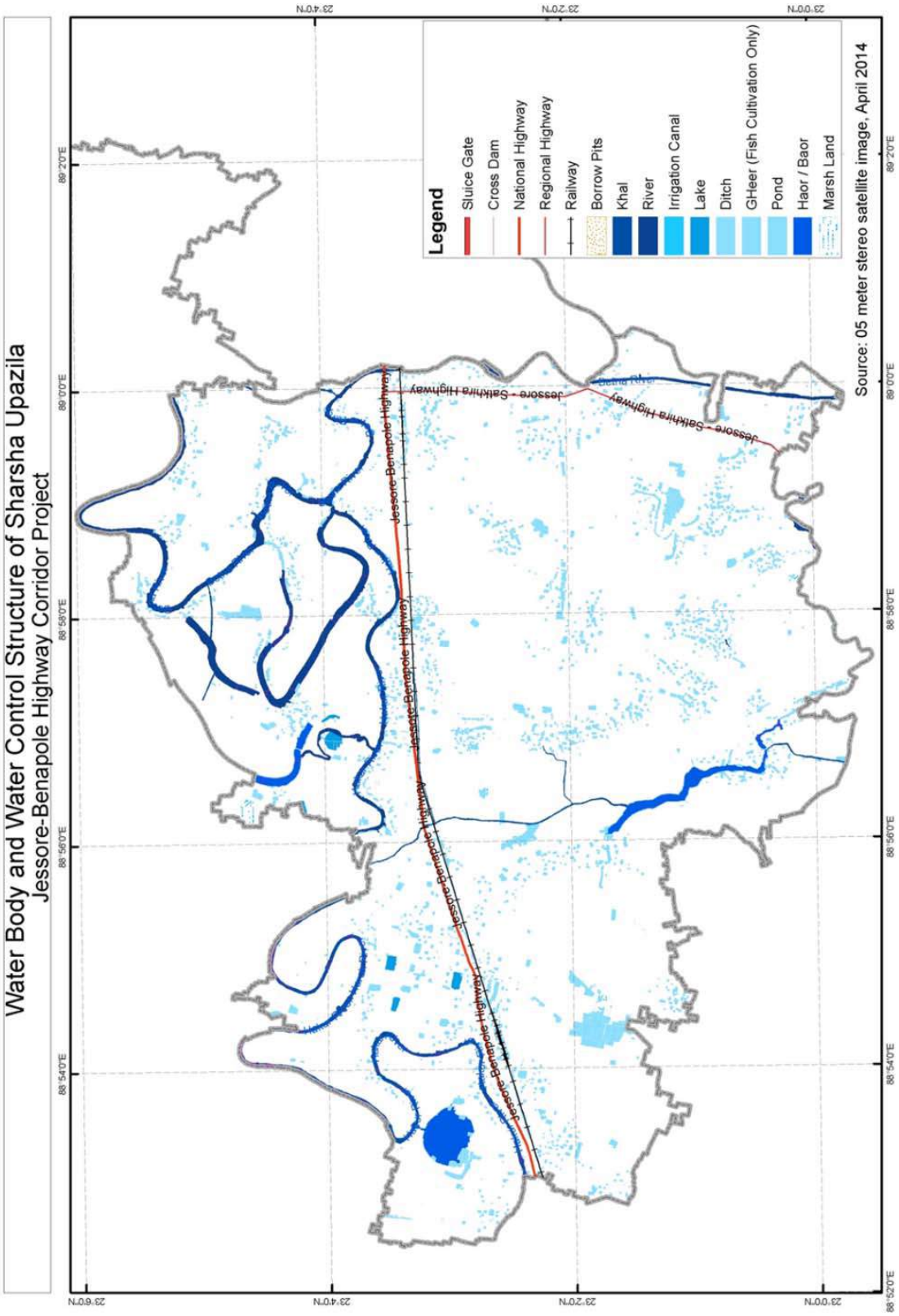
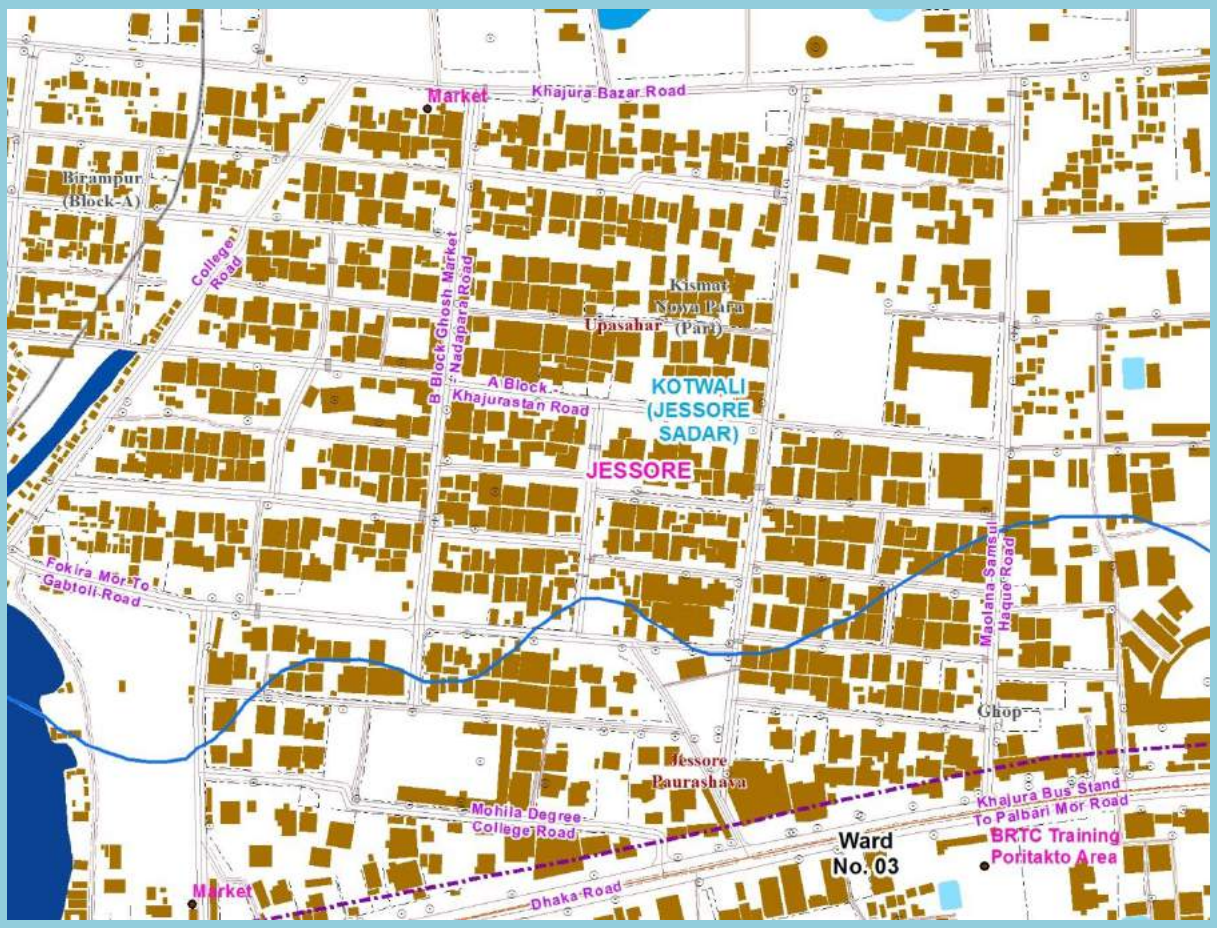


Figure 36 Water Body of Sharsha Upazila



Chapter 03

Socio Economic Survey and Study of Urban & Rural Economy and Social Infrastructure



CHAPTER 03

3 Socio Economic Survey and Study of Urban & Rural Economy and Social Infrastructure

3.1 Socio-Economic Survey

3.1.1 Introduction

Physical Plan aims to improve the living condition of the residents of the area for which such a plan has been prepared. In order to ascertain the felt needs, expectations and the level of prevailing services it is necessary to conduct socio-economic surveys. Socio-economic Survey provides the socio-economic profile of an area as well as attitudes/aspirations of the residents which help the planners to decide on the requirement of land for different uses as well as level of services that needs to be ensured and incorporated in the plan document. The TOR provides for survey households of the project area to get information on the following aspects:

- Demographic information: Age, sex, growth rate, household size, migration, etc.
- Religious Group: Religious status.
- Education Status : Primary, secondary, higher & others
- Occupation Pattern : Government, private, business, farming, labour and others
- Income Level : Lower, medium and higher (income range)
- Ownership Pattern: Land ownership information, type of dwelling houses etc.
- Land Value: Low land, ditch land, built-up & buildable land etc.
- Health Facilities: Type of facilities in hospital, private clinic and dispensary etc.
- Recreation facilities: Type of facilities (Active and Passive).

Data from both the secondary and primary sources are utilised to accomplish the specified objectives of the study.

3.1.2 Methodology

3.1.2.1 Preparation of Questionnaire

With a view to achieving the above aspects of information and fulfilling the objective, the broader methodology has been chosen to include reconnaissance survey, pre-testing of questionnaire and sampling of the questionnaire. In order to conduct the socio-economic survey a compact and extensive pre-coded structured questionnaire was prepared for all the groups and was approved by the authority. The questionnaire was pre-tested before actual

survey is carried out. Some additional information, other than the questionnaire was also incorporated in the study.

3.1.2.2 Sample Selection for Household Survey

We used stratified random sampling method for distributing the questionnaire. For sampling the questionnaire, ward wise total household in the Paurashavas & Unions was determined. A total 1036 sample of households were drawn and distributed proportionally among the ward. The survey teams was ascertained the extent of ward boundary before going to the field for interview.

In total 12 members of survey teams were deployed for conducting the questionnaire survey. For delivery and receipt of the questionnaires one Survey Manager was also appointed. The Team Leader along with the support members of the planning team kept vigilance on the entire socio-economic survey operation. The socio-economic survey team members were taken from the students of Jessore Science and Technology University. Before sending them to the field they were trained in the consultant office.

3.1.3 Household Sample Survey

Head of the households were chosen for interviewing the questionnaire. Table below shows the number of sample surveyed in the Ward of Jessore, Jhikargacha, Benapole Pourashava and 9 Unions of the study area. The collected data from questionnaire survey was checked, verified and edited to remove errors, omissions and inconsistencies. The edited data was coded before processing and tabulation.

Table 10: Sampling Distribution Of Questionnaire Survey

Area Name	%
Jessore Pauroshava	43.35
Jhikargachha Pauroshava	14.64
Benapole Pauroshava	15.41
Arabpur Union	2.12
Chanchra Union	4.24
Diara Union	1.93
Gadkhali Union	2.12
Jhikargachha Union	2.31
Nabharan Union	1.93
Panisara Union	1.93
Sharsha Union	3.85
Ulashi Union	2.31
Upashahar Union	3.85
Total	100.00

3.1.4 Findings of Scio Economic Survey in Tabular Format

Findings

In this section the output from the survey data is presented in different aspect regarding to socio-economic variables.

Types and Size of Household

This table is representing that, major portion of the people of this area are leading nuclear household (80.68%) who are living with their children and wives and usually migrants. The remaining 19.32 % are the leading joint household whom are mainly the permanent residents of this area since their birth. Arabpur, Chachara, Godkhali and Ulashi Union are dominants the joints family households and Benapole, Jessore pourashava and Upashore union shows the dominant nuclear types of households.

Table 11: Percentage Of Family Types In The Study Area

Union/Pourashava	Type of Family (%)		
	Single	Joint	Total
Arabpur	60.98	39.02	100.00
Benapole	96.30	3.70	100.00
Chanchara	62.86	37.14	100.00
Deraia	62.79	37.21	100.00
Godkhali	69.23	30.77	100.00
Jessore	85.08	14.92	100.00
Jichorgacha	80.00	20.00	100.00
Navaron	82.22	17.78	100.00
Panisara	77.78	22.22	100.00
Sharsha	81.48	18.52	100.00
Ulashi	71.43	28.57	100.00
Upshore	91.30	8.70	100.00
Total	**80.68**	**19.32**	**100.00**

Source: Field Survey, 2015

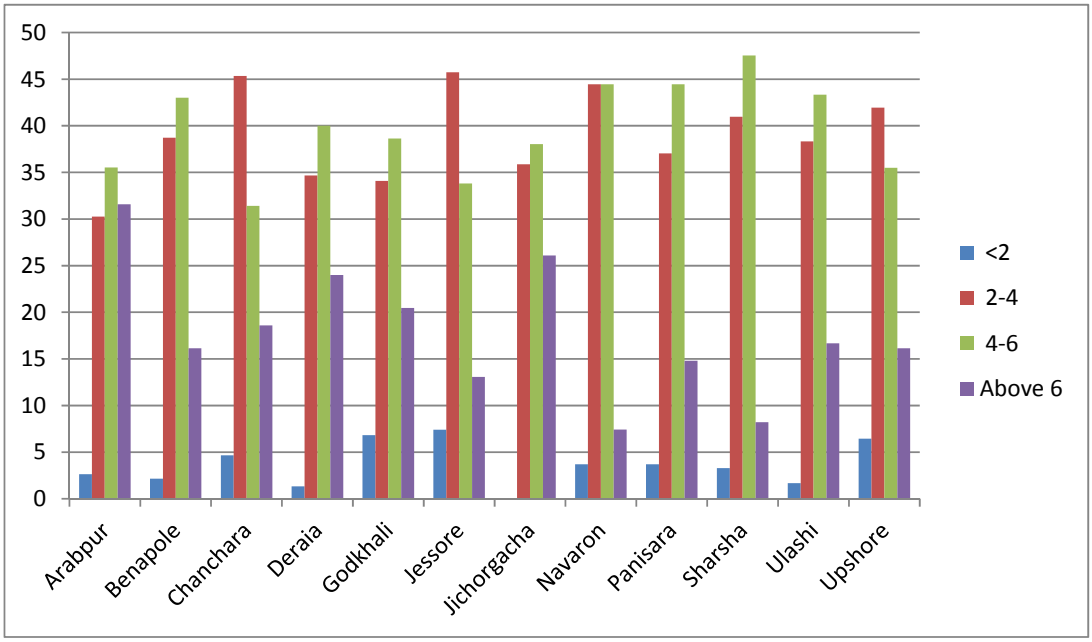
The bellow table reveals that, majority household belongs to 2 to 6 members representing near about 79 percent .Generally Due to joint family about 17.13 percent families found more than 6 household member s and Only 4.38 percent families found less than or equal to 2 household members.

Table 12: Percentage Of Household Size In The Study Area

Union/Pourashava	Number of Family Member				
	Bellow 2	2-4	4-6	Above 6	Total
Arabpur	2.63	30.26	35.53	31.58	100.00
Benapole	2.15	38.71	43.01	16.13	100.00
Chanchara	4.65	45.35	31.40	18.60	100.00
Deraia	1.33	34.67	40.00	24.00	100.00
Godkhali	6.82	34.09	38.64	20.45	100.00
Jessore	7.39	45.74	33.81	13.07	100.00
Jichorgacha	0.00	35.87	38.04	26.09	100.00
Navaron	3.70	44.44	44.44	7.41	100.00
Panisara	3.70	37.04	44.44	14.81	100.00
Sharsha	3.28	40.98	47.54	8.20	100.00
Ulashi	1.67	38.33	43.33	16.67	100.00
Upshore	6.45	41.94	35.48	16.13	100.00
Total	**4.38**	**40.72**	**37.77**	**17.13**	**100.00**

Source: Field Survey, 2015

Figure 37: Household Size In The Study Area



Housing Status

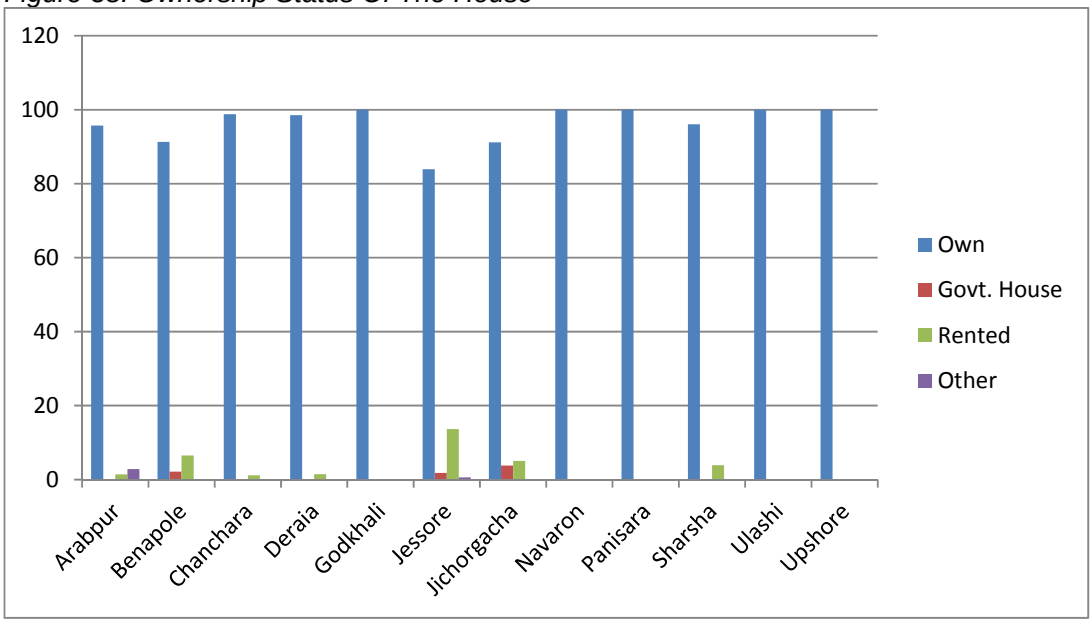
In the study area most of the households lives in own house and the percentage is about 92.38. The rental housing status is only 6.10 percent and mostly in the pourashava area.

Table 13: Ownership Status of The House

	Ownership of the House (%)				
	Own	Govt. House	Rented	Other	Total
Arabpur	95.71	0.00	1.43	2.86	100.00
Benapole	91.30	2.17	6.52	0.00	100.00
Chanchara	98.81	0.00	1.19	0.00	100.00
Deraia	98.53	0.00	1.47	0.00	100.00
Godkhali	100.00	0.00	0.00	0.00	100.00
Jessore	83.89	1.82	13.68	.61	100.00
Jichorgacha	91.14	3.80	5.06	0.00	100.00
Navaron	100.00	0.00	0.00	0.00	100.00
Panisara	100.00	0.00	0.00	0.00	100.00
Sharsha	96.08	0.00	3.92	0.00	100.00
Ulashi	100.00	0.00	0.00	0.00	100.00
Upshore	100.00	0.00	0.00	0.00	100.00
Total	**92.38**	**1.12**	**6.10**	**.41**	**100.00**

Source: Field Survey, 2015

Figure 38: Ownership Status Of The House



The bellow table shows that most of the households live in the single-stored house and it is about 39.49 percent and multi-stored structure of the households in about 19.84 percent. The

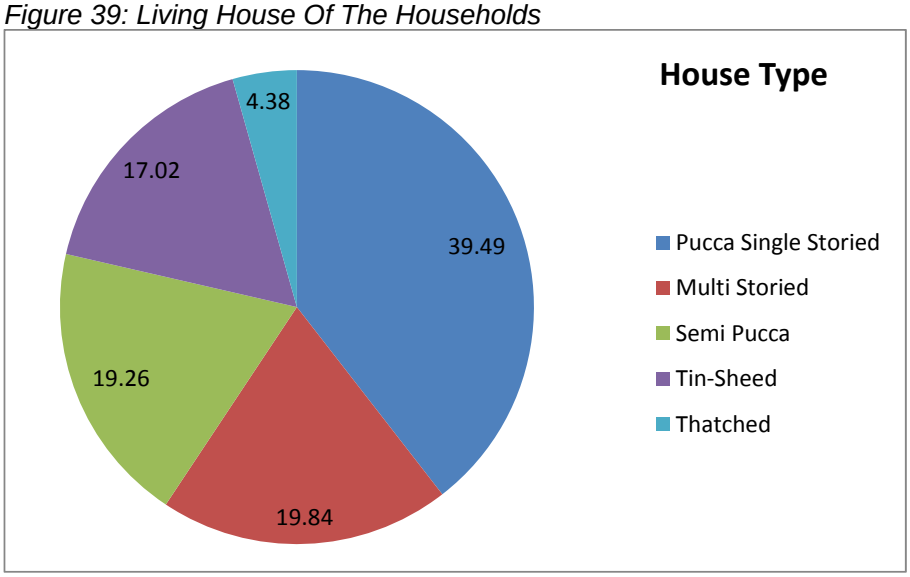
multi-stored buildings are greater in the Jessore (34.38%) and upashore (46.67%). The semi-pucca and tin-shed structure are small in number in the study area.

Table 14: Building Material of the Households

Union/Pourashava	Living House Type (%)					
	Single-Storied	Multi_Storied	Semi_Pucca	Tin-Shed	Thatched	Total
Arabpur	24.32	8.11	24.32	37.84	5.41	100.00
Benapole	61.29	22.58	7.53	8.60	0.00	100.00
Chanchara	23.68	2.63	36.84	32.89	3.95	100.00
Deraia	30.14	1.37	27.40	34.25	6.85	100.00
Godkhali	26.19	11.90	40.48	9.52	11.90	100.00
Jessore	42.98	34.38	14.90	7.16	.57	100.00
Jichorgacha	57.30	29.21	2.25	11.24	0.00	100.00
Navaron	24.07	5.56	33.33	29.63	7.41	100.00
Panisara	59.26	3.70	3.70	18.52	14.81	100.00
Sharsha	42.62	3.28	29.51	13.11	11.48	100.00
Ulashi	28.33	5.00	21.67	26.67	18.33	100.00
Upshore	23.33	46.67	13.33	16.67	0.00	100.00
Total	**39.49**	**19.84**	**19.26**	**17.02**	**4.38**	**100.00**

Source: Field Survey, 2015

Figure 39: Living House Of The Households



Residence Status

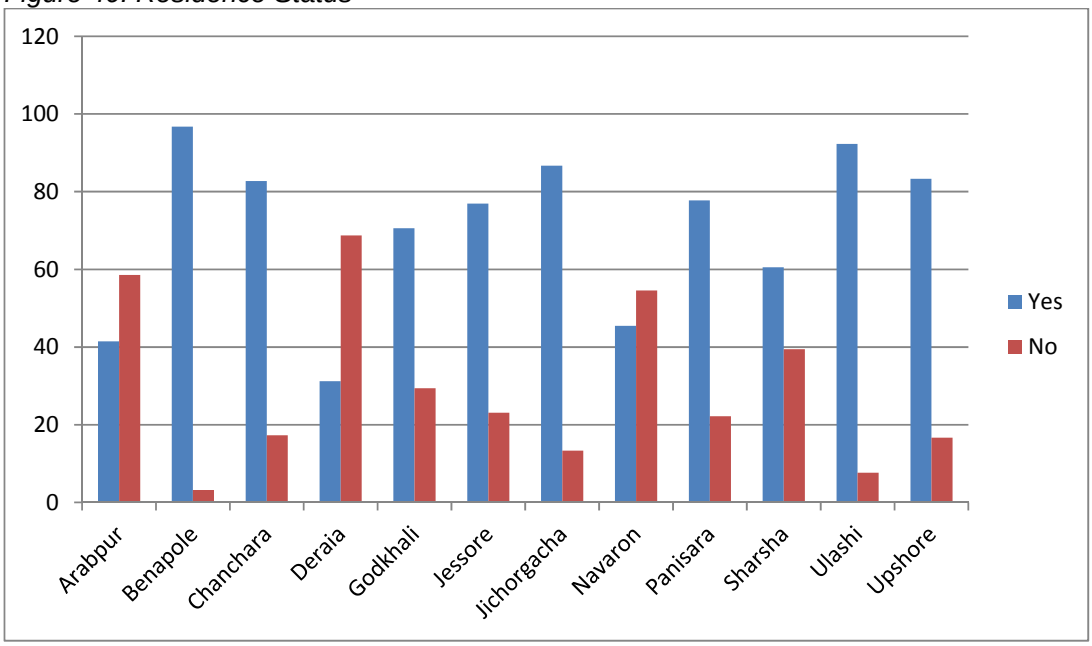
Table is representing the status of permanent residence of study area. Here 75.37 percent people are the permanent residence and only 24.63 percent are migrated residences.

Table 15: Residence Status

Union/Pourashava	Permanent Resident In Union (%)		
	Yes	No	Total
Arabpur	41.46	58.54	100.00
Benapole	96.77	3.23	100.00
Chanchara	82.72	17.28	100.00
Deraia	31.25	68.75	100.00
Godkhali	70.59	29.41	100.00
Jessore	76.90	23.10	100.00
Jichorgacha	86.67	13.33	100.00
Navaron	45.45	54.55	100.00
Panisara	77.78	22.22	100.00
Sharsha	60.53	39.47	100.00
Ulashi	92.31	7.69	100.00
Upshore	83.33	16.67	100.00
Total	75.37	24.63	100.00

Source: Field Survey, 2015

Figure 40: Residence Status



Migration Pattern

Out of 1053 household only 78 households are migrated in this study area for various reasons. Majority migration occurs in the Jessore pourashavas about 36 households and services, business are prominent factor for migration. In the study area there are some households which are migrated for more than one reason. In Navaron, Jessore and Benapole this kind of reasons are noticed.

Bellow the table shows the reasons for coming in this study area regarding to pourashavas/union and reasons.

Table 166: Reason for Migration (Incoming) in the Study Area

Union/Pourashava	Business/Commerce	Better Education	Attracted by facility of urban life	Long-term Treatment	Security Reasons	Service/Transfer	Others Reasons	Total
	Count	Count	Count	Count	Count	Count	Count	Count
Arabpur	6	0	0	0	0	1	2	9
Benapole	0	1	0	0	0	2	1	3
Chanchara	0	0	0	0	0	5	0	5
Deraia	2	0	0	0	0	0	0	2
Godkhali	0	0	0	0	0	0	4	4
Jessore	14	5	0	0	0	21	3	36
Jichorgacha	0	0	0	0	0	1	0	1
Navaron	1	0	0	0	0	1	1	1
Panisara	0	0	0	0	0	0	1	1
Sharsha	0	0	0	0	0	0	3	3
Ulashi	0	0	0	0	0	1	9	10
Upshore	0	0	0	0	0	1	2	3
Total	23	6	0	0	0	33	26	78

Source: Field Survey 2015

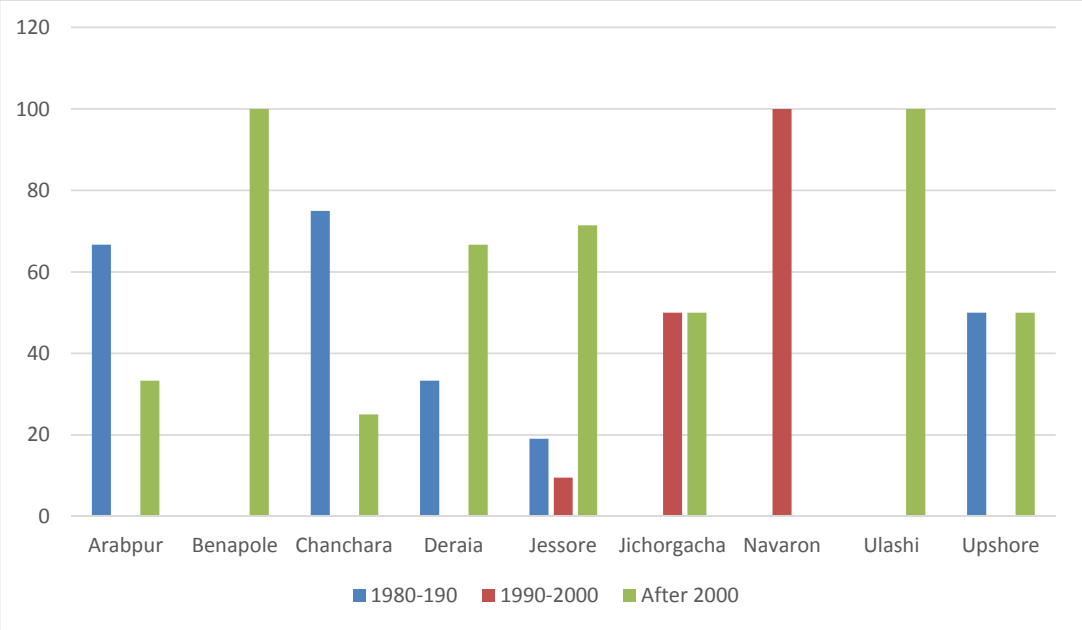
About 65.57 percent of the migrant among the 24.63 % migrant population came in the study area after 2000. Remaining 34.43 percent of the migrant came during 1980 to 2000.

Table 177: Migration Status Of The Households In The Study Area

Union/Pourashava	Year of Migration (%)			
	1980-1990	1990-2000	After 2000	Total
Arabpur	66.67	0.00	33.33	100.00
Benapole	0.00	0.00	100.00	100.00
Chanchara	75.00	0.00	25.00	100.00
Deraia	33.33	0.00	66.67	100.00
Jessore	19.05	9.52	71.43	100.00
Jichorgacha	0.00	50.00	50.00	100.00
Navaron	0.00	100.00	0.00	100.00
Ulashi	0.00	0.00	100.00	100.00
Upshore	50.00	0.00	50.00	100.00
Total	24.59	9.84	65.57	100.00

Source: Field Survey, 2015

Figure 41: Migration Status Of The Households In The Study Area.



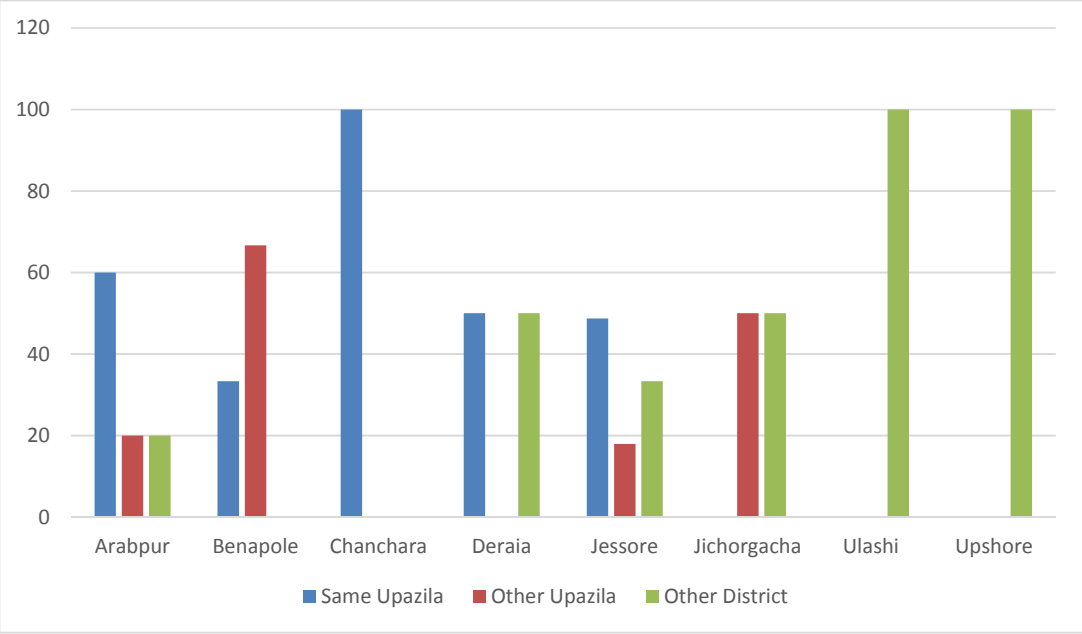
From the table below it shows that among the migrant which is 24.63% of the total population the majority migrant came from the same upazila (45.45%) and migration from other district is (34.55%).

Table 18: Origin Of Migration Of The Households

Union/Pourashava	Migration From (%)			
	Same Upazila	Other Upazila	Other District	Total
Arabpur	60.00	20.00	20.00	100.00
Benapole	33.33	66.67	0.00	100.00
Chanchara	100.00	0.00	0.00	100.00
Deraia	50.00	0.00	50.00	100.00
Jessore	48.72	17.95	33.33	100.00
Jichorgacha	0.00	50.00	50.00	100.00
Ulashi	0.00	0.00	100.00	100.00
Upshore	0.00	0.00	100.00	100.00
Total	**45.45**	**20.00**	**34.55**	**100.00**

Source: Field Survey, 2015

Figure 42: Origin Of Migration Of The Households



Bellow the table shows the reasons for coming in this study area regarding to pourashavas/union and reasons. Majority migration occurs in the Jessore pourashavas (83.7%) and services, business are prominent factor. On the other hand services are the major reasons for migration and it is about 34.9 percent.

Table 19: Reasons For Coming In The Study Area

Pourashava/Union		Service/Transfer	Better Education	Business/Commerce	Home Town (Living since birth)	Others Reasons	Total_Pourashava/Union wise
Benapole	% within Benapole	50.00%	25.00%	0.00%	0.00%	25.00%	
	% of Total	4.70%	2.30%	0.00%	0.00%	2.30%	9.30%
Jessore	% within Jessore	30.60%	11.10%	27.80%	22.20%	8.30%	
	% of Total	25.60%	9.30%	23.30%	18.60%	7.00%	83.70%
Jichorgacha	% within Jichorgacha	100.00%	0.00%	0.00%	0.00%	0.00%	
	% of Total	2.30%	0.00%	0.00%	0.00%	0.00%	2.30%
Upshore	% within Upashore	50.00%	0.00%	0.00%	50.00%	0.00%	
	% of Total	2.30%	0.00%	0.00%	2.30%	0.00%	4.70%
Total_Reasons wise	% of Total	34.90%	11.60%	23.30%	20.90%	9.30%	100.00 %

Source: Field Survey, 2015

Religious Status

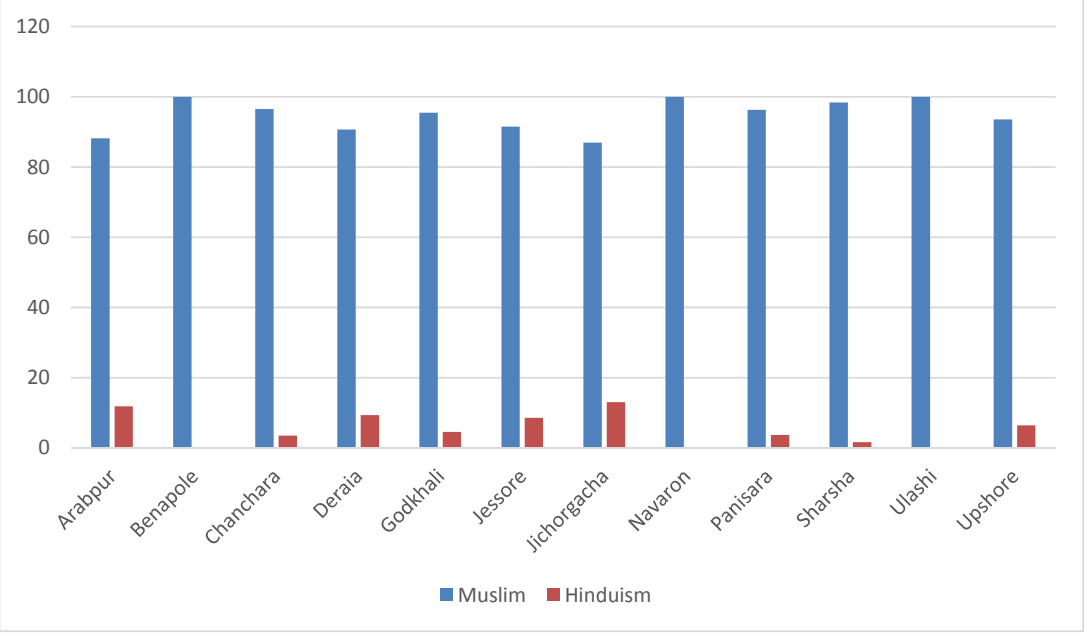
In the study area most of the people are Muslims about 93.63 percent and lest are Hinduism (6.37%). Generally in the unions are mostly Muslims dominant in this study area.

Table 20: Religion Of The Households

Pourashava/Union	Religion of the Households (%)		
	Muslim	Hinduism	Total
Arabpur	88.16	11.84	100.00
Benapole	100.00	0.00	100.00
Chanchara	96.51	3.49	100.00
Deraia	90.67	9.33	100.00
Godkhali	95.45	4.55	100.00
Jessore	91.48	8.52	100.00
Jichorgacha	86.96	13.04	100.00
Navaron	100.00	0.00	100.00
Panisara	96.30	3.70	100.00
Sharsha	98.36	1.64	100.00
Ulashi	100.00	0.00	100.00
Upshore	93.55	6.45	100.00
Total	**93.63**	**6.37**	**100.00**

Source: Field Survey, 2015

Figure 43: Religion of the Households



Educational status of the household head

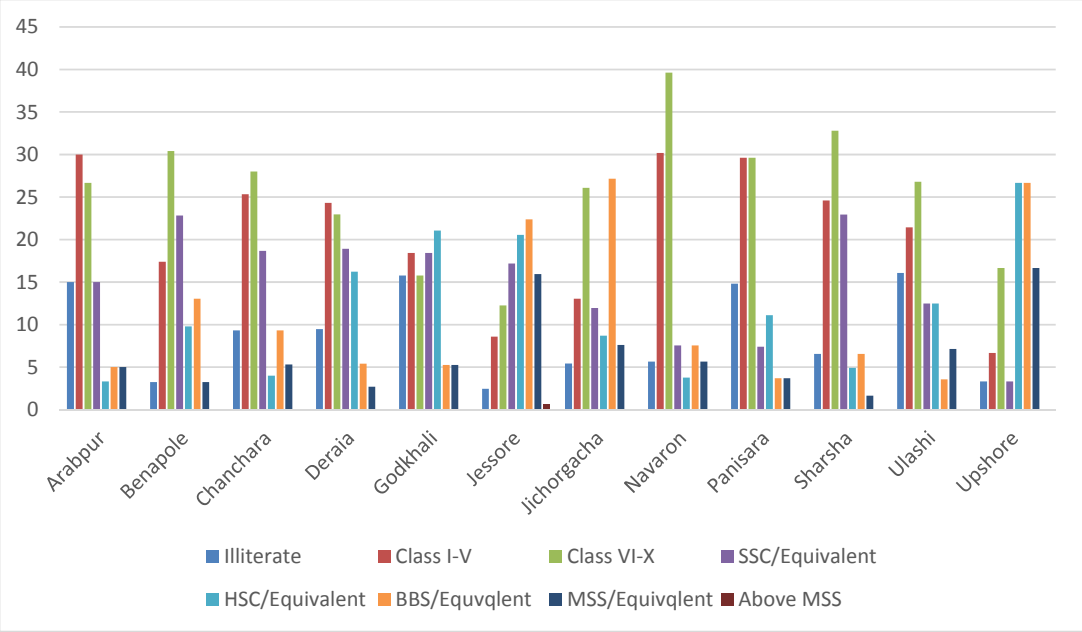
In the project area it is found that 69.51 percent household head have attained education level ranging from primary level to higher certificate level. Out of the total sample 23.78 percent have higher or more education. Only 6.71 percent of the total sample does not have any education.

Table 21: Education Of The Households Head

Pourashava/ Union	Education of the Households Head (%)								
Pourashava/ Union	Illiterate	Class I-V	Class VI-X	SSC/Equivalent	HSC/Equivalent	BBS/Equvqlent	MSS/Equivqlent	Above MSS	Total
Arabpur	15.00	30.00	26.67	15.00	3.33	5.00	5.00	0.00	100.00
Benapole	3.26	17.39	30.43	22.83	9.78	13.04	3.26	0.00	100.00
Chanchara	9.33	25.33	28.00	18.67	4.00	9.33	5.33	0.00	100.00
Deraia	9.46	24.32	22.97	18.92	16.22	5.41	2.70	0.00	100.00
Godkhali	15.79	18.42	15.79	18.42	21.05	5.26	5.26	0.00	100.00
Jessore	2.45	8.59	12.27	17.18	20.55	22.39	15.95	.61	100.00
Jichorgacha	5.43	13.04	26.09	11.96	8.70	27.17	7.61	0.00	100.00
Navaron	5.66	30.19	39.62	7.55	3.77	7.55	5.66	0.00	100.00
Panisara	14.81	29.63	29.63	7.41	11.11	3.70	3.70	0.00	100.00
Sharsha	6.56	24.59	32.79	22.95	4.92	6.56	1.64	0.00	100.00
Ulashi	16.07	21.43	26.79	12.50	12.50	3.57	7.14	0.00	100.00
Upshore	3.33	6.67	16.67	3.33	26.67	26.67	16.67	0.00	100.00
Total	6.71	17.38	22.46	16.26	13.41	14.74	8.84	.20	100.00

Source: Field Survey, 2015

Figure 44: Education of the Households head



Main Occupation of the Household Head

In the study area small business are prominent (39.32%) and govt. employee are also remarkable in the sample size which is about 11.22 percent. Skilled and unskilled job, handicraft, rickshaw/van puller are small in number to the study area according to the sample size.

Table 22: Occupation Of The Households Head

	Pourashava/Union												
Main Occupation	Arabpur	Benapole	Chanchara	Deraia	Godkhali	Jessore	Jichorgacha	Navaron	Panisara	Sharsha	Ulashi	Upshore	**Total**
Govt. Office	4.55	5.49	1.16	0.00	2.27	9.28	0.00	1.85	0.00	1.64	1.72	0.00	**4.37**
other Govt. Employee	1.52	16.48	1.16	0.00	6.82	6.89	10.99	1.85	11.11	3.28	15.52	3.33	**6.85**
Teaching	0.00	2.20	5.81	1.54	0.00	3.29	10.99	1.85	11.11	1.64	3.45	3.33	**3.67**
Farming/Agriculture	12.12	9.89	26.74	33.85	36.36	.90	1.10	29.63	25.93	24.59	36.21	0.00	**14.00**
Housewife	1.52	4.40	1.16	0.00	6.82	5.09	4.40	0.00	0.00	1.64	3.45	16.67	**3.77**
Large Business	1.52	6.59	2.33	9.23	2.27	5.69	5.49	3.70	0.00	3.28	0.00	3.33	**4.47**
Small Business	43.94	31.87	41.86	33.85	31.82	44.01	36.26	42.59	22.22	44.26	27.59	46.67	**39.32**
Private Service	4.55	10.99	9.30	9.23	4.55	13.17	5.49	3.70	3.70	8.20	3.45	6.67	**8.94**
Handicrafts	3.03	0.00	0.00	0.00	0.00	.60	0.00	0.00	3.70	0.00	0.00	0.00	**.50**
Skilled Laour	22.73	1.10	6.98	4.62	0.00	.90	3.30	7.41	3.70	1.64	6.90	3.33	**4.17**
Unskiled Labour	0.00	1.10	0.00	0.00	0.00	.60	1.10	0.00	0.00	1.64	0.00	3.33	**.60**
Rickshaw/Van pullar/Driver	1.52	5.49	1.16	1.54	6.82	1.50	6.59	5.56	18.52	3.28	0.00	3.33	**3.28**
Hawker/Vendor	0.00	1.10	0.00	0.00	0.00	.30	0.00	0.00	0.00	0.00	0.00	0.00	**.20**
Student	0.00	0.00	0.00	0.00	0.00	.30	0.00	0.00	0.00	0.00	0.00	0.00	**.10**
Employed Retired	3.03	3.30	2.33	6.15	2.27	7.49	14.29	1.85	0.00	4.92	1.72	10.00	**5.76**
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	**100.00**

Source: Field Survey, 2015

Sex of the Households Head

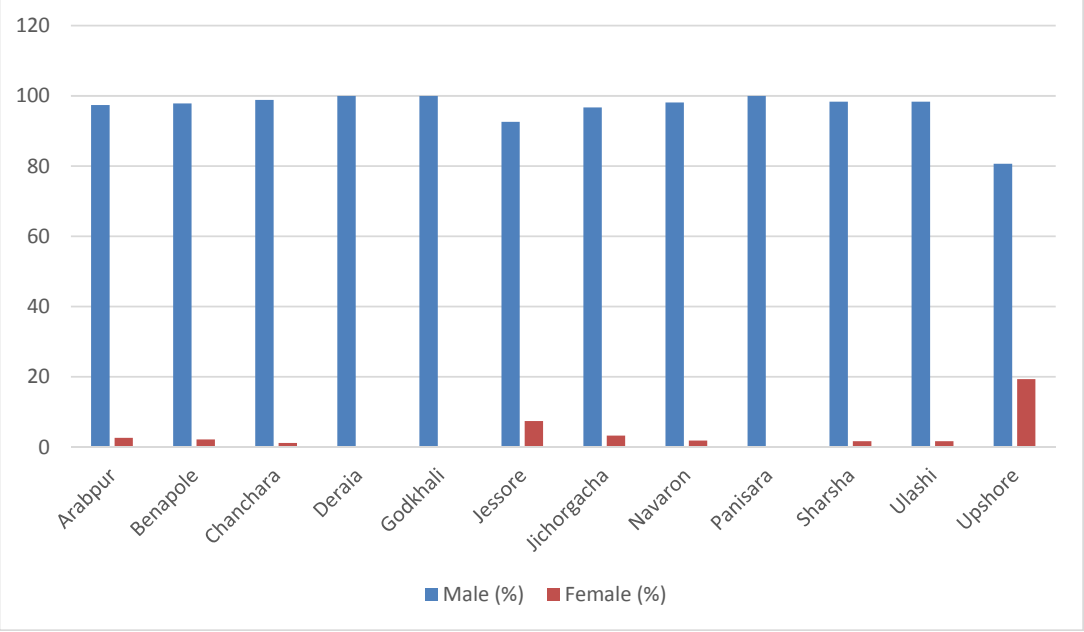
The table shows the sex of the households in the study area. Most of the area is headed by male and it is about 95.92 percent, rest of the household is headed by female (4.08) to the sample size.

Table 23: Sex of the Households Head

Pourashava/Union	Sex of the Households Head		
	Male (%)	Female (%)	Total (%)
Arabpur	97.37	2.63	100.00
Benapole	97.85	2.15	100.00
Chanchara	98.84	1.16	100.00
Deraia	100.00	0.00	100.00
Godkhali	100.00	0.00	100.00
Jessore	92.63	7.37	100.00
Jichorgacha	96.74	3.26	100.00
Navaron	98.15	1.85	100.00
Panisara	100.00	0.00	100.00
Sharsha	98.36	1.64	100.00
Ulashi	98.36	1.64	100.00
Upshore	80.65	19.35	100.00
Total (%)	**95.92**	**4.08**	**100.00**

Source: Field Survey, 2015

Figure 45: Sex Of The Households Head



Monthly Income of the Households

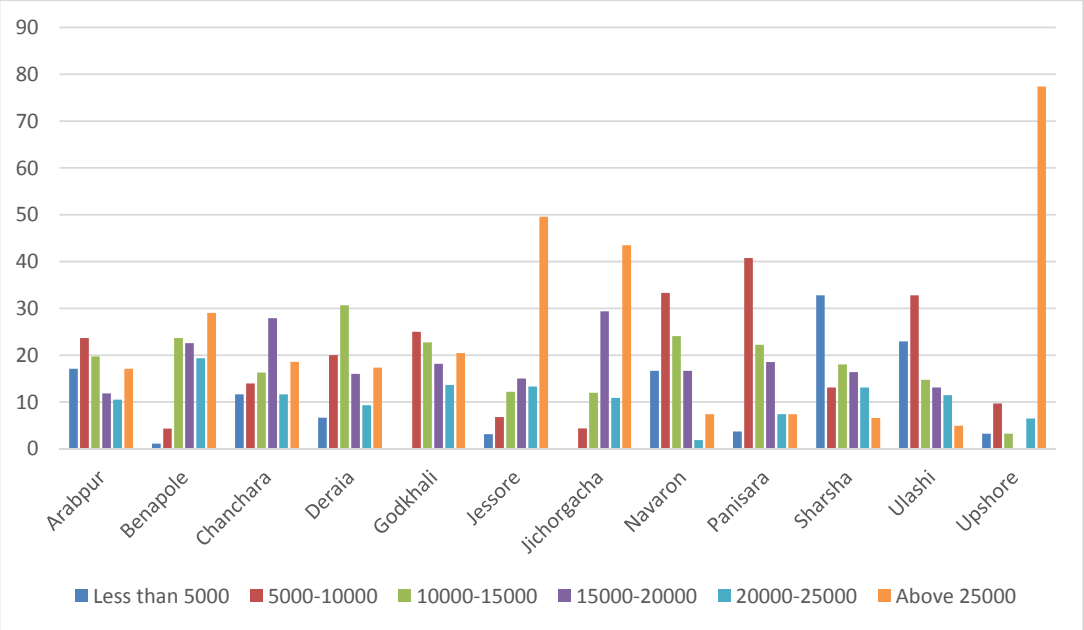
From the survey according to the sample size it is found that most of the households earn more than 25000tk per month and it is greater in the urban area of the study area. Less than 5000tk earning households is very poor only 1.4 percent.

