A STUDY OF CHOWHALI UPAZILLA AND ITS EFFECTS DUE TO RIVER EROSION

June - 2015

PREPARED BY:

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Rajshahi Regional Office, Rajshahi

URBAN DEVELOPMENT DIRECTORATE (UDD)

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Preface

Chowhali Upazilla is a well known upazilla under Sirajgonj district. Previously it was an administrative area under Chowhali police station and then its administrative name was 'Chowhali thana'. It is a river eroded area and due to high erosion by the Jamuna in the last three years its main land area excluding the char area has come down to only 15-20% of its total geographical area. In the last year the upazilla head quarter with other offices collapsed and washed out due to erosion by the Jmuna. Along with these other infrastructures like roads, bridge, and flood control measures, hat bazaars collapsed and washed out within a few hours. A huge amount of government investment has gone under water. Government is very much concerned about the losses of government investment and the miseries of the people of the Chowhali Upazilla. From the information found through media and news paper it is known that like Chowhali Upazilla twenty two more upazillas throught the whole Bangladesh are in a threatening situation due to flood and riverbank erosion. It is a great concern for the government. Government should think about restructuring the administrative areas of all these affected district,upazilla and union headquarters.

Urban Development Directorate(UDD) under the Ministry of Housing and Public Works is a national agency entrusted with urban and regional planning works and related researches. Erosion of Chowhali Upazilla, the miseries of the local people and huge loss of investment of the government is a big issue which claims an intensive research in this respect and a guideline for proper investments of government money in the future. Therefore as a research and planning organization of the government UDD has decided to start such a research on Chowhali Upazilla and its effect due to river erosion. This research intends to determine the reasons, impacts of erosion and the environmental degradation due to erosion. It would also try to see the weaknesses and the need of interventions in specific fields. It will try to recommend some policy guidelines for improving the environmental degradation of Chowhali Upazilla.

It is hoped that this research paper will try the attention of the policy makers to see and analyze the government investments prior funding and encourage all concerned to pay attention to the sufferings of the people. It is also hoped that policy makers of the governments and government agencies may have an opportunity to save guard public funding by proper planning.

These research paper has been completed in a very short time and there might have any mistake and in that case we express our sorrow. Any advise given would be cordially accepted. This research paper has been completed with the advise, support and inspiration of the Director, UDD Mr. Khondker Fowze Muhammed Bin Farid and under the guidance and direction of the Deputy Director (Research & coordination), Mr. K.Z. Hossain Toufiq. Thanks to Mr. Jahangir Ali, Sinior Geographer, Mr. Fakhrul Islam, Planner, Mr. Mokhlesur Rahman, Geographer, Mrs. Ishrat Jahan, Reaserch officer, staffs of Rajshahi regional office and the research wing of the head office of this directorate for their cooperation.

Md. Abdur Rahman Khan
Senior Planner, UDD
Rajshahi

Directors Message

It is a great pleasure for me that the research paper titled as 'A Study of Chowhali Upazilla and its effect due to river erosion' is being published. It was very urgent to complete this research work within a very short period as the Chowhali Upazilla sadar and its surrounding areas are going under water due to river bank erosion. It is known that only a small portion of the upazilla is left for its dwellers. Many of the dwellers are now in a very critical condition loosing their home, agricultural land and all other assets and properties. Students are facing educational problems due to collapse of their institute or due to lack of financial capability of their parents due to river erosion. News papers