Table 24: Monthly Income Of The Households

Pourashava/Union	Total Monthly Income of the Households (Taka)						
	Less than 5000	5000-10000	10000-15000	15000-20000	20000-25000	Above 25000	Total
Arabpur	17.11	23.68	19.74	11.84	10.53	17.11	100.00
Benapole	1.08	4.30	23.66	22.58	19.35	29.03	100.00
Chanchara	11.63	13.95	16.28	27.91	11.63	18.60	100.00
Deraia	6.67	20.00	30.67	16.00	9.33	17.33	100.00
Godkhali	0.00	25.00	22.73	18.18	13.64	20.45	100.00
Jessore	3.12	6.80	12.18	15.01	13.31	49.58	100.00
Jichorgacha	0.00	4.35	11.96	29.35	10.87	43.48	100.00
Navaron	16.67	33.33	24.07	16.67	1.85	7.41	100.00
Panisara	3.70	40.74	22.22	18.52	7.41	7.41	100.00
Sharsha	32.79	13.11	18.03	16.39	13.11	6.56	100.00
Ulashi	22.95	32.79	14.75	13.11	11.48	4.92	100.00
Upshore	3.23	9.68	3.23	0.00	6.45	77.42	100.00
Total	**8.07**	**14.06**	**16.90**	**17.66**	**11.97**	**31.34**	**100.00**

Source: Field Survey, 2015

Figure 46: Monthly Income Of The Households



Source of Income of the Households

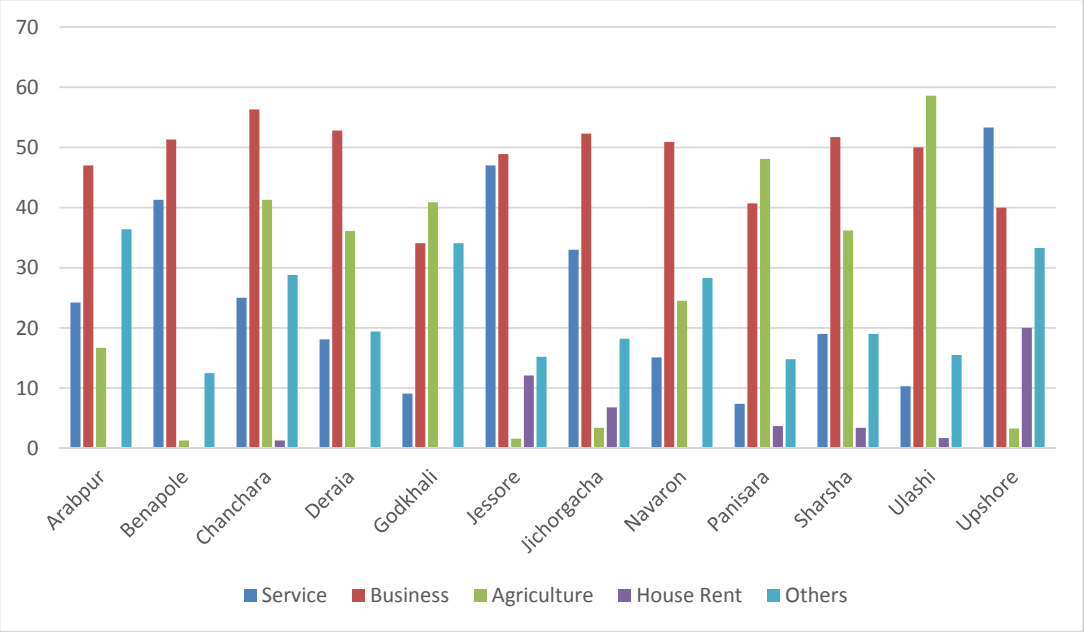
The bellow table shows the income on the household's member. In a household it may remain multiple source of income that has been included. From the analysis it is found that, services and business are the dominant source of income in the study area.

Table 25: Source Of Income Of The Household's Members

Pourashava/Union	Source of Income (%)				
	Service	Business	Agriculture	House Rent	Others
Arabpur	24.2	47.0	16.7	0.0	36.4
Benapole	41.3	51.3	1.3	0.0	12.5
Chanchara	25.0	56.3	41.3	1.3	28.8
Deraia	18.1	52.8	36.1	0.0	19.4
Godkhali	9.1	34.1	40.9	0.0	34.1
Jessore	47.0	48.9	1.6	12.1	15.2
Jichorgacha	33.0	52.3	3.4	6.8	18.2
Navaron	15.1	50.9	24.5	0.0	28.3
Panisara	7.4	40.7	48.1	3.7	14.8
Sharsha	19.0	51.7	36.2	3.4	19.0
Ulashi	10.3	50.0	58.6	1.7	15.5
Upshore	53.3	40.0	3.3	20.0	33.3
Total	31.5	18.4	49.3	5.7	20.5

Source: Field Survey, 2015

Figure 47: Source Of Income Of The Household's Members



The bellow table represents the number of earning member of the family. Most of the households are have single earning member and it is about 76.74 percent according to the

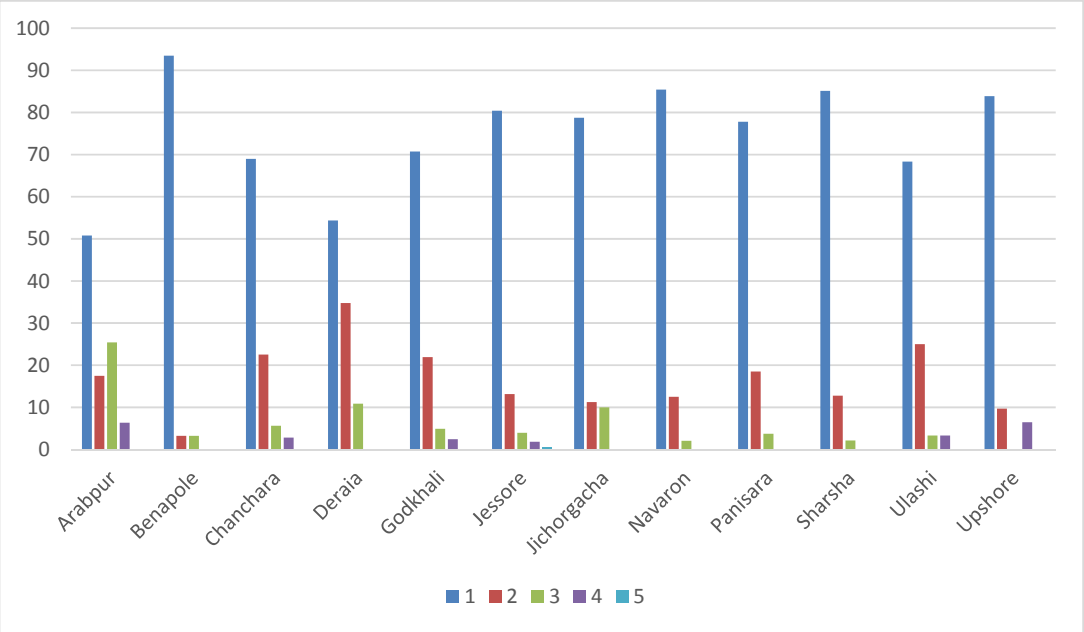
sample size of the study area. And earning member two or more than two is near about 15.22 percent.

Table 26: Number Of Earning Member Of The Households

Pourashava/Union	Number of earning member including HH (%)					
	1	2	3	4	5	Total
Arabpur	50.79	17.46	25.40	6.35	0.00	100.00
Benapole	93.48	3.26	3.26	0.00	0.00	100.00
Chanchara	69.01	22.54	5.63	2.82	0.00	100.00
Deraia	54.35	34.78	10.87	0.00	0.00	100.00
Godkhali	70.73	21.95	4.88	2.44	0.00	100.00
Jessore	80.43	13.15	3.98	1.83	.61	100.00
Jichorgacha	78.75	11.25	10.00	0.00	0.00	100.00
Navaron	85.42	12.50	2.08	0.00	0.00	100.00
Panisara	77.78	18.52	3.70	0.00	0.00	100.00
Sharsha	85.11	12.77	2.13	0.00	0.00	100.00
Ulashi	68.33	25.00	3.33	3.33	0.00	100.00
Upshore	83.87	9.68	0.00	6.45	0.00	100.00
Total	76.74	15.22	6.00	1.82	.21	100.00

Source: Field Survey, 2015

Figure 48: Number Of Earning Member Of The Households



Homestead Land Ownership Pattern

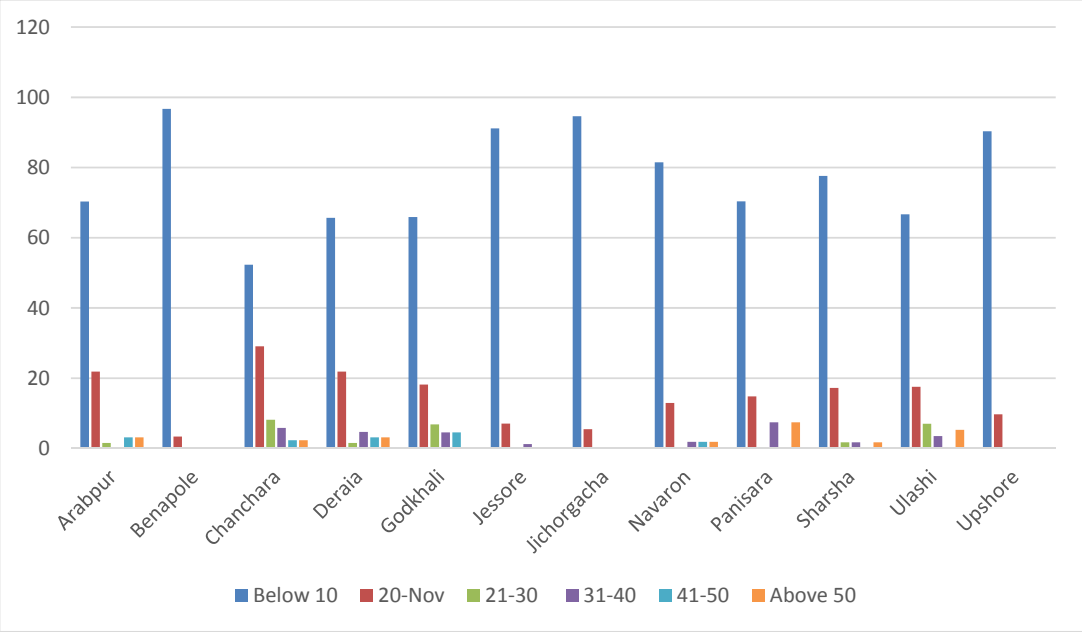
In the study area most of the households have less than 10 decimal land and it is about 81.31 percent to the sample size.

Table 27: Ownership Of Homestead Land

Pourashava/Union	Homestead Land In Decimal (%)						
	Below 10	11-20	21-30	31-40	41-50	Above 50	Total
Arabpur	70.31	21.88	1.56	0.00	3.13	3.13	100.00
Benapole	96.67	3.33	0.00	0.00	0.00	0.00	100.00
Chanchara	52.33	29.07	8.14	5.81	2.33	2.33	100.00
Deraia	65.63	21.88	1.56	4.69	3.13	3.13	100.00
Godkhali	65.91	18.18	6.82	4.55	4.55	0.00	100.00
Jessore	91.15	7.08	.29	1.18	0.00	.29	100.00
Jichorgacha	94.57	5.43	0.00	0.00	0.00	0.00	100.00
Navaron	81.48	12.96	0.00	1.85	1.85	1.85	100.00
Panisara	70.37	14.81	0.00	7.41	0.00	7.41	100.00
Sharsha	77.59	17.24	1.72	1.72	0.00	1.72	100.00
Ulashi	66.67	17.54	7.02	3.51	0.00	5.26	100.00
Upshore	90.32	9.68	0.00	0.00	0.00	0.00	100.00
Total	81.31	12.62	1.79	1.99	.89	1.39	100.00

Source: Field Survey, 2015

Figure 49: Ownership Of Hamestead Land



Land Price of Homestead

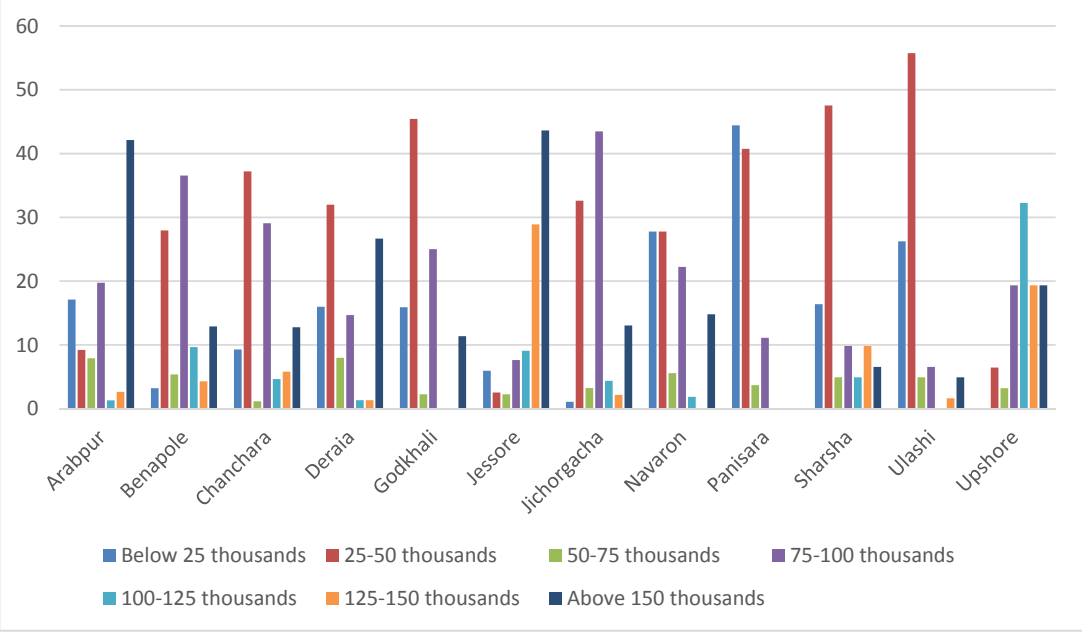
The land price in Jessore pourashava and its surrounding suburban area is greater than the other sites of the study area.

Table 28: Homestead Land Price

Pourashava/ Union	Homestead Land Price in Decimal							
	Below 25 thousands	25-50 thousands	50-75 thousands	75-100 thousands	100-125 thousands	125-150 thousands	Above 150 thousands	Total
Arabpur	17.11	9.21	7.89	19.74	1.32	2.63	42.11	100.00
Benapole	3.23	27.96	5.38	36.56	9.68	4.30	12.90	100.00
Chanchara	9.30	37.21	1.16	29.07	4.65	5.81	12.79	100.00
Deraia	16.00	32.00	8.00	14.67	1.33	1.33	26.67	100.00
Godkhali	15.91	45.45	2.27	25.00	0.00	0.00	11.36	100.00
Jessore	5.95	2.55	2.27	7.65	9.07	28.90	43.63	100.00
Jichorgacha	1.09	32.61	3.26	43.48	4.35	2.17	13.04	100.00
Navaron	27.78	27.78	5.56	22.22	1.85	0.00	14.81	100.00
Panisara	44.44	40.74	3.70	11.11	0.00	0.00	0.00	100.00
Sharsha	16.39	47.54	4.92	9.84	4.92	9.84	6.56	100.00
Ulashi	26.23	55.74	4.92	6.56	0.00	1.64	4.92	100.00
Upshore	0.00	6.45	3.23	19.35	32.26	19.35	19.35	100.00
Total	**11.21**	**22.70**	**3.89**	**18.42**	**6.17**	**12.25**	**25.36**	**100.0**

Source: Field Survey, 2015

Figure 50: Homestead Land Price



Access to services Facilities

The bellow table shows the access to services facilities. In the pourashava area the facilities are generally available, but in the rural area this facilities is not available.

Table 29: Access to Piped Water Supply

Union/Pourashava	Piped Water Supply (%)				
	Good	Moderate	Poor	No Facilities	Total
Arabpur	2.3	0.0	0.0	97.7	100.0
Benapole	3.7	4.9	3.7	87.8	100.0
Chanchara	6.9	0.0	0.0	93.1	100.0
Deraia	4.2	0.0	0.0	95.8	100.0
Godkhali	0.0	0.0	0.0	100.0	100.0
Jessore	34.5	59.0	1.3	5.2	100.0
Jichorgacha	14.3	37.4	0.0	48.4	100.0
Navaron	2.0	0.0	0.0	98.0	100.0
Panisara	0.0	0.0	0.0	100.0	100.0
Sharsha	0.0	0.0	0.0	100.0	100.0
Ulashi	8.0	0.0	0.0	92.0	100.0
Upshore	13.3	26.7	10.0	50.0	100.0
Total	15.9	26.3	1.2	56.7	100.0

Source: Field Survey, 2015

Figure 51: Access to Piped Water Supply

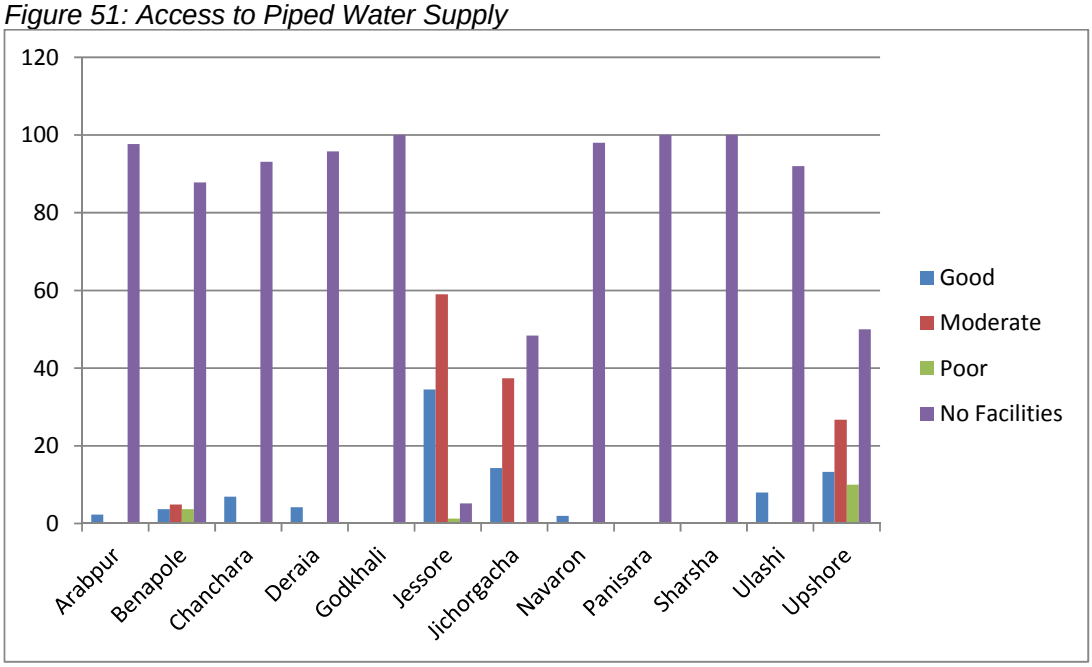


Table 30: Access to Electricity Connection

Union/Pourashava	Electricity Connection (%)				
	Good	Moderate	Poor	No Facilities	Total
Arabpur	76.1	16.9	0.0	7.0	100.0
Benapole	21.3	56.2	22.5	0.0	100.0
Chanchara	58.0	22.2	6.2	13.6	100.0
Deraia	72.6	17.8	1.4	8.2	100.0
Godkhali	53.8	38.5	2.6	5.1	100.0
Jessore	28.5	56.1	15.5	0.0	100.0
Jichorgacha	15.2	68.5	15.2	1.1	100.0
Navaron	63.0	33.3	0.0	3.7	100.0
Panisara	48.1	22.2	14.8	14.8	100.0
Sharsha	66.7	25.0	0.0	8.3	100.0
Ulashi	68.6	23.5	0.0	7.8	100.0
Upshore	19.4	51.6	25.8	3.2	100.0
Total	43.1	42.4	10.4	4.1	100.0

Source: Field Survey, 2015

Figure 52: Access to Electricity Connection

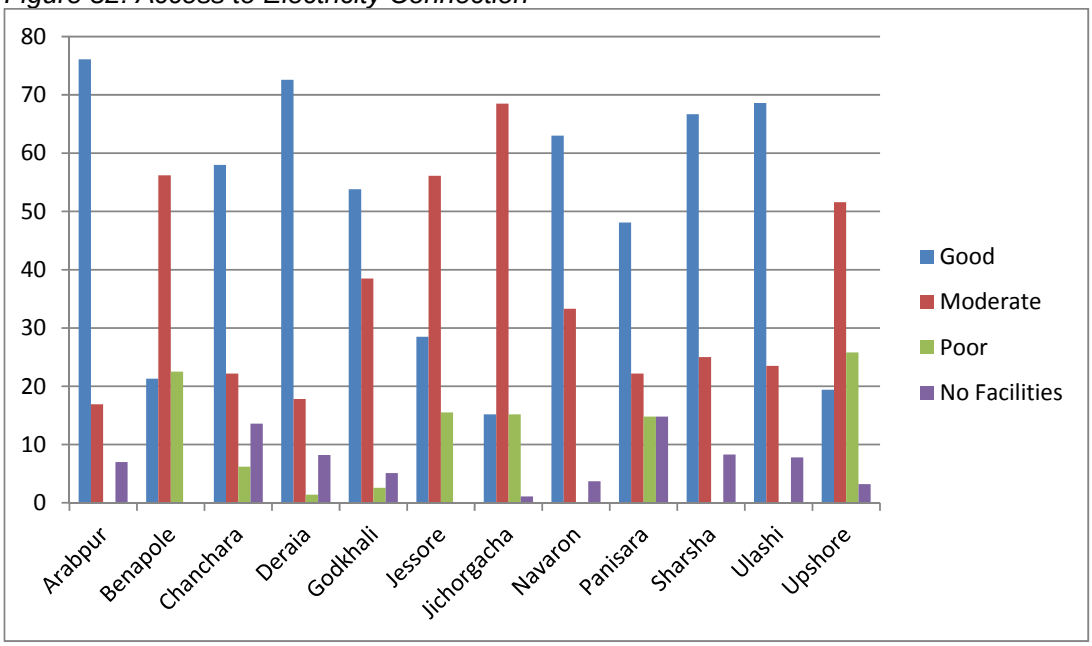


Table 31: Access to Gas (Cylinder) Facilities

Union/Pourashava	Gas (Cylinder) (%)				
	Good	Moderate	Poor	No Facilities	Total
Arabpur	2.2	0.0	0.0	97.8	100.0
Benapole	1.3	0.0	0.0	98.8	100.0
Chanchara	0.0	0.0	0.0	100.0	100.0
Deraia	0.0	0.0	0.0	100.0	100.0
Godkhali	0.0	0.0	0.0	100.0	100.0
Jessore	1.9	.8	.8	96.6	100.0
Jichorgacha	3.3	1.1	0.0	95.7	100.0
Navaron	0.0	0.0	0.0	100.0	100.0
Panisara	0.0	0.0	0.0	100.0	100.0
Sharsha	0.0	0.0	0.0	100.0	100.0
Ulashi	0.0	0.0	0.0	100.0	100.0
Upshore	0.0	3.2	0.0	96.8	100.0
Total	1.2	.5	.2	98.1	100.0

Source: Field Survey, 2015

Figure 53: Access to Gas (Cylinder) Facilities

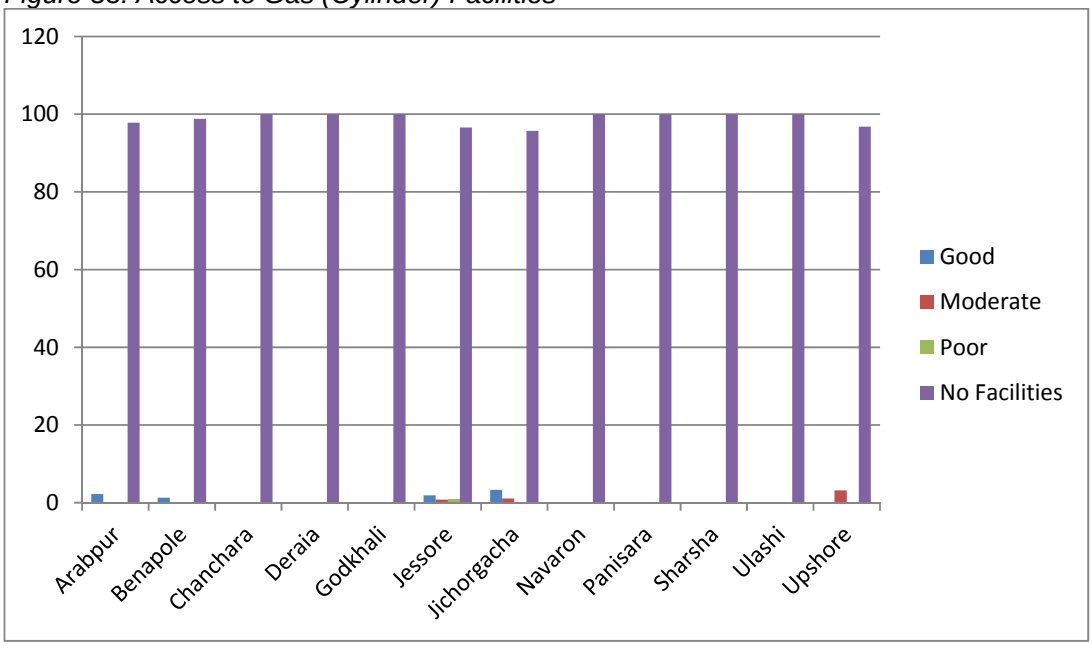


Table 32: Access to Drainage Facilities

Union/Pourashava	Drainage Condition (%)				
	Good	Moderate	Poor	No Facilities	Total
Arabpur	2.2	0.0	0.0	97.8	100.0
Benapole	3.4	21.8	21.8	52.9	100.0
Chanchara	0.0	0.0	0.0	100.0	100.0
Deraia	1.4	0.0	0.0	98.6	100.0
Godkhali	0.0	0.0	0.0	100.0	100.0
Jessore	16.9	58.0	20.1	5.1	100.0
Jichorgacha	9.8	43.5	12.0	34.8	100.0
Navaron	0.0	0.0	0.0	100.0	100.0
Panisara	0.0	0.0	0.0	100.0	100.0
Sharsha	0.0	0.0	0.0	100.0	100.0
Ulashi	4.2	0.0	0.0	95.8	100.0
Upshore	3.2	12.9	48.4	35.5	100.0
Total	7.8	27.8	12.3	52.0	100.0

Source: Field Survey, 2015

Figure 54: Access to Drainage Facilities

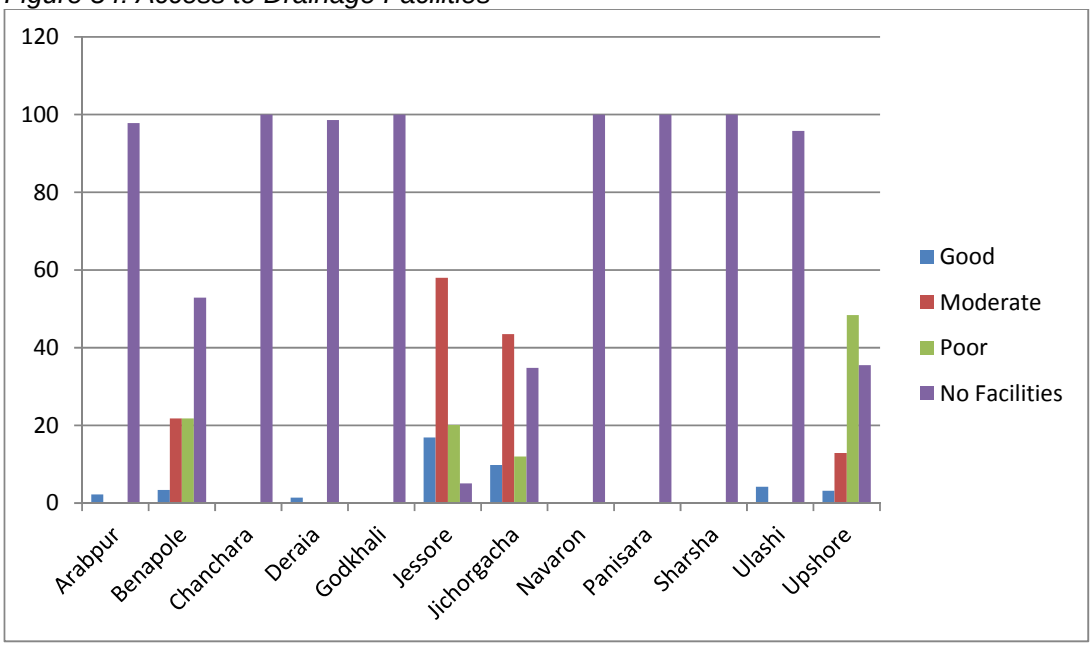


Table 33: Access to Sewerage Facilities

Union/Pourashava	Sewerage Condition (%)				
	Good	Moderate	Poor	No Facilities	Total
Arabpur	4.8	0.0	0.0	95.2	100.0
Benapole	0.0	0.0	0.0	100.0	100.0
Chanchara	0.0	0.0	0.0	100.0	100.0
Deraia	0.0	0.0	0.0	100.0	100.0
Godkhali	0.0	0.0	0.0	100.0	100.0
Jessore	8.0	4.5	1.0	86.4	100.0
Jichorgacha	0.0	1.1	0.0	98.9	100.0
Navaron	0.0	0.0	0.0	100.0	100.0
Panisara	0.0	0.0	0.0	100.0	100.0
Sharsha	0.0	0.0	0.0	100.0	100.0
Ulashi	0.0	0.0	0.0	100.0	100.0
Upshore	0.0	0.0	0.0	100.0	100.0
Total	3.0	1.7	.4	95.0	100.0

Source: Field Survey, 2015

Figure 55: Access to Sewerage Facilities

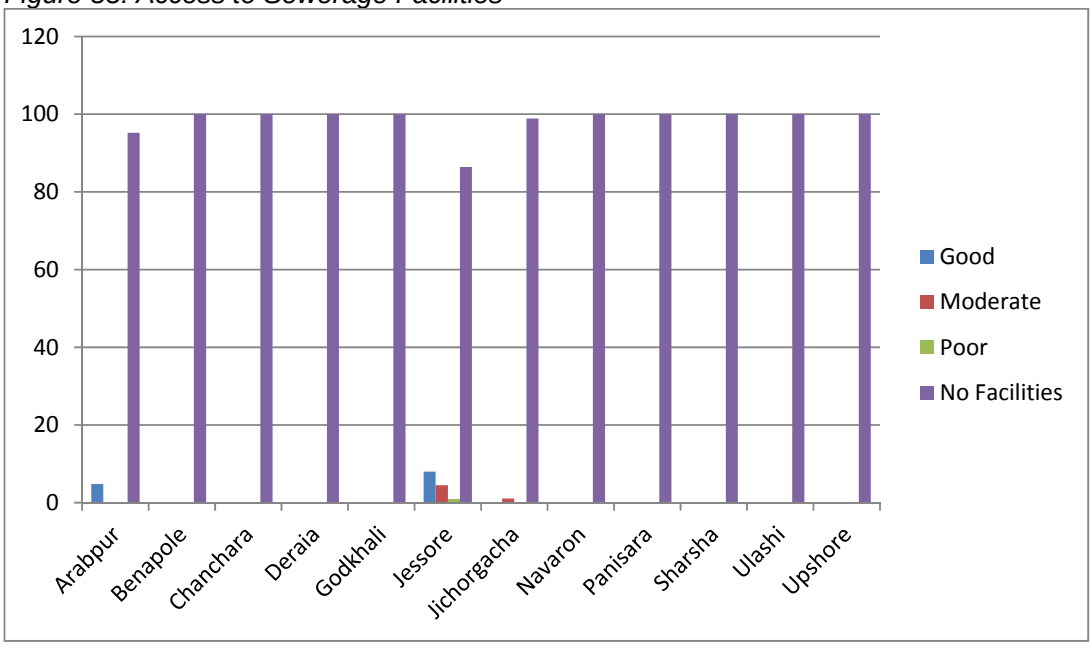


Table 34: Access to Solid Waste Disposal Facilities

Union/Pourashava	Solid Waste Disposal (%)				
	Good	Moderate	Poor	No Facilities	Total
Arabpur	2.4	0.0	0.0	97.6	100.0
Benapole	0.0	6.3	7.5	86.3	100.0
Chanchara	3.6	0.0	0.0	96.4	100.0
Deraia	0.0	0.0	0.0	100.0	100.0
Godkhali	0.0	0.0	0.0	100.0	100.0
Jessore	5.0	39.8	11.2	44.0	100.0
Jichorgacha	2.2	13.3	8.9	75.6	100.0
Navaron	0.0	0.0	0.0	100.0	100.0
Panisara	0.0	0.0	0.0	100.0	100.0
Sharsha	0.0	0.0	0.0	100.0	100.0
Ulashi	4.2	0.0	0.0	95.8	100.0
Upshore	0.0	16.7	0.0	83.3	100.0
Total	2.3	15.4	5.3	76.9	100.0

Source: Field Survey, 2015

Figure 56: Access to Solid Waste Disposal Facilities

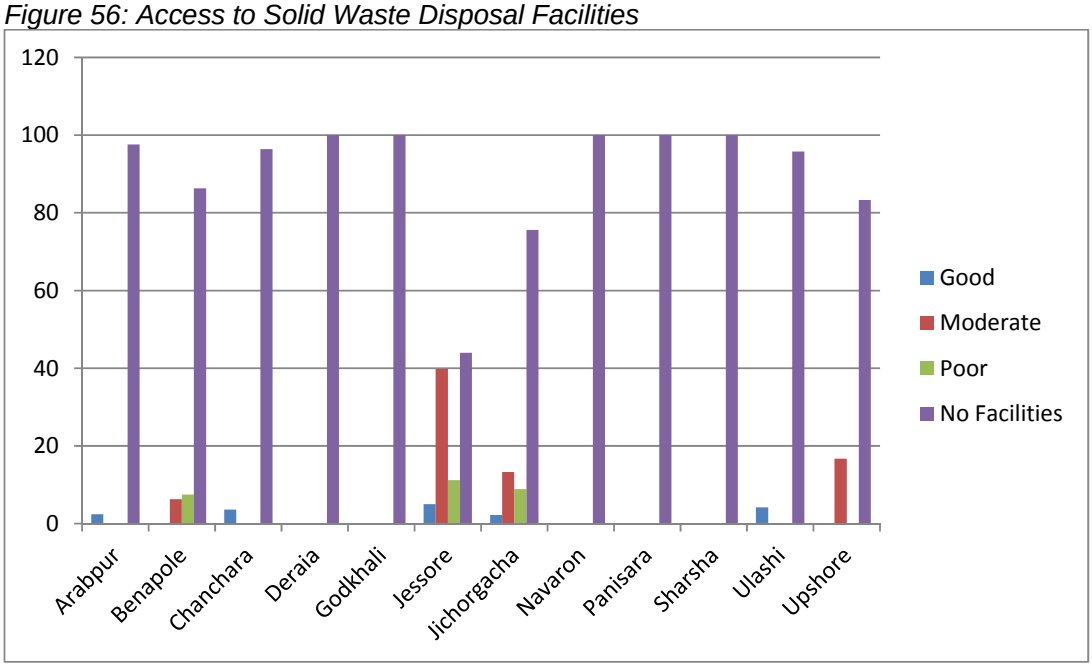


Table 35: Access to Cable line (Internet or Dish) Facilities

Union/Pourashava	Cable line (Internet or dish) (%)				
	Good	Moderate	Poor	No Facilities	Total
Arabpur	72.1	5.9	0.0	22.1	100.0
Benapole	45.8	54.2	0.0	0.0	100.0
Chanchara	49.4	22.8	0.0	27.8	100.0
Deraia	74.0	1.4	0.0	24.7	100.0
Godkhali	48.6	29.7	0.0	21.6	100.0
Jessore	44.2	54.9	.3	.6	100.0
Jichorgacha	47.3	51.6	1.1	0.0	100.0
Navaron	72.2	24.1	0.0	3.7	100.0
Panisara	55.6	18.5	7.4	18.5	100.0
Sharsha	59.3	24.1	0.0	16.7	100.0
Ulashi	86.0	0.0	7.0	7.0	100.0
Upshore	16.1	64.5	3.2	16.1	100.0
Total	53.1	36.9	.8	9.2	100.0

Source: Field Survey, 2015

Figure 57: Access to Cable line (Internet or Dish) Facilities

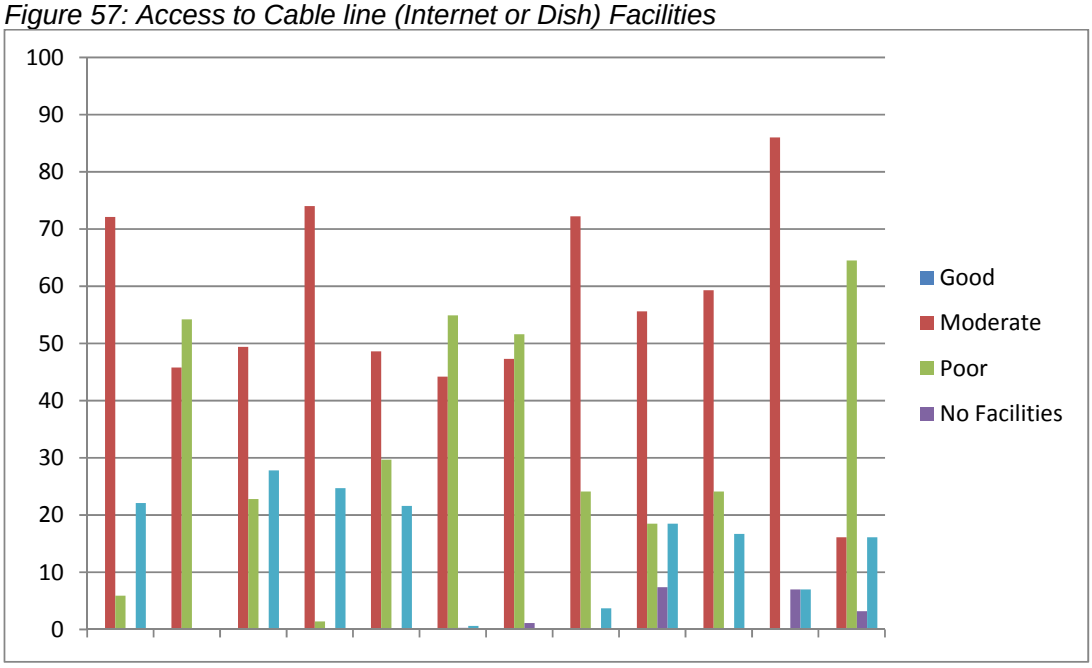
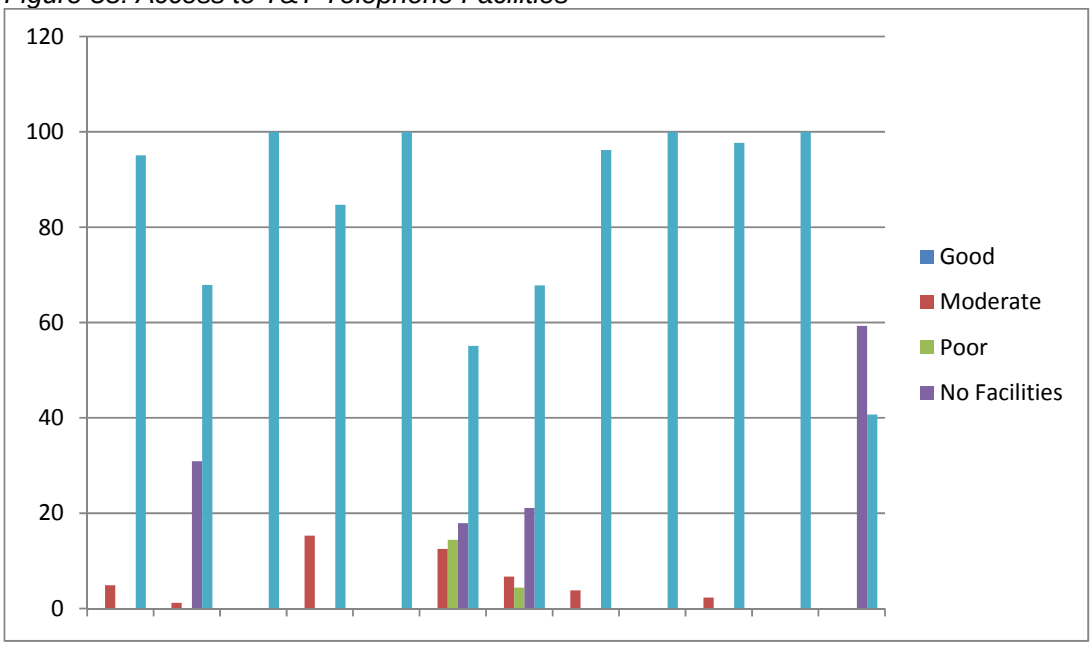


Table 36: Access to T&T Telephone Facilities

Union/Pourashava	TNT telephone Line (%)				
	Good	Moderate	Poor	No Facilities	Total
Arabpur	4.9	0.0	0.0	95.1	100.0
Benapole	1.2	0.0	30.9	67.9	100.0
Chanchara	0.0	0.0	0.0	100.0	100.0
Deraia	15.3	0.0	0.0	84.7	100.0
Godkhali	0.0	0.0	0.0	100.0	100.0
Jessore	12.5	14.4	17.9	55.1	100.0
Jichorgacha	6.7	4.4	21.1	67.8	100.0
Navaron	3.8	0.0	0.0	96.2	100.0
Panisara	0.0	0.0	0.0	100.0	100.0
Sharsha	2.3	0.0	0.0	97.7	100.0
Ulashi	0.0	0.0	0.0	100.0	100.0
Upshore	0.0	0.0	59.3	40.7	100.0
Total	6.9	5.2	13.2	74.7	100.0

Source: Field Survey, 2015

Figure 58: Access to T&T Telephone Facilities



Road Condition in front of the House

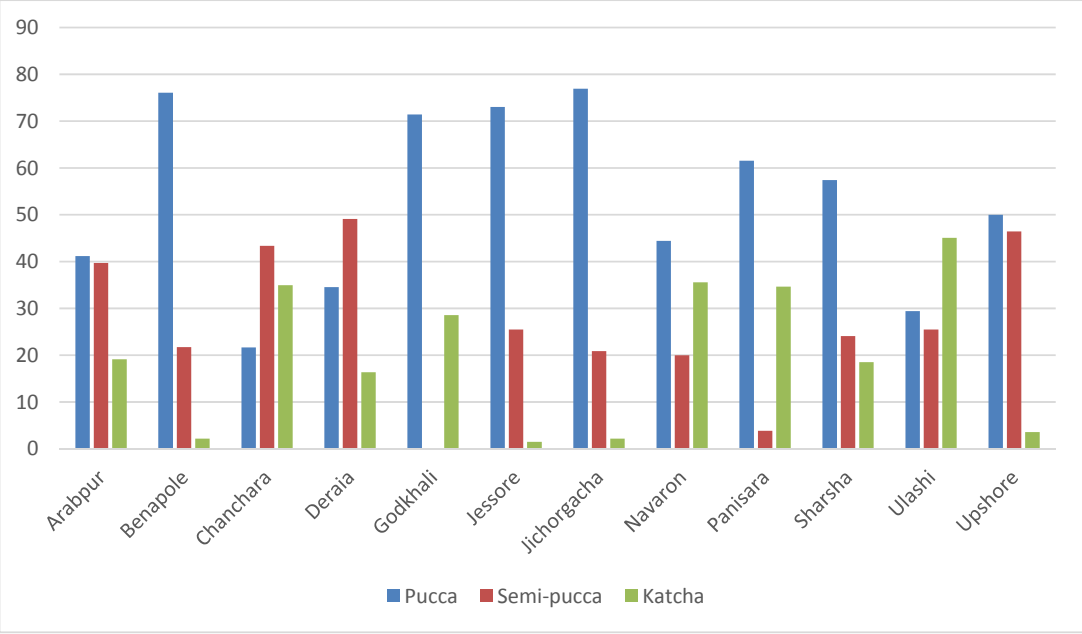
According to the sample size to the study area, the road condition in front of the house is shown. About 59.43 percent households have the access of pucca road in front of the house. Only 13.42 percent households have katcha road in front of their house.

Table 37: Availability Of Road In Front Of House

Pourashava/Union	Availability of Road in front of House (%)			
	Pucca	Semi-pucca	Katcha	Total
Arabpur	41.18	39.71	19.12	100.00
Benapole	76.09	21.74	2.17	100.00
Chanchara	21.69	43.37	34.94	100.00
Deraia	34.55	49.09	16.36	100.00
Godkhali	71.43	0.00	28.57	100.00
Jessore	73.02	25.51	1.47	100.00
Jichorgacha	76.92	20.88	2.20	100.00
Navaron	44.44	20.00	35.56	100.00
Panisara	61.54	3.85	34.62	100.00
Sharsha	57.41	24.07	18.52	100.00
Ulashi	29.41	25.49	45.10	100.00
Upshore	50.00	46.43	3.57	100.00
Total	**59.43**	**27.15**	**13.42**	**100.00**

Source: Field Survey. 2015

Figure 59: Availability Of Road In Front Of House



Drainage and Sanitation condition

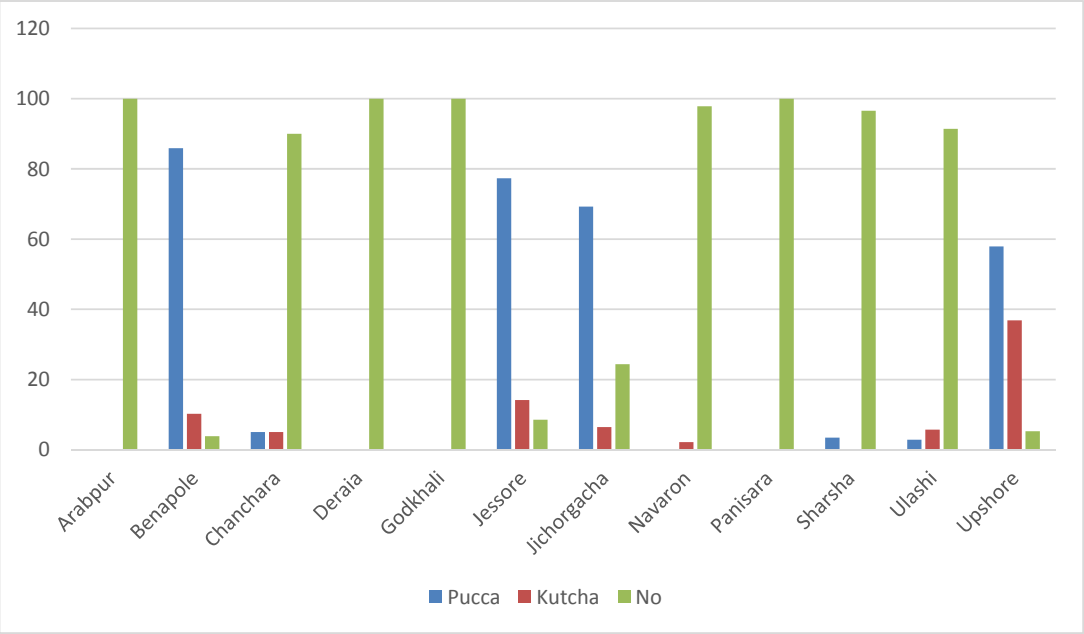
This table shows the drainage condition in front of the house of the households. Most of the drainage is pucca which is about 51.53 percent and kutcha is 9.44 percent. On the other hand about 39.03 percent households do not have the drainage facilities in front of the house.

Table 38: Drainage Condition In Front Of House

Pourashava/Union	Drainage Condition (%)			
	Pucca	Kutcha	No Facilities	Total
Arabpur	0.00	0.00	100.00	100.00
Benapole	85.90	10.26	3.85	100.00
Chanchara	5.00	5.00	90.00	100.00
Deraia	0.00	0.00	100.00	100.00
Godkhali	0.00	0.00	100.00	100.00
Jessore	77.30	14.14	8.55	100.00
Jichorgacha	69.23	6.41	24.36	100.00
Navaron	0.00	2.17	97.83	100.00
Panisara	0.00	0.00	100.00	100.00
Sharsha	3.45	0.00	96.55	100.00
Ulashi	2.86	5.71	91.43	100.00
Upshore	57.89	36.84	5.26	100.00
Total	**51.53**	**9.44**	**39.03**	**100.00**

Source: Field Survey. 2015

Figure 60: Drainage Condition In Front Of House



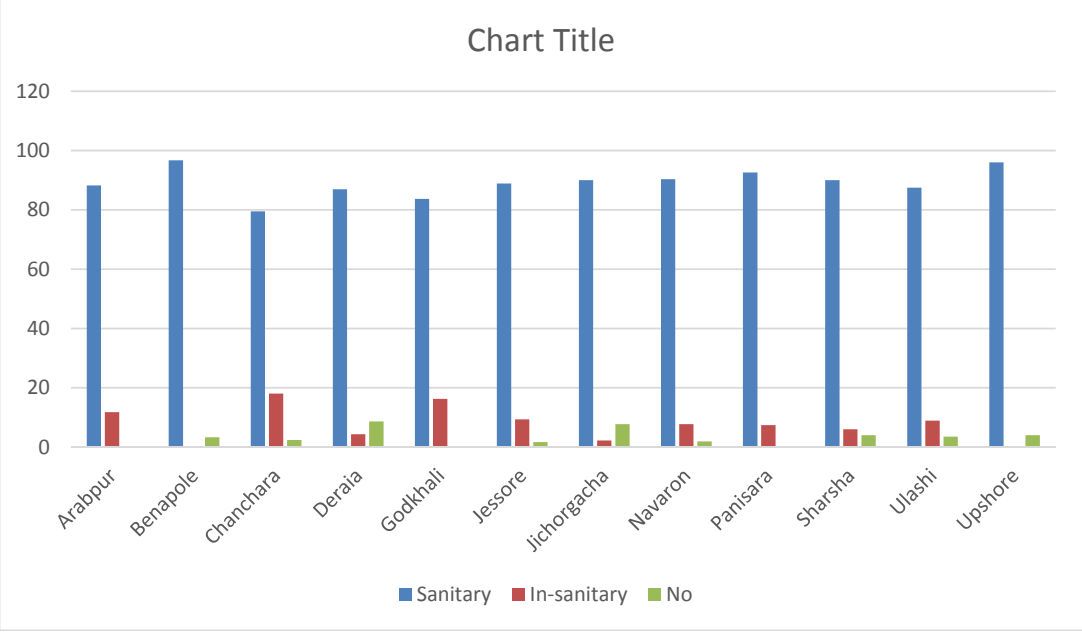
This table is about the sanitation condition in the study area. Most of the households have the proper sanitation system and only 2.84 percent don't have the sanitation facilities.

Table 39: Sanitation Condition Of The Households

Pourashava/Union	Sanitation Condition (%)			
	Sanitary	In-sanitary	No Facilities	Total
Arabpur	88.24	11.76	0.00	100.00
Benapole	96.70	0.00	3.30	100.00
Chanchara	79.52	18.07	2.41	100.00
Deraia	86.96	4.35	8.70	100.00
Godkhali	83.72	16.28	0.00	100.00
Jessore	88.89	9.36	1.75	100.00
Jichorgacha	90.00	2.22	7.78	100.00
Navaron	90.38	7.69	1.92	100.00
Panisara	92.59	7.41	0.00	100.00
Sharsha	90.00	6.00	4.00	100.00
Ulashi	87.50	8.93	3.57	100.00
Upshore	96.00	0.00	4.00	100.00
Total	**88.97**	**8.19**	**2.84**	**100.00**

Source: Field Survey. 2015

Figure 61: Sanitation Condition Of The Households



Pollution

In the study area there is water, air, sound as well as others pollution. The study area is mixed up area regarding to industrial to agricultural, with residential use. Moreover a highway and railway is situated in the study area, which creates pollution with industrial pollution.

Table 38: Total Pollution by Union

Union/Pourashava	Attract by Pollution (%)		
	Yes	No	Total
Arabpur	17.1	82.9	100.0
Benapole	67.7	32.3	100.0
Chanchara	36.0	64.0	100.0
Deraia	17.3	82.7	100.0
Godkhali	43.2	56.8	100.0
Jessore	61.5	38.5	100.0
Jichorgacha	77.2	22.8	100.0
Navaron	24.1	75.9	100.0
Panisara	51.9	48.1	100.0
Sharsha	26.2	73.8	100.0
Ulashi	34.4	65.6	100.0
Upshore	85.0	15.0	100.0
Total	48.8	51.2	100.0

Source: Field Survey, 2015

Figure 62: Total Pollution by Union

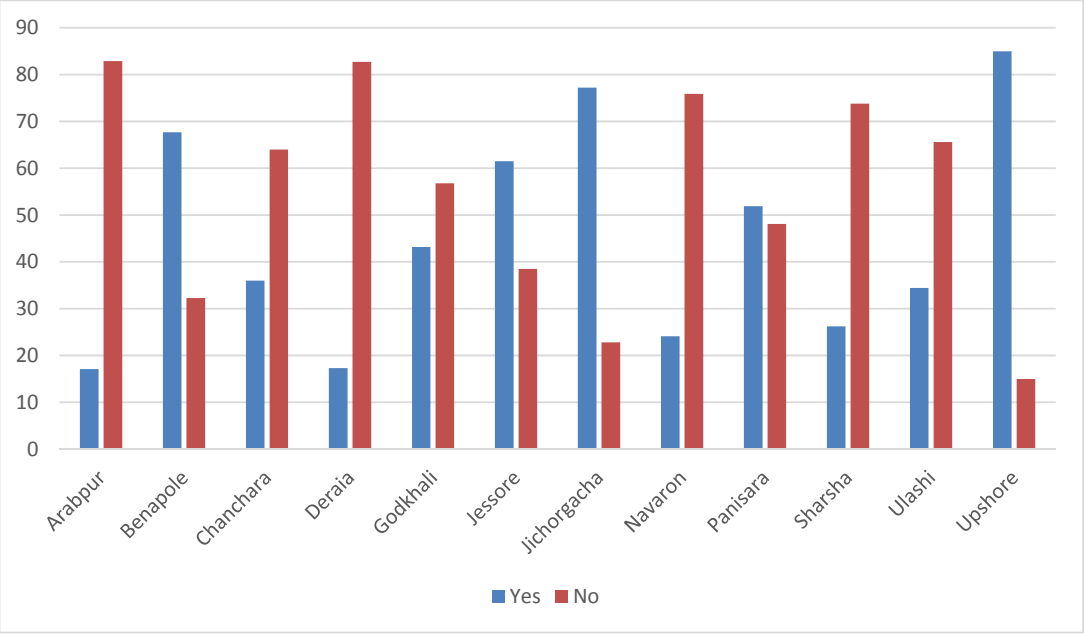
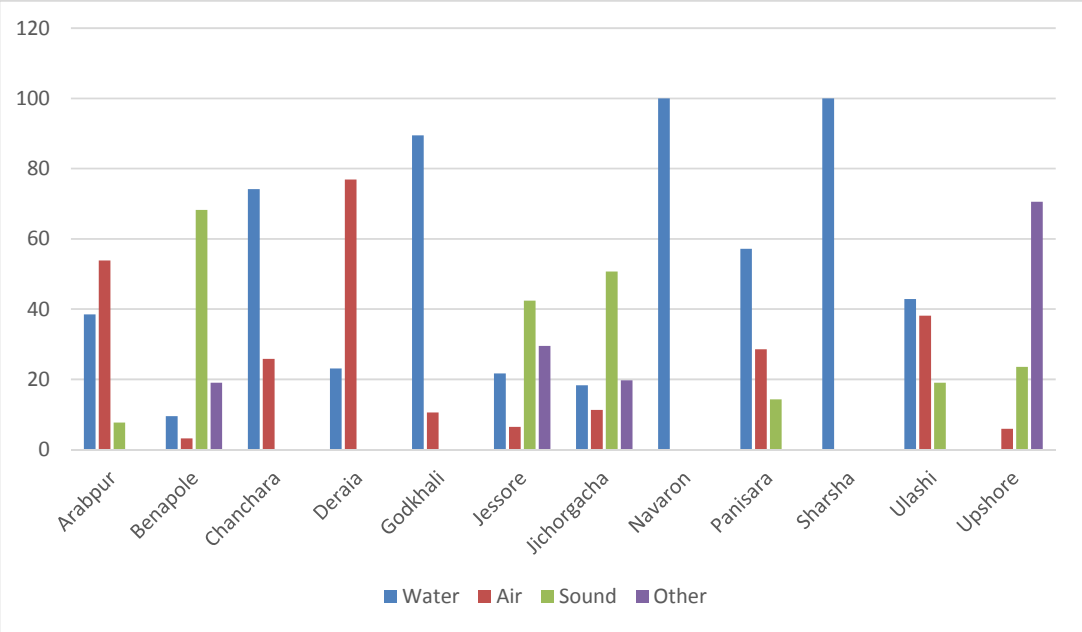


Table 39: Percentage of Different Types Of Pollution among area wise pollution

Pourashava/Union	Area Wise Pollution %	Pollution (%)				
		Water	Air	Sound	Other	Total
Arabpur	17.1	38.46	53.85	7.69	0.00	100.00
Benapole	67.7	9.52	3.17	68.25	19.05	100.00
Chanchara	36.0	74.19	25.81	0.00	0.00	100.00
Deraia	17.3	23.08	76.92	0.00	0.00	100.00
Godkhali	43.2	89.47	10.53	0.00	0.00	100.00
Jessore	61.5	21.66	6.45	42.40	29.49	100.00
Jichorgacha	77.2	18.31	11.27	50.70	19.72	100.00
Navaron	24.1	100.00	0.00	0.00	0.00	100.00
Panisara	51.9	57.14	28.57	14.29	0.00	100.00
Sharsha	26.2	100.00	0.00	0.00	0.00	100.00
Ulashi	34.4	42.86	38.10	19.05	0.00	100.00
Upshore	85.0	0.00	5.88	23.53	70.59	100.00
Total	**48.8**	**31.50**	**12.60**	**35.83**	**20.08**	**100.00**

Source: Field Survey. 2015

Figure 63: Different Types Of Pollution



Source of Water

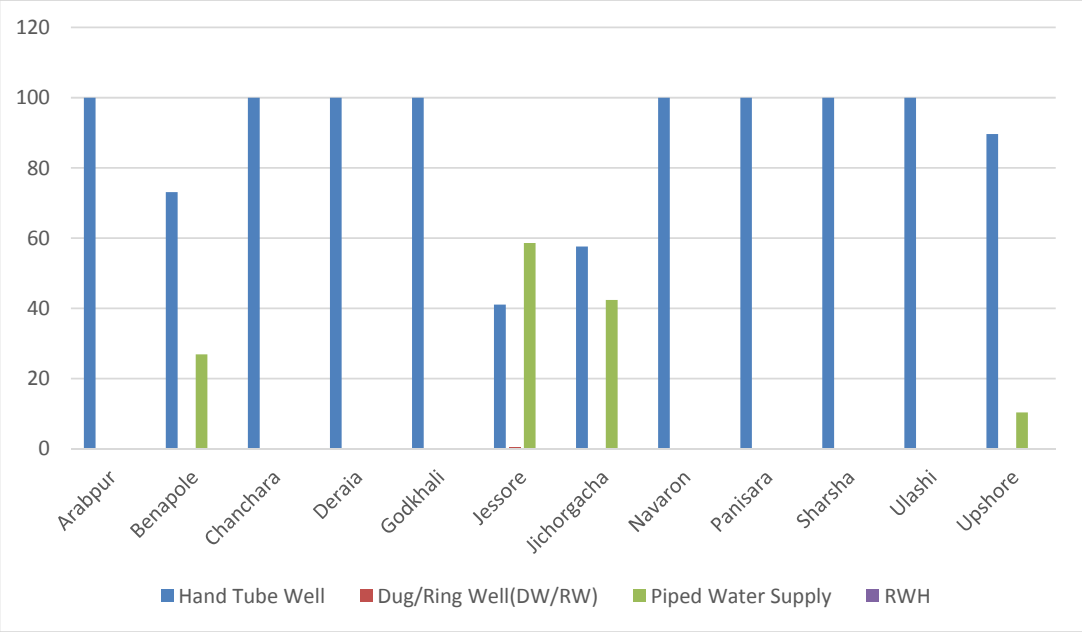
In the study are most of the households use tube-well and in the pourashavas there is facility of piped water supply provided by the Pourashava.

Table 40: Source Of Drinking Water

Pourashava/Union	Source of Drinking Water (%)				
	Hand Tube Well	Dug/Ring Well(DW/RW)	Piped Water Supply	RWH	Total
Arabpur	100.00	0.00	0.00	0.00	100.00
Benapole	73.12	0.00	26.88	0.00	100.00
Chanchara	100.00	0.00	0.00	0.00	100.00
Deraia	100.00	0.00	0.00	0.00	100.00
Godkhali	100.00	0.00	0.00	0.00	100.00
Jessore	41.09	.29	58.62	0.00	100.00
Jichorgacha	57.61	0.00	42.39	0.00	100.00
Navaron	100.00	0.00	0.00	0.00	100.00
Panisara	100.00	0.00	0.00	0.00	100.00
Sharsha	100.00	0.00	0.00	0.00	100.00
Ulashi	100.00	0.00	0.00	0.00	100.00
Upshore	89.66	0.00	10.34	0.00	100.00
Total	**73.80**	**.29**	**26.11**	**0.00**	**100.00**

Source: Field Survey. 2015

Figure 64: Source Of Drinking Water



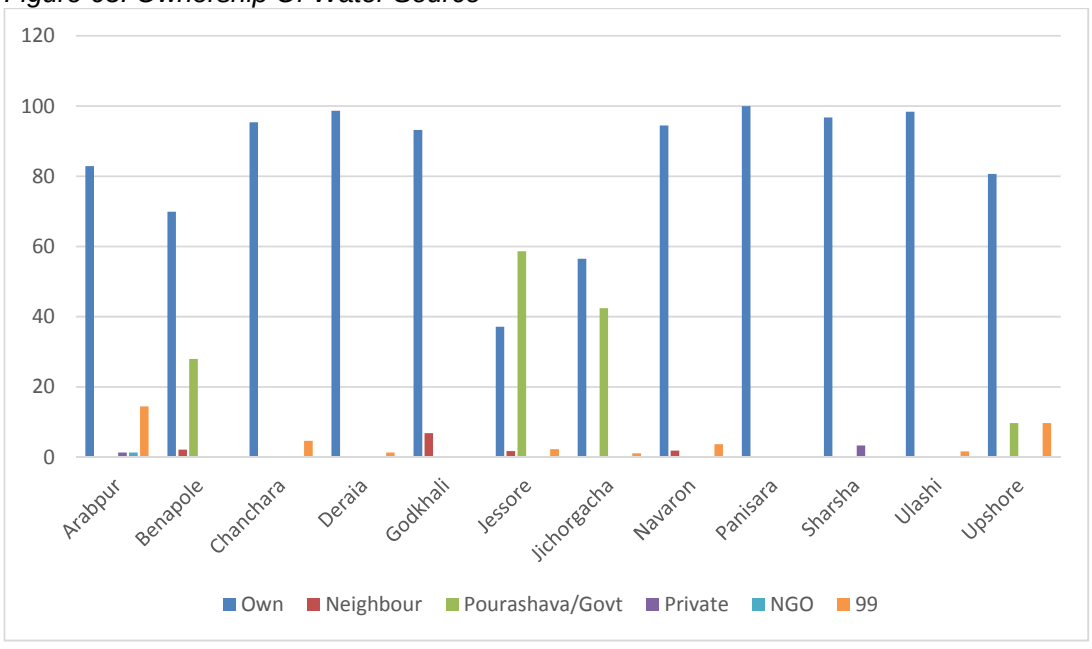
In the study area most of the source of water is private and pourashavas provide water supply only in the pourashava area.

Table 41: Ownership Of Water Source

Pourashava/Union	Ownership of Water Source (%)						
	Own	Neighbour	Pourashava/Govt	Private	NGO	99	Total
Arabpur	82.89	0.00	0.00	1.32	1.32	14.47	100.00
Benapole	69.89	2.15	27.96	0.00	0.00	0.00	100.00
Chanchara	95.35	0.00	0.00	0.00	0.00	4.65	100.00
Deraia	98.67	0.00	0.00	0.00	0.00	1.33	100.00
Godkhali	93.18	6.82	0.00	0.00	0.00	0.00	100.00
Jessore	37.11	1.70	58.64	0.00	.28	2.27	100.00
Jichorgacha	56.52	0.00	42.39	0.00	0.00	1.09	100.00
Navaron	94.44	1.85	0.00	0.00	0.00	3.70	100.00
Panisara	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Sharsha	96.72	0.00	0.00	3.28	0.00	0.00	100.00
Ulashi	98.36	0.00	0.00	0.00	0.00	1.64	100.00
Upshore	80.65	0.00	9.68	0.00	0.00	9.68	100.00
Total	**69.33**	**1.14**	**26.12**	**.28**	**.19**	**2.94**	**100.00**

Source: Field survey, 2015

Figure 65: Ownership Of Water Source



3.2 Traffic Survey

3.2.1 Introduction

In order to determine the transportation needs and appropriate solutions for an area it is important to have an understanding of the underlying characteristics of travel. The origins and destinations, volume of traffic are among the most important of these characteristics. For the traffic study in the Jessore-Benapole highway corridor, basically three types of survey have been done according to the TOR and these are O-D survey, Traffic volume counting survey and passenger survey in different stations. The aim of this survey is to following:

- Identify the volume of traffic
- Identify the origin and destination of the traffic
- Identify the condition of the critical junction of the study area
- Mode, purpose of travel by the passengers

3.2.2 Methodology

At first for conducting traffic survey in the study area the point have been identified separately for different purpose.

3.2.3 Traffic Volume Survey

For traffic volume counting seven points has been identified in the study area. In every point 24 hours in two days the survey has been conducted.

Figure 66: Traffic Survey Day01

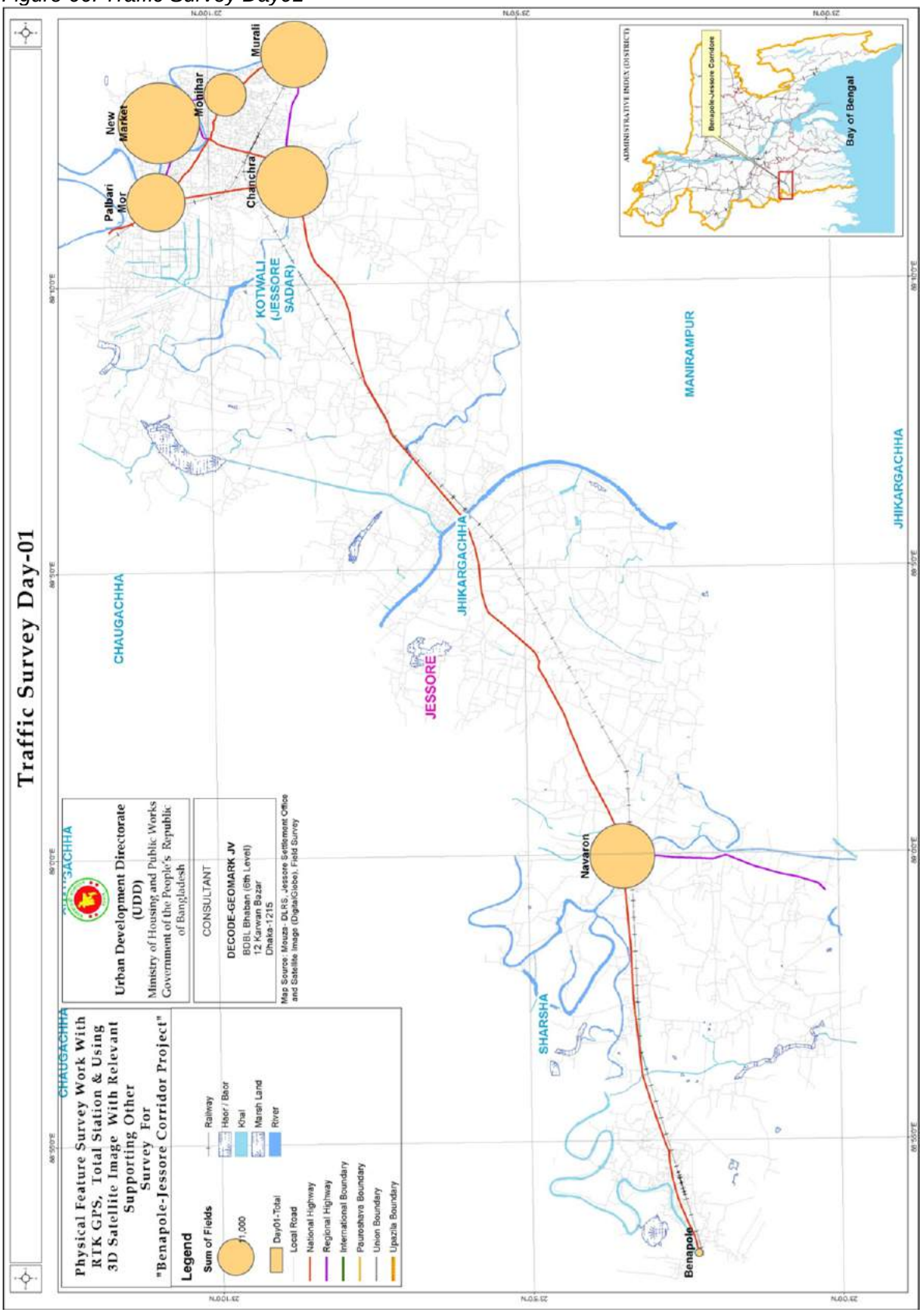
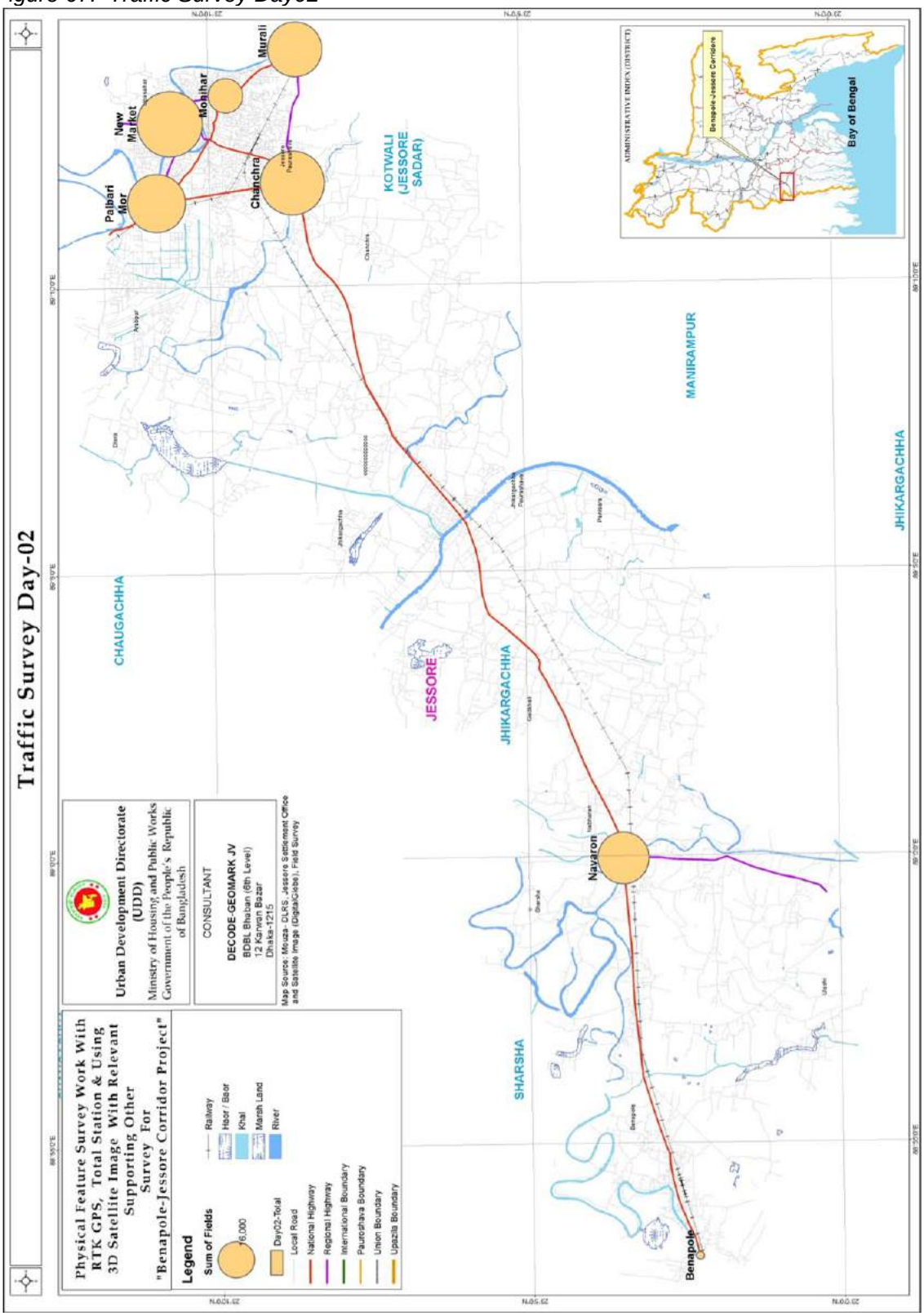


Figure 67: Traffic Survey Day02



Transport survey Data Summery

Table 42: Transport Survey Data Summery for Different Location- Day 01

	Vehicle Type	Bus (Large)	Bus (mini)	Truck	Cargo / Lorry / CV	Pick Up	Micro Bus	Car	Easy Bike	Motor cycle	Riksha / Van	Nosimon / Korimon	Others	**Total**
Location	Navaron	1295	627	3043	852	1140	743	1262	6509	8650	6718	2976	440	**34255**
	Benapole	6	0	809	106	40	3	3	0	0	0	0	0	**967**
	Chanchra	155	1406	3541	1418	1443	986	1686	8731	10020	8532	2582	387	**41987**
	Palbari	1236	641	3878	766	1506	1014	1202	5577	4237	3528	2152	2064	**27801**
	New Market	1418	476	2813	943	1053	909	1310	16055	12016	11870	1674	3413	**53950**
	Monihar	60	219	408	186	213	147	308	4746	3692	4325	513	0	**14817**
	Murali	2318	12	4985	1754	1780	1178	1272	10500	9519	5198	3645	55	**14817**
Total		**6488**	**3381**	**19477**	**6025**	**7175**	**4980**	**7043**	**52118**	**48134**	**40171**	**13542**	**6359**	**188594**

Figure 68: Chart for Different Vehicle Type at Survey Location- Day 01

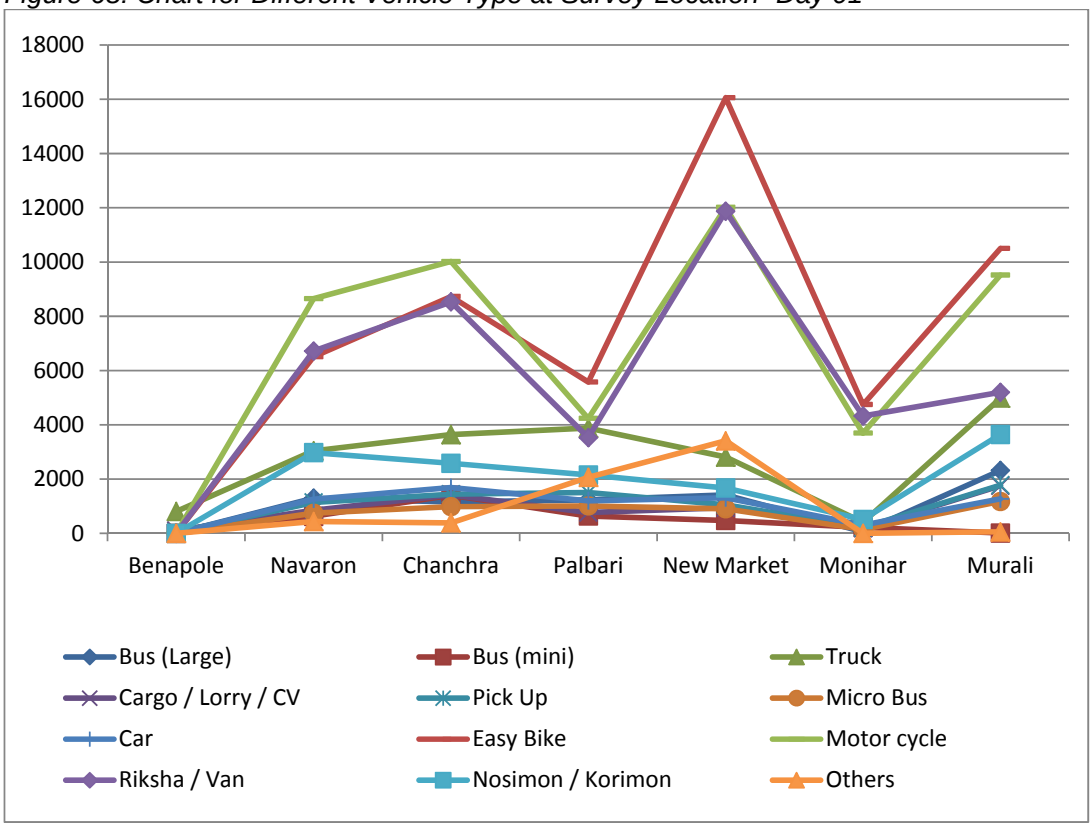
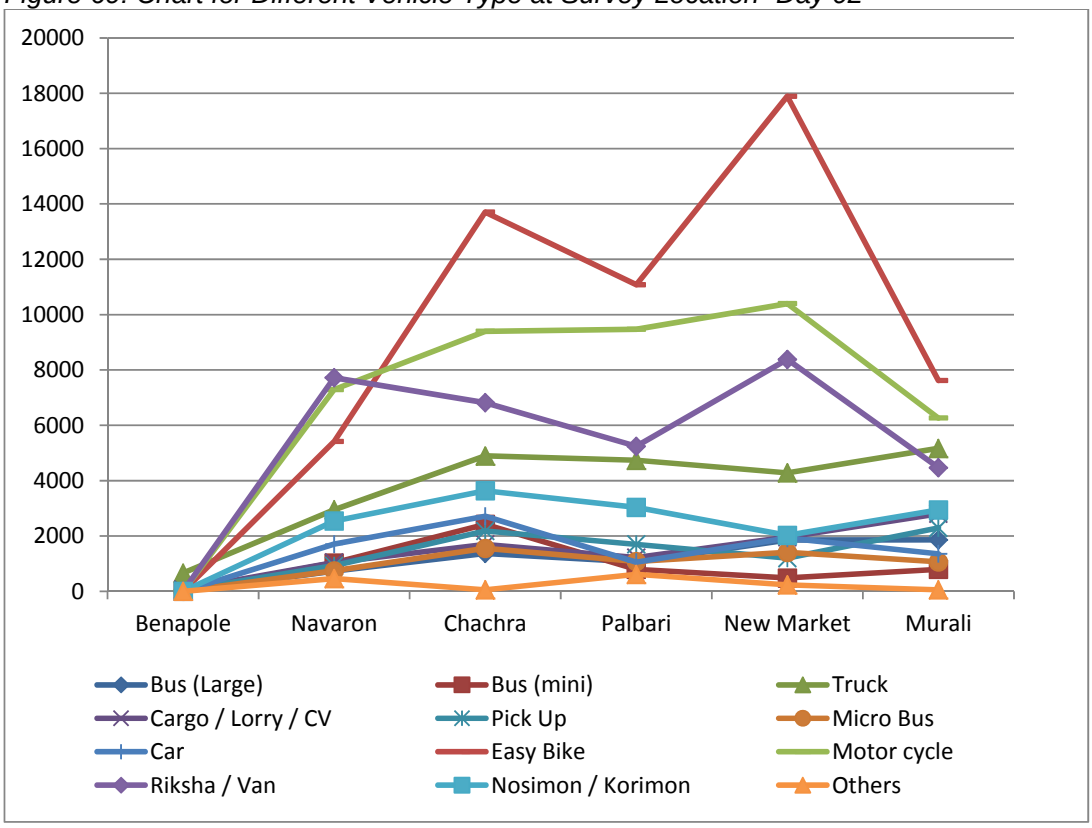


Table 43: Transport Survey Data Summery for Different Location- Day 02

	Vehicle	Bus (Large)	Bus (mini)	Truck	Cargo / Lorry / CV	Pick Up	Micro Bus	Car	Easy Bike	Motor cycle	Riksha / Van	Nosimon / Korimon	Others	Total
Location	Benapole	4	2	660	66	35	2	0	0	1	0	0	0	770
	Navaron	732	1027	2950	1046	927	744	1705	5415	7293	7720	2541	463	32563
	Chachra	1370	2420	4895	1697	2180	1554	2715	13704	9395	6818	3634	56	6468
	Palbari	1061	795	4737	1220	1698	1080	1057	11079	9470	5243	3035	613	41088
	New Market	1856	482	4283	1957	1199	1406	1923	17892	10396	8382	2024	235	52035
	Murali	1857	794	5165	2802	2291	1065	1355	7619	6262	4470	2943	54	36677
Total		6880	5520	22690	8788	8330	5851	8755	55709	42817	32633	14177	1421	169601

Figure 69: Chart for Different Vehicle Type at Survey Location- Day 02



Vehicle Trend for 20 years:

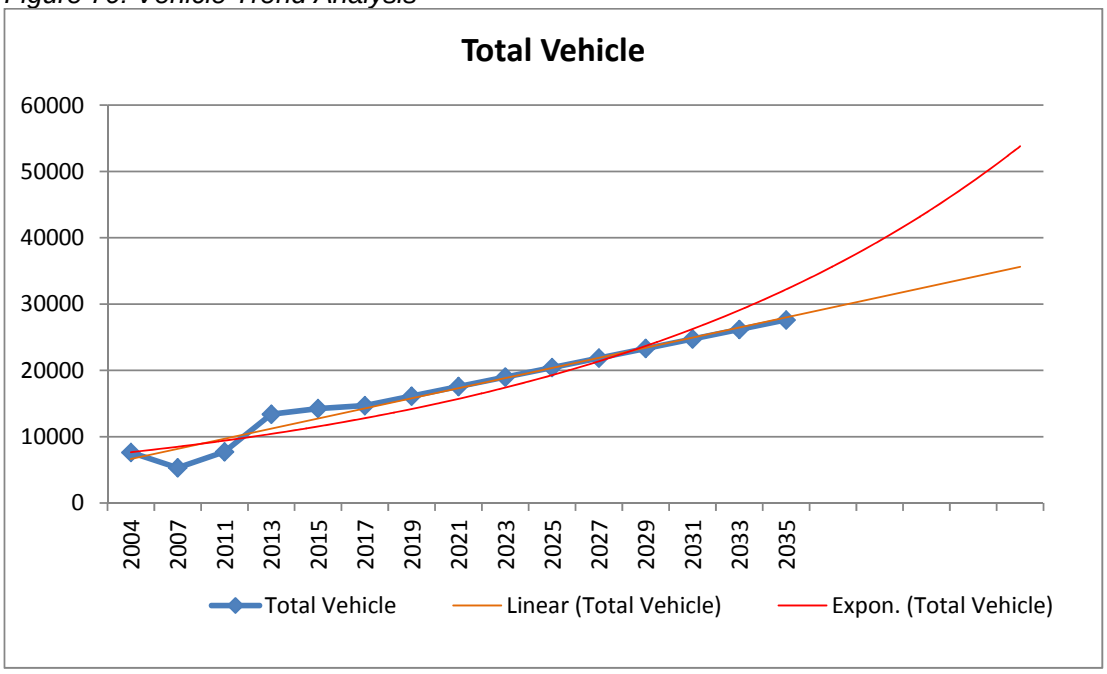
We collected secondary data from Roads and Highway Department for National Highway N706, Jesssore to Benapole road's traffic data and we have collected traffic data from field in 2015. In Microsoft Excel we did a trend analysis and calculate total vehicle in linear prediction. In 2007 total vehicle value is lower than previous year for

Table 44: Past Total Vehicle and Vehicle Prediction Value

Year	Total Vehicle	Source
2004	7625	RHD
2007	5313	
2011	7718	
2013	13399	
2015	14244	Filed Survey 2015
2017	14686	Linear Prediction
2019	16122	
2021	17559	
2023	18995	
2025	20431	
2027	21867	
2029	23303	
2031	24739	
2033	26176	
2035	27612	

Source: Road and Highway Department

Figure 70: Vehicle Trend Analysis



3.2.4 O-D Survey

The origin and destination survey have been done in 4 points in the jessore pourashava for two days. Large bus, trucks which runs through or use bypass of Jessore city is mostly goes to Dhaka, Rajshahi, Kustia, Jhinadaha, Rangpur, Barisal, Chittagong district. Approximately 3613 big bus, 10000 truck pass through Jessore city every day

Figure 71: Origin-Destination Map

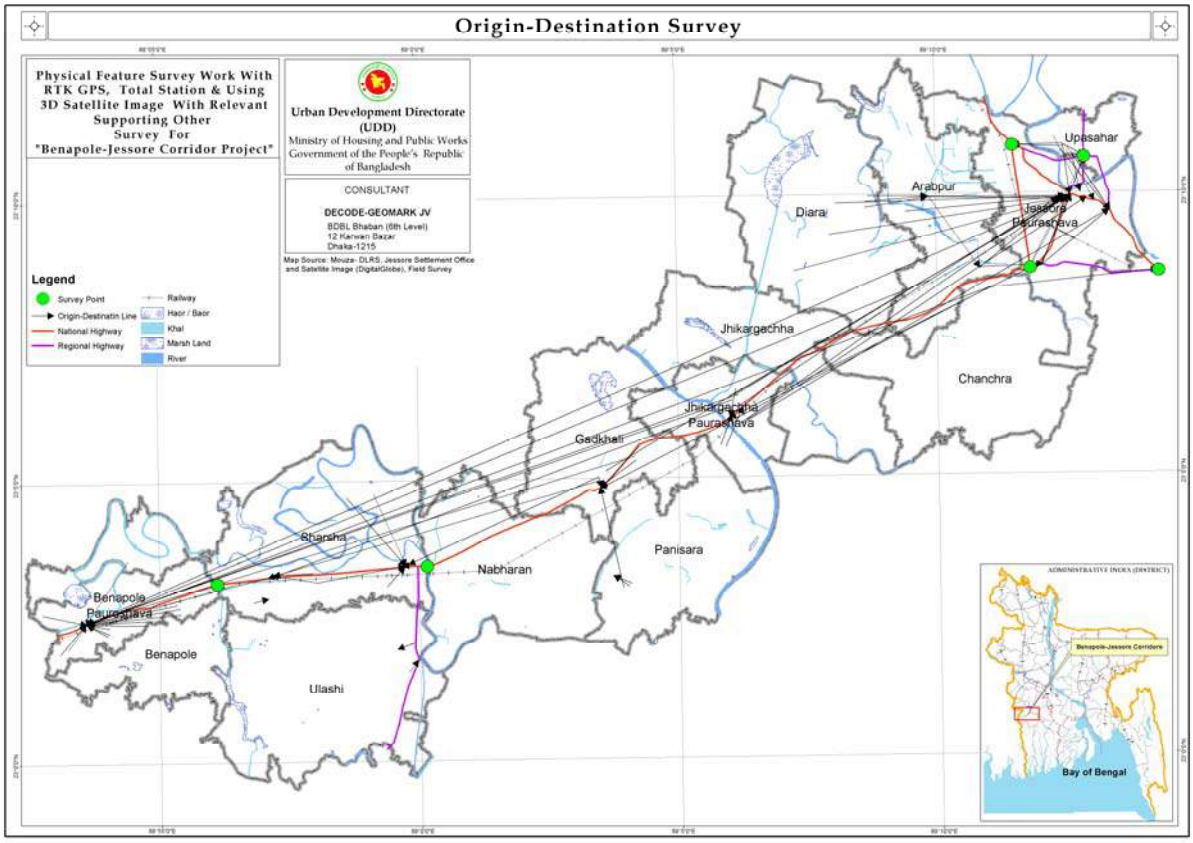


Table 45: Number of Vehicle Depart From Benapole Port Every Day

Destination	Number
Dhaka	62
Rajshahi	19
Rangpur	16
Mymensingh	11
Khulna	22
Barishal	6
Mongla	11
Others (Jessore, Narail, Kushtia, pabna etc.)	17
Total	164

Figure 72: External Origin-Destination Map

3.2.5 Passenger Survey

The passenger survey has been done in the different stations in the study area, like Palbari mor, newmarket mor, Chacra mor, murali mor, arabpur mor etc, point of the study area.

Pic 1: Traffic Volume Counting Survey

Pic 2: O-D Survey

Critical Traffic Junctions:

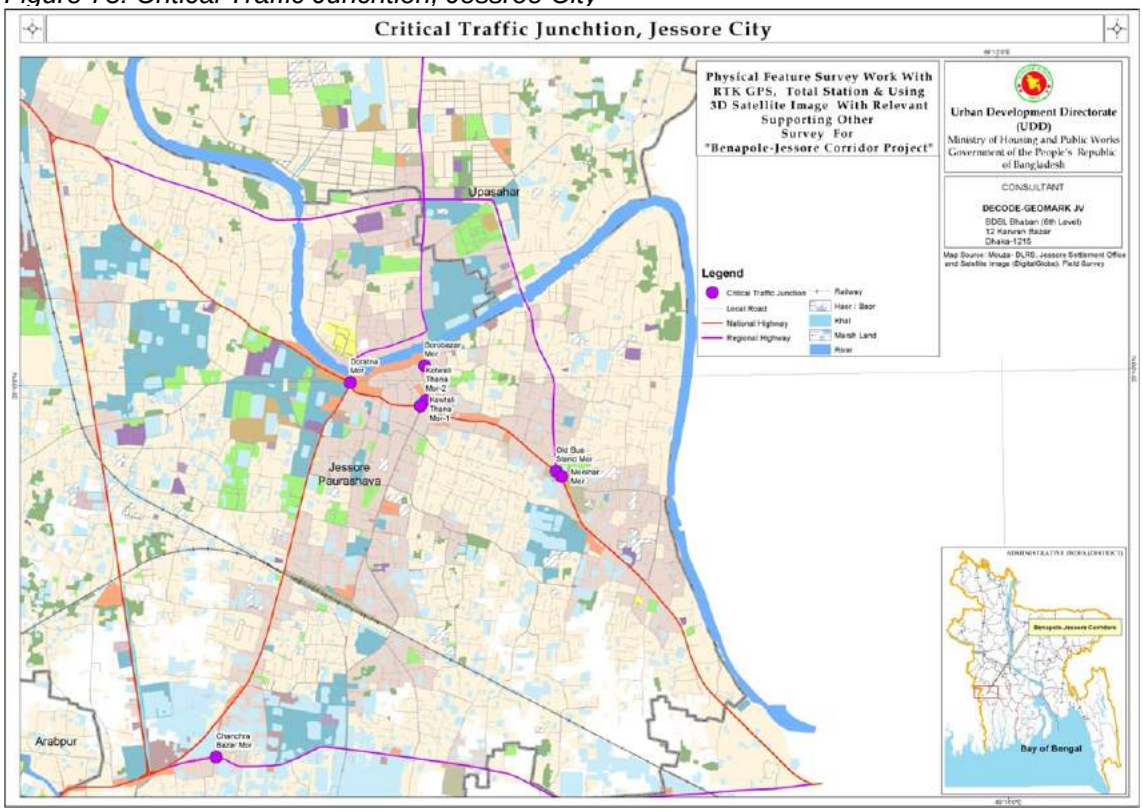
The project area is generally traffic free area. Some places in the jessore city found traffic. There are 7 places where the traffic is critical. In the day time the traffic is less but in the afternoon and evening time the traffic became works.

Traffic Junction:

A) Doratana Mor B) Old Bus Stand Mor C) Monihar Mor D) Kotwali Thana Mor-1 e) Kotwali Thana Mor-2 f) Borobazar Mor and G) Chanchra Bazar Mor

Within these 7 points borobazar mor, kotwali thana more have more traffic. These place became very severe at the evening time. Out of the jessore city only at Jhikargaccha have some traffic problem. Bridge on Kabadak river and road connection with the bridge is very narrow. This is the main cause of traffic congestion.

Figure 73: Critical Traffic Junchtion, Jessroe City



Jessore Inter District Bus Terminal:

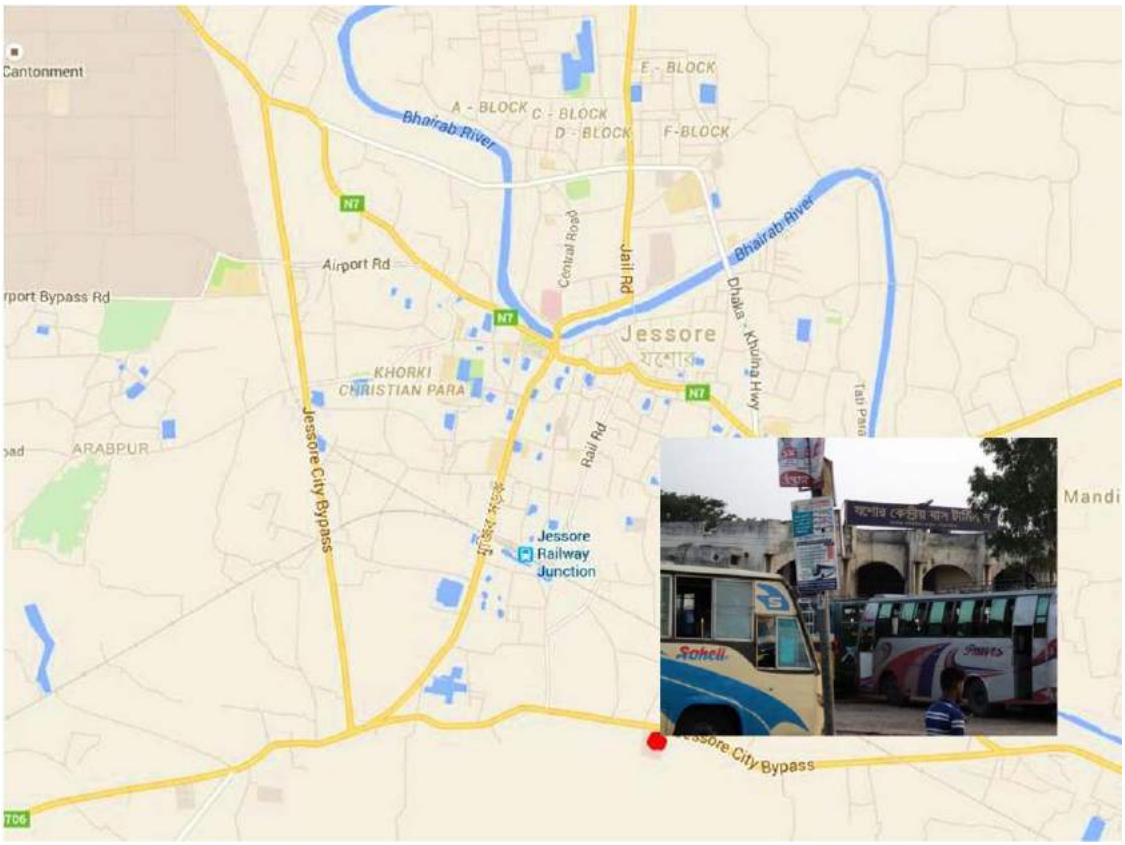


Figure 74: Jessore Inter District Bus Terminal

The geographic location of Jessore inter district bus terminal is latitude 23° 8.666'N and longitude 89° 12.943'E. The terminal is located beside Jessore Khulna road and 3 km far from Jessore CBD area. The area of the Jessore inter district bus terminal is about 5.62 acres.

The connectivity of road network from this bus terminal greatly affects the accessibility of the people from different district including Jessore intra district routs.

The Jessore bus terminal is used for both long and short route distance for commuting. There are some regular buses that travel within an interval of short period of time and this kind of travel is greater in this terminal as usual. On the other hand there are some buses which travel long distance route. This kind of bus follow time schedule, but may delay because of shortage of passenger.

Here are the lists of routes with necessary details from the Jessore bus terminal.

Table 46: Regular Routes from Jessore Bus Terminal

SL	Jessore To	Number	Fare	Travel Time (Hour)	Trip Schedule (Time Interval)	Trip Start	Trip Stop
1	Benapole	127	50	1:30	7 minutes interval	5:55 am	8:45 pm
2	Kaligang (Navaron, Shatkhira)	86	150	3:45	10 minutes Interval	5:10 am	7:30 pm
3	Shatkhira(Keshobpur)	90	100	2:30	10 minutes Interval	5:30 am	8:00 pm
4	Chougacha	30	40	1:05	25 minutes Interval	6:30 am	6:55 pm
5	Narail	76	60	1:10	10 minutes interval	6:30 am	7:15 pm
6	Rajgong	32	33	1:10	25 minutes Interval	6:15 am	7:30 pm
7	Chuadanga	87	140	2:45	9 minutes interval	4:50 am	6:15 pm
8	Magura	32	80	2:00	15 minutes interval	9:00 am	5:00 pm
9	Khulna	75	90	1:40	10 minutes interval	6:00 am	6.20 pm
10	Kustia	76	130	2:20	10 minutes interval	6:00 am	6:45 pm

Table 47: Long-Distance Route from Jessore Bus Terminal

SL	Jessore To	Number	Travel Time (Hour)	Fare
1	Pabna	3 to 5	4:40	220
2	Barishal	7		350
3	Faridpur	5	2:30	150
4	Rajshahi	3	5:00	300
5	Bagura	2	5:00	350
6	Rangpur	1	7:00	500
7	Meharpur	7	3:00	150
8	Dhaka	12	5:00	480

3.3 Formal and Informal Industrial Survey

3.3.1 Introduction

Industries consideration has great importance in physical feature planning for creating healthy and livable environment as well as creating flow of economic growth. Jessore-Benapole highway corridor is one of the important sites for developing various industries varying from formal to informal. According to TOR the formal and informal industries have been surveyed on the basis of following aspects.

- Details of location, size and capacity of the existing
- Details of labor statistics with the housing conditions and their quality of life
- Service facilities of the industry
- Trading boundary etc.

The data are taken from both primary and secondary sources to accomplish the objective of this study.

3.3.2 Methodology

For achieving full information of the industries, all the industries within the study are surveyed with a view to achieving the above aspects of fulfilling the objective. Questionnaire has been prepared according to the objective of the study and then census survey of the industries has been done. Then all the information is collected from the field survey have been inputted in the SPSS software.

3.3.3 Findings and Recommendations

Formal Industry:

Table 48: Number of Formal Industry in Jessore-Benapole Highway Corridor

Type of Industry	Number	Classification
Painting	1	Light Industry
Cold Storage	2	Light Industry
Brick Field	25	Medium Industry
Filling Station	13	Light Industry
Jute Mill	3	Heavy Industry
Rice Mill	5	Medium Industry
Printing and Packaging	1	Heavy Industry
Tobacco	1	Heavy Industry
Total	51	

Source: Field survey, 2015

Pic 3.3: Formal and Informal Industrial Survey

Pic 3 Poultry Firm

Pic 4 Rice Mill

Informal Industry: The project area Jessore to Benapole is one of the most important economic hubs in Bangladesh. Along with the Jessore to Benapole highway about thirteen huts or bazaars are found where different informal economic activity are performed. Among them Godkhali bazaar is one of the most important informal economic hub for flower's market. Every morning about 3 hundred flowers farmer come to sell flowers in this market. A gross scenario about Godkhali flower's market is demarked bellow-

Pic 5 Flower Hat at Gadhali Bazar

Table 49: Flower Industry Information at Gadkhali Bazar

Flowers	Farmers	Amount (Thousands/Person)	Price/ Thousands
Marigold	160-180	7000	120
Rose	60-70	1500	500
Tuberose	40-50	1200	800
Others	10-15	800	300

Source: Field Survey, 2015

In jessore chachra fish hatchery is also a agriculture base informal industry. Jessore region is well known in Bangladesh for fish hatchery business. Jessore city is the transportation hub for south western region in Bangladesh. For that reason small and medium workshop grown in Jessore city. But it is an informal industry

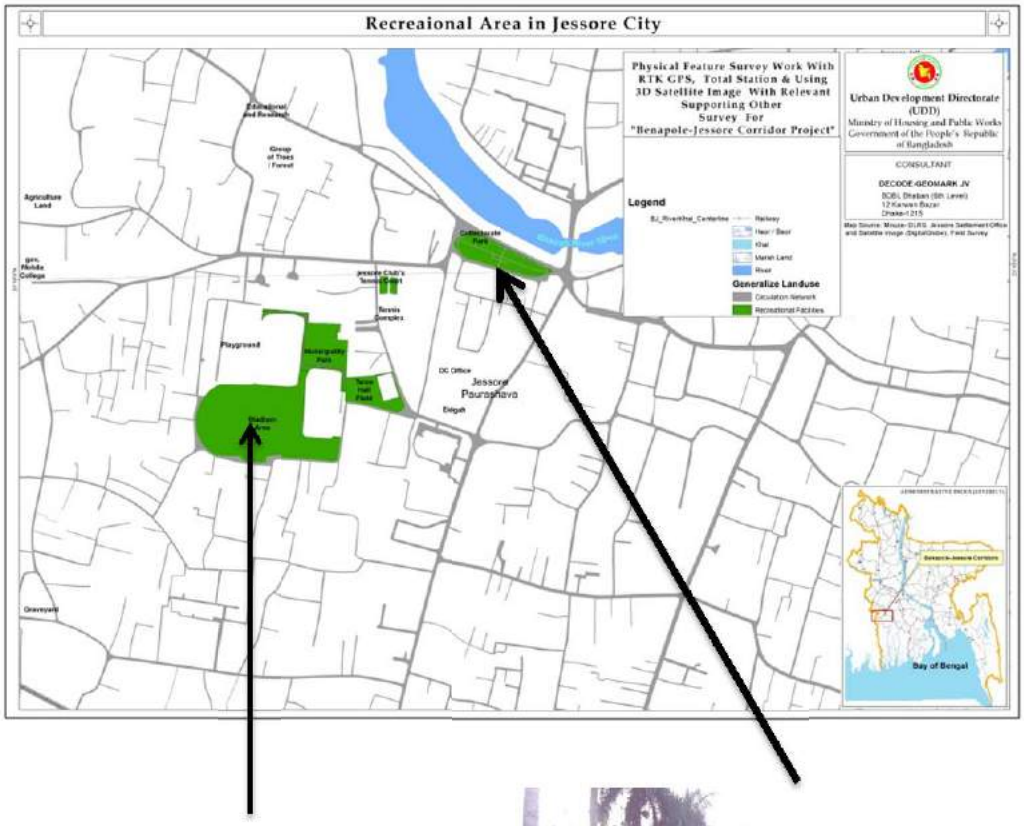
3.4 Recreational Open Space

This section is to explore the existing recreational open space, including parks, playgrounds and other open space that are used for recreational purposes. In the study area the recreational open space is limited according to the population.

In the Project area there are only 2 formal active open space which is Jessore Stadium and Jessore Municipality Swimming Pool But there also 43 informal active open space which are part of educational institute.

Collectorate Park, Municipality Park and Jessore Boat Club are the only passive open space within the project area.

Figure 75: Parks and Stadium at Jessore City



Pic 7: Jessore Stadium

Pic 7: Collectorate Park

3.5 Health Facilities Including Community Health Facilities

Introduction

This section aims to identify the existing health facilities in the Jessore-Benapole highway corridor area to give further instruction for future expansion of the services in this area. Moreover there is both govt. and private health in the study area.

Table 50: Status of Health Facilities

Provider	Number	Doctor	Nurse	Bed
Govt.	2	46	140	275
Private	17	58	136	525
Total	19	104	276	760

Source: Field Survey, 2015

3.6 Stake Holder Participation for Planning and Development Control

A participatory research approach was applied in conducting the study. For gathering

Information and data to investigate objectives, a number of participatory rural appraisal (PRA) tools will be used. It is essential to explain importance of adopting a participatory research approach, particularly the use of Participatory Rural Appraisal methods. Participatory Rural Appraisal (PRA) is an approach which incorporates methods to learn about rural or urban life and conditions from with and by rural or urban people. It can enable local people to share, enhance and analyse their knowledge for incorporating in designing, planning and formulating effective implementation strategies of the project and research. In PRA approach, the methods are more shared and owned by local people and it includes the methods like mapping and modelling, transect walks, matrix scoring, seasonal calendars, trend and change analysis, wellbeing and wealth ranking and grouping, and analytical diagramming to apply in natural resources management, agriculture, poverty and social programmes, and health and food security (Chambers, 1994). In addition, PRA methods can promote collective action and community building and continuous empowerment of the participants through involving the participation of people in all phases like analysis, planning, implementation and monitoring and evaluation of research or project. It is more flexible approach and does not create any rigidity in the application. Nevertheless, the approach has some limitations and sometime these delimit the scope of programmes or projects. These may be compared with threats of this approach. For implementing effectively in the field, it requires a lot of commitment from participants and authorities and also needs well skilled and genuine facilitators to manage both participatory process and product. Specific methods utilized for the data collection process include focus group discussions, semi-structured interviews, key-informant interviews, observations, and photographs.

3.7 Educational Facilities

Introduction

This section aims to identify the existing situation of the educational facilities in the study area and provide necessary instruction for developing the facilities in the study area. The information on different categories of schools, colleges, university and other educational institutions is shown according to location, sizes and capacity .The literacy rate in Jessore sadar is about 63.8%. , in Sharsha 49.8% and in Jhikargachha is about 53% according to BBS 2011. As per field survey the teacher student ration is 1:26.

Table 51: Existing Educational Institutions of the Study Area

Category	No.
Pre-Cadet/Academy	8
Primary School	43
High School	21
Collegiate School	3
Collage	11
Collage for Female	3
Open University	1
Madrasha	24
Nursing Institure Jessore	1
Primary Training Institute Jessore	1

Source: Field Survey, 2015

Table 52: Teacher and Student Status of the Study Area

Educational Institutions	Total Teacher	Total Student	Teacher Student Ratio
Pre-Cadet/Academy	70	2004	29
Primary School	269	11890	44
High School	354	11075	31
Collegiate School	83	1772	21
Collage	655	52555	80
Collage for Female	62	4000	65
Technical Institutions	404	5561	14
Open University	**285**	35949	13
Madrasha	280	4462	16
Nursing Institure Jessore	17	227	13
Primary Training Institute Jessore	21	399	19
Total	**5020**	**129894**	**26**

Source: Field Survey, 2015

3.8 Agriculture and Land Demarcation Survey

Introduction

This aims to explore the agricultural land of the project area. We used 3D satellite image to determine the agricultural land. First we digitize the agricultural land by image interpretation and validate the land by field survey.

Figure 76: Agricultural Land Map

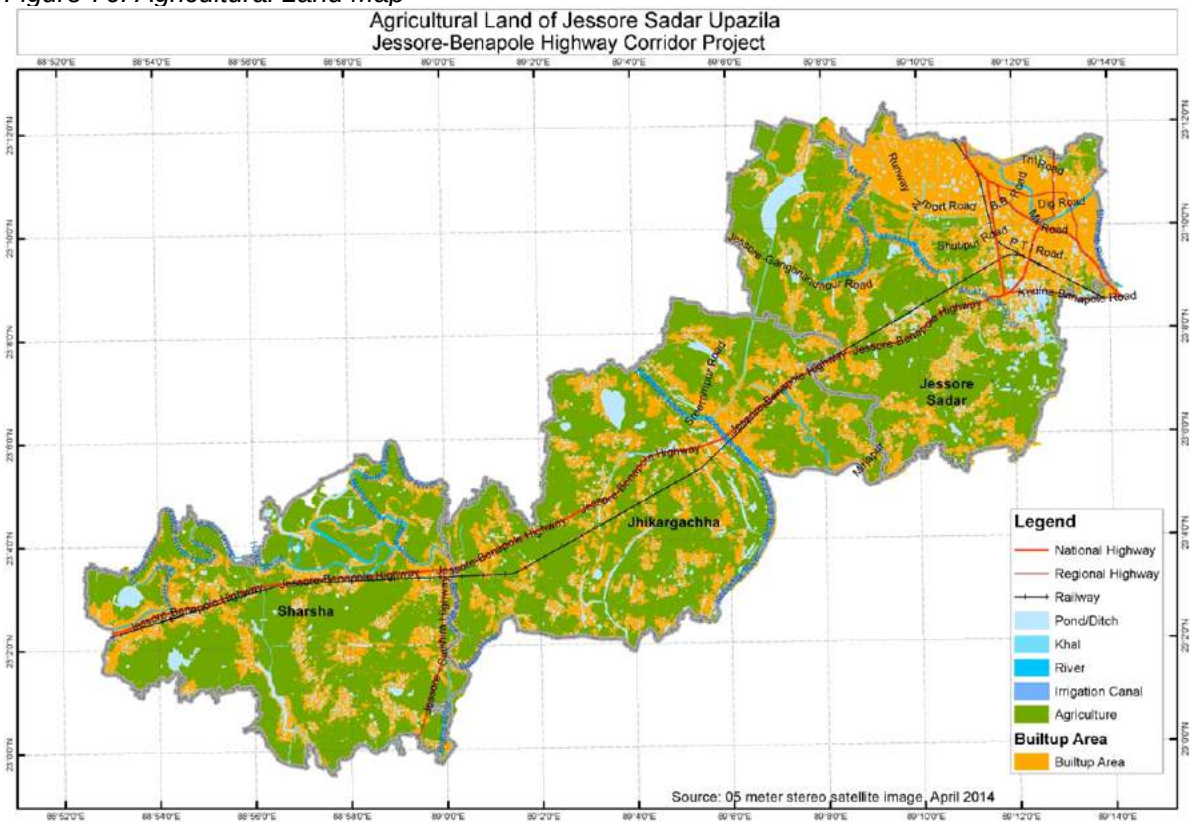


Figure 77: Agricultural Land of Jessore Sadar Upazila

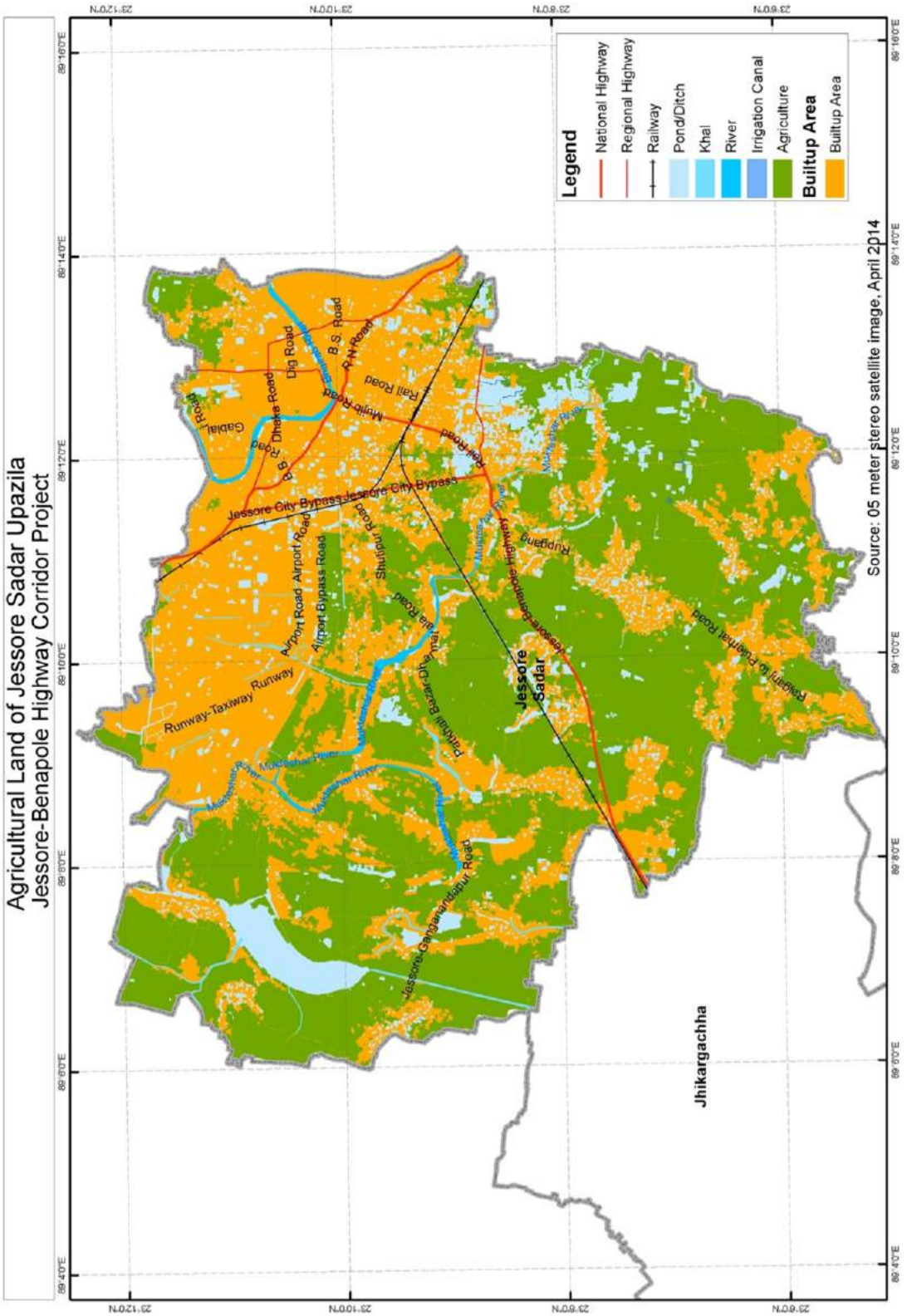


Figure 78: Agricultural Land of Jhikargcha Upazila

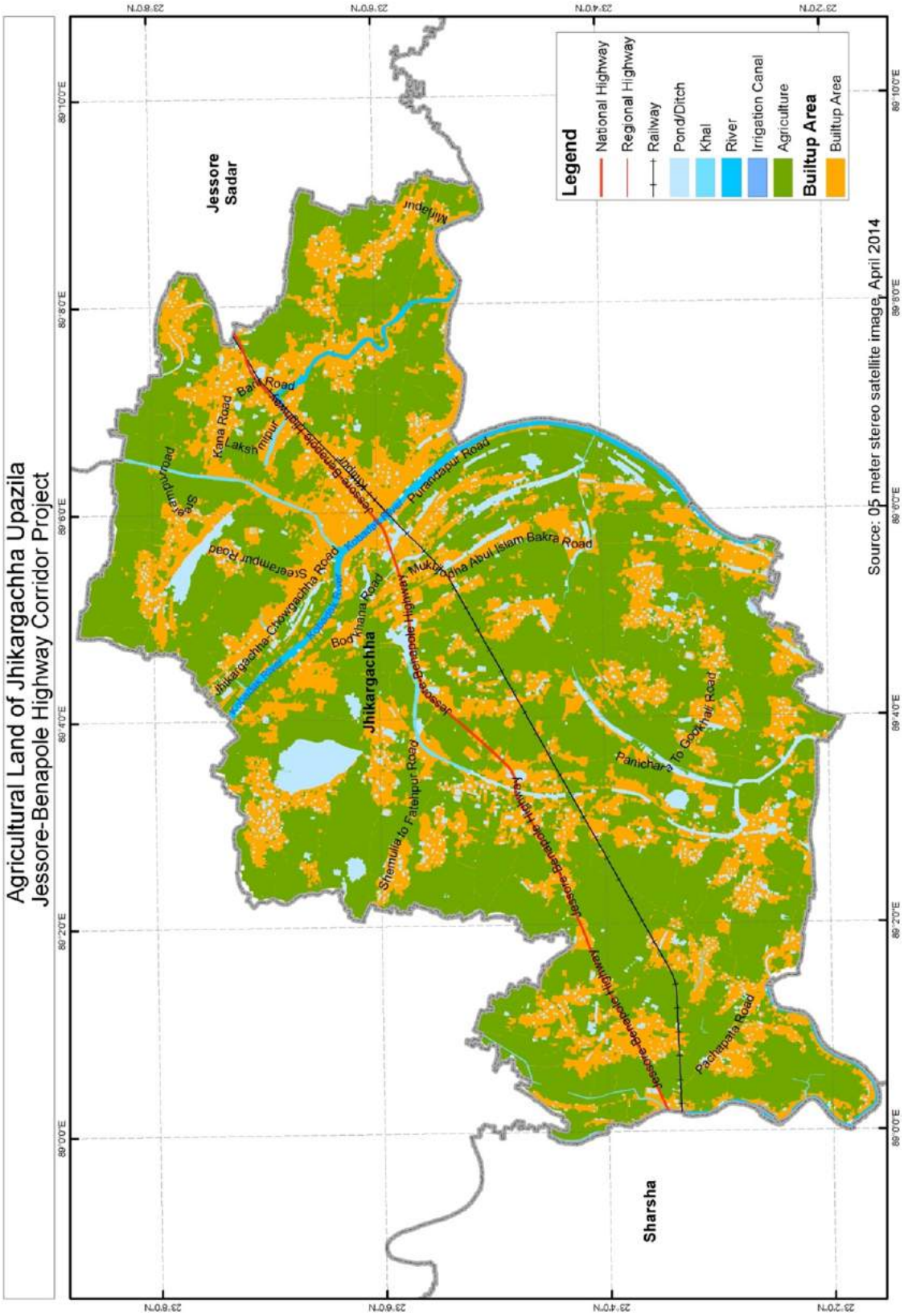
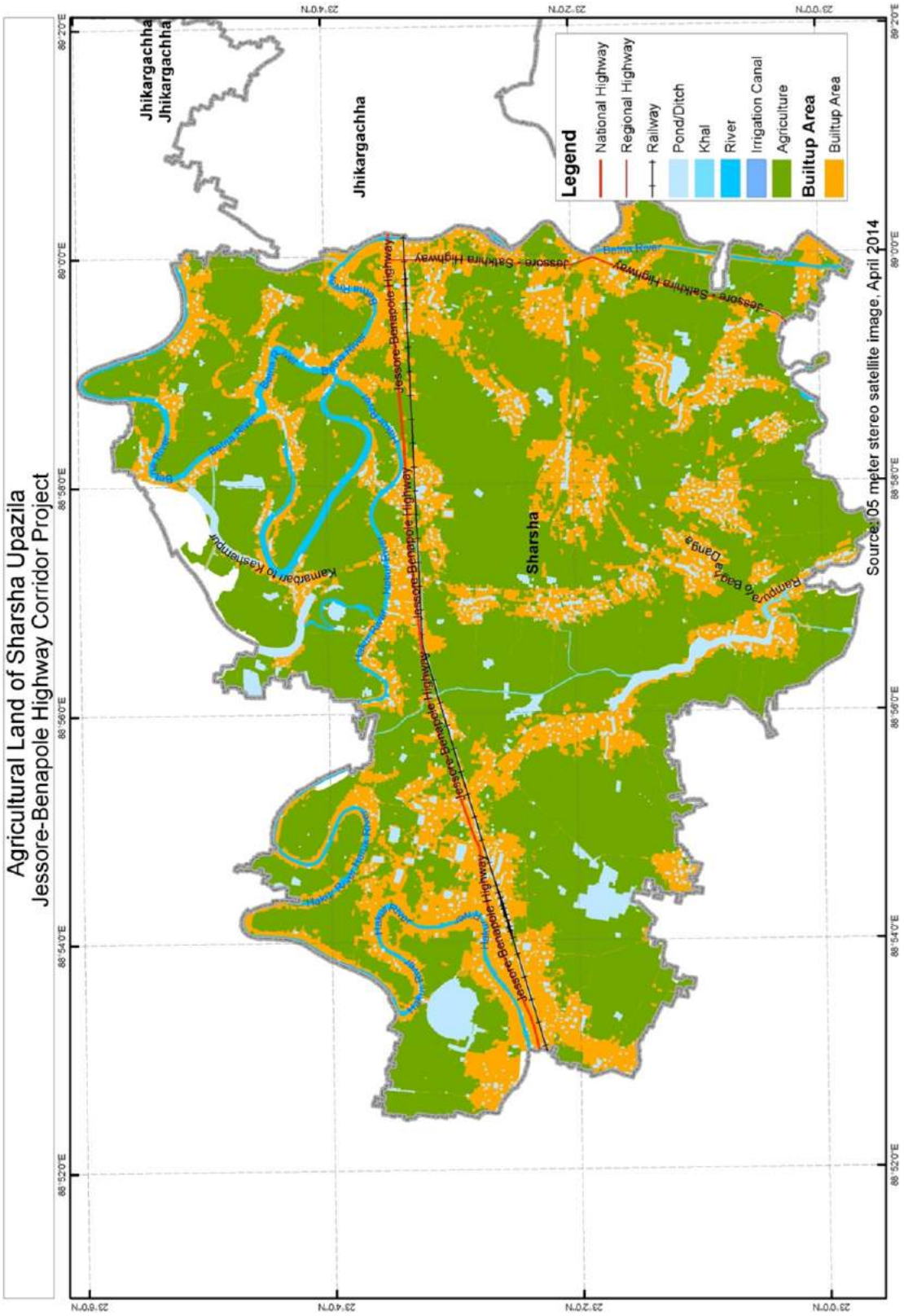


Figure 79: Agricultural Land of Sharsha Upazila



3.9 Archaeological Study and Tourism Development

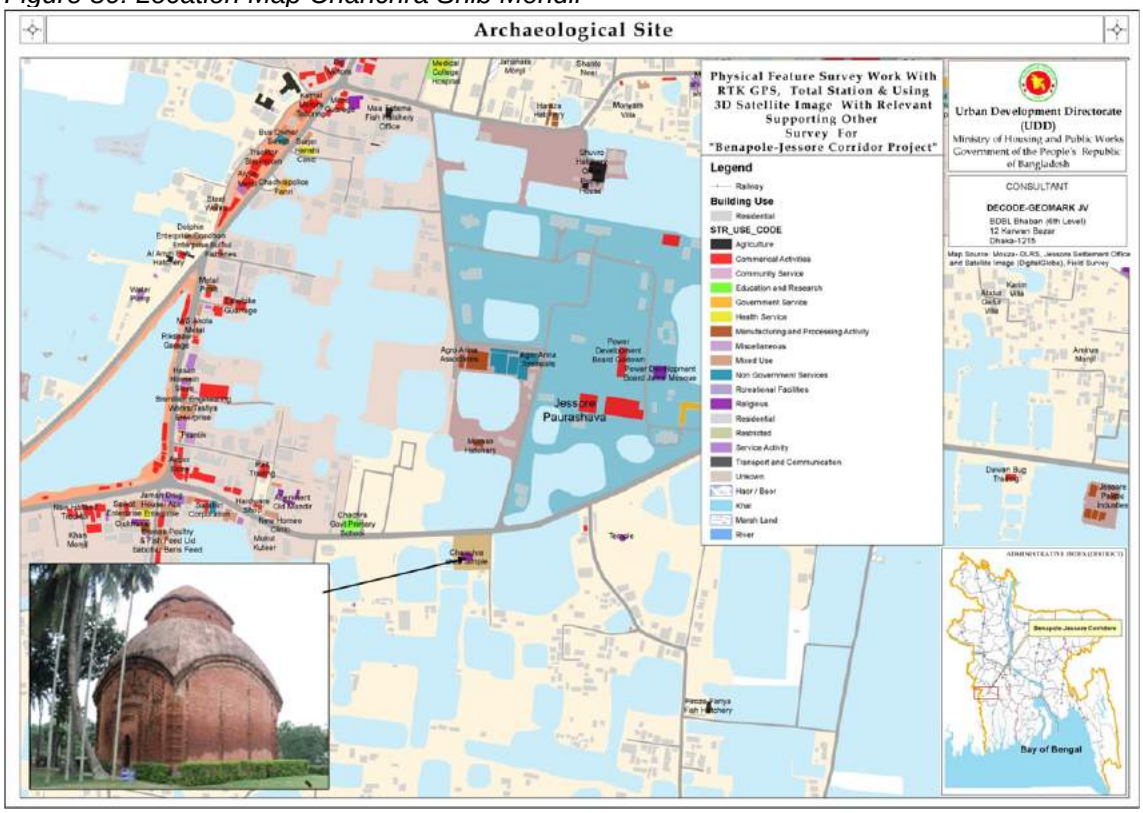
Introduction

The aim is to identify the historical sites and find out some places which can be a tourist place in the study area which have tangible or intangible value. Bangladesh is a country considerably rich in archaeological wealth, especially of the medieval period both during the Muslim and pre-Muslim rules, though most of it is still unexplored and unknown. In archaeological fieldwork and research this area was very much neglected for a long time for various reasons, not the least of which is its difficult geography and climate and remoteness from the main centers of the subcontinent. With the independence of Bangladesh in 1971 the Government has undertaken a number of field projects including a comprehensive survey and exploration of the hitherto unexplored areas and a fairly ambitious scheme of excavations on selected sites.
In Jessore-Benapole highway corridor there is few archeological sites, which is situated in Jessore paurashava area named Shib Mondir and Imam Bara of Hazi Md. Mohashin

Chanchra Shib Mondir

The Chanchra Shib Mondir was established around three hundred years ago. The archeology department has declared it as an archeological site which consists of about 1 bigha of land and the structure is about (30×30) ft. The Hindus use this place as a temple.

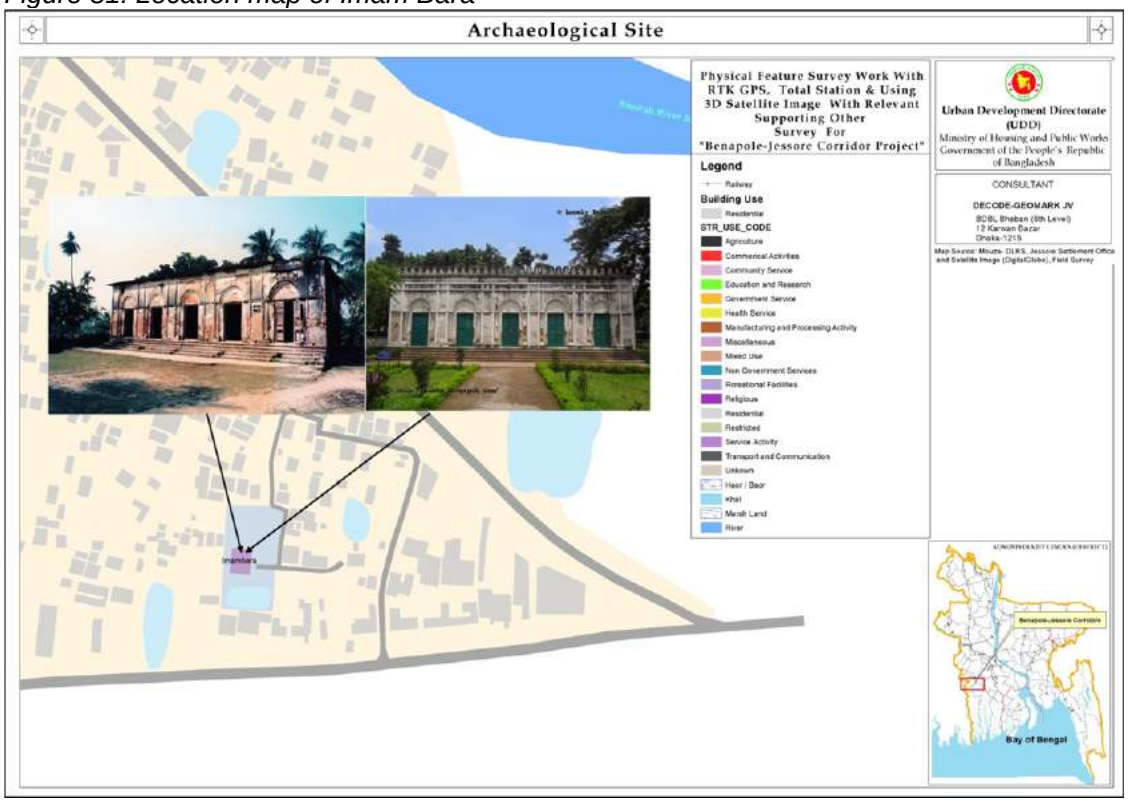
Figure 80: Location Map Chanchra Shib Mondir



Imam Bara

The structure was established by Munnjan Khanam in 1802, step sister of Hazi Md. Mohasin. Now it is called Imam bara of Hazi Muhammad Mohasin. The structure is about 18×15 meter. The place is the focal point of the Shia Muslims.

Figure 81: Location map of Imam Bara



Residence of DC or Satkhira House:

Since 1921, the building known as the House of Satkhira, Jessore Deputy Commissioner has been used as a residence. The original owner of the building, the landlord, a Shoilojanando Chowdhury. At the end of 1895, one of the bright signs, architectural heritage house built in Satkhira. A total of 2475 acres of land adjacent to the two-storey building. Since 1921, the then Emperor of India took two phases lease for 5 years. At that time, the property was mortgaged to Jessore loan company. According to the Bank of Calcutta's right to purchase the company receives. The bank did not want to nabayana Deputy lease in favor of the public interest in 1948, the government took over the property. Meanwhile, the Bank of Calcutta and the

Bangladesh Bank likudisane the liquidity of the Dhaka High Court appointed an inter-ministerial meeting chaired by Secretary Establishment haya1691987 on value of the land in respect of building 4359624/34 is fixed at the residence of the Deputy Commissioner for the property was acquired on 03-09-1988. Field visits to the local Public Works Department building on 11-5-1995 declared uninhabitable due to the Prime Minister presided over the 81st meeting of NICAR on 12031999 according to the Deputy Commissioner is to build a new residence.

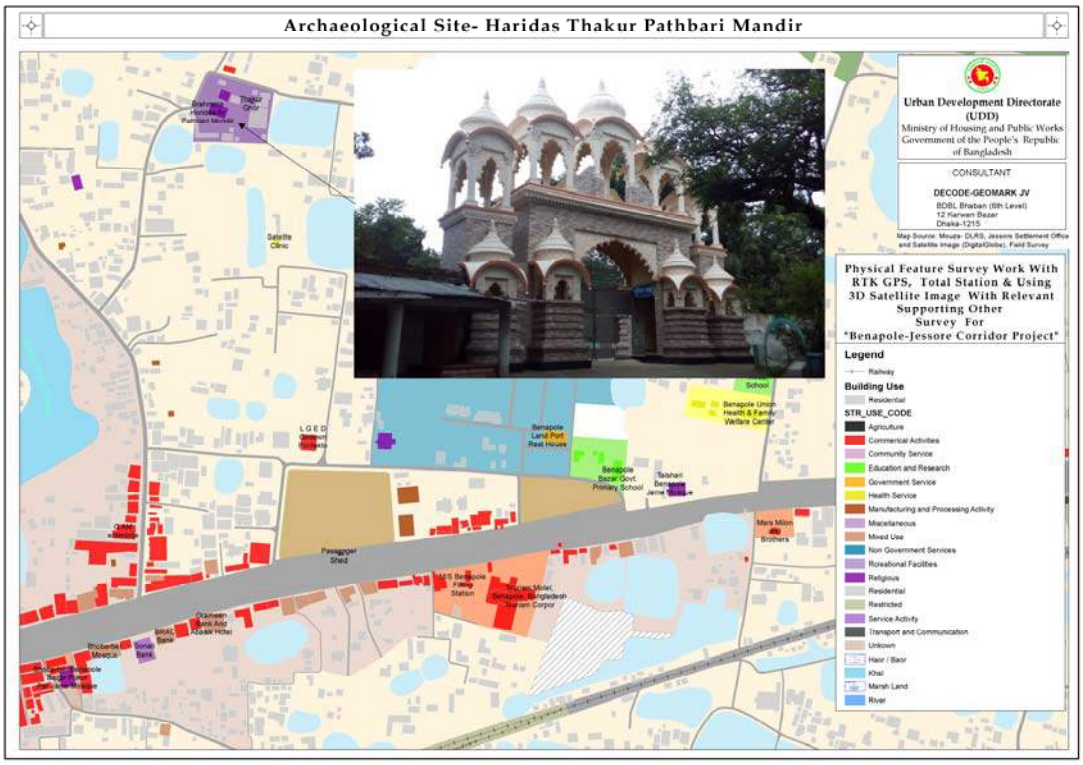
Collectorate Bhaban:

Current Collectorate building was built in 1885 as a single, then two lakh 63 thousand 6 hundred at a cost of 79. Bengal was the longest building in the 360 at the entrance to the spectacular and the house was known to the general public for a long time. While maintaining the original structure and elegance 198 AD, it was turned into the first floor. The building is still the atyatama spectacular.

Hridas Thakur Pathbari Temple:

Haridas Thakur Pathbari Temple is situated in Benapole city. Just 500 meter from the national highway. Haridasa Thakur (IAST Haridāsa) (born 1451 or 1450) was a prominent Vaishnava saint known for being instrumental in the initial propagation of the Hare Krishna movement. He was born in the Village of Buron (Budana) in the present district of Satkhira, Bangladesh. Haridasa Thakura lived for some time at Benapol.

Figure 82: Haridas Tahkur Pathbari Mandir Location Map



3.10 Pollution Study

This aims to explore the pollution in the Jessore-Benapole Highway Corridor that has impact on the human in this area both in short term and long term effect. Jessore-Benapole is one of the most important and higher traffic volume roads, because of Benapole land Port. Beside there is number of brick burning field and industries beside the Jessore-Benapole highway road that creates pollution. Air and noise pollution is common in the study area because of vehicle and industry. Beside waste pollution is common in the study area mostly from household's solid waste. The waste management system is not satisfactory in the study area, because of proper management and shortage of technology and manpower.

Noise Pollution:

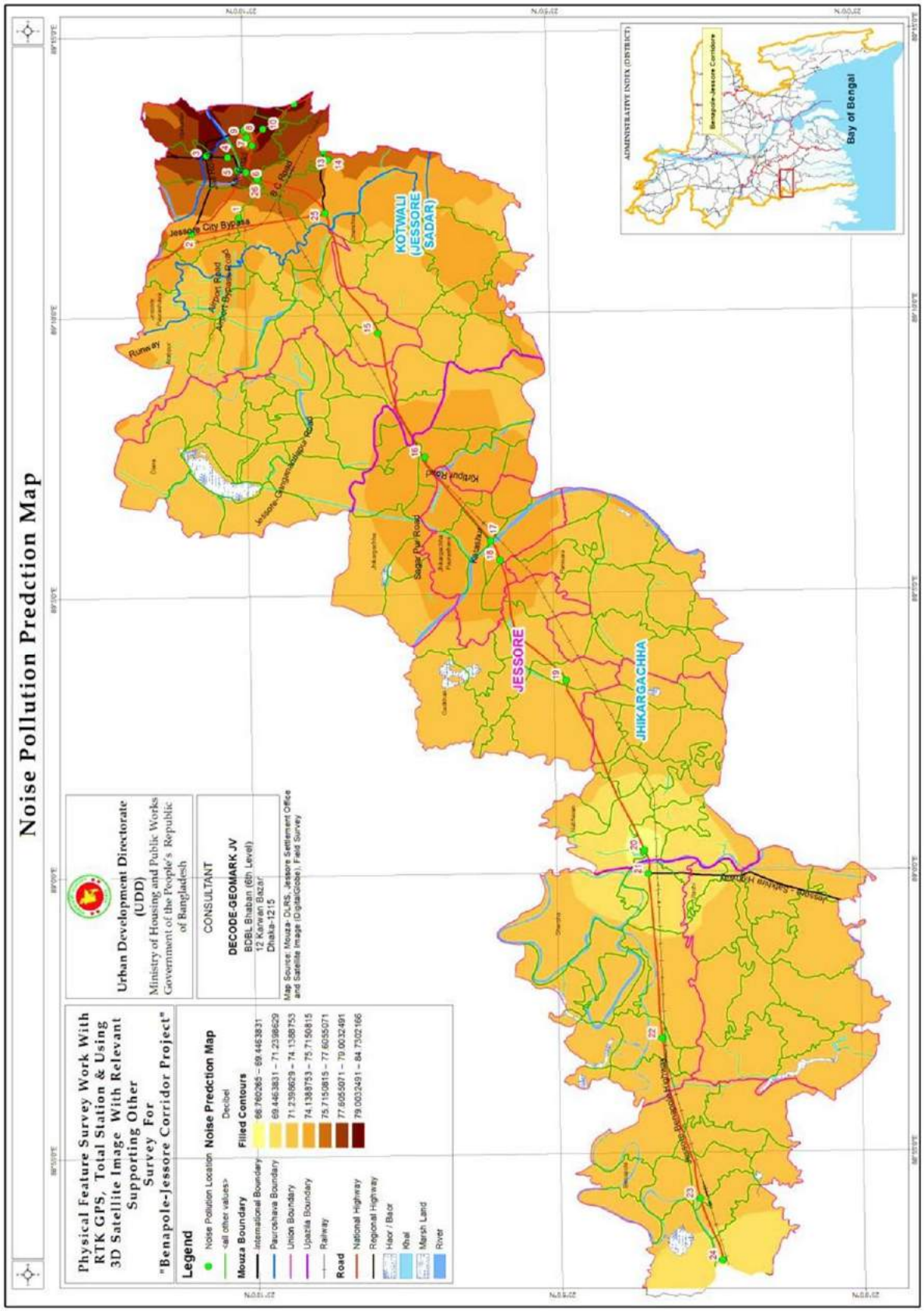
We collected 26 Noise reading in the project area. Most of the points in Jessore City and on Jessore-Benapole Highway Corridore. We used Mobile phone application to measure the value. This application measures continuous value with the GPS location. From the data we calculated minimum, average and maximum value and we used IDW (inverse distance weighting). Prediction might give wrong impression with distance from highway corridor.

Table 53: Noise Reading

Id	Min_value	Max_Value	Average	Latitude	Longitude
1	57.77	88.45	68.15	N23° 10' 5.820"	E89° 11' 45.008"
2	66.85	85.92	74.13	N23° 10' 52.288"	E89° 11' 28.763"
3	73.90	94.08	82.24	N23° 10' 36.540"	E89° 12' 52.347"
4	69.54	90.53	77.65	N23° 10' 15.669"	E89° 12' 50.471"
5	72.92	96.41	83.12	N23° 10' 6.386"	E89° 12' 37.032"
6	67.21	93.45	80.42	N23° 9' 57.923"	E89° 12' 34.081"
7	74.24	96.90	83.85	N23° 9' 51.315"	E89° 13' 2.639"
8	66.11	92.94	71.11	N23° 9' 56.573"	E89° 13' 11.590"
9	68.26	95.96	78.24	N23° 9' 59.201"	E89° 13' 19.795"
10	75.94	96.97	84.73	N23° 9' 40.569"	E89° 13' 20.320"
11	72.28	94.86	80.74	N23° 9' 9.521"	E89° 13' 46.609"
12	70.58	93.10	79.00	N23° 8' 34.512"	E89° 14' 11.199"
13	69.30	95.97	78.45	N23° 8' 40.816"	E89° 12' 55.390"
14	62.65	88.07	71.24	N23° 8' 36.611"	E89° 12' 46.404"
15	63.51	82.84	69.88	N23° 7' 49.757"	E89° 9' 40.184"
16	68.95	90.44	77.47	N23° 7' 5.125"	E89° 7' 27.152"
17	66.42	97.85	77.45	N23° 6' 1.193"	E89° 5' 56.333"
18	69.37	86.74	74.32	N23° 5' 52.163"	E89° 5' 36.095"
19	64.90	89.98	72.26	N23° 4' 48.444"	E89° 3' 25.942"
20	61.95	80.76	66.76	N23° 3' 33.499"	E89° 0' 23.302"
21	64.98	82.89	70.37	N23° 3' 29.781"	E88° 59' 57.868"
22	65.30	93.12	77.11	N23° 3' 18.189"	E88° 57' 2.203"
23	62.03	85.65	74.30	N23° 2' 42.600"	E88° 54' 10.501"
24	61.28	78.10	67.36	N23° 2' 20.665"	E88° 53' 4.302"
25	64.60	89.38	74.15	N23° 8' 40.249"	E89° 11' 49.213"
26	64.88	95.28	73.25	N23° 9' 46.785"	E89° 12' 26.709"

Source: Field Survey, 2015

Figure 83: Noise Pollution Prediction Map



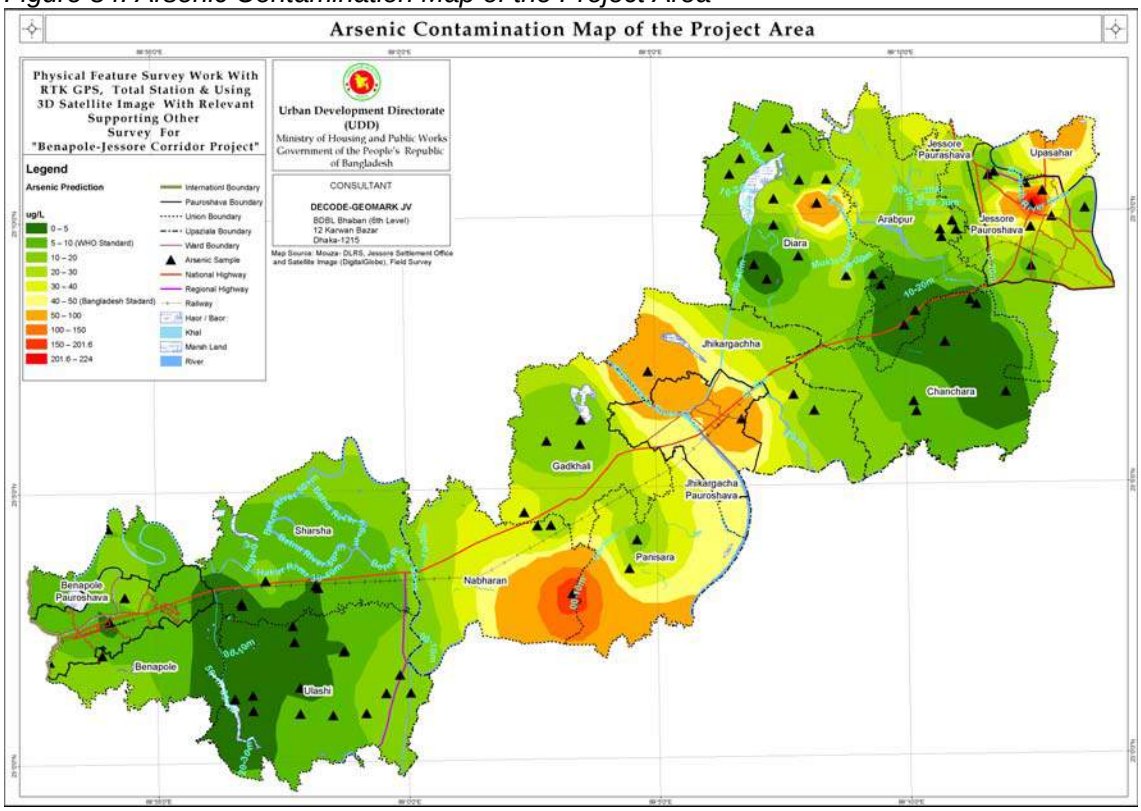
Arsenic Pollution:

Arsenic contamination of groundwater is widespread and there are a number of regions where arsenic contamination of drinking-water is significant.

Arsenic in Bangladesh has attracted much attention since recognition in the 1990s of its wide occurrence in well-water in that country. Since this time, significant progress has since been made and the number of people exposed to arsenic exceeding the Bangladesh drinking-water quality standard has decreased by approximately 40%. Despite these efforts, it is estimated that about 20 million and 45 million people in Bangladesh are at risk of being exposed to arsenic concentrations that are greater than the national standard of 50 µg/litre and the WHO guideline value of 10 µg/litre respectively.

We have collected 104 secondary data from BARC and Sigma Engineers Ltd. for arsenic data. With the data we have prepared a arsenic contamination contour map by using geostatistical analyst in ArcGIS and prepared a contour map for the project area. We found that Jhikargacha city, Jessore City, Navharan Union and Panisara union has very high arsenic than other area of the project area. If we consider WHO standard value then most of the area is arsenic contaminated but if we consider Bandaldesh National Standard then Jessore City, Jhikargacha Union, Jhikargacha City, Nabharan union and Panisara Union is arcsenic contaminated.

Figure 84: Arsenic Contamination Map of the Project Area



Source: BARC and Sigma Engineers Ltd.

Table 54: Sample Data for Arsenic

SL	Well Type	Depth (Ft)	District	Thana	Union	Mouza	Arsenic ug/l
1	STW	45	Jessore	Jhikargachha	Magura	Mohammadpur	111
2	STW	51	Jessore	Jessore Sadar	Labutala	Khajura	9
3	STW	22	Jessore	Sharsha	Nizampur	Amtala	54
4	DTW	118	Jessore	Chaugachha	Chaugachha	Chaugachha	49
5	STW	67	Jessore	Manirampur	Shyamkur	Aminpur	168
6	STW	35	Jessore	Jhikargachha	Jhikargachha	Hariadhara	107
7	STW	92	Jessore	Jhikargachha	Jhikargachha	Kirtipur	72
8	DTW	195	Jessore	Jhikargachha	Gadkhali	Kamarpara	0
9	STW	25	Jessore	Jhikargachha	Nabharan	Haria	201
10	STW	37	Jessore	Jhikargachha	Hazirbagh	Kulla	83
11	STW	40	Jessore	Jhikargachha	Bakra	Bakra	107
12	STW	40	Jessore	Jhikargachha	Shankarpur	Ulakol	49
13	STW	50	Jessore	Jessore Sadar	Ichhali	Hasimpur	1
14	STW	22	Jessore	Jessore Sadar	Noapara	Bahadurpur	77
15	STW	62	Jessore	Jessore Sadar	Narendrapur	Hatbila	121
16	STW	40	Jessore	Sharsha	Lakshmanpur	Badepukuria	30
17	DTW	199	Jessore	Sharsha	Sarsa	Sarsa	21
18	STW	39	Jessore	Sharsha	Sarsa	Sarsa	7
19	STW	44	Jessore	Sharsha	Benapole	Benapole	1
20	STW	41	Jessore	Sharsha	Putkhali	Sikri	38
21	STW	39	Jessore	Sharsha	Kayba	Baikala	57
22	STW	44	Jessore	Sharsha	Ulashi	Dhaldaha	15
23	STW	34	Jessore	Jessore Sadar	Haibatpur	Uttar lalitadaha	172
24	STW	49	Jessore	Jessore Sadar	Churamankati	Bagdanga	90
25	STW	25	Jessore	Jessore Sadar	Diara	Alamnagar	132
26	Tara	49	Jessore	Jessore Sadar	Chanchra	Maidia	0
27	DTW	148	Jessore	Jessore Sadar	Paurashava w02	Puratan kasba	10
28	STW	49	Jessore	Jessore Sadar	Paurashava w02	Puratan kasba	0
29	STW	49	Jessore	Jessore Sadar	Paurashava w04	Nazir shankarpur	0
30	STW	50	Jessore	Jessore Sadar	Paurashava w03	P. off. para	0
31	STW	45	Jessore	Chaugachha	Chaugachha	Chaugachha	59
32	STW	48	Jessore	Chaugachha	Kharingha	Kharingha	52
33	STW	54	Jessore	Chaugachha	Singhajhuli	Jahangirpur	86
34	STW	40	Jessore	Chaugachha	Singhajhuli	Singhajhuli	68
35	Tara	47	Jessore	Chaugachha	Phulsara	Atra	0
36	STW	57	Jessore	Manirampur	Kultia	Padmanathpur	71
37	STW	43	Jessore	Manirampur	Haridashkati	Bhomardaha	178
38	STW	53	Jessore	Manirampur	Manirampur	Jalshara	96
39	STW	34	Jessore	Manirampur	Khedapara	Dhigirpar	224
40	STW	60	Jessore	Manirampur	Rohita	Sharashkati	40
41	STW	44	Jessore	Manirampur	Maswimnagar	Maswimnagar	88
42	STW	47	Jessore	Bagher Para	Raipur	Raipur	0

44	STW	95	Jessore	Jhikargachha	Gadkhali	Fatehpur	10
45	DTW	288	Jessore	Jhikargachha	Gadkhali	Jafarnagar	1
46	DTW	275	Jessore	Jhikargachha	Jhikargachha	Mallikpur	30
47	STW	120	Jessore	Jhikargachha	Jhikargachha	Mirzapur	10
48	DTW	286	Jessore	Jhikargachha	Panisara	Taora	10
49	STW	120	Jessore	Jhikargachha	Panisara	Taora	30
50	STW	120	Jessore	Sharsha	Benapole	Bara Achra	10
51	DTW	300	Jessore	Sharsha	Benapole	Bara Achra	10
52	HTW	66	Jessore	Sharsha	Benapole	Narayanpur	10
53	DTW	300	Jessore	Sharsha	Ulashi	Dhaldaha	0
54	STW	120	Jessore	Sharsha	Ulashi	Jirangachha	0
55	STW	120	Jessore	Sharsha	Ulashi	Jirangachha	0
56	Bill	5	Jessore	Sharsha	Ulashi	Kanyadaha	0
57	DTW	300	Jessore	Sharsha	Ulashi	Rampur	0
58	STW	120	Jessore	Sharsha	Ulashi	Rampur	0
59	DTW	283	Jessore	Sharsha	Ulashi	Sambandba Kathi	10
60	STW	100	Jessore	Sharsha	Ulashi	Sambandba Kathi	0
61	STW	263	Jessore	Sharsha	Ulashi	Ulashi	25
62	STW	120	Jessore	Kotwali	Arabpur	Durgapur	0
63	Surface	5	Jessore	Kotwali	Ward No-01	Barandi Para (Khaldha Road)	0
64	HTW	313	Jessore	Kotwali	Ward No-02	Khorki	0
65	DTW	290	Jessore	Kotwali	Ward No-03	Bogchar	20
66	STW	165	Jessore	Kotwali	Ward No-03	Kholadanga	300
67	STW	105	Jessore	Kotwali	Ward No-03	Nazir Shankarpur	10
68	STW	120	Jessore	Kotwali	Arabpur	Malanchi	0
69	DTW	300	Jessore	Kotwali	Arabpur	Malanchi	0
70	DTW	295	Jessore	Kotwali	Arabpur	Sujalpur	10
71	DTW	300	Jessore	Kotwali	Arabpur	Sujalpur	0
72	DTW	271	Jessore	Kotwali	Arabpur	Sujalpur	0
73	STW	105	Jessore	Kotwali	Arabpur	Sujalpur	50
74	DTW	268	Jessore	Kotwali	Chanchra	Berbari	0
75	HTW	110	Jessore	Kotwali	Chanchra	Sarapol	0
76	STW	160	Jessore	Kotwali	Chanchra	Tapaswidanga	0
77	DTW	285	Jessore	Kotwali	Chanchra	Tentulia	10
78	HTW	160	Jessore	Kotwali	Chanchra	Tentulia	10
79	DTW	283	Jessore	Kotwali	Diara	Arijpur	10
80	STW	180	Jessore	Kotwali	Diara	Arijpur	10
81	DTW	300	Jessore	Kotwali	Diara	Chandutia	0
82	STW	120	Jessore	Kotwali	Diara	Chandutia	0
83	DTW	258	Jessore	Kotwali	Diara	Erenda	0
84	HTW	70	Jessore	Kotwali	Diara	Erenda	30
85	STW	120	Jessore	Kotwali	Diara	Faridpur	10
86	DTW	300	Jessore	Kotwali	Diara	Ichhapur	0
87	STW	120	Jessore	Kotwali	Diara	Mahadebpur	0

88	STW	120	Jessore	Kotwali	Diara	Mathbari	35
89	STW	120	Jessore	Kotwali	Diara	Mathbari	0
90	DTW	300	Jessore	Kotwali	Diara	Narangali	0
91	STW	120	Jessore	Kotwali	Diara	Narangali	0
92	STW	120	Jessore	Jhikargachha	Nabharan	Sharifpur	10
93	DTW	290	Jessore	Jhikargachha	Nabharan	Sharifpur	30
94	DTW	255	Jessore	Sharsha	Benapole	Benapole	15
95	DTW	300	Jessore	Sharsha	Sharsha	Chatkapota	0
96	STW	120	Jessore	Sharsha	Sharsha	Chatkapota	0
97	DTW	300	Jessore	Sharsha	Sharsha	Samlagachhi	0
98	DTW	300	Jessore	Sharsha	Ulashi	Bara Baria	10
99	DTW	300	Jessore	Sharsha	Ulashi	Bara Baria	10
100	STW	120	Jessore	Sharsha	Ulashi	Bara Baria	10
101	DTW	300	Jessore	Sharsha	Ulashi	Jirangachha	0
102	Surface	3	Jessore	Sharsha	Ulashi	Ulashi	0
103	HTW	120	Jessore	Sharsha	Ulashi	Ulashi	25
104	STW	120	Jessore	Jhikargachha	Gadkhali	Gadkhali	40

Source: BARC and Sigma Engineers Ltd.

3.11 Hydrological and Bathymetry Report Studies:

Hydrological data from 1981 to 2003 data was collected from Bangladesh water development board at Kobadak River. We calculated average, minimum and maximum value from collected data. Maximum water level of this place is 5.59 meter and danger water level is 4.11 meter.

There is no bathymetry report on Kabadak River & Bairab River.

Figure 85: Water Level of Kobadak River June 05, 2015

Source: Bangladesh Water Development Board

Table 55: Analysis of Hydrological data.

	Max	Min	Average
High Tide	5.45	0.81	2.22
Low Tide	5.44	0.61	2.08

Source: Bangladesh Water Development Board

Table 56: Hydrology Sample Data

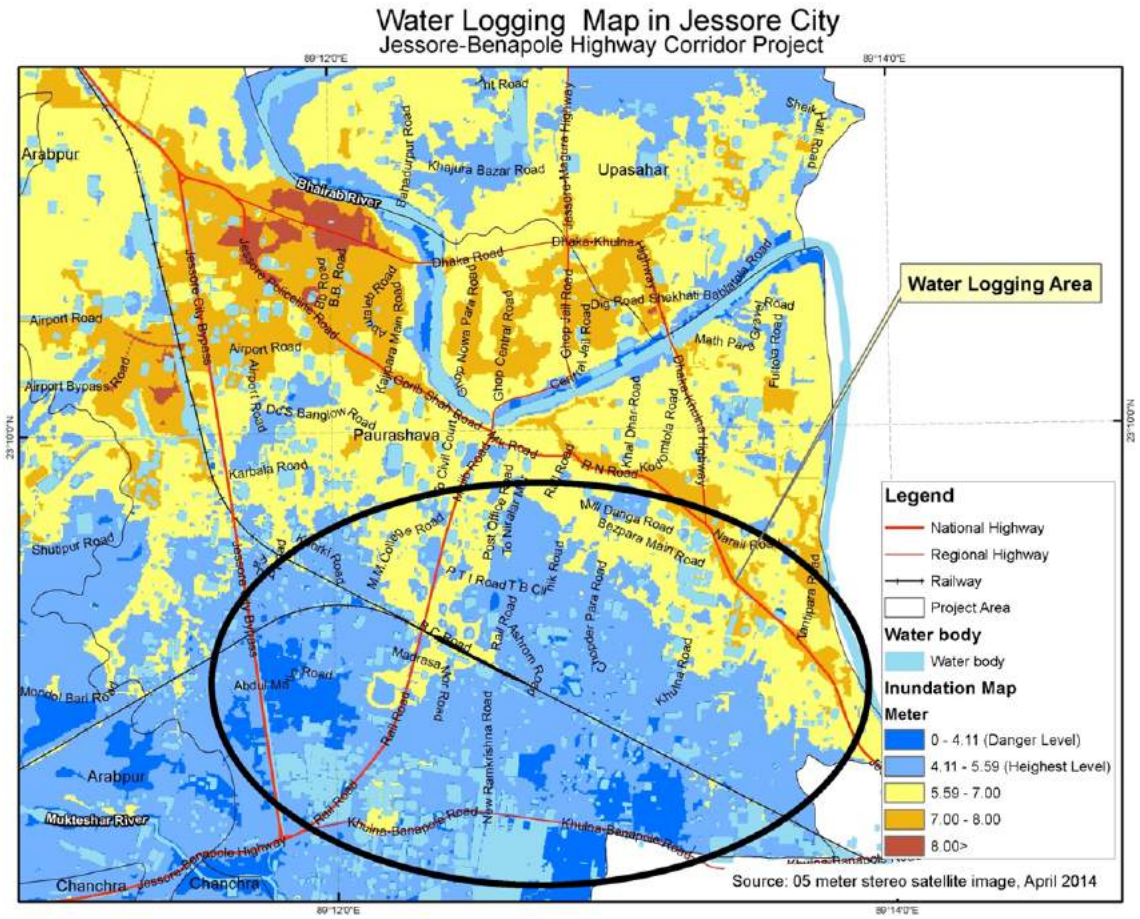
RiverName	StationName	StationID	DateTime	HighTide	LowTide
Kobadak	Jhikargacha	SW162	01/04/1981	1.91	1.91
Kobadak	Jhikargacha	SW162	02/04/1981	1.93	1.93
Kobadak	Jhikargacha	SW162	03/04/1981	1.94	1.94
Kobadak	Jhikargacha	SW162	04/04/1981	1.98	1.98
Kobadak	Jhikargacha	SW162	05/04/1981	2.07	2.07
Kobadak	Jhikargacha	SW162	06/04/1981	2.08	2.08
Kobadak	Jhikargacha	SW162	07/04/1981	2.07	2.07
Kobadak	Jhikargacha	SW162	08/04/1981	2.05	2.05
Kobadak	Jhikargacha	SW162	09/04/1981	2.03	2.03
Kobadak	Jhikargacha	SW162	10/04/1981	1.98	1.98
Kobadak	Jhikargacha	SW162	11/04/1981	1.95	1.95
Kobadak	Jhikargacha	SW162	12/04/1981	1.92	1.92
Kobadak	Jhikargacha	SW162	13/04/1981	1.91	1.91
Kobadak	Jhikargacha	SW162	14/04/1981	1.89	1.89
Kobadak	Jhikargacha	SW162	15/04/1981	1.89	1.89

Source: Bangladesh Water Development Board

3.12 Water Logging:

Generally flood doesn't not occur in this area but now a days water logging is becoming very frequent. Due to unauthorized blockade in river/khal, controlling of water flow water logging is heaping during rainy season especially in jessore city. It takes 2-3 hours to drain out the rain water. Height from mean sea level Jessore city is gradually decreased in south part. Northern part is generally higher. Rainwater moves from northern part to southern part and goes to *honirar beel*. But due to unplanned development water flow is interrupted. Some small but important drain is blocked or destroyed for development work which is the main cause for the water logging problem.

Figure 86: Water Logging Area in Jessore City



3.13 Unauthorized Encroachment:

Unauthorized encroachment, land gabbing or unplanned encroachment is a big problem for Bangladesh and its sustainable development. Because of encroachment water logging, unexpected flooding is happening. With the help of recent satellite image and georeferenced mouza maps (CS) we found some unauthorized land grabbing or encroachment in the project area which we shown in the below maps. Now a days waterlogging is a big problem in the project area which was not present in this area before. Because of encroachment, unauthorized intervention water logging is a big problem now.

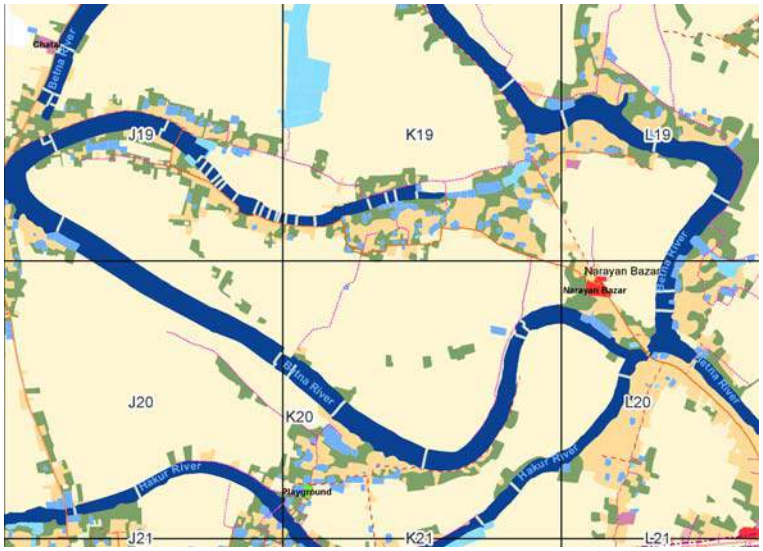


Figure 87: Unauthorized Cross Dam in Hakur River, Benapole

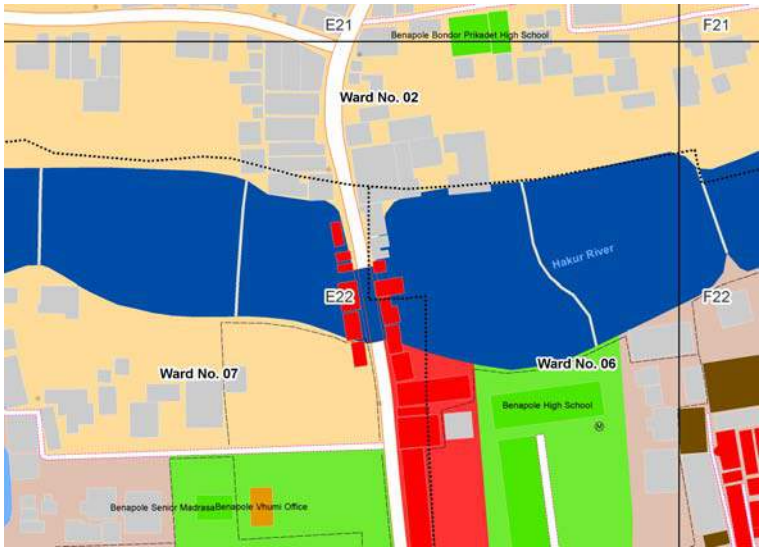


Figure 88: Unauthorized Building on Hakur River

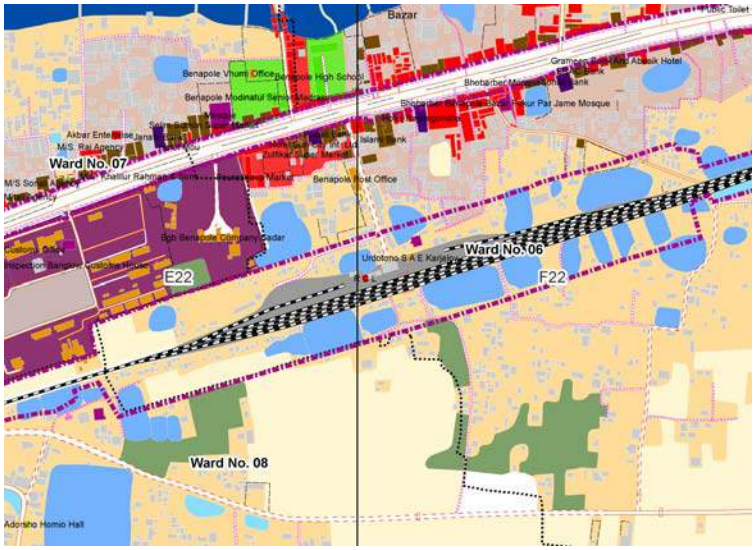


Figure 89: Human Settlement inside Railway Benapole Station Area

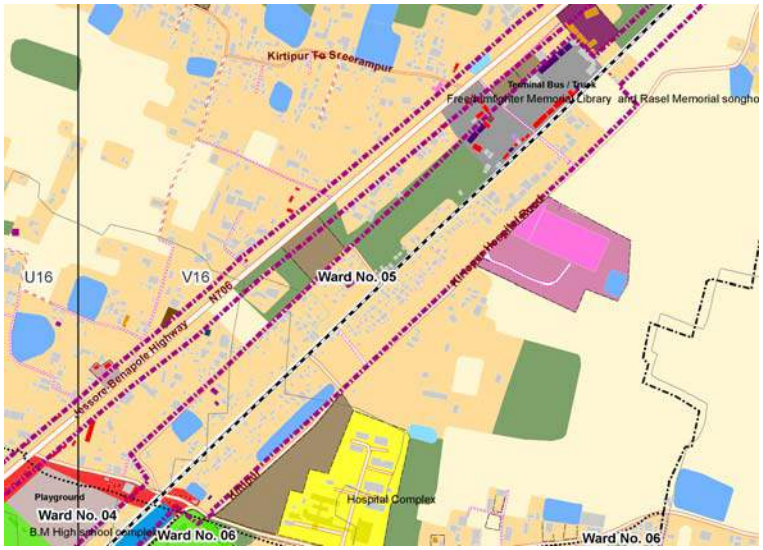


Figure 90: Human Settlement inside Jhikarcachha Railway Station Area

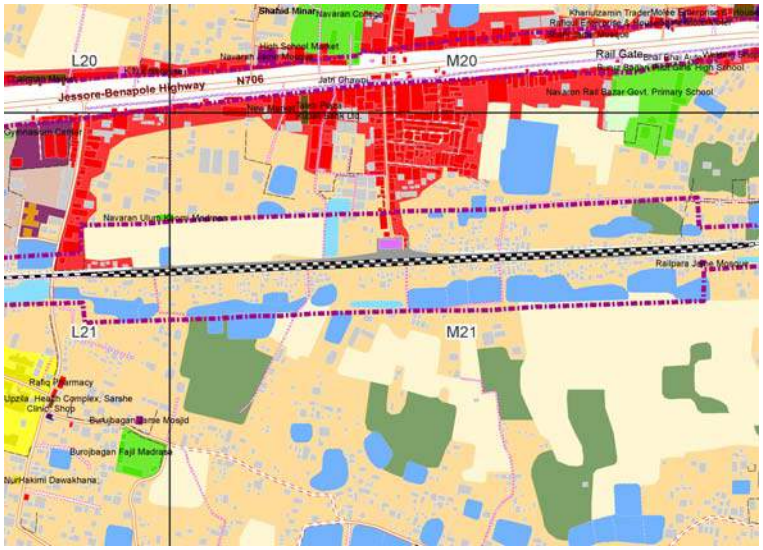


Figure 91: Human Settlement inside Railway Navaron Station Area

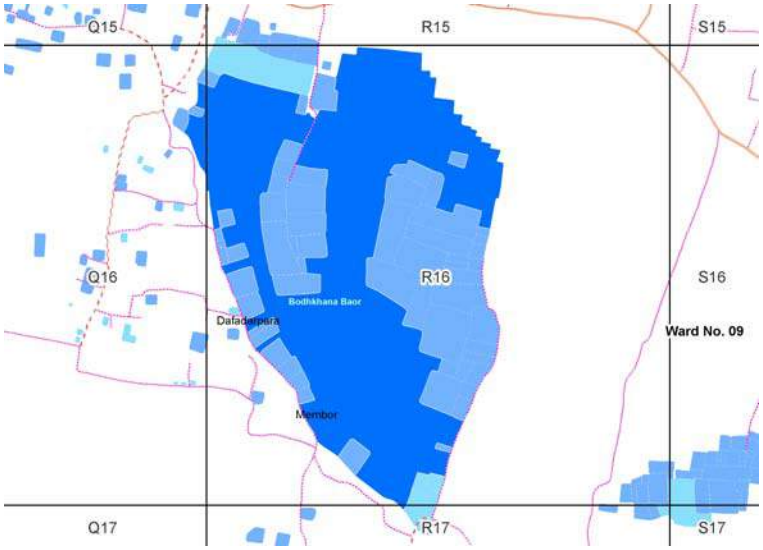


Figure 92: Human Intervention in Bodhkahana Baor

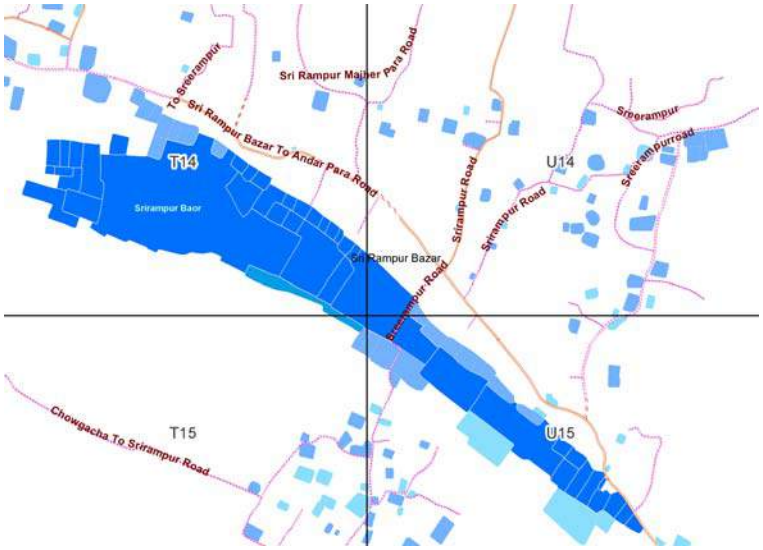


Figure 93 : Human Intervention in Srirampur Baor

Figure 94: River Branch is seperated by Unplanned Road

3.14 Environmental Overview:

Jessore district (coordinate 88^{o} 40' to 89^{o}50' E and 22^{o} 47' to 23^{o} 47' N) with an area of 6674sq. km, is bounded by Jhenaidah districts on the north, Khulna and Satkhira district on the south, Narail and Magura on the east, India on the westhere are some prominent rivers in this district namley Kopothakko, Bhairab, Chitra, Ichamoti, Harihor, Dadra, Betraboti & Kodla.This chapter provides the detailed baseline and analysis for the proposed project area.

Consisting of all or part of 15 Districts, the South-Western Region of Bangladesh (NWMP, 2000) has an area of about 26,000 km2. Khulna is a large industrial city and a major river port, with a population of more than a million, the largest in the region and the third largest in the country. Other important towns are Jessore, Chuadanga, Bagerhat, Jhenaidah and Kushtia, each of which has a population of over 200,000. Mongla is the second port of the country.

The Region is a complex of inter-linked ecosystems in the delta of the Ganges-Brahmaputra-Meghna Rivers. Salinity intrusion in the rivers is a major feature of the region, which is influenced especially by the distributaries of the Ganges flowing south eastwards to the Bay of Bengal. By far the most important of these is the Gorai, which carried some 15% of the Ganges flow before construction of the Farakka Barrage upstream on the Ganges in India in the mid-1970s. The Gorai flow was reduced by about one third after commissioning of the barrage, although it has recently improved, following the Ganges water sharing agreement in 1996 and the restoration of dry season flows in the Gorai by dredging in early 1999. However, there appears to have been a natural trend over the last 100 years or so for the Ganges and its distributaries to migrate eastwards, leaving the South-Western region of Bangladesh and the adjacent territory in India progressively drier.

Considerable development of groundwater resources for tubewell irrigation has taken place in the Region, except in the southern part nearer the coast. There the quality of the upper aquifer in areas south of Satkhira is poor because of salinity, which precludes its use as a source of irrigation water. The lower aquifers exploited by deep tube wells (DTWs) are of good quality. Irrigation abstractions cause drawdown of the water table over the dry season, with the lowest levels in Jessore, Satkhira and Chuadanga Districts. Elsewhere, groundwater abstraction for irrigation causes similar drawdown problems to those noted for the NW in the late dry season, with household supplies from HTWs being vulnerable.

Physical Environment

Topography

Natural environment has a profound impact on a town in shaping its physical setting and its pattern of growth. Jessore town is located in the southwest region of the country, which has been developed and influenced by the process of siltation from a network of rivers. Because of its location in a moribund delta and tidal environment, the town has specific characteristics on land, soil, climate, hydrology and rainfall.

Topography of the project area is undulating, with pond, social forest and high land. Its elevation is 8 meters above mean sea level and the area is nearly slope from north to south (Banglapedia, 2006). The land of Jessore region can be broadly characterized by the Ganges-tidal floodplain having lower relief and being crass-crossed by innumerable tidal rivers and channels. It is nearly flat and the surface is poorly drained

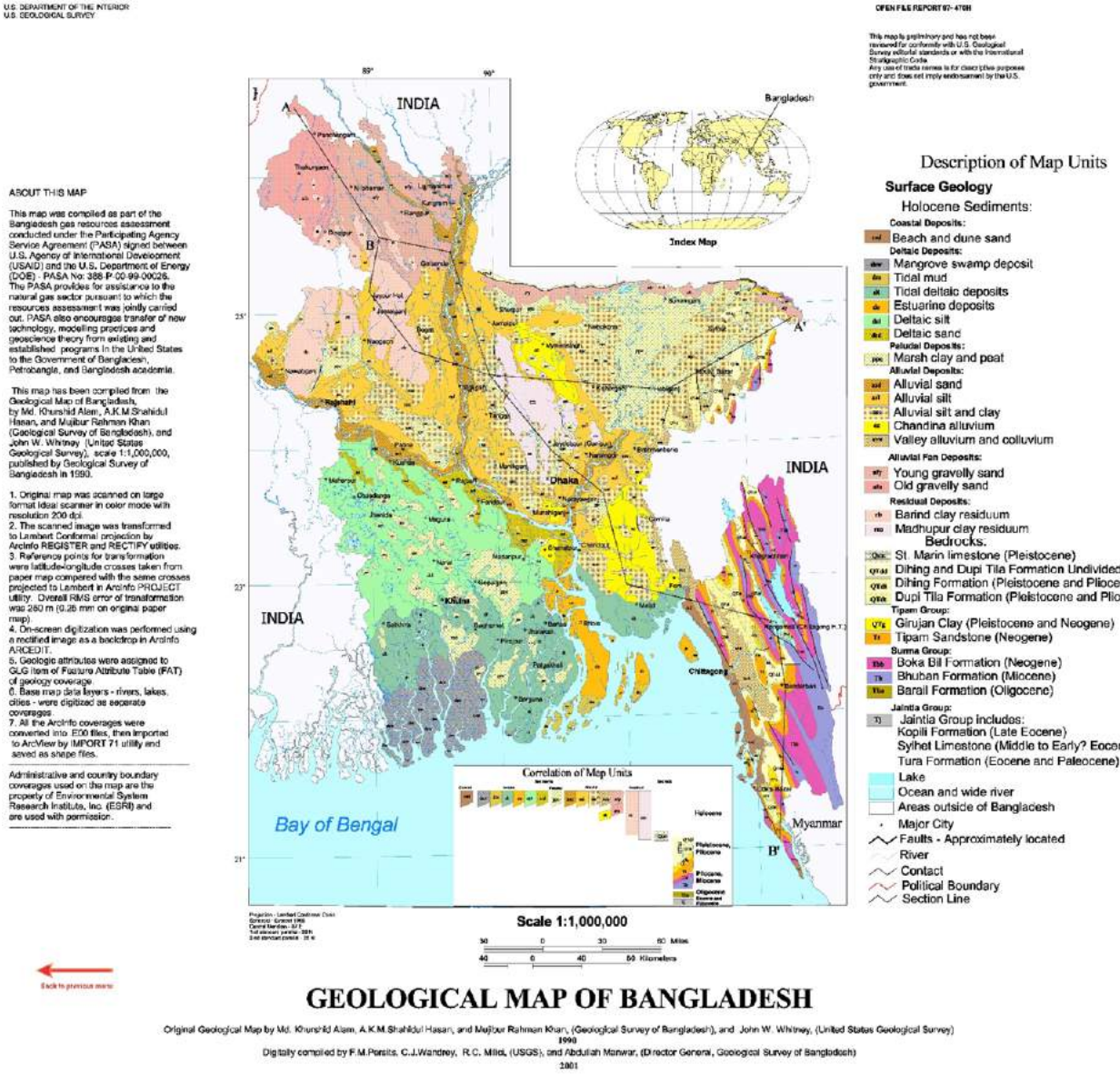
The land surface of Jessore town area is not perfectly level and is characterized by six major geomorphic units. These are natural levees, floodplains, old meander complex, bar, tidal marsh and back swamps. Natural levees are well developed along the Bhairab-Kopodak banks and are occupied mainly by the present built-up area of the town. This part of the city is 8m above the mean sea level (MSL). The low-lying areas extend mainly towards fringe areas of the town characterized by swampy areas, currently used for agricultural purposes that are poorly drained and persistent water logging problems (Reiman, 1993).

Jessore district is formed entirely by the deltaic action of the Ganges which brought mud and lime stone from the Himalayas. The soil is to a great extent uniform in character and varies only greater or smaller admixture of sand, silt and clay. Naturally, the percentage of sand is greater along the river side and smaller in those areas where deltaic action has ceased. The town fringes particularly are the marsh areas (Hassan, 1984)

Surrounding land use

The site is located in Barandi and Shonkorpur Mouza of the Sadar Upazila of Jessore district. The proposed 3.03acre area consists of existing concrete road, some paddy at the east side of the Project. West side is TTC and passport office is situated. There is a big pond at the North side of the Project. Like other parts of Bangladesh agricultural crops are not dominant within the area. So productions not hamper to construct the proposed park. These agricultural lands only used for seasonal cultivations. The nearest railway junction called Jessore Railway Junction on the south, which are about 3 km away from the proposed park.

Map 3.4: Geological Map of Bangladesh



Climate

Bangladesh is located at the central part within the Asiatic monsoon region where the climate tropical. Relatively small size of the country and generally low-lying area cause moderate spatial variation of temperature, precipitation, relative humidity, wind speeds and other climatic variables. However, the climate of Bangladesh exhibits pronounced temporal variability. This is because of the moisture-laden monsoon winds flowing predominantly from the south-west during summer and the comparatively dry and colder north-western winds during winter.

Jessore has a humid sub-tropical climate with large variations between summer and winter temperatures. The cluster has a tropical monsoon climate. It has three main seasons.

Summer/Pre-monsoon	-	March to May
Rainy Season/monsoon	-	June to October
Winter season	-	November to February

The rainy season is hot and humid having about 85 percent of the annual rainfall. The winter is predominately cool and dry. The summer is hot and dry interrupted by occasional heavy rainfall. The annual average temperature maximum 31.3^{0}C and minimum temperature is about 16. Annual average rainfall is about 1402 mm.

Different meteorological data like rainfall, temperature, relative humidity and wind speeds monitored at the meteorological station in Jessore, Khulna are described in the following sub-sections and summarized in **Table 3.12**

Table 57: Monthly Averages of Climatic Variables of the Project Site, 1948-2013

Mean Temp (oc)	18	22	26	29	30	29.6	29	29	29	27.6	24	20
Max Temp (oc)	26	29	33	35	35	33.3	32.1	32.2	32.5	32.1	30	27
Min Temp (oc)	11	14	19	23	24.9	25.9	25.9	25.9	25.5	23.2	18	12
Rainfall (Mm)	12	21	42	69	153	298	331	280	234	137	25	9
Humidity (%)	69	70	66	69	75.8	84	87	87	86.2	82.6	78	77
Avg. Wind Speed (Meter/Second)	1	1.3	2.3	3.6	3.66	3.23	2.96	2.64	2.18	1.08	0.8	0.8
Max. Wind Speed (Meter/Second)	5.6	5.6	9	9.6	11.2	8.6	8	6.8	6.9	4.1	3.4	3.1
Sunshine (hours)	7	7.7	7.7	7.9	7.3	4.66	3.97	4.46	4.76	6.57	7.3	6.8
Cloud (Octa)	1.1	1.4	2.1	3.1	4.19	5.73	6.21	6.06	5.52	3.6	1.8	0.9

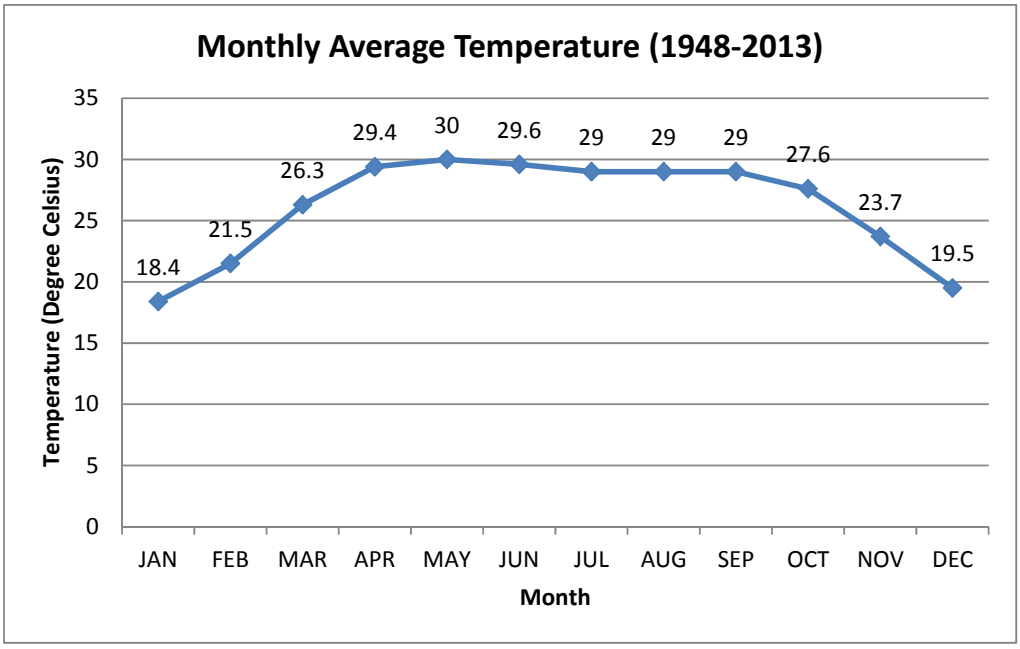
Source: Bangladesh Agricultural Research Council

Temperature

Remarkable changes in temperature can be found with the changes of seasons in Jessore town. May is the hottest month sowing a monthly average maximum temperature of up to 31.3°C. However, Jessore town shows a mild summer than of inland areas, particularly northwestern district, where summer temperature sometimes exceeds 34°C. In June, there is sharp fall in temperature due to the outbreaks of monsoon. During the monsoon, the monthly average temperature is about 28.9°C. The cool dry winter season begins in November and

January is the coldest month with an average minimum is about 18.4°C (Meteorological Dept. Jessore, 1948-2013).

Figure 3.5: Average Monthly Temperature (1948-2013)



Source: Bangladesh Agricultural Research Council

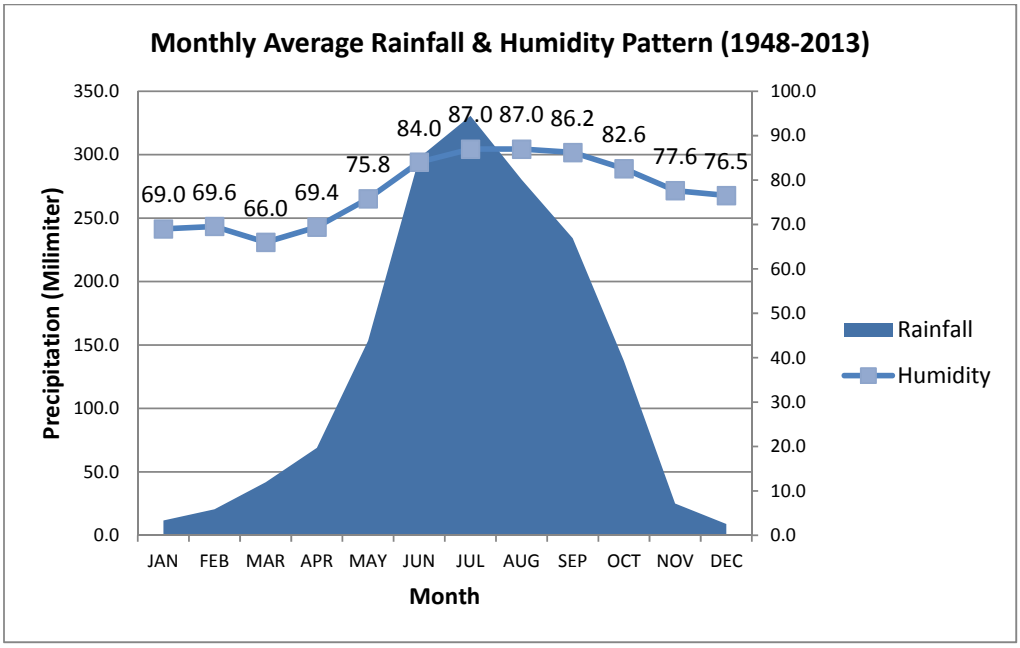
Rainfall

The average rainfall of this town is about 117mm. The main source of rainfall is the southwestern monsoon. Nearly 85% of total rainfall occurs during May-September. During March-April some rainfall also occurs due to Northwester effect. Winter is the dry period with little or nearly no rainfall. However, during the months of December and February little rainfall is recorded (Meteorological Dept. Dhaka, 2009)

Humidity

As would be expected, humidity during the wet season is significantly higher, as shown in **Table 4.1** and **Figure 4.2** those occurring at other times of the year. Maximum average relative humidity for the project area is found as 85% in the month of August, whereas minimum relative humidity is 70% in the month of March.

Figure 3.5: Average monthly rainfall and humidity pattern during 1948-2013

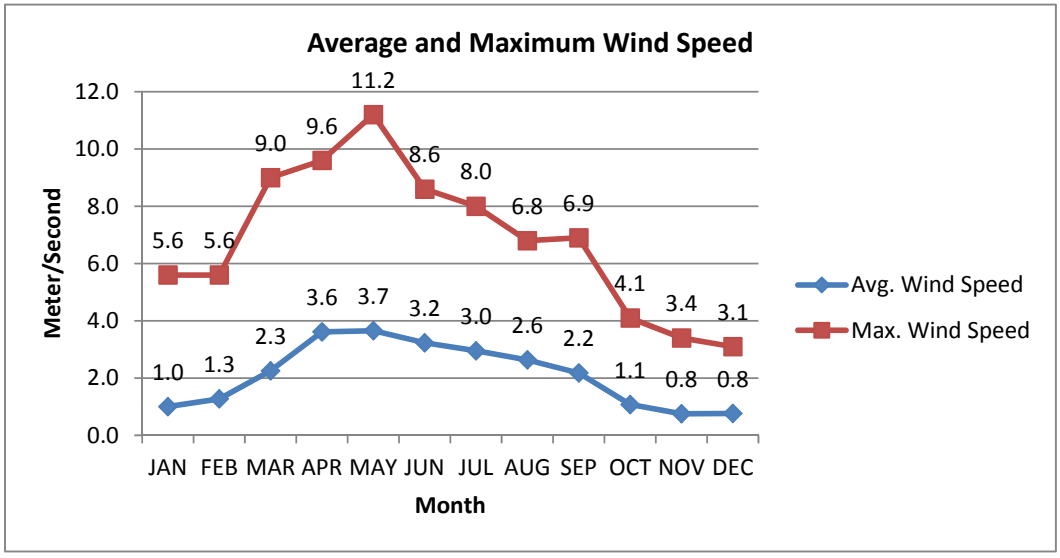


Source: Bangladesh Agricultural Research Council

Wind Speed and Wind Direction

72. Due to monsoonal variation of the climate, there are variations in wind direction in Jessore town. The southwesterly monsoon starts from about the middle of March and recedes about the end of September. The monsoon winds blow from the south with sustain force from March to October, The wind blows from the north and northeast in January. February is a clam month with foggy weather in the morning particularly (Bangladesh Agricultural Research Council, Dhaka, 1948-2013). Monthly maximum wind speed and monthly average wind speed showed in **Figure 3.5** during 1948-2013.

Figure 3.6: Average and Maximum Wind Speed



Source: Bangladesh Agricultural Research Council

Water Quality

Surface water quality

The project site crosses a number of rivers, ponds and ditches. The ponds are used for fishing. There is no remarkable source of water pollution in the project site. A surface water sample collected from the inside of the project pond on 16th November 2014 and analyzed in the laboratory. Physically we found that the pond water is turbid and brown in color. The Detailed of surface water quality test results of parameter like pH, TDS, EC, DO, TSS, BOD and COD is shown in **Table 3.13**.

Table 58: Surface Water Chemical Parameters

SN	Parameter	Unit	Concentration of Surface Water	Bangladesh (DoE) Standard for Surface Water
01	pH		7.6	6.5 – 8.5
02	DO	mg/l	5.1	≥5
03	BOD_5	mg/l	15	≤10
04	COD	mg/l	32	NYS
05	TDS	mg/l	276	NYS
06	EC	µS/cm	547	2250
07	TSS	mg/l	78	NYS

Source: Enviro Quality Lab
Note:
NYS- Not Yet Set

Ground water quality

The project site is located in the high land area and water is available within 100-120 ft depth. The ground water table varies 4-6 meter in the year at the project area and is potable. The ground water samples were collected from the project site for analysis of chemical parameters in order to get the primary idea regarding the quality of ground water. **Table 3.14** shows the groundwater chemical parameters. From the test result it is found that the Iron concentration is higher than standard.

Table 59: Groundwater Chemical Parameters

SN	Parameter	Unit	Concentration of Ground Water	Bangladesh (DoE) Standard for Ground Water
01	pH		7.8	6.5 – 8.5
02	DO	mg/l	3.3	6
03	COD	mg/l	2.2	4
04	TDS	mg/l	120	1000
05	EC	µS/cm	324	NYS
06	Iron	mg/l	9.09	0.3-1.0

Source: Enviro Quality Lab

Air Quality

There are no remarkable industrial/commercial sources of air pollution around the project site that causes air pollution. The vehicular movement and emission from vehicle in the create dust and gaseous mission and impair the air quality. Around the project site there is no brick field and polluting industries hence the project area is found quite clean and rural in nature.

Fisheries

Fresh water fish habitat such as pond and ditches exist in and around the project site, which provide shelter, feeding, and spawning ground for different types of fresh water fish species. Large-scale human intervention for catching fresh water fishes from their natural habitat has been observed. The reproduction, breeding and multiplication of aquatic fishes are very finely tuned and adjusted to the rhythm and amplitude of monsoon flooding in and around the proposed project. The existing pond will be affected due to construction of MTB by filling the pond. A small quantity of fish production will be hampering every year.

Flooding

As Jessore lies in the South-Western region of Bangladesh and adjacent to Bhairab River, the project area has low risk of natural disasters like cyclone, flood and earthquake, as the area is in a geographically elevated area. The area is low flood risk zone as per the records of 1988 & 1998 flood level. The communication never disrupted or stopped during the high flood. The national highway is above the high flood level. The area faces no river flooding.

Source of Drinking Water:

In Jessore City has water supply system from municipality but other municipality Jhikargacha, & Benapole don't have any water supply system. All other urban area and whole rural area uses tube well as source of drinking water. No surface is used for dinking.

Figure 95: Flood Types in the Project Area Map

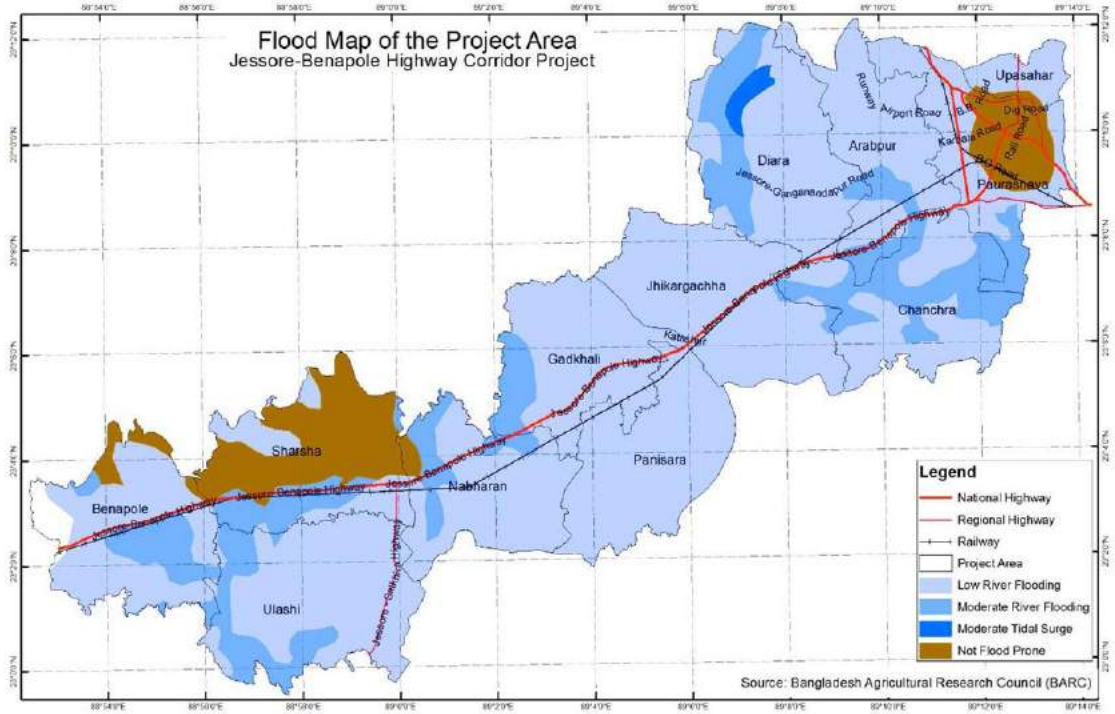
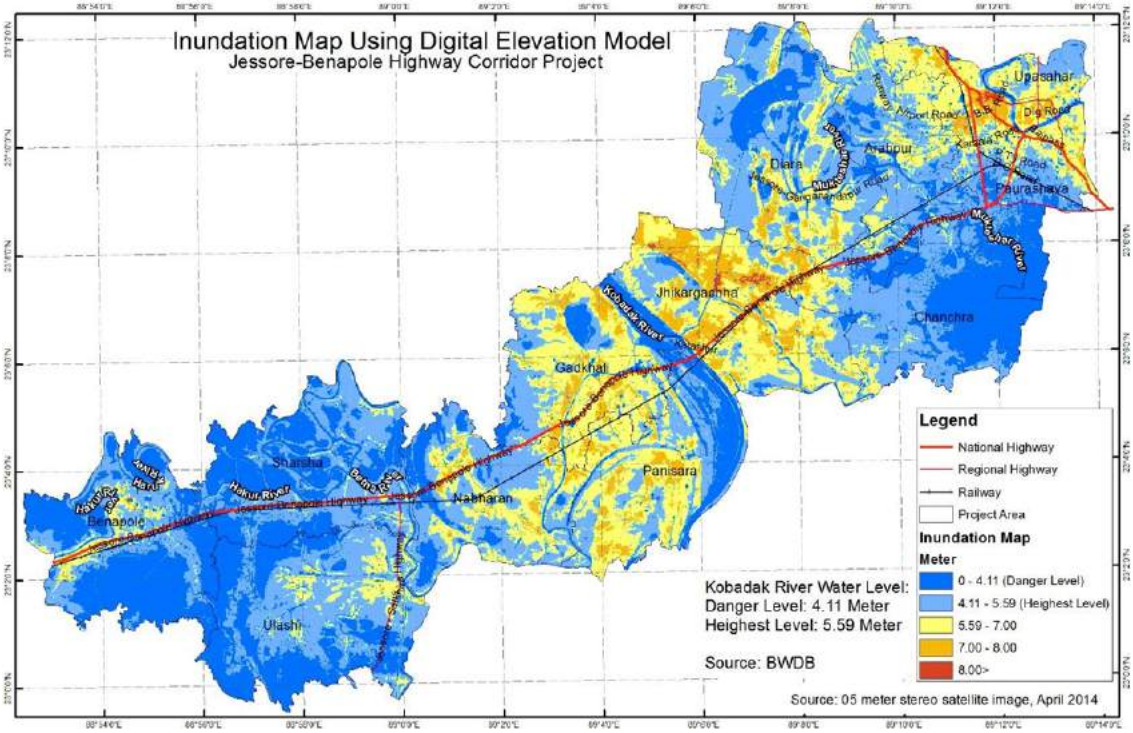


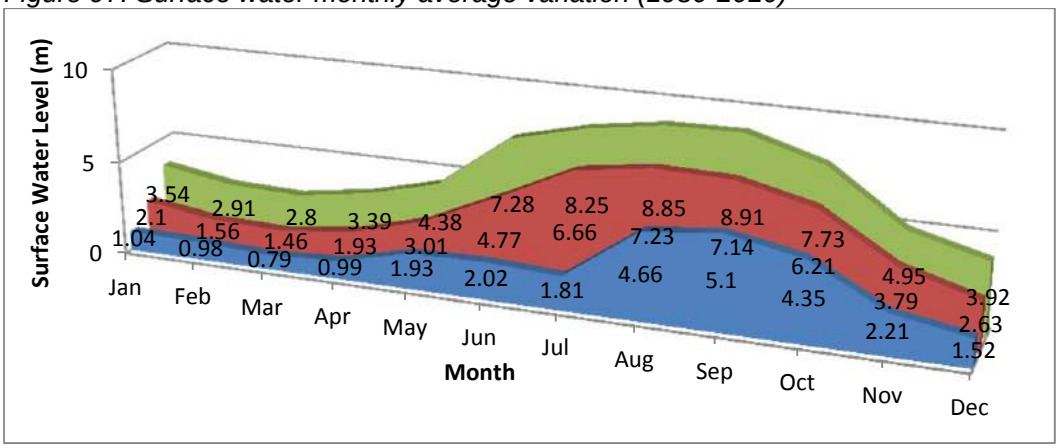
Figure 96: Inundation Map from Digital Elevation Model



Detail of last 20 years of flooding

Below Figure shows the detail of last 30 year monthly average variation (1980-2010) of flood situation in Bangladesh. From the Figure4.5 it is found that 1988 and 2008 July to October surface water level increases and maximum water level found in August to September.

Figure 97: Surface water monthly average variation (1980-2010)



Inundation Map on the Basis of Return Period

Kobadak at Jhikargacha (Slope 5.16 cm/km)

PDF	Return period					PPCC	Rank
	2.33	5	20	50	100		
LN2	**4.77**	**5.25**	**5.91**	**6.27**	**6.53**	0.98852	1
LN3	4.75	5.21	5.84	6.19	6.43	0.98847	3
P3	4.75	5.22	5.84	6.18	6.42	0.98850	2
LP3	4.76	5.25	5.92	6.29	6.56	0.98844	3
EV1	4.67	5.15	5.93	6.42	6.78	0.97997	5

Betna at Navaron (slope 1.00 cm/km)

PDF	Return period					PPCC	Rank
	2.33	5	20	50	100		
LN2	4.72	5.13	5.69	6.00	6.21	0.99468	4
LN3	**4.68**	**5.13**	**5.78**	**6.16**	**6.43**	0.99507	1
P3	4.70	5.14	5.73	6.06	6.29	0.99483	3
LP3	4.70	5.12	5.74	6.10	6.36	0.99501	2
EV1	4.64	5.08	5.80	6.25	6.59	0.99084	5

Figure 98 Map Of the Study Are and Corridor On Google Map

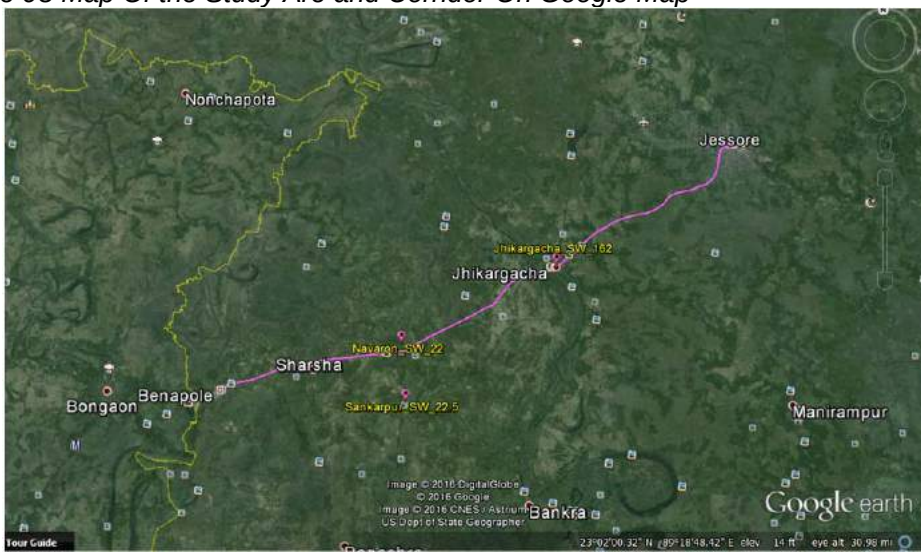


Figure 99: High Resolution Digital Elevation Model (Dem) Of The Study Area

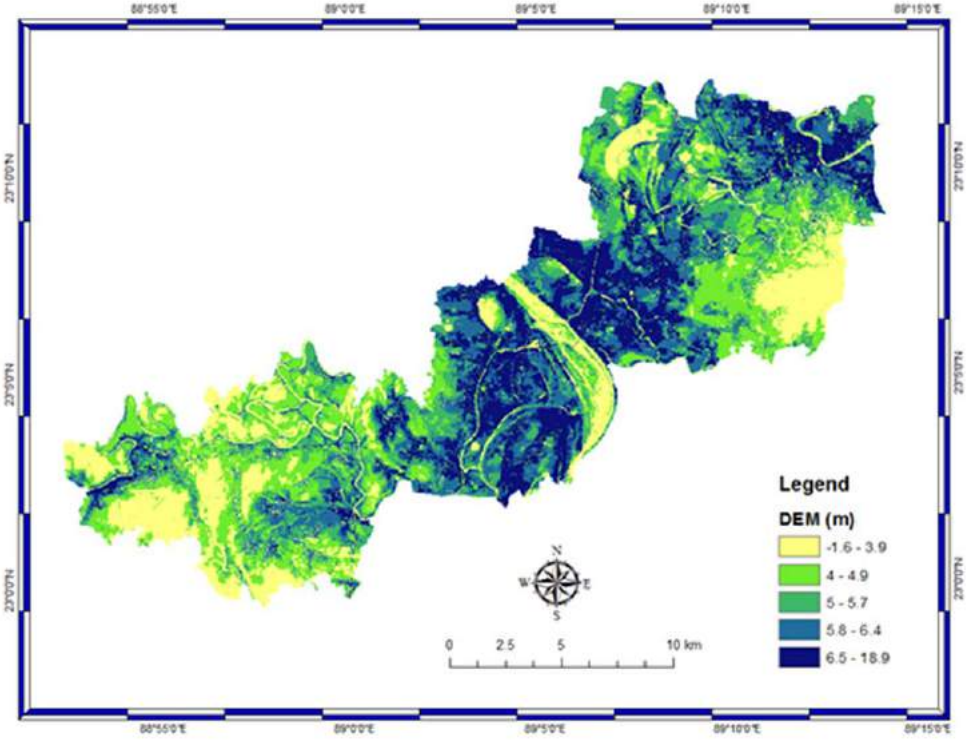


Figure 100: Inundation Map Of Mean Annual Flood (2.33 Year Return Period).

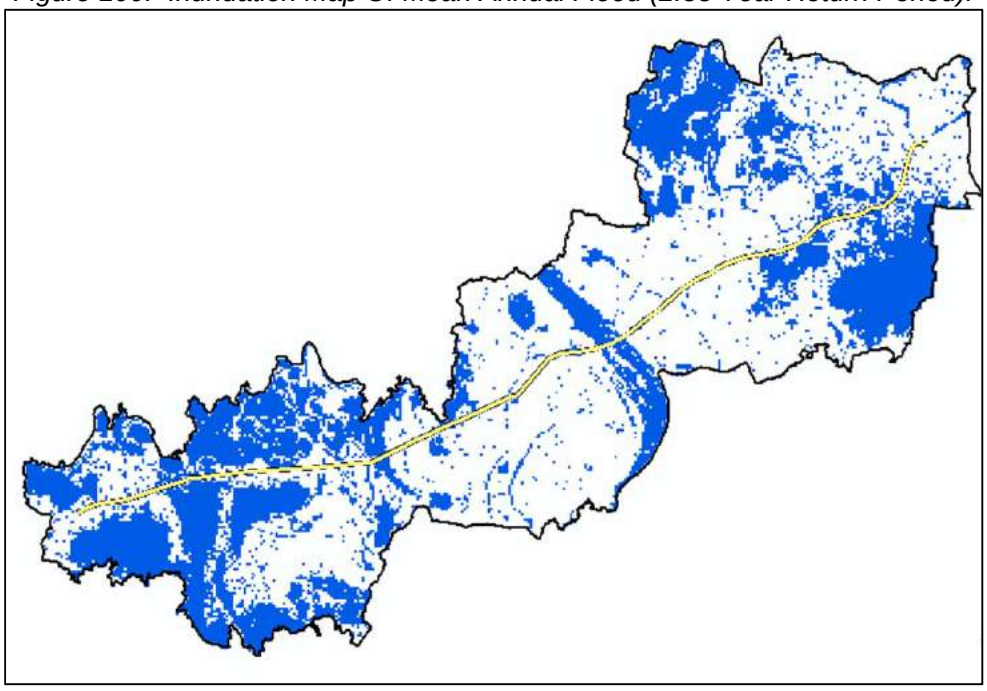


Figure 101: Inundation Map Of 5 Year Flood.

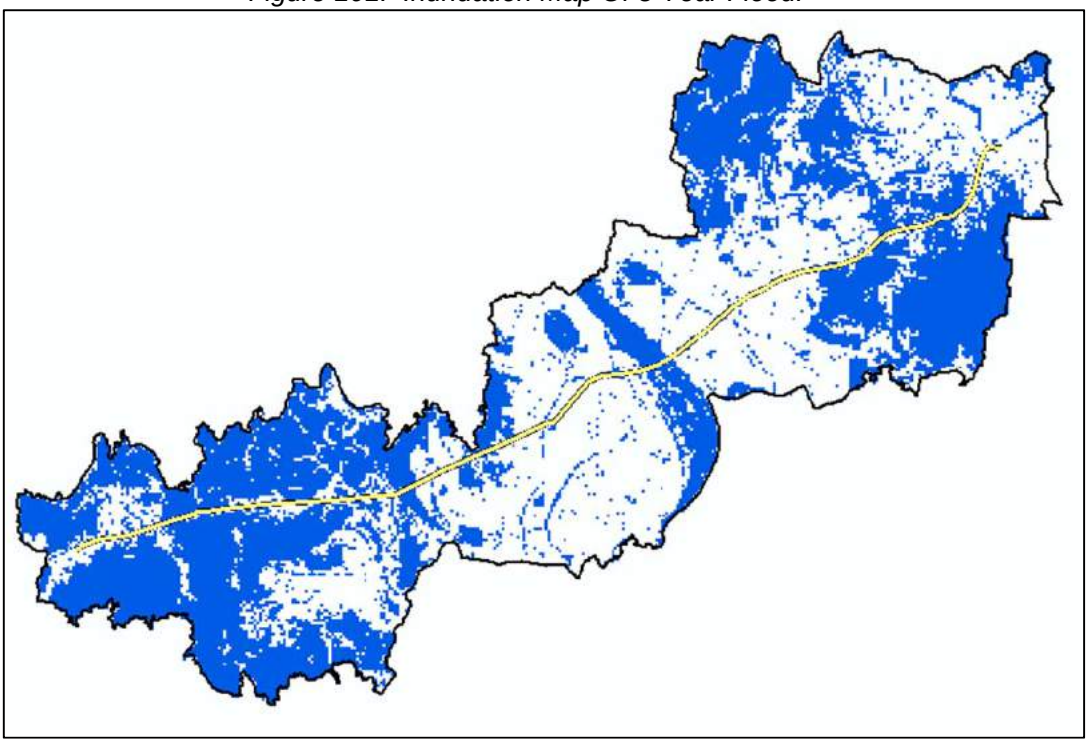


Figure 102: Inundation map of 20 year flood.

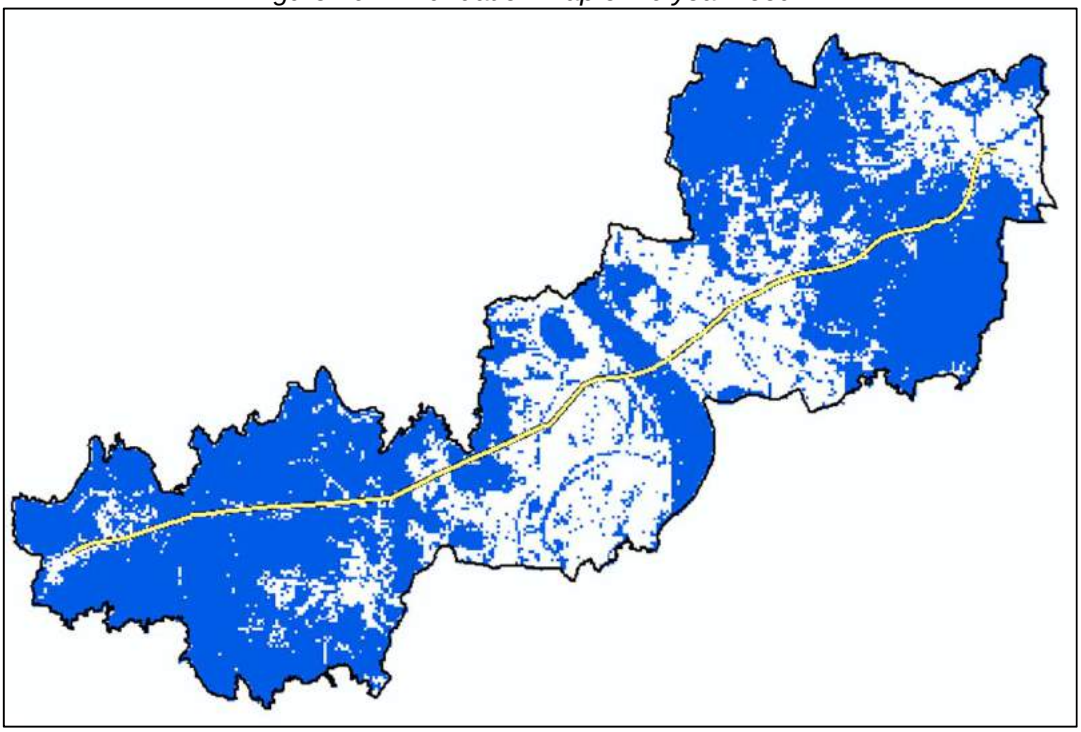


Figure 103: Inundation Map Of 50 Year Flood.

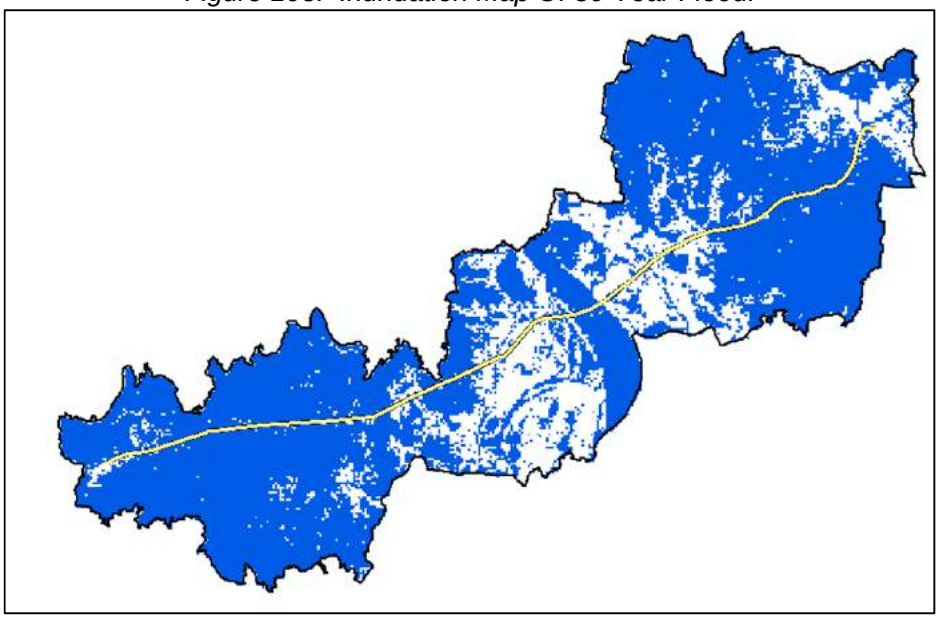


Figure 104: Inundation Map Of 100 Year Flood.

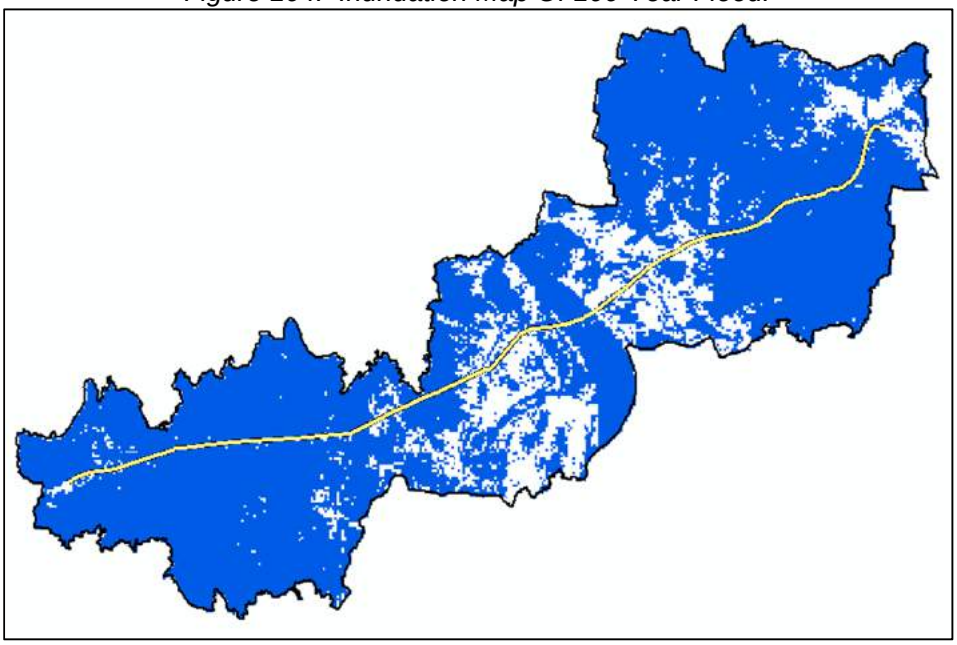
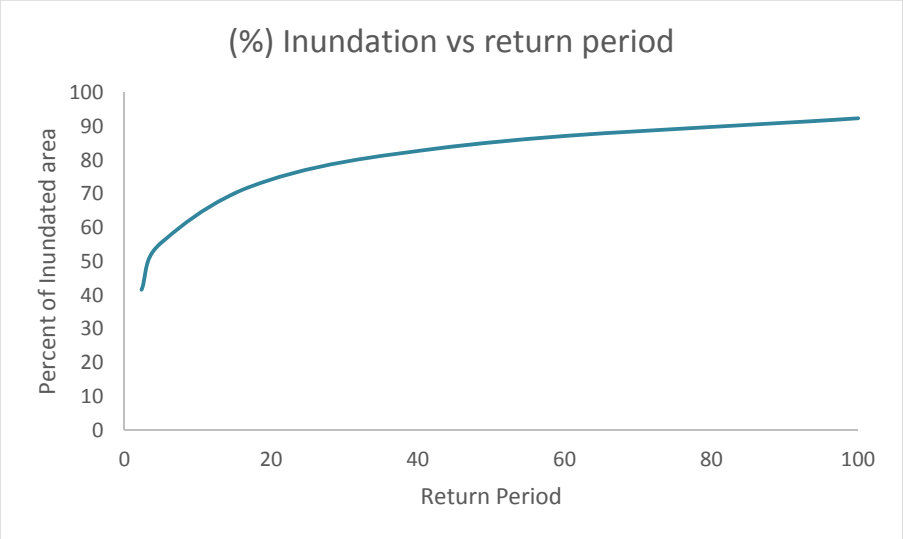


Table 60: Flood Affected Area in Different Return Perion

	Return period				
	2.33	5	20	50	100
Area (m^2)	12194	16259	21771	24977	27066
(%) of the study area	41.65	55.54	74.36	85.31	92.45

Figure 105: Percentage (%) Inundation Area versus Return Period



Seismicity

On the basis of distribution of earthquake epicenters and morph tectonic behavior of different tectonic blocks Bangladesh has been divided into three generalized seismic zones. The south of Bangladesh is seismically severe zone and represented by zone II with Bask coefficient 0.05. Ground condition (firm or soft) has not been taken into consideration during the seismic zonation of Bangladesh. So, considering the seismic zoning of Bangladesh the project area is less vulnerable for earthquake. Characteristic features of seismic zonation of Bangladesh are presented in the Table.

Table 61: Seismic Zones of Bangladesh

Zoning	Area Mercalli Scale	Modified
I	North and eastern regions of Bangladesh (Seismically most active)	IX
II	Lalmai, Barind, Madhupur Tracts, Dhaka, Comilla, Noakhali and western part of Chittagong Folded belt.	VIII
III	Khulna division S-E Bangladesh (Seismically relatively quiet)	VII

(Source: *ASM Woobaidullah*)

Bangladesh lies in a region with low to high seismic hazard that increases in the northern and eastern parts of the country. Major clustering of seismicity has been observed around the Dauki Fault and scattering of other events along other major fault systems of Bangladesh. However, based on intensity (Mercalli intensity scale) of earthquake, Department of Disaster Management of the Ministry of Disaster Management and Relief has divided Bangladesh into three zones (Figure 4). The project area is located in the southern part of the country, the least active region, where the maximum intensity is not likely to exceed VII (maximum scale is XII), is in the Zone-III (with 0.04g Bask co-efficient).

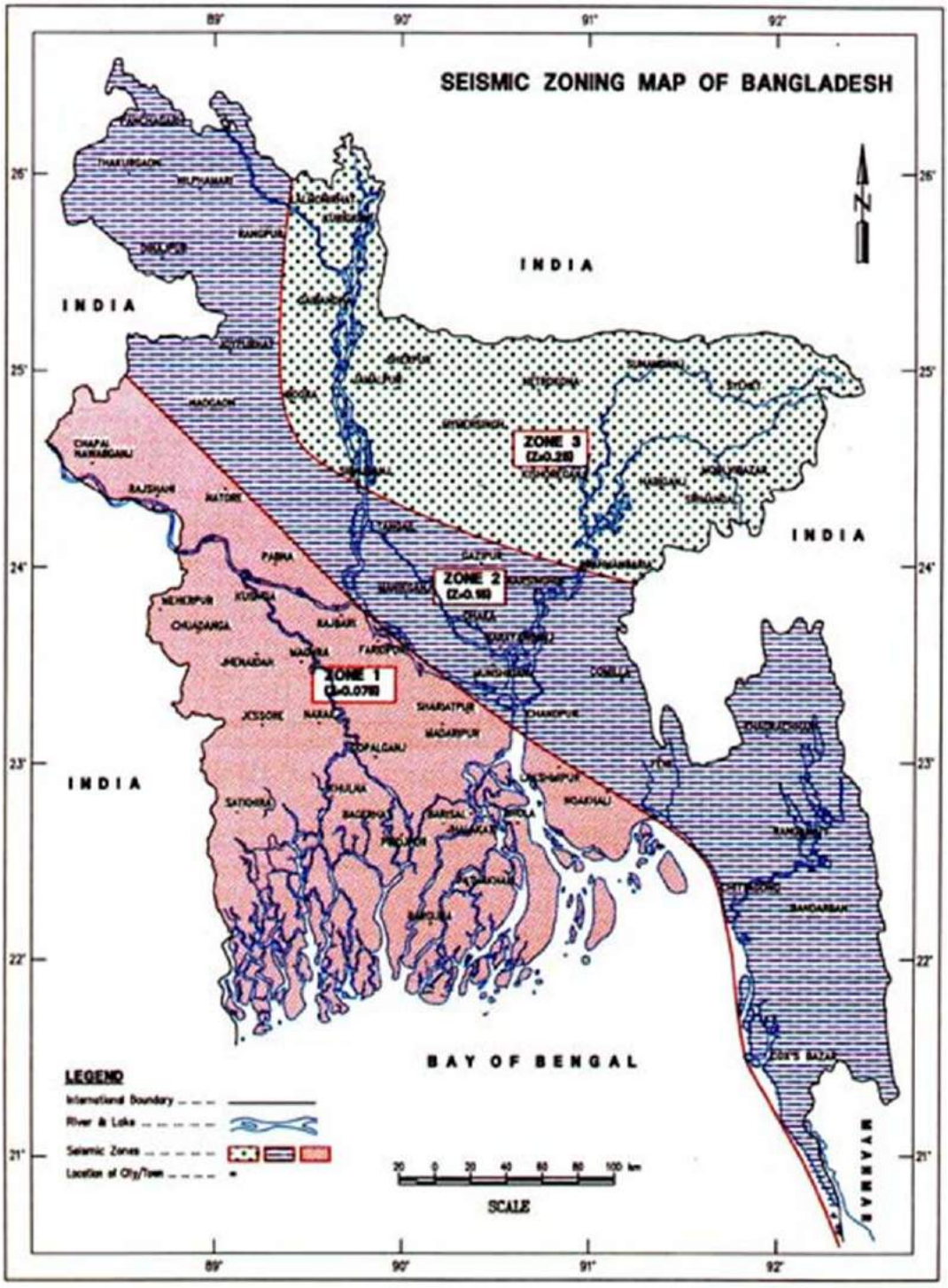
The project area is located in the Bengal Foredeep (precisely in Faridpur Trough). This Trough is bounded by the Barisal Gravity High in the east and southeast and a hinge zone in the west. In the northeast it finds its continuation in the Sylhet Trough. The Faridpur Trough is characterized by a general gravity low trending north-east. The basement is deeply buried here (about 8 to 10 Km. below mean sea level). Historically majority of the earthquakes are shallow depth in Bangladesh. So, probability of earthquake incidence in the project area is comparatively lower.

Being convinced about the safety of the project area from the earthquake hazard, UDD has decided to drop this portion from the DPP. Instead, UDD feels that this money should be invested in the planning phase to make it a better one.

According to the map Bangladesh has been classified into three seismic zones, with

Zone-III the most severe, Zone-II severe and Zone-I the least severe. The project area falls in Zone-I, which is the least severe zone and shown in Map 3.9

Figure 106: Seismic Map of Bangladesh

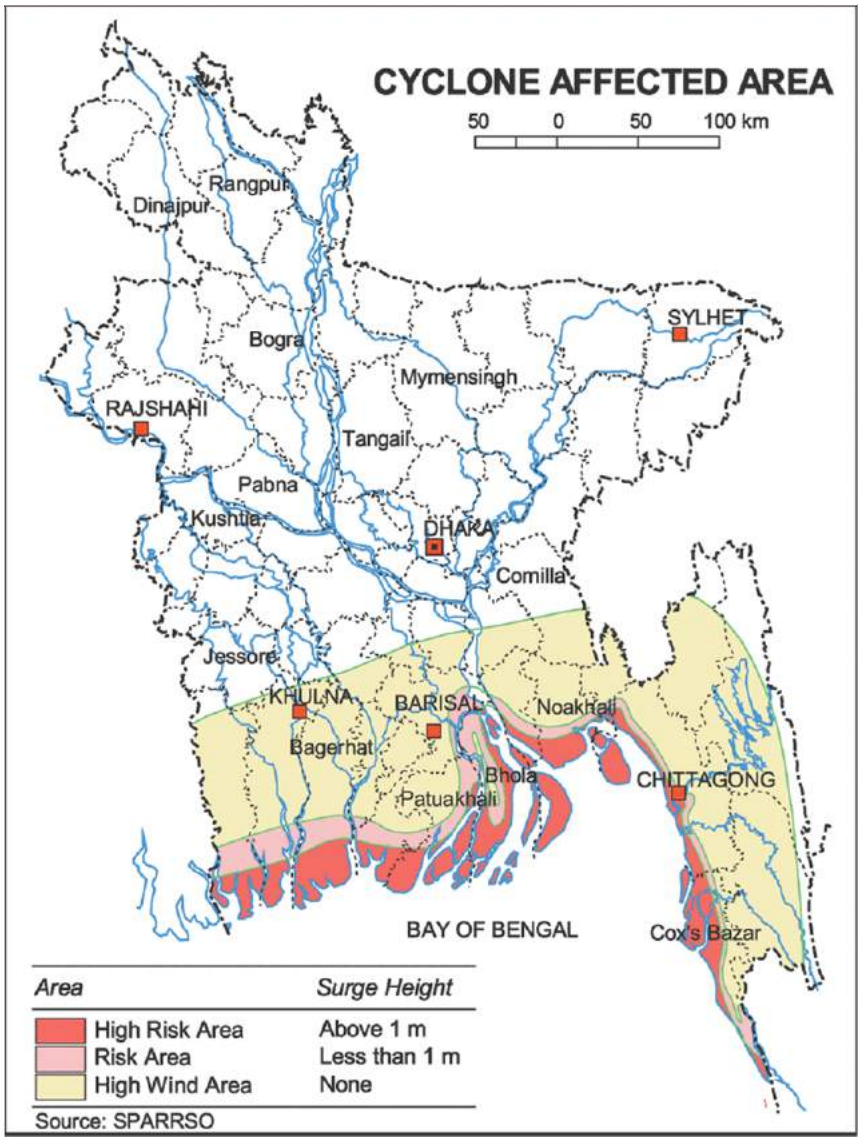


Source: Geological Survey of Bangladesh

Cyclones

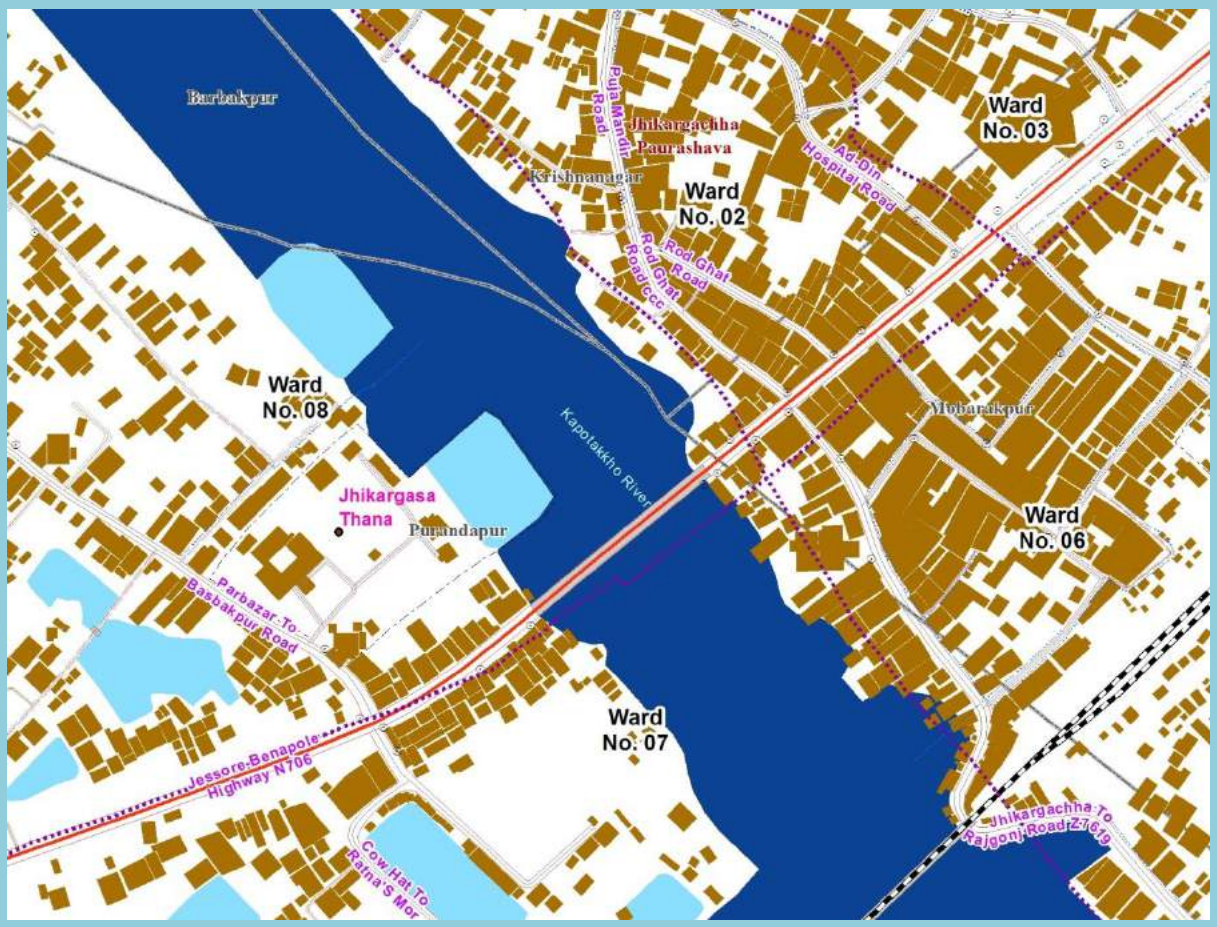
Cyclones occur in the Bay of Bengal mainly in two seasons – April to May and October to November. Due to the funnel shaped coast of the Bay of Bengal, Bangladesh very often becomes the landing ground of cyclones formed in the Bay of Bengal. Approximately damaging cyclones were reported in the coastal area of Bangladesh from 1793 through May 1997. Thus cyclone frequency during this period averaged about once in every 4.5 years. These cyclones cause enormous damage to the nation's lands, crops, infrastructure and lives of coastal people. The intensity of cyclone around the project location is generally less than other part of the coastal belt. Our project area Jessore-Benapole Highway Corridor is our of cyclone affected area.

Figure 107: Cyclone Zonation Map



Chapter 04

Conclusion



CHAPTER 04

Conclusion

4.1 Conclusion

As evident from the report the consultants approached to address the following issues as per Tor of the project a) 3D satellite image processing b) 3D digitization c) base map preparation d) Socio economic survey e) different kinds of study

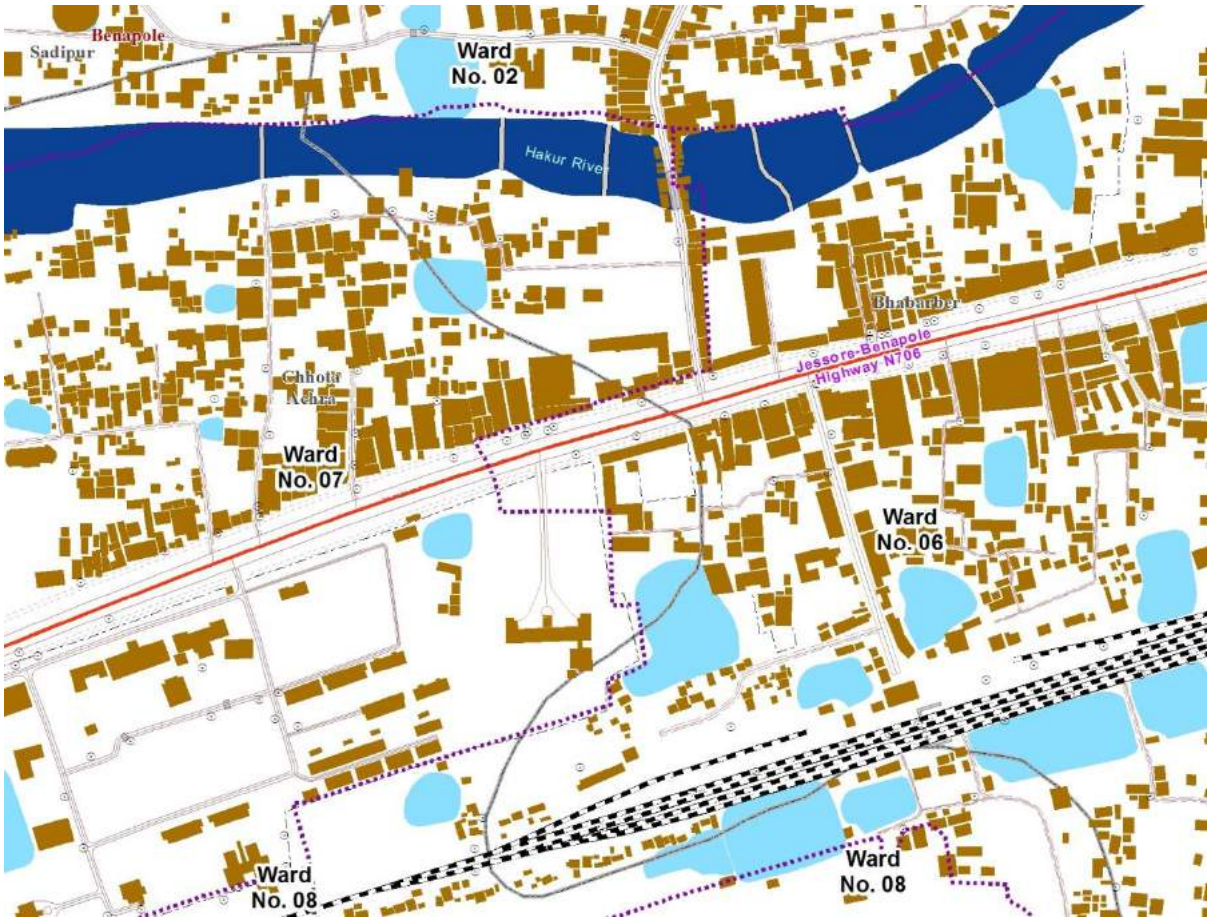
All the above tasks have been completed & detail procedure and data are laid down in the report. It may be noted from the report that the entire mentioned task has been completed and satisfactory results are achieved.

Digital Elevation Model (DEM) is a very import data to crate the inundation map, and for development work. To create the DEM we used 0.5 meter stereo satellite image. Which was not used before 2011 and 2013 in planning project in Bangladesh. High density/resolution DEM was not prepared then as it is impossible to collect 10x10 meter gridded DEM from field by using RTK GPS or Total Station for a large area. Though accuracy of DEM is very much dependent of image resolution. 0.3 meter stereo satellite image is now available which was not available at the time we purchase the 0.5 meter image. Not only DEM but also physical feature's accuracy needs to be improved by using very high resolution image. This could be 0.1 meter aerial photograph.

We worked our best to complete the task.

Annexure

Sob BM List
ToR
Socio Economic Questionnaire
Urban & Rural Economy
Archeology Checklist
Educational checklist
Health Facility Checklist
Industry Checklist
Traffic Questionnaire & Traffic
Recreational Open Space



SOB BM List

SURVEY OF BANGLADESH
Geodetic Detachment
Tejgaon, Dhaka-1208
Ph: 02-9131193

Coordinate, Heights and Location of Geodetic Control Point.

Sl No	ID No	Height above MSL(m)	WGS-84			UTM (Grid)		Description
			Latitude ddmmss.sssss	Longitude ddmmss.sssss	Zone	Easting (Meter)	Northing (Meter)	
01	BM-5001	5.3491	-	-	-	-	-	The pillar is situated just behind the main building of Jessore Degree College and about 300m north-east from Jessore Central Bus Terminal Vill: Mobarak Kathi, Upazila: Jessore Sadar, District: Jessore
02	BM-1063	6.2261	230918.87519	891139.31152	45 Q	724650.632	2562397.410	The pillar is situated about 30m west from rail line & road crossing at Kholadanga. The rail line crossing is near Ma-Moni Saw Mill at Kharaki-Dhaka bypass road in Jessore. Vill: Kholadanga, Upazila: Jessore Sadar, District: Jessore.
03	BM-1059	7.1181	-	-	-	-	-	The pillar is situated 7.2m south from south east corner of Hazir Ali Non Govt. Primary School On Benapol-Jessore road. Vill: Hazir Ali, Upazila: Jhikargachha, District: Jessore.
04	BM-1060	8.1172	-	-	-	-	-	The pillar is situated south side of a Km post indicated Jessore-12 & Benapol-26 km On Jessore-Jhikargachha road. Vill: Kirtipur, Upazila: Jhikargachha, District: Jessore.
05	BM-1057	6.0819	-	-	-	-	-	The pillar is situated closed to east boundary wall of Boroj Bagan Girl's High School On Navaron-Sharsha road. Vill: Boroj Bagan, Upazila: Sharsha, District: Jessore.
06	GPS-101	7.1150	230055.50321	885741.05198	45 Q	701012.218	2546572.058	The pillar is situated S.W. corner of Dhaldaha High School's field. It is about 6 km South from Sharsha Upazila. Vill: Dhaldaha, Upazila: Sharsha, District: Jessore.

Note: These values are not to be co-ordinated to any other person/ organisation except this project.

Prepared by:

Checked by:

20.05.2010

Ganesh Chandra Roy
Assistant Director (Survey)
Incharge, Geodetic Detachment
Survey of Bangladesh, Dhaka.

ToR, Page – 39 & 49

- Other related survey (Socio-Economic Survey, traffic survey, bathymetric report studies, hydro-geological survey, survey of Urban and Rural Economy, environment studies, disaster studies, social space studies, etc.)
- Collection of Socio Economic data from published sources

Step-wise detailed activities to be performed by the survey firms are described below:

Step 5-I Topographical Ground Truthing Survey

- Topographic survey will cover the following features:
  - Topographic survey by using RTK-GPS and Total Station to obtain 3-D data (X,Y, Z value)-location and alignment of all roads, flood embankments and other drainage divides. Location and alignment of all drainage and irrigation channels/canals showing depth and direction of flow. Closed boundary/outline of homestead, water bodies, swamps, forest etc. junctions, spot heights or land levels at roughly 10 m intervals for urban area and 20 m intervals for rural areas.
  - All collected raw data shall be submitted to PD before processing.
  - Generating contours at 0.5 meter intervals with denser intervals for undulations.
  - Alignment and crest levels (not exceeding 50meter) of road, embankment, dykes and other drainage divides.
  - Alignment of rivers, lake, canal and drainage channels etc
  - Outline of bazaars, water body, swamps etc.

Step 5-II Physical Infrastructure Survey

- All existing structures position and dimension (3-D-X,Y, Z value).
- Cross section, long section, type, width, length and name of road, road level above datum, flooding, land slopes, borrow pit.
- Identification of any bridge or culvert on the road and their length, width and span of the bridge, condition of abutments, condition of the dyke, wing walls abutment.
- Type, size, depth, inlet and outlet location of drain along with flow direction width and depth of the canal, place of encroachment.
- Type of sewer system, size, type and location of sewerage line, location of bins, identification of any other sewerage collection system.
- Identification of the water supply system, location of deep tubes well, overhead water tank and its capacity, catchment area of overhead tank.
- Identification, location and capacity of electric substation, telephone exchange, Titas gas subs station etc. Treatment plant and waste disposal facilities.
- Identification, location and capacity of electricity, telephone, gas, and waste disposal and treatment system.

Step 5-III LAND USE SURVEY UPDATING

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

Step 5-IV SOCIO ECONOMIC SURVEY AND STUDY OF URBAN & RURAL ECONOMY AND SOCIAL INFRASTRUCTURE)

STEP 5-IV-A House-hold Sample survey will be done using the approved Questionnaire based on specified Questionnaire format indicated in TOR. Sample size will be minimum 5% of total household (sample size shall be determined in consultation with PD).

STEP 5-IV-B Case Studies will be conducted highlighting the issues like tourism development, housing for disadvantaged group, informal economic activity, traffic congestion, drainage, water logging, unauthorized encroachment, waste disposal, playground and park, stakeholders participation for planning and development control.

Step 5-IV-C Inventory of survey will have to be prepared as per format. Data processing, analysis of survey data, mapping and reporting will be made as per requirement of TOR.

Step 5-V Other Related Surveys

Other related surveys and studies (traffic survey, hydrological studies, bathymetric report studies, environment studies, disaster studies, social space studies etc.) shall also be conducted in consultation with PD.

Step 5-VI Relating all collected spatial and attribute data with other spatial database.

Step 5-VII Submission of **Draft Survey Report** along with maps and chart (physical feature, land use & socio-economic) for approval.

Step 6 Submission of **Final Survey Report** (with necessary correction of Draft Survey Report). The Survey firm shall conduct RTK-GPS based Survey (as and when necessary in consultation with the PD) for proper joining of the both dataset.

Step 7 Submission of **Survey Completion Report** (which will be deliverable after finalization of Draft Plan). The report will contain evaluation of both quantity (as per ToR) and quality/ accuracy of spatial and attribute data. In addition if part of the survey is partially incomplete or inaccurate during the earlier stages the report will ensure completeness and accuracy of the database (as consultation with the PD during the work)

Appendix 2: Reporting Requirements

1.0 Report submission schedule and Mode of Payment for Image Processing, Physical Feature, Topographic, Land Use and Other Related Surveys

Reports shall be presented and illustrated in a clear and concise professional manner, including maps, plans, diagrams and other graphics. Schedule of submission:

Sl no.	Report	Language	Copy	Period of Submission	Binding Status	Mode of Payment (% of Contract amount)
1	Mobilization Report	English	20	Within 15 days of Signing contract	Spiral Binding	Not more than 10%
2	Inception Report	English	20	End of 1st month	Spiral Binding	Not more than 15%
3	Report on collection of GCP and satellite image for base map preparation	English	20	End of 2nd month	Spiral Binding	Not more than 10%
4	Report on Interpretation of Image and preparation of base map	English	20	End of 3rd month	Spiral Binding	Not more than 20%
5	Draft Survey Report	English	20	End of 4th month	Spiral Binding	Not more than 20%
6	Final Survey Report	English	20	End of 5th month	Spiral Binding	Not more than 20%
7	Survey Completion Report	English	20	After Finalization of Draft Plan	Hard Binding	Not more than 5%

Urban Development Directorate (UDD)
Preparation of Development Plan for Benapol-Jessore Highway Corridor
Consultant: DECODE-GEOMARK Joint venture

Questionnaire No…… Mobile/Telephone (Households):……

Basic Socio- economic Information	**Answer**

A. Location of The Sampled Households

A1.	Area Type	1. Core 2. Potential 3. Fringe 4. Slum			
A2.	Ward No.		A3.	Mouza/ Mahallah	
A4.	Holding No.		A5.	Street/ Lane/Road	

B. The Respondent

B1.	Name Of the Respondent		B2.	Sex 1. [M] 2. [F]	
B2.	Relation with the HH Head	1. [Self] 2. [Wife] 3. [Son] 4. [Daughter]			
B3.	Education		B5.	Age	

C. The Head of Household

C1.	Name Of the Head of HH		C2.	Sex 1. [M] 2. [F]	
			C3.	If, (F) 1. Widow 2. Divorced	
C4.	Education		C5.	Age	
C6.	Main Occupation		C7.	Religion	

1. Type of Dwelling House and Ownership

1	Ownership of house	1. Own, 2. Govt. House, 3. Rented, 4. Other					
2	Living house type	1.Single- storied	2. Multistoried	3.Semi-pucca	4.Tin-Shed	5.Thatched	
3	Length of Stay						

2. Type of Family and Household Members

1	Type of family	1.Single 2.Joint							
2	No. of family Members	Male	Female	Age Profile of HH members					
				Below 6	6-15	16-25	26-57	57+	Total

3. Source of Income of Household Members

1	NO. of earning members (Including Head of Households)					
2	Source of Income	1.Service	2.Business	3.Agriculture	4. House Rent	5. Others

4. Land Ownership Pattern (Area in decimal) and Market Value

Land Type	1.	Habitable Land	2	Low Land	3	Medium High Land	4	High Land
Land area (decimal)								
Land Value (Tk.)/decimal								

5. Available Facilities &Service Quality.

Code	Item/ Facilities	Service Quality	Code	Item/ Facilities	Service Quality	
1	Piped Water Supply		5	Sewerage		
2	Electricity		6	Solid Waste disposal		
3	Gas		7	T&T Telephone line		
4	Drainage		8	Cable line(Internet/Dish)		

Code: (Service quality) 1. Good 2. Moderate 3.Poor 4. No facilities

CODE of A,B,C

Education

1	Illiterate	5	HSC/Equivalent
2	Class I-V	6	BSS/Equivalent
3	Class VI-X	7	MSS/Equivalent
4	SSC/ Equivalent	8	Above l'vISS

Occupation

1	Govt. Office	6	Large Business	11	Unskilled Labor
2	Others Govt. Employee	7	Small Business	12	Rickshaw/Van Puller/Driver
3	Teaching	8	Private Service	13	Hawker/Vendor
4	Farming/ Agriculture	9	Handicrafts	14	Student
5	Housewife	10	Skilled labor	15	Unemployed Retied

Religion

1.	lslam	2	Hinduism	3	Christian	4	Buddhist	5	Tribal

6. How many times in the last 12 months have you used the following services?

How satisfied were you with the help you received from those services? Please give reasons for your answers.

Type of Service	Frequency of use (no. of times)	Satisfaction 1=Low (dissatisfied) 2=Moderate 3=High (very satisfied)	Reasons for satisfaction/ dissatisfaction
1. Urban			
1. Government services			
1.Paurashava			
2.Power Development Board			
3.Government Hospital			
4.Government Banks			
5.PWD			
6.DPHE			
7.Land Office			
8.Court			
9.Other.....			
2. Private services			
1. Private clinics, hospitals			
2.NGOs services			
3.Banks			
4. Other.....			
2. Rural			
1.Government services			
1. Department of agriculture extension/ fisheries/ livestock – SPECIFY WHICH			
2. Govt. Immunization services			
3. Govt. Health facilities (Union/ Upazilla or District)			
4. Union/Upazila Parishad			
5. Land registration office/ *tahsil* office			
6. Other (e.g. BRDB/ Ansar-VDP/ Police/ Youth Development Dept etc.) 7. SPECIFY:……			
2.Private services			
1. Private health services			
2. NGOs			
3. Agri private companies			
4. Other (SPECIFY):			

7. Approximate Monthly Expenditures for the Household.

Code		Taka/ Month	Code	Cost Item	Taka/ Month
1	Food		7	Education	
2	House rent		8	Vehicle / transport	
3	Water		9	Recreation	
4	Electricity		10	Others	
5	Gas/ Others Fuel		11	T&T Telephone ,phone Bill	
6	Health Care		12	Cable Line	

8. Total Monthly Income of the Family Tk.....

9. Migration Pattern.

1	Permanent resident of the Pourashava area	1. Yes 2. No		If Yes, go to Q.10	
2	If No, Migrated in the Pourashava	1. 1980-1990	2. 1990-2000	3. After 2000	
3	Migrated from	1. Same Upazila	2. Other Upazilas of the District	3. Other District	

10. Reasons for coming to this town (from rural area/other town).

Code	Reasons	Code	Reasons
1	Service/ Transfer	5	Long-term Treatment
2	Better education	6	Attracted by facility of urban life
3	Business/ Commerce	7	Home town (Living since birth)
4	Security Reasons	8	Others (mentioned)

11. Condition and width of the road beside / in front of the house/ holding

Code	Type of road	Availability	condition	Width (in feet)
1	Pucca			
2	Semi-Pucca			
3	Kutcha			

Code for Availability: 1 Available 2 Not Available **Code for Condition:** 1 Good 2 Moderate 3 Bad

12. Drainage, Sewerage and other Facilities of house

Code	Facilities							
		Code		Code		Code		Code
1	Drainage	1	Pucca	2	Kutcha	3	No drain	
2	Sewerage	1	Pucca	2	Kutcha	3	None	
3	Toilet	1	Sanitary	2	In-Sanitary	3	None	
4	Pollution	1	Water	2	Air	3	Sound	4. Other

13. Availability of facilities in the town

SI. No.	Facilities	Availability	Distance (km)	Mode of transport	Service quality
1	Medical hospital/ clinic				
2	Community Center				
3	Shopping Center				
4	Dustbin				
5	Police box				
6	Park/play ground				
7	Bank				
8	Post office				
9	Fire Brigade				
10	Primary School				
11	High School				
12	Collage				
13	Kutcha bazaar				
14	Bus Stand				
15	Library				
16	Graveyard/ cremation area				
17	Mosque/Temple				

Code:
Facility: 1 Available 2 Not Available
Service quality: 1 Good 2 Moderate 3 poor
Distance: 1. Walking Distance 2. Within ½ km, 3. ½ km-1km, 4. 1km – 2 km, 5. Above 2 km
Mode of transport: 1. Walking 2. Bi- cycle 3. Rickshaw/Van, 4. Tempo, 5. Bus, 6. Easy Bike 7. Others

14. Travel Pattern

Member	Trip Purpose	Travel Mode* (Major)	Trip Rate (trip/week)	Destination (area/ward)	Cost (Tk.)	Travel Time (min)
1	1. Work					
	2. Shopping					
	3. Education					
	4. Social					
	5. Others					
2	1. Work					
	2. Shopping					
	3. Education					
	4. Social					
	5. Others					
3	1. Work					
	2. Shopping					
	3. Education					
	4. Social					
	5. Others					
4	1. Work					
	2. Shopping					
	3. Education					
	4. Social					
	5. Others					
5	1. Work					
	2. Shopping					
	3. Education					
	4. Social					
	5. Others					

***Travel Mode:** 1. Walking 2. Bi- cycle 3. Rickshaw/Van, 4. Tempo, 5. Bus, 6. Easy Bike 7. Others

15. Transport Problem

Code	Problem	Code	
1	Narrow road	4	No town bus service
2	Roads are flooded and damaged time to time	5	Don't Know
3	Traffic congestion most of the time		

16. Main Water Options/ Sources for Drinking and Cooking

Sl. No.	Source of Drinking Water		
1	Water Option/Source	1 Hand Tube Well, 2. Dug/ Ring Well (DW/RW,) 3. Piped Water Supply, 4. RWH	
2	Ownership of Sources	1 Own 2. Neighbor 3. Pourashava/ Govt. 5. Private 6. NGO	
3	Others Sources	1 River 2. Pond 3. Canal	

(RWH: Rain Water Harvesting)

17. Affected house by flood of 2007

1	UP-to plinth level (in Feet)	
2	Above The plinth level (in Feet)	
3	Not Affected	
4	Type of Damage	

Code for Damage: 1. Death of Family members 2. Injury of members 3. Property 4. Loss of Job
5. Loss of Income from Business 6. Crop Loss 7. Other (Specify)

18. What were your coping strategies to mitigate the effects of last major disaster?

1. Loan from neigbors/relatives or donation		2. Sold tin sheets	
3. Loan from money lender		4. Sold standing crops	
5. Loan from NGO (NGO name)		6. Sold men labour	
7. Grain loan from Kin		8. Sold women labour	
9. Migration to sale labour		10. Sold child labor	
11. Cash loan from Merchants		12. Occupation change	
13. Loan from bank (Bank name)		14. Sold farmlend	
15. Adjustment to meals		16. Sold household productive assets	
17. Cereal loan from Metchants		18. Sold small animals	
19. Farmland mortgage out		20. Sold trees	
21. Farmland leased out		22. Sold Jewelary	
23. Taken relief		24. Sold cows/bullock	
25. Begging		26. Taken famine foods	
27. Migrated permanaantly		28. Utilized savings	
29. Migrated temporariliy			

19 . Natural Disasters and Household Coping Strategies

1. Have you noticed any long-term changes in the mean temperature over the last 5 years? Code: 1=Yes 2=No	
2. Have you noticed any long-term changes in the mean rainfall over the last 5 years? Code: 1=Yes 2=No	

3. If the answers of 1 & 2 are yes, then identify problems that the household has experienced due to extreme heat and rainfall events in last 5 years, Code: 1=Yes 2=No

1. Urban	***Code***	***2. Rural***	Code
1. Problems with drinking water		1. Problems with drinking water	
2. Water logging due to sudden heavy rainfall		2. Loss of crops due to sudden heavy rainfall	
3. Loss of working hours due to extreme heat		3. Can't cultivate the crops in due time	
4. Can't go outside of house due to extreme heat		4. Yield of crops has decreased	
5. Diseases/health problems/sickness has increased		5. Can't go outside of house due to extreme heat	
6. Other.....		6. Have to work hard for irrigation	
.....		7. Diseases/health problems/sickness has increased	
		8. Others……	

20. What adjustments have you made to these long-term shifts in temperature and extreme rainfall? Code: 1=Yes 2=No

1. Urban	***Code***	***2. Rural***	code
1. Increase power usages		1. Change from crop to livestock	
2. Cleaning the drains		2. Reduce number of livestock	
3. Taking healthy food		3. Seasonal migration to urban area	
4. Change employment		4. Find off-farm job	
5. Raising plinth levels of houses, tube wells and sanitary latrines		5. Change crop variety	
6. Buy insurance		6. Build a water-harvesting scheme	
7. Put trees for shading		7. Raising plinth levels of houses, tube wells and sanitary latrines	
		8. Put trees for shading	
		9. Irrigate more	

21. Willingness to participate in the development activities

1. Yes	2. No	

If Yes

Code	How	Code	How	
1	Contribution of land for service facilities	4	Providing advice for service facilities	
2	Contribution of Money for service facilities	5	Other	
3	Contribution of labor for service facilities			

22. Are any of the men/HH head is the memeber of a local institution or committe? ☐

1 = Yes 2= No

1) How are you involved in the activities of that institutions?

2) How have you benefited from your involevement in the activities of that institution?

Institution/Committe	Memebrship 1= Yes 2 = No	Involvement in activities (Position and activities)	Benefits
1. Local residential committee			
2. Mosque or other religious committe			
3. Local club/samity			
4. NGO/CBO			
5. School/madrassah			
6. Market committe			
7. Village court/Shalish			
8. Bank or Grammeen bank			
9. Other-specify			

23. Priority need and order of Development Activities.

1st) ----------

2nd) ----------

3rd) ----------

24. Suggestion for Road and Drainage activities (if any)

Sl. No.	Activity Type	1 (Yes)	2 (No)
1	Increase numbers of Road		
2	Widening of existing Road		
3	Increase numbers of Drainage		
4	Widening of existing Drainage		
5	Others (Specify)		

25. Suggestion for Road and Drainage activities (if any)

Interview and Data Entry Details

Name of the Investigator……..Data Of Interview……/……/…….

Data crosschecked by ……

Date……/……/…….

Name of the Operator……..

Date……/……/……

Urban Development Directorate (UDD)
Preparation of Development Plan for Benapol-Jessore Highway Corridor
Consultant: DECODE-GEOMARK Joint venture

Urban and Rural Economy

Agri-product

Agri-product information will be collected through questionnaire survey (given as below)

Item	Production		Local market price		Local demand
	2013	2003	2013	2003	

(Source, Union Parishad)

Trade

Bazaar and Hat

- ✓ Location of Hats and Bazars(source, Union Parishad)
- ✓ No. of shops (retail and wholesale) in each Hat and Bazar (source, Union Parishad and bazar committee)
- ✓ Revenue collection and lease amounttrend (10 years) of Hat and Bazar(source, Union Parishad and bazar committee)
- ✓ Daily trade (source, shop owner and bazar committee)
- ✓ Trade license

Shops (excluding hat and bazar)

- ✓ Number of shops i.e. retail and wholesale(source, chamber of commerce)
- ✓ Types of shops (categorized according to physical feature survey)
- ✓ Daily trade of shops(source, chamber of commerce)
- ✓ Catchment / hinder land identification /hare key

Industry

- ✓ Location of industries
- ✓ Type of industry (categorized by product)
- ✓ Production volume trend (10 years) of industry

(source, interview of industry authority)

Forward- Backward linkage

- ✓ Agri-product (farmer → local seller→ Godown→Hat and Bazar → consumer/buyer)
- ✓ Industry product (industry → wholesale → retail → end consumer)

(source, field survey, interview of market committee)

Archeology

History (Attached)		
Name of Archeology Building:		
Location Archeology Building:		
Year of construction		
Use during establishment		
Current use		
Attached facilities		
Maintenance	**No. of staff**	
	Staff type	
Economical Value		
Archeological Preservation conservation		**Yes/No**
		If yes

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EDUCATIONAL (SCHOOL) SURVEY

Name of Building:							
Location of Building:							
Institution	**Area (sq m)**	**No. of student**	**No. of teacher**	**Attached facilities (yes/No)**		**No. of dropout students**	
				Hostel	**Transport**	**Primary**	**Secondary**

Code:

1= school

2= college

3= university

4- Madrasah

5-others

Health Facilities

Name of Health Facilities center :

Location Health Facilities center:

No. of Patient	No. of Doctor (Permanent)	No. of Nurse (Permanent)	No. of Doctor (Consultant)	
			No.	Working Hour

Urban Development Directorate (UDD)
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Questionnaire on Formal and Informal Industrial Survey

Sample no: …… Physical feature ID: …… Date……/……/…….

1. Basic information

a) Name of Industry: b) location:

c) Area: d) Building footprint: Size: 1) Small 2) Medium 3) Large

e) Type: 1) Formal 2) Informal

f) Nature: 1) Green 2) Yellow 3) Red

g) Finance: 1) Self 2) Loan 3) Joint venture 4) PPP 5) Govt. owned

h) Land Ownership: 1) Own 2) Rental I) Year of Establishment:

2. Input (Raw material)

Item	Source	Carrier	Vol. required/month	Unit buying price	Seller

Carrier: Track =1, train=2, lorry=3, ship=4, others=5

3. Output

Output	Item	Outlet location	Carrier	Production Vol./month		Unit selling price	Buyer
				2013	2003		
Product							
By-product							

Carrier: Track =1, train=2, lorry=3, ship=4, others=5

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Questionnaire on Formal and Informal Industrial Survey

4. Labor information:

a) Total Number of Labor:

b) Type:

Category		Skilled			Unskilled		
Sub-category		Top	Mid	Lower	Top	Mid	Lower
No. of labor							
Wage/month							
Labor source (location)							
Housing	type						
	h.size						
	No. of room						

Wage/month: 1= <5000, 2= 5001-10000, 3=10001-15000, 4=15000>

Housing Type: 1= pacca, 2= semi-pacca, 3= katcha

f) Facilities:

Type		Yes/No	No. of labor
Accommodation			
Transport			
Health	Health insurance		
	Health Support (Financial)		
	Campaign		

Code: yes=1, No=2

5. Pollution Control System:

a) Industrial discharge:

Pollutant		Non-pollutant	
Name (effluent)	State	Name (effluent)	State

Code: State: 1= Solid, 2= Liquid, 3= Gas

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Questionnaire on Formal and Informal Industrial Survey

a) Pollution Control Device

Device name	Installation Cost	Maintenance Cost/Month	Followed by govt. regulation (yes/no)

b) Effluent disposal place: 1) Pond 2) Land 3) Marshy land 4) River 5) Other ……

c) ETP:

ETP	Capacity	Number of chamber	Standard
1.			
2.			
3.			
4.			

Name of Informer: ……

Mobile no: ……

Signature: ……

Date: ……

Name of Surveyor:

……

Date: ……/……/ …….

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TRAFFIC SURVEY (Origin and Destination)

SN	LOCATOIN	DIRECTION	DATE	HOUR	SHEET NO.	INTERVIEWR	SUPERVISOR
	VEHICLE TYPE	**NO. OF PERSONS**	**ORIGIN**	**DESTINATION**	**TRIP PURPOSE**	**FOR TRUCKS**	
	1. Motorcycle 2. Auto Rickshaw 3. Car 4. Pickup Truck 5. Micro Bus 6. Mini Bus 7. Large Bus 8. Small Bus 9. Medium Truck 10. Large Truck	**Including Driver**	Address/Place of Origin A:Division (country: from foreign Country) B: District: Zila C: Thana (Khulna, Bagerhat Zila only) D:Ward/Land Mark (Jessore City only) E: Port/ Ghat/ Railway Station.	Address/Place of Origin A:Division (country: from foreign Country) B: District: Zila C: Thana (Khulna Jessore Zila only) D:Ward/Land Mark (Jessore city only) E:Port/Ghat/Railway Station.	1.To Working Place (from Residence) 2.To School/Institution 3. To Home 4. Working 5. Private Purpose (Shopping and Eating, etc) 6. Other (Please specify)	**Type of Commodity** 1.Jute 2.Prawn/Shrimp/ Fish 3. Grain 4. Cotton 5. Fertilizer 6. Cement 7.Construction Materials 8.Metal and Machinery 9. Crude Oil and Oil Products 10. Empty Container 11. Others (General Cargo/Please Specify) 12. Empty	**1.Loading Capacity** **2. Condition** 1.Capacity (ton) 1. Full 2. ¾ 3. ½ 4. ¼ 5. Less then ¼ 6. Empty
1			A:---------- B:---------- C:---------- D:---------- E:----------	A:---------- B:---------- C:---------- D:---------- E:----------			1 ton 2
2			A:---------- B:---------- C:---------- D:---------- E:----------	A:---------- B:---------- C:---------- D:---------- E:----------			1 ton 2
3			A:---------- B:---------- C:---------- D:---------- E:----------	A:---------- B:---------- C:---------- D:---------- E:----------			1 ton 2
4			A:---------- B:---------- C:---------- D:---------- E:----------	A:---------- B:---------- C:---------- D:---------- E:----------			1 ton 2

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TRAFFIC VOULUME COUNT SURVEY

SN	Location	Direction	From		To	Date	Interviewer	Supervisor	Sheet	Remark
	Vehicle Type / Hour (AM-AM)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	Total Count
1	Motor Cycle									
2	Auto Rickshaw									
3	Car									
4	Pickup Truck									
5	Micro Bus									
6	Mini Bus									
7	Large Bus									
8	Small Bus									
9	Medium Truck									
10	Large Truck									
11	Others									

Cloud Coverage (Oktas) - Year-wise Monthly Average													
Station Name	**YEAR**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Jessore	1948	1.5	2.1	1.9	2.5	1.2	4.3	4.7	4.2	4.2	3.7	3.5	0.2
	1949	1	0.8	1.2	3.1	3.8	5.5	5.1	5.7	5	2.8	0.9	0.2
	1950	0.5	1.2	2.1	1.9	4	6.2	6.3	6.6	4.7	4.9	2.2	1
	1951	0.5	0.8	3.1	2.7	2.8	5.3	6.6	5.8	4.5	3.2	1.2	0.4
	1952	0.7	0.9	2.1	3.3	3.6	5.4	6.8	6.1	5.6	3.2	2.2	0.7
	1953	2	2.1	2.5	2.9	3.9	6.4	6	5.9	6.1	4.1	1.8	0.5
	1954	1.1	1.3	1.1	2.4	4.3	5.9	6.1	6.6	5.9	3.6	0.7	1.2
	1955	1.5	0.7	2.6	3.1	4	6.6	7.2	6.6	6.1	4.8	3.4	0.7
	1956	0.7	1.6	2.8	2.9	5.6	5.9	6.4	6.4	5.7	4.5	1.8	0.9
	1957	2	1.9	2.3	2.6	3	5.2	6.4	6	5.3	4	1.2	0.5
	1958	1.6	2.8	2.1	3.1	4.2	4.5	6.3	6.5	5.8	4.3	3	1.9
	1959	1.9	1.1	2	3	4.2	6	6.2	6.3	6.9	5	0.7	0.7
	1960	1	0.4	2.5	1.1	4.1	5.4	6.5	6.2	5.9	3.2	2.1	1.5
	1961	1.8	2.5	2.3	2.3	4.4	6.5	6.7	6	5.4	3.9	1.5	0.4
	1962	0.5	1.7	1.2	3.3	4.2	6.6	5.7	6.4	5.3	3.9	0.6	1
	1963	0.5	0.8	1.5	3.7	5	6.1	6.8	5.6	5.6	3.9	1.3	1.2
	1964	1	2.1	1.8	4.2	4.5	6.6	6.9	6.6	5.9	5.1	2.3	1.2
	1965	1.2	1.5	2.1	3.2	4.3	5.8	6.3	6.2	5.6	3.7	2	1
	1966	1.2	1.5	2.1	3.2	4.3	5.8	6.3	6.2	5.6	3.7	2	1
	1967	1.2	1.5	2.1	3.2	4.3	5.8	6.3	6.2	5.6	3.7	2	1
	1968	1.2	1.5	2.1	3.2	4.3	5.8	6.3	6.2	5.6	3.7	2	1
	1969	1	1.1	2.7	3.1	3.7	6.2	6.2	6.4	5.6	3.2	2.1	1.2
	1970	1.8	1.2	2.3	3.3	3.8	6.1	6.5	6	6.2	4	2	0.2
	1971	1.9	1.6	2.1	3.2	4.3	6.2	6.9	7.1	6.1	3.7	2	1
	1972	1.2	0.9	1.4	2.9	2.9	5.4	6.2	6.4	4.7	2.8	2.2	0.9
	1973	0.3	1.6	1.7	2.9	4.9	5.7	6.1	5.7	5.8	4	2.8	1.4
	1974	0.3	0.6	2	2.9	4.3	5.3	6.8	6.1	5.2	4.3	2.4	0.1
	1975	1.1	1.9	1.3	2.5	4.5	6	7	5.5	5.6	4	2.6	0.3
	1976	0.7	1	1.3	3	4.1	5	5.4	5.6	4.6	2.8	2.3	0.8
	1977	0.8	1.6	1.9	4.6	4.6	5.8	5.9	5	4.5	2.9	3	1
	1978	1.2	1.5	2.1	3.2	4.3	5.8	6.3	6.2	5.6	3.7	2	1
	1979	1.5	2	2.3	2.4	2.8	5.5	6.1	6.4	5.6	2.8	2.5	1.3
	1980	0.9	1.6	2.8	2.9	4.7	6.2	6.5	6.3	6.2	3.3	1.5	1.7
	1981	1.9	1.4	4	4.1	5.6	5.8	6.7	6.4	6.2	2.5	1.5	2.2
	1982	1	2.4	2.8	4	3.4	6.2	6	6.8	5.5	3	1.9	0.7
	1983	1.4	2.1	2.6	3.7	4.3	5.4	5.9	6.1	6	4	2	1.5
	1984	1.7	1.9	1.5	3	4.8	6.7	6.4	6.4	4.9	3.9	1	1.1
	1985	2.2	1.1	2.3	3.1	4.1	5.5	6.3	6.4	6.1	3.1	1.6	1.2
	1986	1.7	1.7	1.4	3.4	3.7	5.4	5.9	5.8	6	3.4	2.6	1.9
	1987	0.7	1.2	2.6	3.5	3.4	6.1	6.6	6.4	6	2.6	3	1.3
	1988	1	1.7	2.6	4	5.7	6.4	6.6	6.6	5.7	3.1	2.3	1
	1989	1.2	1.5	2.1	3.2	4.3	5.8	6.3	6.2	5.6	3.7	2	1
	1990	0.4	3	3.6	3.8	5.2	6.2	6.8	6	6.2	4.2	2.9	1.3
	1991	1.6	1.2	2.3	3.2	5.6	6.3	6.4	6.3	6.4	4.3	2.1	2
	1992	0.8	2.1	1.9	2.6	4	5.2	6.4	5.9	5.2	3.4	2.4	0.3
	1993	1	1	1.7	3.9	4.1	5.7	5.8	6.5	6	3.7	1.3	1.2
	1994	0.9	1.4	1.9	3.5	4.3	6.3	6.6	6.5	5	3.3	2.8	0.7
	1995	1.5	2.1	2.1	2.8	4.8	6.2	6.5	6.4	6.2	3.6	2.8	0.4

	1996	0.9	1.4	2.3	3.2	4.6	5.6	6.3	6.3	5.2	2.8	1.1	1.4
	1997	1.1	1.2	2.3	3.8	4.3	5.8	6.2	6.2	5.6	2.4	1.9	2.5
	1998	2.8	2.1	2.6	3.6	4.9	5.3	6.3	6	4.8	3.8	2.5	0.1
	1999	0.6	0.7	1	2.8	5.2	5.8	6.5	6.5	6.2	5.2	1.4	0.5
	2000	0.9	3.2	2.3	4	5.3	6	6.2	6.1	5.7	4.1	0.9	0.2
	2001	0.5	1.2	2.1	3.4	5.1	6.6	6.6	6.2	5.6	4.4	2.3	0.8
	2002	1.4	0.9	2.2	4.1	4.9	6.1	6.3	6.2	5.6	2.9	2.4	0.7
	2003	1.1	1.8	2.4	3.7	3.7	6.3	6.2	5.7	5.8	5.4	0.4	1.5
	2004	1.8	0.6	2	4.3	3.6	5.9	6.3	6.2	6.1	3.4	0.4	0.7
	2005	1.6	1.3	2.8	2.7	3.9	4.6	6	5.8	5.4	4.6	1	0.8
	2006	0.7	0.3	1.4	3.4	3.7	5.3	5.9	5.8	5.4	2.8	1.9	0.2
	2007	0.4	1.9	1.4	2.8	3.3	5.4	6	5.3	5.6	3.1	1.2	0.3
	2008	1.4	1.2	2.7	2.3	4	5.8	6	5.1	4.9	2.5	0.7	1.2
	2009	0.4	0.2	1.6	1.5	3.8	4	5.3	5.3	4.2	2.1	1.3	0.4
	2010	0.7	1.2	1.5	2.4	4.1	5.4	5.1	4.7	4.6	3.4	1.4	1.2
	2011	0.4	0.7	2.3	2.9	4.2	5.5	5.2	6.2	5.3	2	0.5	0.9
	2012	1.8	0.6	1	2.8	2.6	4.7	5.3	5.3	4.6	2.3	1.7	0.9
	2013	0.3	1.2	1.2	2.4	5.2	4.4	5.3	5.4	4.6	4.3	0.4	0.6

Relative Humidity (Percent) - Year-wise Monthly Average													
Station Name	**YEAR**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Jessore	1948	69	70	60	68	92	84	87	87	83	82	81	76
	1949	69	68	65	68	75	84	87	87	86	82	77	75
	1950	69	71	65	69	75	88	88	90	87	88	83	83
	1951	69	69	67	61	70	82	87	87	85	86	85	80
	1952	69	73	69	73	77	85	88	88	86	86	81	82
	1953	69	75	75	64	78	86	89	89	89	84	84	87
	1954	69	77	69	68	75	90	87	90	88	86	82	83
	1955	69	69	71	66	74	85	89	89	89	89	85	79
	1956	69	72	69	66	82	89	90	90	91	89	82	79
	1957	69	72	63	69	72	81	89	91	89	87	80	80
	1958	69	75	60	69	75	80	87	86	85	82	75	73
	1959	69	69	63	72	78	86	89	91	92	90	77	77
	1960	69	64	65	57	76	83	89	87	86	78	73	71
	1961	69	68	70	65	77	85	84	86	85	80	72	70
	1962	69	67	60	70	80	87	85	88	84	79	72	72
	1963	69	62	60	71	79	86	86	85	84	82	75	74
	1964	69	67	66	79	79	91	92	91	90	88	82	80
	1965	69	67	62	67	69	83	85	89	86	81	75	71
	1966	69	63	53	62	69	86	86	88	86	82	76	74
	1967	69	62	67	61	71	83	86	88	87	77	68	71
	1968	69	59	52	65	69	88	87	86	83	80	76	72
	1969	69	61	64	65	73	85	89	88	85	78	72	70
	1970	69	63	64	69	70	86	87	86	86	84	72	69
	1971	69	68	65	68	75	84	87	87	86	82	77	75
	1972	69	66	61	64	70	77	85	88	84	76	70	67
	1973	69	58	61	62	80	85	87	87	87	84	81	77
	1974	69	59	64	74	75	83	90	87	87	82	72	69
	1975	69	63	53	63	73	82	90	86	87	84	75	70

	1976	69	67	58	62	78	84	88	87	85	76	73	67
	1977	69	63	61	75	78	88	87	85	85	80	77	73
	1978	69	68	65	68	75	84	87	87	86	82	77	75
	1979	69	67	54	62	60	78	84	85	84	76	71	74
	1980	69	66	65	64	74	84	87	86	82	78	68	67
	1981	69	70	67	74	79	81	89	85	86	71	74	77
	1982	69	65	66	72	70	84	84	87	83	76	74	71
	1983	69	70	67	63	78	81	86	88	87	85	72	72
	1984	69	66	56	67	79	88	87	88	84	80	70	70
	1985	69	63	65	64	76	86	88	87	87	78	76	72
	1986	69	62	55	71	76	84	87	85	89	84	84	77
	1987	69	67	66	69	73	83	90	87	86	81	77	78
	1988	69	71	71	70	79	85	86	88	85	79	76	80
	1989	69	67	61	67	76	84	86	85	88	85	77	77
	1990	69	75	77	76	80	85	88	85	88	84	80	79
	1991	69	74	72	71	77	86	86	87	88	86	78	81
	1992	69	76	68	65	77	81	88	87	86	84	78	78
	1993	69	73	67	74	81	85	87	88	88	86	81	78
	1994	69	74	67	69	74	85	86	86	81	77	76	70
	1995	69	74	63	67	74	83	87	85	86	82	78	75
	1996	69	76	71	73	77	85	88	89	87	84	80	78
	1997	69	76	76	76	75	84	89	88	89	81	80	84
	1998	69	78	73	79	80	83	87	88	86	85	83	81
	1999	69	73	67	73	78	83	89	88	88	86	80	79
	2000	69	73	70	75	80	84	86	85	87	86	81	79
	2001	69	73	71	75	80	88	87	85	86	86	83	81
	2002	69	70	69	77	79	86	86	87	87	84	83	83
	2003	69	76	76	77	74	84	85	84	87	88	80	83
	2004	69	74	73	77	73	85	86	87	88	84	80	83
	2005	69	76	75	74	76	80	87	86	85	88	81	79
	2006	69	75	69	74	78	85	88	86	87	83	81	80
	2007	69	81	71	75	76	82	88	85	86	83	83	80
	2008	69	76	77	76	76	84	88	86	87	84	80	85
	2009	69	74	70	71	76	78	84	87	84	81	78	79
	2010	69	71	69	71	76	82	81	82	84	82	79	79
	2011	69	71	70	73	76	82	82	87	85	79	79	82
	2012	69	72	68	73	69	77	85	84	85	82	79	81
	2013	69	71	66	67	80	81	83	85	85	85	76	78

Precipitation (mm) - Year-wise Monthly Average													
Station Name	**YEAR**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Jessore	1948	0	58	72	102	6	348	272	379	115	132	102	0
	1949	14	2	30	321	212	150	343	326	173	216	0	0
	1950	0	13	17	42	77	557	281	327	126	55	124	0
	1951	0	0	34	19	170	113	279	244	147	224	0	0
	1952	0	0	38	123	95	275	280	207	210	117	10	0
	1953	7	81	102	10	181	322	349	476	301	12	20	0
	1954	6	0	0	32	192	606	339	427	159	110	0	8
	1955	0	0	11	63	126	175	313	209	82	54	63	0

1956	0	17	58	26	200	367	298	267	282	24	20	0
1957	27	38	0	30	15	332	381	14	82	60	0	0
1958	9	25	0	97	158	57	284	177	85	37	1	0
1959	19	10	30	82	315	205	211	478	276	511	0	0
1960	0	0	287	0	153	112	546	170	171	117	0	0
1961	16	81	51	18	115	288	216	418	147	70	1	0
1962	10	27	2	108	109	183	167	174	199	242	0	0
1963	0	0	34	70	23	297	244	178	248	185	20	1
1964	3	4	28	189	67	218	549	177	129	440	50	1
1965	0	34	45	28	33	574	234	406	172	114	0	0
1966	27	0	5	18	96	352	175	191	49	216	10	13
1967	57	3	52	68	121	192	265	295	239	65	0	1
1968	0	4	18	132	141	603	546	205	156	135	55	0
1969	0	10	50	77	94	253	308	366	428	47	27	1
1970	31	30	45	87	29	352	415	280	490	339	10	0
1971	16	0	31	61	141	421	489	500	313	112	15	4
1972	0	4	7	37	22	110	169	372	131	17	1	0
1973	0	10	75	32	263	361	214	224	226	131	45	97
1974	0	0	112	44	202	160	353	436	225	99	9	0
1975	7	0	10	10	130	142	444	128	150	215	7	0
1976	0	28	21	68	141	243	253	278	132	11	4	0
1977	1	25	0	162	181	344	301	99	224	93	30	40
1978	3	10	31	61	141	290	300	269	202	112	15	4
1979	45	36	6	18	17	203	359	394	402	119	14	38
1980	8	60	57	4	193	214	309	309	85	119	0	0
1981	8	108	45	292	234	124	377	292	251	0	0	148
1982	0	4	52	224	71	319	171	195	232	5	21	1
1983	20	118	71	61	361	142	189	465	255	152	0	14
1984	51	1	0	18	305	822	247	365	168	54	0	0
1985	46	4	50	2	179	318	251	300	237	189	0	0
1986	9	0	1	73	174	319	362	181	606	228	159	6
1987	1	0	58	97	120	327	321	768	196	136	5	10
1988	0	27	93	148	297	543	257	307	113	91	99	1
1989	0	2	1	39	198	164	255	88	168	192	0	10
1990	0	54	173	25	162	335	369	137	196	99	126	10
1991	24	10	31	54	186	407	220	543	216	285	0	76
1992	27	77	0	1	223	303	307	152	204	36	3	0
1993	0	33	115	147	132	437	327	213	336	58	4	0
1994	10	31	1	51	175	365	225	253	83	64	2	0
1995	17	25	18	5	88	196	279	288	270	95	113	3
1996	39	20	22	90	146	350	271	380	195	257	5	0
1997	9	39	51	64	116	231	406	227	361	15	14	20
1998	44	26	141	130	216	163	181	209	174	88	118	0
1999	0	0	0	22	141	244	356	251	301	151	1	0
2000	1	19	7	74	164	209	486	239	467	145	0	0
2001	0	0	56	29	317	498	317	109	137	134	14	0
2002	18	0	22	161	264	535	524	231	221	32	112	0
2003	0	5	119	49	72	404	427	177	148	466	0	25
2004	3	0	9	70	138	305	398	347	917	257	0	0

	2005	33	16	129	31	59	141	546	115	194	412	2	0
	2006	0	0	1	52	302	214	455	316	400	16	13	0
	2007	0	66	21	62	159	289	735	299	259	116	113	0
	2008	70	35	37	39	208	242	459	204	415	179	0	0
	2009	0	2	31	15	166	175	523	435	165	69	3	0
	2010	0	6	0	12	142	367	215	209	195	189	12	62
	2011	0	0	34	33	132	314	296	306	227	18	1	0
	2012	31	4	5	82	36	221	334	187	271	71	61	2
	2013	6	15	8	63	278	203	249	309	322	223	0	0

Bright Sunshine (Hours) - Year-wise Monthly Average

Station Name	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Jessore	1967	7.6	7.9	8	8.1	7.4	7.2	5.7	5.4	5.2	9	10.1	7.3
	1968	9.3	9.3	9.1	9.5	9.9	4.2	5.3	6	6.7	7.4	8.4	9.3
	1969	9.6	9	8.3	8.3	9.5	4.7	5	4.9	6.3	8.8	9.3	8.9
	1970	8.4	10.2	8.7	9.2	9.8	5.6	4.5	6.4	5.4	7.3	9.5	10.3
	1971	8.7	7.9	8	8.1	7.4	4.8	4.4	3.1	5.6	6.9	7.5	7.3
	1972	7.4	8.6	9.1	8.9	7.9	5.6	4.1	3.5	5.9	7.7	8.6	8.6
	1973	9	7.7	8.2	8.2	5.9	4.3	4.3	5.5	3.6	6.4	6.9	7.9
	1974	8.7	9.1	8.1	8.6	7.6	4.9	1.9	4.3	5.2	7	8	8.3
	1975	8.3	8.5	8.9	8.9	7.8	6.3	3.9	5.8	4.7	6.4	7.2	8.4
	1976	7.4	8.8	9.3	8.8	7.4	4.4	4.8	4.6	5	6.9	7.5	7.3
	1977	7.9	8.5	7.8	7.1	7.6	3.8	4.4	5.8	5.7	7.9	7.1	8.3
	1978	8.9	9.2	9	8.6	7.9	4.7	3.9	4.7	3.1	5.9	7.7	8.2
	1979	8.3	7.8	9.2	8.2	8.6	5	5	4.4	5.4	8.2	7.8	7.5
	1980	7.5	7.9	7.6	8.2	6.9	4.9	3.8	4.2	6	7	8.4	7.2
	1981	6.8	7.6	6.5	7.2	6.6	5.8	2.8	5.2	4.1	8.4	8.2	6.3
	1982	7.2	6.9	6.4	6.7	7.9	3.7	4.4	4.7	5.6	7.8	7.3	6.9
	1983	5.9	7.1	7.4	8	7.6	5.8	4.3	4.5	4.4	5.2	8	7.6
	1984	7	6.8	8.2	7.3	6.6	3.3	3.5	3.1	5	5.3	8.4	6.5
	1985	5.9	7.3	7.5	7.8	7.6	4.2	3.6	4.6	4.7	7.4	7.5	6.9
	1986	6.5	7.3	8.1	7.6	7.5	4.5	4	4.7	3.9	6.3	6.3	5.9
	1987	7.5	7.8	7.4	7.3	8.4	5.4	1.5	3.9	3.6	7.6	5.9	5.9
	1988	6.8	7.1	6.8	7.7	6.2	3.9	3.9	2.8	5.7	8	7.2	7.4
	1989	8.1	8.5	7.7	8.7	7	4.7	4.4	6.2	3.8	6.2	8	7.7
	1990	7.4	7.4	6.2	7.8	6.6	5.3	3.4	5.7	4.7	5.4	6.7	7
	1991	6.2	7.9	7.6	7.6	6.2	4	4.2	4.6	4.1	4.8	6.6	5.5
	1992	6.5	7.2	7.8	8.5	7.5	6.1	3.8	5.1	6	6.7	6.5	7.2
	1993	6.4	7.3	7.7	8.4	6.8	4.3	3.4	2.9	3.9	5.9	7.1	7.2
	1994	6.7	7.1	7.3	7.5	7.7	3.9	4.1	4.3	6.3	7.5	5.8	7.4
	1995	6.4	6.3	8.1	8.5	5.9	3.6	3.2	4.2	3.9	6.3	5.9	7.9
	1996	7.7	8.1	8.2	8	8	5.1	3.8	3.2	5.7	7.1	7.8	6.4
	1997	6.8	7.6	7.7	7.8	7.5	5.8	3.6	3.6	4	8	6.5	5.6
	1998	4.8	6.8	7.7	7.5	6.4	5.7	3.2	3.7	4.5	6.2	6.7	7.8
	1999	7.6	8.3	9	8.8	6.7	5	4.6	4.9	5.1	6.6	8.3	3.6
	2000	8.5	7.5	9.2	9.2	7.4	6.1	6.2	5.7	6.1	7.4	8.8	7.3
	2001	7.3	7.5	7.9	7.6	7.1	3	3.2	5.1	5	6	5.7	6.3

	2002	6	8	7.2	7.5	5.8	3.5	3.7	4.3	5.2	7.3	6.9	6.5
	2003	6.2	7.4	7.5	8.2	7.8	4.1	4.7	5.6	4.2	4.3	7.9	6.1
	2004	5.9	7.7	7.8	7.7	8.1	4.7	4.8	4.9	3.7	6.6	7.6	6.5
	2005	5.8	7.7	7.1	7.7	7.8	5.3	3.8	3.2	4.4	4.1	7.1	7.4
	2006	7.2	7.7	7.3	6.9	6.6	3.9	4	4.6	4.7	5.7	5.3	5.3
	2007	5.2	5	6.8	7.3	7.6	4.9	3	4.4	3.8	5.4	6.3	5.7
	2008	5.4	6.6	6	7.5	7.6	3.4	2.5	3.9	4.3	5.9	8.2	4.6
	2009	5.7	7.7	5.7	7.6	5.9	5.9	3.5	2.9	4	5.9	5.4	3.5
	2010	5.6	6.3	6.6	5.4	4.6	3.1	4.3	4.6	4.1	5.3	5.5	4.6
	2011	5.6	7.1	6.6	6.9	6.4	3.8	4.9	2.9	3.4	5.9	4.8	3.5
	2012	3.5	7.2	6.8	7.2	6.9	2.8	3.1	3.9	4.5	6	5.7	4.6
	2013	4.7	6.8	6.9	6.9	7.4	3.8	4.3	3.2	3.6	3.7	7	4.5

Year-wise Monthly Maximum Temperature (Degree Celsius)

Station Name	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Jessore	1948	28.2	32.4	37.1	37	35.7	36.9	34.1	33.1	34.1	32.9	31.4	26.1
	1949	26.9	34.4	36.2	36.6	36.2	35	35	34.6	35.6	36.4	31.7	29.6
	1950	29.3	33.4	36.3	37.5	37.3	37.4	34.3	34	36.7	34.3	31.7	30.8
	1951	28.2	33.5	35.7	37.6	37.6	37.7	35.1	35.6	36.9	37	32.2	30.8
	1952	29.4	36.7	36.2	37.5	36.7	36.1	34.4	34	35.2	35.2	34.8	28.8
	1953	28.9	34.4	37.2	37.2	37.2	36.7	34.9	34.8	35	33.9	30.6	29.6
	1954	29.4	35.1	37.6	37.6	37.6	35.7	33.5	34.4	34.4	34.4	29.5	30.2
	1955	29.9	33.3	37.3	37.4	37.4	35.7	33.9	32.8	33.9	34.4	31.2	31.1
	1956	30.1	34.4	37.4	37.2	35.6	34.4	33.3	33.4	33.9	34.4	31.7	30
	1957	29.4	32.2	36.7	37.2	37.2	37.2	34.4	36.1	35.6	35	32.2	30
	1958	31.7	32.8	37.2	37.3	37.3	37.7	34.9	34.4	36.6	35	32.1	30
	1959	30.6	31.3	36.7	37.2	37.2	34.6	34.3	33.3	33.3	32.8	32.6	30.6
	1960	28.2	34.2	37.3	37.4	37.4	35.9	33.4	34.1	34.9	34.8	30.4	29.4
	1961	30.1	32.8	36.6	37.7	37.5	36.1	34.5	34.4	34.1	34.2	32.2	28.1
	1962	29.8	32.4	37.7	37.3	37.4	35.9	35.1	33.4	34.9	33.4	32.4	29.6
	1963	28.6	33.9	37.1	37.3	37.6	36.8	34.2	35.6	35.9	34.3	32.1	30
	1964	31	35.2	37.7	37.4	37.6	37.7	33.6	33.8	34.4	34	31.4	30.4
	1965	28.7	31.9	35.9	37.7	37.6	37.6	34.2	33.6	34.6	33.6	34.3	31.7
	1966	27.5	34.7	37.7	37.6	37.7	37.6	34.9	34.2	35.2	33.1	31.8	28.2
	1967	28.1	35.7	35.6	37.7	37.6	37	34	33.3	33.4	33.7	30.6	28.6
	1968	27.9	30.8	37.2	37.2	37.6	34.4	33.3	34.8	35.7	33.3	31.6	28.3
	1969	30	35.6	37.1	37.7	37.7	35.6	33.4	35	34.6	37.7	32.5	28.1
	1970	27.4	32.5	37.4	37.4	37.2	37.2	35.6	35	34.2	37.1	32.1	27.8
	1971	31.4	31.7	34.7	35.9	35.3	34.7	33.3	32.4	36.1	32.9	31.1	28
	1972	26.8	32.2	36.9	37.7	37.5	37.4	35.5	33.9	35.8	35.5	32.8	31.1
	1973	31.5	35.7	37.5	37.7	35.8	35.3	33.5	33.2	33.6	34	31	27
	1974	27.5	35.1	37.1	37.6	37.6	35.6	32.6	34.5	34.6	35.2	32.5	30.8
	1975	27.1	34.4	37.5	37.6	37.7	36.1	33.3	34.4	34	34.7	31.1	27.6
	1976	35.3	36.4	37.7	37.6	37.3	36	33.8	34.4	34.3	34.8	33.6	30.4
	1977	29.5	34.2	37.4	37.5	36.8	35.5	34.7	34.5	35.2	34	33.3	30.2
	1978	26.8	31	34.7	35.9	35.3	34.7	32.3	32.5	33.2	32.9	31.1	28
	1979	28.8	31.7	37.4	37.6	37.6	35.6	35.8	35.5	37.2	34.4	33.5	27.4

	1980	29.6	32.2	37.5	37.5	37.6	35.9	36.1	36.6	34.4	33.5	32.4	30.6
	1981	28.9	34	34.5	36.8	35	37.5	35	34.4	34.8	34.3	34.4	29.2
	1982	30.6	31.5	35.9	38	39.4	37.3	38.1	33.4	36	35.2	33.5	29
	1983	29.2	33.4	36.7	40	38	39.7	35.8	34	34.6	35	34.5	29.1
	1984	28	31.8	38.8	40.1	38	37.7	33.7	34.8	34.7	34.5	31.5	30.5
	1985	30.4	32.6	38	40.6	36.6	38	34.4	35	33.8	34.6	32.6	30
	1986	29.8	32.6	40.2	39.8	37.8	38.2	35	35.4	35.8	33.2	32.5	29.4
	1987	28.2	34.4	38.1	39.5	40.3	37.5	35	35.5	34.5	36.5	32.5	29.2
	1988	29.2	32.5	36	41	36.5	37.5	34.3	34.2	35.2	34.2	32.8	28.5
	1989	27.2	33.8	37	41.5	41.2	35.6	34.3	34	34	35.2	32.6	28.6
	1990	30.5	32	35.7	37	36.6	35.2	34	35	35.5	34.4	33.2	30.2
	1991	29.3	35.2	38.5	38.2	38.4	36	36	36	35	35	31.6	28.6
	1992	28.3	30.5	37.2	41.8	39.6	37	35.5	34.8	35.5	34.6	34.2	28.5
	1993	29.2	35	38	38	35.8	36.1	35.5	34.8	35.6	35.3	31.8	29.8
	1994	30.5	31.8	38.6	39.3	41.7	36.9	35	34.5	36.6	35.4	32.4	30.7
	1995	27.5	31.6	38.5	42.7	40.2	37.2	34.5	34	34.8	35	33.7	29.2
	1996	28.6	31.5	36.5	41.4	39.4	36.2	34.8	34.3	37	34.8	33.8	28.6
	1997	28	30.4	36	37.1	39.8	37.2	35.4	36.6	35	34.8	34	30
	1998	28	31.4	35	36.4	38.2	38.8	35.4	35	37	36.5	34.2	30.4
	1999	30	34	38.4	41	39.2	38.4	35	35.2	34.9	34.4	33.4	29.8
	2000	29.8	29.8	36.4	39.2	38.2	36.4	36.6	37	35.2	35.2	33.5	28.2
	2001	28.6	33.4	36.6	39.5	37.2	34.4	34.4	35.8	36	36.2	33	30.4
	2002	29	33.5	39	36.5	41.8	37.4	37.2	35	35.6	36.2	33.2	31
	2003	27.4	33	35.4	38	40.8	39.6	35.8	36	35.1	35.4	33	29.2
	2004	28.5	35.4	37.8	38	41.4	37.4	36.4	35.4	35	35	33.7	29.6
	2005	29.2	33.2	37.4	40.5	39.8	41.8	35.4	36.5	36	35.6	32.5	29.8
	2006	31	37.8	41	40.5	38.8	38.2	35.6	36.4	36	35.5	32.6	30
	2007	31.2	32	37	39.2	39.7	38.7	36.2	35.9	36.2	36	32.6	29.2
	2008	29.8	31	36.8	40	38.6	37.2	34.4	35.6	35.8	35.5	32.8	30.7
	2009	30	35.2	36.8	42.8	43.2	38.3	36.4	36	36.4	35.2	34.4	30.3
	2010	28.5	34.2	38.8	40.6	37.8	37.4	35.6	36.5	35.4	38.6	34.4	29.4
	2011	28.6	32.8	35.8	37.4	37.8	39.4	35.8	35.6	36.9	36.2	32.6	31
	2012	29.6	34.4	39.6	39.3	40.2	40.8	35.8	35.3	36	35.2	32.4	29.7
	2013	29.2	33.2	37.8	39.2	37.6	36.4	35.4	36.2	35.8	35	32.8	29.8

Maximum Temperature (Degree Celsius) - Year-wise Monthly Average

Station Name	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Jessore	1948	26.1	27.8	32.4	34.2	34.6	33.4	31.6	31.1	32.2	32	27.6	25.1
	1949	25.5	27.3	33.2	32.6	32.1	32.3	31.7	31.6	32.8	32.5	28.6	25.4
	1950	26.8	28.6	33.3	35.4	35.3	32.4	32.1	31.8	32.7	30.7	27.4	26
	1951	25.2	28.3	32.2	35.4	35.4	34	33	33.5	33.6	33.3	29.4	27.4
	1952	27.3	30.7	32.3	34.1	34.5	33.2	31.1	32.1	32.8	32.4	29.5	27.1
	1953	25.3	30.4	34	35.8	35.2	32.6	31.6	32.1	31.9	31.9	28.8	28
	1954	25.3	30.7	33.8	35.6	34.5	31.6	31.7	31.8	32.1	31	28.6	26.6
	1955	26.3	29.4	34.2	35.1	35	32.5	31.5	31.2	32	31.1	28.7	25.7
	1956	26.9	28	33.4	35.4	33.8	30.7	31.2	31.6	31.1	31.4	28.6	26.9
	1957	25.6	27.4	32.3	35.6	35.3	34.6	31.6	32.5	32.5	32.7	30.4	27.9

1958	28.3	29.2	33.9	35.8	35.3	34.6	31.9	31.6	32.5	32.5	30.5	27.4
1959	26.7	27.5	33.3	35	34.8	32.3	31.3	31.3	30.8	29.8	28.4	26.2
1960	25.8	31.1	32	35.4	33.9	33.5	30.8	31.9	31.7	31.5	28.8	26.9
1961	26.4	26.5	34.2	35.6	34.3	32.7	32.1	32.1	31.9	31.8	29.2	25.3
1962	25.4	29.6	34	34.6	34.6	32.5	32.6	31.8	32.4	30.7	29.6	26.6
1963	26	31.4	34.1	34.3	33.8	32.3	32	32.3	32.6	31.6	29.4	26.8
1964	25.9	29.9	34.9	34	34.7	33.7	30.8	32	32.2	31	29	26.7
1965	26.3	28.7	32.6	34.7	35.3	32.7	31.5	30.6	32.3	31.6	31	26.1
1966	25.3	31.1	34	35.8	35.2	32.1	32.5	31.8	31.9	30.9	29.6	25.5
1967	25.1	29.9	31.7	35	35.3	33.6	31.9	30.9	31.6	31.5	28.8	26.9
1968	25.3	28.2	33.2	34.9	35.3	30.9	31.1	31.8	33	30.8	28.2	25
1969	25.5	29.8	34.3	35	34.9	33.2	31.7	31.2	31.5	31.3	29.4	26
1970	24.9	28.3	32.4	35.2	34.4	32.3	31.9	31.9	31	30.7	28.1	25.8
1971	25.4	28.2	33.3	35.3	34.8	32.3	30.9	29.8	32.3	32	29.6	26.2
1972	25.7	26.1	34	35.9	34.8	34.1	32.3	30.7	32.6	32.3	29.8	27.5
1973	27.6	31.3	32.2	35.6	33.7	33	31.5	31.5	30.9	30.5	27.5	24.4
1974	25.1	28.6	32.8	34.5	34.3	33	30.7	31.5	31.3	31.9	30	25.4
1975	25.2	28.7	33.8	35.8	34.5	33.1	30.6	31.7	31.6	31.7	27.8	25.6
1976	26.5	28.9	34.1	35	33.5	33	31.9	31.3	32.3	32.3	30.5	26.7
1977	25.5	29.2	34.6	33.9	32.9	31.4	31.4	32.2	32.5	31.5	29.4	25.8
1978	25.7	28.8	33.3	35.3	34.8	33	32	32	32.4	32	29.6	26.5
1979	26.3	26.6	33.3	35.4	35.2	32.8	32.6	32.2	32.7	32.2	31.4	25.9
1980	25.6	28.6	32.2	35.2	34.9	32.6	31.9	32.2	32.8	31.4	29.8	26.5
1981	25.1	27.6	31.4	31.8	33	33.4	31.9	32.5	32.3	33.1	30.5	24.8
1982	27.1	28.1	31.1	35	36.5	33.3	33.3	31.7	33.4	33.2	28.8	26.5
1983	25.6	27.7	32.7	36.2	34.5	34.9	33.1	32.1	32.7	31.8	30.7	26
1984	24.7	27.3	34.9	36.8	35.1	31.5	31.5	31.8	32.4	32.5	30.1	27.1
1985	25.8	28.8	35.2	37.5	34.6	32.8	31.2	32.3	32	32.4	29.9	27.9
1986	25.8	29.4	35.2	35.6	34.3	33.2	32	32.9	31.4	31	29.1	26.3
1987	25.7	29.9	33.1	35	34.6	34.2	31.4	32.1	32.6	32.7	29.4	26.9
1988	26.6	30.1	32.7	36.4	33.6	32.4	32.2	31.9	33.4	32.5	30.1	27.2
1989	24.6	28.6	33.8	37.8	35.5	32.9	32.2	32.4	32.2	31.8	30.1	26.3
1990	26.5	28.7	29.8	33.7	34.2	33.3	31.9	32.8	32.7	31.1	30.5	27.4
1991	24.8	30.7	34.3	36.1	36	33.6	32.7	32.6	32.8	31.6	29.3	25.4
1992	24.7	26.9	33.5	38.8	34.8	34.6	32.5	32.6	32.8	32.9	30.3	26.7
1993	25.3	29.2	32.2	34.7	33.9	33.1	32.3	32.1	32.1	32.8	30.1	27.1
1994	26.4	27.1	34.4	36	36.5	32.5	32.5	32.2	33.6	33.4	29.6	27.4
1995	24.5	27.9	33.4	38	36.7	33.7	31.7	32.3	32.3	32.5	29.2	26.6
1996	25.2	28.5	34.2	36	36	32.9	32.5	31.7	33.7	32.2	30.6	26.9
1997	25	27.3	33	32.6	36	34.3	32.6	32.8	32.5	33	30.9	25
1998	22.6	28	30.5	33.8	34.8	35.2	33.1	32.9	32.9	34	31.3	28.3
1999	26.3	31	35.2	37.1	35.5	34	32.5	32.8	32.3	32.4	30.8	28
2000	26.1	26.9	33.3	35.8	35.1	33.9	33	33.5	32.6	32.6	31.3	27.3
2001	25.9	30.2	33.5	35.7	34.5	32.2	32.4	33.7	33.8	33.4	30.8	27.3
2002	26.3	29.9	33.9	34.1	35.1	33.4	34	32.8	33.2	33	30.3	27.4
2003	23.8	29.2	31.7	35.9	36.8	34.1	33.6	33.9	33.4	32.1	31.1	26.4
2004	24.1	29.3	33.9	35.2	37.3	34.2	33.2	32.8	32.1	31.9	30.6	27.7
2005	25.3	30.2	33.8	36.3	36.6	36.8	32.5	33.4	34.1	31.1	30.2	27.7
2006	27.1	32.9	34.9	36.1	35.6	34.6	32.8	33.2	33.3	33.3	30.2	27.9

	2007	26.2	28	32.4	35.6	36.4	34.5	32.6	33.2	33.1	32.8	30	26.7
	2008	25.6	27.1	33.1	36	36.7	33.6	32.7	33.4	33.3	32.5	30.8	27
	2009	27.3	30.8	34.5	38.2	36.3	35.9	33.3	33.3	33.9	33.2	31.1	27.4
	2010	24.7	30.3	35.8	37.6	35.7	34.7	34	34.1	33.8	33.2	31.4	26.3
	2011	24.8	29.6	33.5	35.1	35.4	34.2	33.2	32	32.7	34.1	30.7	26.1
	2012	24.8	29.5	34.6	35.3	37.6	36.1	33.1	33.2	33.5	33.1	29.4	25.4
	2013	24.8	29.2	34.5	35.9	33.9	34	33.2	32.9	33.3	31.9	30.7	27.2

Year-wise Monthly Minimum Temperature (Degree Celsius)													
Station Name	**YEAR**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Jessore	1948	10.3	12.2	16.4	21.9	23.8	25.4	25.6	25.6	24.8	20.6	14.7	11
	1949	10.3	12.2	10.2	18.5	19.7	22.4	23.2	24.3	24.1	19.6	9.6	6.3
	1950	5.6	3.6	12.9	14.7	20.6	21.6	24.1	22.9	21.8	20.7	10.2	7.1
	1951	5.7	6.4	10.2	16.3	18.4	22.9	22.2	24.4	22.2	20.6	12.5	9.1
	1952	7.2	8.8	12.2	19.5	18.4	22	22.6	20.3	23.9	16.7	10.3	7.3
	1953	5.6	7.8	17.8	19.4	20.6	22.2	23.9	24.3	23.3	19.1	11.4	10
	1954	5.2	9.6	8.6	20.3	21.3	22.8	23.3	24.6	24.6	16.7	11.3	8
	1955	6.3	7.4	12.9	14.1	19.6	23.1	22.8	23.9	24.4	16.8	15.2	6.7
	1956	6.3	7.4	10.8	18.8	21.5	23.4	23.8	24.2	23.2	21.2	13.4	8.9
	1957	8.9	7.8	10.6	15.6	21.1	21.1	23.9	23.9	23.9	17.8	11.7	8.3
	1958	8.9	8.9	13.3	22.2	20	22.6	23.2	23.3	23.3	19.3	16.1	8.7
	1959	5.3	8.3	11.2	20.6	20.4	22.2	24.1	23.7	23.8	19.1	14.2	8.4
	1960	7.9	7.8	12.9	20.9	20.3	23.8	24.1	23.8	23.8	20.7	12.1	6.6
	1961	7.2	7.5	16.7	19.3	19.8	23.1	22.2	21.7	23.5	19.9	10.6	7.1
	1962	5.1	10.2	13.1	19.4	20.3	23.4	25.6	22.4	24.3	19.9	12.2	6.7
	1963	5.6	10	11.7	18.9	19.8	22.8	25.2	23.1	23.7	20.2	14.5	10.4
	1964	5.8	10.6	14.1	18.7	21.2	23.7	22.6	24.5	24.2	21.1	13.8	7.4
	1965	8.2	10.5	12.2	18	22.8	23.3	23.4	23.6	24.2	20.5	14.4	8.2
	1966	8.4	10.1	13.4	21.9	21.3	23.2	23.2	23.1	23.1	18.3	12.9	5.5
	1967	5.6	6.5	11.4	17.2	21.2	21.1	23.9	22.8	23.9	17.3	11.8	9.2
	1968	6.2	5.6	14.7	15.1	20.5	21.9	24.4	24.1	22.2	19.1	13.4	6.2
	1969	5.7	6.5	15.6	19.4	19.3	22.9	23.3	22.9	21.7	19.1	10.7	9.3
	1970	7.2	8.5	15.1	19.1	21.9	22.7	23.7	24.4	23.3	20.5	11.9	7.9
	1971	7.2	7.3	7.3	7.3	7.3	18.8	23.3	23.2	23.4	23.4	23.4	9.9
	1972	10.3	7.1	10.1	18.5	20.6	22.5	22.8	23.1	22.2	19.4	13.3	6.8
	1973	5.6	9.4	11.5	19.1	18.2	21.1	24	22.8	24.1	19.4	14.3	9.4
	1974	6.3	4.9	15	19.6	19.9	22.9	23.7	19.4	22.3	20.5	15.6	8.7
	1975	7.2	9.5	15.2	21.5	20.5	22.7	23.2	22.4	23.3	22	12.2	7.1
	1976	6.4	10.4	10	18.1	19.5	20.4	22.9	21.1	23.9	18.5	13.6	5.7
	1977	5.6	6	14.4	19.5	18.6	21.9	24	24.6	22.9	19.5	14.5	8.1
	1978	10.3	12.2	16.4	21.9	23.8	25.4	25.6	25.6	24.8	20.6	14.7	11
	1979	9.1	8.6	10.2	18.3	18.2	22.1	23.5	23	23	21.4	17.8	8.8
	1980	7.7	8.5	13.7	15.8	19.4	22.8	24.2	24.1	24.7	14.2	14	9.4
	1981	9.2	9.7	14	10.3	20	23	24	24.5	14.4	18.2	11.5	8.7
	1982	9	10.5	14.5	17.8	20.2	22.5	24.2	24.4	21.1	19	9	8.6
	1983	7.5	8.2	14	18.2	17	22.2	24.6	20.8	23	18.5	14.5	8.5
	1984	7.3	7.3	11.3	18.6	19.3	23	22.8	24.4	22.2	20.7	13	7.5
	1985	10.6	10	15.5	21	19.2	23	22.7	23.9	22.5	18.8	12.6	10.6
	1986	10.1	10.9	13	17.5	19.9	21.6	21.5	21.2	21	18	15	10

	1987	8.2	12.4	15.6	19.5	18.6	22.8	24	22.5	23.8	18.3	11.3	10
	1988	7.2	9.8	15.6	19.8	22	22.5	24.3	24	23.8	18.6	12.2	11.5
	1989	5.9	9.3	12.5	15.8	22	22.8	22.6	24.2	23.5	19.7	14	7.6
	1990	7.4	12	14.4	14.7	21.2	22.5	24.7	24.4	23	16.4	12	8.5
	1991	7.2	11.8	16.5	18.8	20.6	22.2	23	23.6	24.2	19	10	8.5
	1992	8	10.2	15.1	18.5	19.4	22	23.5	24	22.3	16.8	13.4	8
	1993	3.8	9.4	13.5	19.3	20	22.8	23.6	24.6	22.5	18	13.6	10
	1994	7.5	10	13.2	17.7	20.5	22.6	25	23.5	21	19	13.6	8.4
	1995	6	9.2	13.5	19.5	24	23.5	23.7	25	23.5	18.6	11	9.5
	1996	7.8	8.5	14.5	15.4	21.4	22	24.2	23	23	20.1	12.6	8.8
	1997	7	8.4	17	18.4	20.2	21	24.4	24.6	23.5	18.3	15.4	8.1
	1998	6.2	10.4	13.2	17	22.8	24.8	25	25.5	23	20	15.2	10
	1999	8.6	9.6	14.4	19.8	21.2	24.8	23.8	23.6	24	20.8	13.4	11
	2000	6.4	10.4	13.4	19.6	21.2	23	24.2	23.8	23	19	15.8	9.5
	2001	5.8	7.4	15	20	20.5	24	24.6	25.2	23.8	21.2	15.2	8.8
	2002	8.8	9.2	15	17.4	20	22.6	24.8	24.8	24	15.8	14.7	9.2
	2003	5	12.2	11.3	19.8	21	22.6	24.4	24.4	24.3	22.3	12.4	9.4
	2004	7.8	5.4	13.6	18.8	21.6	22	22.7	24.6	23.4	19.8	14.3	8.4
	2005	8.8	9	16.5	19	19.6	23.5	23.5	24	23.7	20.2	13	9.8
	2006	6.2	12.3	14	20.8	20	24.2	24.8	23	24.4	20	11.2	8.8
	2007	7	12.2	12.2	19.4	23.2	22.6	24	24.7	24.8	19	14.8	7.2
	2008	8	7.6	15.6	18.7	21.8	23	25	24.8	22.2	17.6	13.6	10.2
	2009	9.2	11	13.2	19.2	21.2	23.4	24.6	24.2	23.6	16.8	11.2	6
	2010	6.7	10	17.2	20.6	22	25	24.8	24.8	24	18.8	13.6	7
	2011	4.5	10.4	10.8	20.4	20.8	24.2	24.2	24.2	24.2	17.4	12.7	6
	2012	6.2	7.4	14.4	19.2	21.2	23	25.6	24.6	24.4	17	10.6	7
	2013	4.2	9.3	12.6	19	21.8	20.6	24.2	25.2	24.8	18.8	13	9.4

Minimum Temperature (Degree Celsius) - Year-wise Monthly Average													
Station Name	**YEAR**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Jessore	1948	11.1	14.1	19.2	23.3	24.8	25.8	25.9	25.9	25.5	23.2	17.7	12.5
	1949	11.1	14	18.6	22.6	24.1	25.1	25.7	25.9	25.7	23.6	14.9	9.1
	1950	10.3	12.9	17.7	22.6	24.3	25.1	25.7	25.1	24.8	22.7	15.9	11.4
	1951	9.4	12.1	17.7	22.6	24.1	25.7	25.3	25.8	24.9	23.4	17.5	12.3
	1952	10.8	13.8	18.3	22.9	24.5	25.5	25.3	25.6	25.5	22.9	17.6	10.6
	1953	10.3	14.3	22.5	24.1	25.2	25.3	25.9	26	25.4	23	16.6	13.1
	1954	9.7	15	18.5	25.2	25.9	25.3	26.1	26	25.9	22.1	14.5	12.3
	1955	10.6	11.4	20.4	22.7	25.4	25.6	25.4	25.6	25.4	23.5	17.6	11
	1956	10.9	11.4	19.7	23.5	25.7	25.2	25.6	26	25.3	23.5	17.2	12.2
	1957	13.2	13.2	17.4	22.8	26.9	26	25.9	26.2	25.7	22.8	15.2	11.9
	1958	12.6	15.2	18.9	24.6	26.1	26.5	25.9	25.9	25.4	24.1	18.7	13.8
	1959	11.7	12.5	18.3	24.2	25.6	26	26	25.7	25.4	23.8	16.5	12.4
	1960	10.9	14.6	18.4	24.4	26.2	26.6	25.7	26.6	25.8	23.4	16.4	12
	1961	12.4	13.4	22.2	24.5	25.2	26.4	25.9	26.3	25.8	23.6	16.2	9.8
	1962	9.4	14.4	18.2	23.7	24.9	25.7	26.5	25.6	25.7	22.5	16.1	11.8
	1963	9.8	14.6	18.3	22.6	24	25.7	26.3	26.1	25.9	23.6	17.9	13.6
	1964	12	15.7	21.2	23.7	25.4	26.6	25.5	26.1	26	24.5	18.5	13.6
	1965	12.6	14.3	17.9	23.7	26.3	26.1	26	25.6	25.8	23.1	17.6	13
	1966	11.9	15.3	19.3	24.1	25.9	25.7	25.5	25.5	24.5	21.8	18.1	11
	1967	10.9	13	18.4	20.9	25.5	25.7	25.8	25.7	25.6	22.5	14.7	13.1

	1968	10.6	12.8	19.1	23.1	25.5	25.1	26.1	26	26.1	22.9	17.6	11.7
	1969	9.6	13.2	20.5	24	24.9	26	25.9	25.4	25.3	23.1	17.3	11.9
	1970	11.2	14.3	20.2	24.4	25.6	25.9	25.9	26	25.6	23.6	17.1	10.8
	1971	11.8	13.5	13.4	13.5	13.4	25.3	25.5	24.9	25.7	25.6	25.7	19.9
	1972	11.1	10.7	19.4	23.5	26.1	26.2	25.8	25	24.7	22.8	16.5	11.3
	1973	11	15.5	17.9	24.7	23.9	25.2	25.8	25.6	25.5	23.6	18.1	12.6
	1974	10.4	11.5	18.7	24.1	24.2	25.3	25.2	25.6	25.2	24.4	19.3	10.7
	1975	10.4	13.3	19	24.2	25	25.6	25	25.4	25.3	24.5	17.4	10.7
	1976	10.4	14.5	20.1	23	23.7	25.3	25.5	24.9	25.3	22.8	18.5	10.7
	1977	10	13.7	21.2	23.2	23.5	25.1	25.9	26	25.7	22.8	19	11.8
	1978	11.1	14	19.2	23.3	24.8	25.8	25.9	25.9	25.5	23.2	17.7	12.5
	1979	12.2	13.5	18.5	23.4	26	26.1	26.2	26.1	25.8	23.7	20.8	14
	1980	11.7	14.8	20	25.1	23.9	26	26.2	26.3	26.1	22.7	17.2	13.5
	1981	12.2	14.8	19	21.7	24.2	26.4	25.8	26.1	25.1	22.7	16.3	12.5
	1982	12.4	15.1	18.4	22.8	25.1	25.4	26.3	25.6	25.2	22.1	16.8	11.5
	1983	11.6	14.2	20.4	22.9	23.9	26.3	26.2	25.8	25.8	23.7	18.1	11.9
	1984	11.5	13.4	19.2	23.3	25.4	25.4	25.7	25.6	25.2	23.8	16.2	12.5
	1985	13.6	14.4	21.8	25.2	24.4	25.8	25.1	25.8	25.4	23.2	17.4	12.9
	1986	11.2	14.1	19.8	23.5	24	25.4	24.2	25.6	24.6	22.5	19.4	14.3
	1987	11.5	16	20.1	23.9	25.1	26.4	26.1	26.1	26.1	23.5	18.8	13.7
	1988	11.9	15.3	19.7	24.2	25.7	25.8	26.4	26.2	25.9	22.6	17.7	14.7
	1989	9.5	13.9	18.4	24.2	25.7	25.9	26	26.1	25.5	23.9	17.1	11.9
	1990	11.3	15.7	18.7	23.1	24.7	26.5	26.1	26	25.6	22	18.5	11.8
	1991	10.8	15.3	20.6	23.5	25.8	25.8	26.2	26.1	25.6	23.1	16.3	12.4
	1992	11.3	14.7	20.5	24	23.9	25.8	25.5	25.8	24.9	22.4	17	11.4
	1993	10.9	15.6	17.7	22.8	24.6	25.6	26.2	26.2	25.2	23.1	18.1	12.8
	1994	11.3	13.7	20.3	23	25.5	26.2	26.2	25.9	25	23	17.8	11.5
	1995	10.1	14.2	18.4	24.3	26.9	26.7	26.1	26.1	25.8	23.5	18.6	12.3
	1996	11.5	14.2	21.1	22.8	25.2	25.2	26.1	25.7	25.5	22.3	17	12.1
	1997	10.2	14.2	20.6	21.2	24.4	25.3	26.2	26.2	25.3	21.6	18.6	13.3
	1998	11	15.5	17.4	23.1	25.6	27.4	26.7	26.5	25.7	24.7	20.2	13.3
	1999	11.2	15.2	19.9	25.1	25.5	26.1	25.8	25.9	25.5	24.2	17.8	13.7
	2000	11.2	14.7	19	23.8	24.9	25.7	26	26	25.2	23.9	18.3	11.6
	2001	9.5	14.1	19.5	23.5	24.2	25.7	26.3	26.4	25.6	23.9	19.4	12.1
	2002	12.2	14.1	19.5	23.2	25	25.9	26.7	26.1	25.4	22.5	18	13.2
	2003	9.3	15.7	18.7	24	25	25.9	26.2	26.2	25.7	24	17	13.2
	2004	11.4	13.7	20.4	23.5	25.3	25.4	25.8	25.9	25.3	22.5	16.3	13.9
	2005	11.8	15.9	20.5	23.7	25.5	26.6	25.8	26.1	25.8	23.5	16.7	12.6
	2006	10.3	16.8	19.1	24.2	24.6	26.5	26.2	26	25.7	23.4	17.9	12.1
	2007	9.9	15.7	17.9	24	25.5	26.3	26.1	26.3	25.9	23	18.9	11.2
	2008	11.2	13.1	20.8	23.3	24.2	25.7	26	26.1	25.4	22.3	16.9	14.6
	2009	12.8	14.3	18.7	24.5	25.3	26.5	26	25.7	25.6	22	17.5	11.1
	2010	9.8	14.2	21.8	26.2	25.6	26.6	26.7	26.5	25.7	23.8	18.9	11.8
	2011	9.3	14	19.2	22.4	25	26.1	26.2	26	25.6	23.2	16.7	12.1
	2012	11.8	13.2	19.7	23.3	25.8	27.2	26.7	26.4	25.9	22.2	16.8	12
	2013	9.3	13.6	19.6	23.6	25.3	26.5	26.5	26	25.9	23.9	16.1	13.1

Wind Speed (Meter Per Second) - Year-wise Monthly Average

Station Name	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Jessore	1960	0.5	0.4	1.3	1.4	5.6	4.3	3.7	1.8	0.8	0.4	0.3	0.3
	1961	0.4	0.9	1.8	1.9	1.8	1.2	1.1	0.9	1.2	0.6	0.4	0.6
	1962	0.7	0.4	0.7	1.2	1.3	0.7	0.7	0.6	0.6	0.3	0.1	0.3
	1963	0.3	0.5	0.5	1.1	1.1	0.7	0.7	1	1	0.9	0.5	0.8
	1964	0.6	0.8	1	1.7	1.5	2	1.4	1.5	0.8	0.8	0.4	0.3
	1965	0.3	0.5	0.7	1.3	1.7	1.4	1.4	1.1	0.8	0.3	0.9	1.2
	1966	1	1.1	1.6	2.9	2.4	2.5	2.3	2.2	1.7	0.8	0.6	0.9
	1967	1.2	1.2	2.1	3.1	4.4	3.7	3.3	3.3	2.5	1.4	0.9	0.8
	1968	1	0.7	1.8	3.8	5.2	4.3	3.8	3.1	3	1.6	1	1.1
	1969	1.2	1.3	2.7	3.8	2.8	2.8	3.3	2.9	2.6	0.9	0.7	1.2
	1970	1.3	1.5	2.9	4.1	4.7	3.4	3.1	2.7	2.7	1.4	1.2	0.8
	1971	0.8	1	1.8	3.3	3.4	2.8	2.7	2.5	2.5	0.9	0.7	0.6
	1972	0.7	1.2	2	2.9	4.1	4.2	3.2	2.8	1.9	0.9	0.9	1
	1973	1.3	1.6	2.2	4.5	2.9	2.2	3.1	2.1	2.1	1.2	1.3	0.8
	1974	0.7	0.8	1.6	3.5	3	2.5	2.2	2.8	2	0.9	0.7	0.9
	1975	1.1	1.4	2.2	5.5	4.4	3.3	3.4	3.2	2.3	1.1	1.3	0.8
	1976	1.1	1.5	2.3	3.5	3.2	3.4	2.9	2.7	2.9	1.4	0.6	0.6
	1977	0.9	1.4	2.9	4.4	3.3	3	3.2	3.1	1.7	1.2	0.9	0.7
	1978	0.7	1	1.8	3.3	3.4	3	2.6	2.3	1.8	0.9	0.7	0.6
	1979	1	1.2	2.3	3	3.2	3	3.1	3.2	2	1.5	0.7	0.9
	1980	1.3	1.7	2.4	6.3	5.9	4	3.8	3.5	2.6	1.5	0.8	0.8
	1981	1.2	1.1	2.4	3.4	3.1	3	2.6	3	2.2	0.7	0.9	1.1
	1982	0.5	1.1	2	5	3.5	3.1	3.2	3.5	2.3	0.9	0.8	0.6
	1983	0.8	1.2	2.5	4	3.6	4	3	3.6	2.9	1.4	1.1	0.8
	1984	0.9	1.3	2.8	5	5.8	4.4	4.2	3	2	1	0.5	0.6
	1985	0.7	1	3.4	4.7	3.9	2.4	2.9	2.4	2	1	0.6	0.6
	1986	0.6	0.8	2.1	4.5	3.2	3.7	3.1	2.5	2.9	1.2	1	0.7
	1987	0.8	0.9	2.6	3.8	3.3	3.6	3.2	2.8	2	0.7	0.9	0.7
	1988	0.6	1	2	4.1	5.4	4.2	3.6	3	1.9	0.9	1.2	0.6
	1989	0.5	1.4	1.4	4	4	3.7	3.2	2.6	1.8	1	0.4	0.5
	1990	0.6	0.7	1.8	4.6	2.6	3.3	2.2	2.7	2.3	1.4	0.7	0.6
	1991	0.5	0.8	1.2	2.7	5.5	2.5	3	2.2	1.3	0.6	0.3	0.4
	1992	0.4	0.7	1.5	2.7	3.3	3	3.1	2.3	1.9	0.8	0.4	0.3
	1993	0.3	1.1	1.2	2.1	3.2	3.4	2.4	1.9	1.7	0.7	0.2	0.2
	1994	0.5	0.6	2	2.1	3.3	2.7	2.5	2.1	1.6	0.5	0.3	0.2
	1995	0.6	0.9	1.2	3	4.6	3.3	2.5	2.6	2.4	0.7	1	0.3
	1996	0.5	0.6	1.8	1.6	3.2	2	1.5	1.2	0.6	0.7	0.1	0.3
	1997	0.4	0.6	1	1.7	2.7	3.1	1.8	1.9	1	0.3	0.2	0.5
	1998	0.4	0.4	0.9	1.5	1.8	2.8	1.2	0.9	0.7	0.3	0.5	0.3
	1999	0.7	1	1.8	3.3	3.4	3	2.6	2.3	1.8	0.9	0.7	0.6
	2000	0.6	1	1.9	4.1	3.2	3.2	2.3	2	1.4	1	0.3	0.2
	2001	0.5	0.7	1.1	2.5	2	2.2	2.6	1.6	0.8	0.5	0.1	0.1
	2002	0.3	0.6	1.3	3.5	2.6	2.2	1.6	1.5	1.3	0.3	0.5	0.2
	2003	0.5	0.7	1.1	2.3	2.8	2.7	2.4	1.7	1	0.7	0.1	0.3
	2004	0.6	0.6	2	3.4	2.8	1.7	2.4	2.1	1.7	0.8	0.1	0.3
	2005	0.4	0.8	1.7	2.3	2.8	2.3	1.9	1.1	1.4	0.8	0.2	0.2
	2006	0.3	0.3	0.6	2.8	2	1.5	2.4	2.6	1.7	0.2	0.1	0.1
	2007	0.3	0.5	1	2.6	1.5	2.9	2.1	1.5	1.5	0.3	0.3	0
	2008	0.4	0.4	1.2	1.9	2.1	2.5	1.8	1.7	1.5	0.7	0.1	0

2009	1.4	3.3	4.8	8.3	5.3	6.3	5.1	5.3	6	1.3	1.2	2.3
2010	5.4	5.1	7.4	9.6	5	5	5.3	5.7	6.7	3.2	2.7	3.1
2011	5.6	5.6	8.6	6.8	7.6	8	7.5	6.3	6.9	3.7	1.8	2.6
2012	4.7	4.8	9	7.9	7.9	8.6	8	6.7	5.5	4	2.4	3
2013	3.7	5.2	5.9	6.8	11.2	5.9	7.4	6.8	5.5	4.1	3.4	3.1

Urban Development Directorate (UDD)
Preparation of Development Plan for Benapol-Jessore Highway Corridor
Consultant: DECODE-GEOMARK Joint venture

Recreational open space

- Location and area of park, playground, river bank, historical place (source, physical feature map)
- Built area and open area measurement (tool- reconnaissance survey)
- Attached facilities and visitor number (tool- observation and interview of authority)
- Questionnaire given as follows

Location	Area (sqft)	Built area (sqft)	Open space (sqft)	Attached facilities	Number of Visitor (daily)

BBS Census and Community Data, 2011

1. Population (Enumerated)

Key Indicatiors	Year 2011		
	Sadar Upazila	Jhikargach	Sharsha
Both Sex	742,898	298,908	341,328
Male	380,314	147,127	170,033
Female	362,584	151,781	171,295
Urban	217,337	32,774	36,524
Other Urban	35,682	8,665	5,084
Rural	489,879	257,469	299,720
Annual Growth Rate	1.42	0.97	0.96

2. Sex Ratio

Area	Year 2011		
	Sadar Upazila	Jhikargach	Sharsha
Total	105	97	99
Urban	114	96	102
Other Urban	103	100	106
Rural	101	97	99

3. Household

Area	Year 2011		
	Sadar Upazila	Jhikargach	Sharsha
Total	169164	72266	82835
Urban	48214	7890	8563
Other Urban	8566	2183	1237
Rural	112384	62193	73035

4. Household Size (General)

Area	Year 2011		
	Sadar Upazila	Jhikargach	Sharsha
Total	4.27	4.12	4.11
Urban	4014	4.12	4.25
Other Urban	4.1	3.96	4.07
Rural	4.33	4.12	4.1

BBS Census and Community Data, 2011

5. Literacy Rate (7 years and above) %

Sex	Year 2011		
	Sadar Upazila	Jhikargach	Sharsha
Both Sex	63.8	53	49.8
Male	66.8	55.3	51.6
Female	60.6	50.9	48

6. School Attendance (5 to 24 years) %

Sex	Year 2011		
	Sadar Upazila	Jhikargach	Sharsha
Both Sex	60.2	57	52.8
Male	62.7	60.1	54.8
Female	57.6	54.1	51

7. Population (Adjusted)

Sex	Year 2011		
	Sadar Upazila	Jhikargach	Sharsha
Both Sex	774385	310765	354841
Male	396496	152962	176769
Female	377889	157803	178072

8. Housing Structure by Type (%)

Type	Year 2011		
	Sadar Upazila	Jhikargach	Sharsha
Pucca	25.9	19.1	17.2
Semi-Pucca	34.8	30.9	28.5
Kutcha	33.6	43.7	45.1
Jhupri	5.7	6.3	9.2

9. Decadal Growth Rate of Population, 1951-2011

Decades	Growth Rate (%)
1951-1961	48.6
1691-1974	65.6
1974-1981	22.9
1981-1991	34.2
1991-2001	19.6
2001-2011	10.2

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10. Household and Population by Sex and Residence

Residence	All Household	Total Population			Floating Population			Ethic Population		
		Both Sex	Male	Female	Both Sex	Male	Female	Both Sex	Male	Female
Jessore Sadar Upazila										
Total	169164	742898	380314	362584	53	35	18	2020	1009	1011
Rural	112384	489579	246596	243283	20	16	4	536	268	268
Urban	56780	253319	133718	119301	33	19	14	1484	741	743
Jhikargachha Upazila										
Total	72266	298908	147127	151781	52	51	1	1132	561	571
Rural	62193	257469	126756	130713	52	51	1	1115	554	561
Urban	10073	41439	20371	21068	0	0	0	17	7	10
Sharsha Upazila										
Total	82835	341328	170033	171295	80	50	30	1121	562	559
Rural	73035	299720	148940	150780	76	48	28	895	450	445
Urban	9800	41608	21093	20515	4	2	2	226	112	114

11. Household by Type, Tenancy and Residence

Residence	Household							
	All Household	General Household				Instituional Household	Others Household	Ethnic Household
		Total	Owned	Rented	Rented-free			
Jessore Sadar Upazila								
Total	169164	167138	121462	36832	8844	246	1780	44
Rural	112384	112052	97457	8004	6591	104	228	123
Urban	56780	55086	24005	28828	2253	142	1552	-79
Jhikargachha Upazila								
Total	72266	72189	67008	2117	3064	26	51	243
Rural	62193	62135	59684	407	2044	19	39	238
Urban	10073	10054	7324	1710	1020	7	12	5
Sharsha Upazila								
Total	82835	82713	74485	3365	4863	34	88	245
Rural	73035	72977	67649	1280	4048	19	39	198
Urban	9800	9736	6836	2085	815	15	49	47

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12. General Household by source of Drinking Water, Electricity Connection, Type of Structure of the Main House and Residence

Type of Structure of the Main House and Residence	General Household				
	Source of Drinking Water				
	Total	Tap	Tube-well	Other	Electricity Connection
Jessore Sadar Upazila					
Total	167138	4029	160042	3067	125660
Pucca	43313	3067	40051	195	41214
Semi-Pucca	58225	636	57063	526	46829
Kutcha	56079	278	53881	1920	32428
Jhupri	9521	48	9047	426	5189
Jhikargachha Upazila					
Total	72189	571	70266	1352	44918
Pucca	13765	294	13404	64	11623
Semi-Pucca	22312	194	21890	228	15977
Kutcha	31542	58	30645	839	15487
Jhupri	4570	25	4327	218	1831
Sharsha Upazila					
Total	82713	896	79578	2239	47616
Pucca	14200	236	13853	111	12101
Semi-Pucca	23586	229	22986	371	15939
Kutcha	37297	312	35788	1191	16794
Jhupri	7630	119	6951	560	2782

13. General Household by Toilet Facilities, Type of Structure of the Main House and Residence

Type of Structure of the Main House and Residence	Toilet Facilities				
	Total	Sanitary (Water Sealed)	Sanitary (Without Water Sealed)	Non-Sanitary	None
Jessore Sadar Upazila					
Total	167138	54037	52881	55424	4796
Pucca	43313	30311	10644	2203	155
Semi-Pucca	58225	17049	24936	15373	867
Kutcha	56079	5559	14956	32685	2879
Jhupri	9521	1118	2345	5163	895
Jhikargachha Upazila					
Total	72189	19981	22057	26703	3448
Pucca	13765	8253	3743	1611	158
Semi-Pucca	22312	7122	8090	6436	664
Kutcha	31542	4170	9135	16269	1968
Jhupri	4570	436	1089	2387	658
Sharsha Upazila					
Total	82713	22383	27358	27599	5373
Pucca	14200	8066	4345	1571	218
Semi-Pucca	23586	7239	8966	6520	861
Kutcha	37297	6132	12264	15764	3137
Jhupri	7630	946	1783	3744	1157

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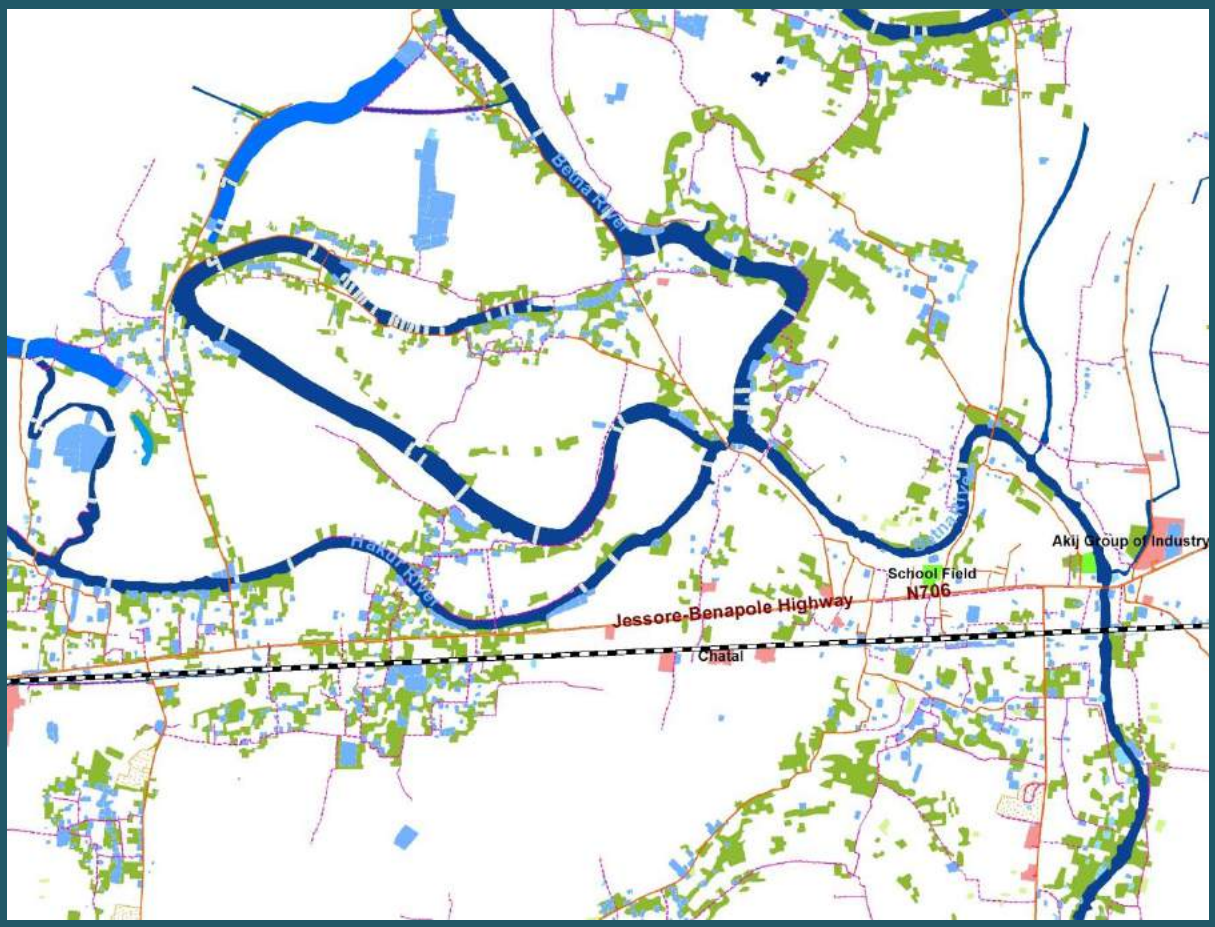
14. Hosuehold Head by Sex, Literacy (7 Years and Above) an d Residence

Residence	Total	Male	Female	Literacy		
				Total	Male	Female
Jessore Sadar Upazila						
Total	167138	149113	18025	58.15	59.7	45.34
Rural	54059	49328	4731	47.71	49.57	28.28
Urban	8173	7318	855	56.01	58.1	38.13
Jhikargachha Upazila						
Total	72189	63339	8850	44.97	46.25	35.77
Rural	62135	54559	7576	42.71	43.84	34.62
Urban	10054	8780	1275	58.9	6126	42.62
Sharsha Upazila						
Total	82713	73688	9025	40.73	42.62	25.25
Rural	72977	64956	8021	39.1	40.78	25.51
Urban	9736	8732	1004	52.94	56.36	23.21

Draft Survey Report

Providing Consultancy services for "Physical Feature Survey Work With RTK GPS, Total Station & Using 3D Image and Other Survey for Area of "Preparation of Development Plan for Benapole-Jessore Highway Corridor Project""



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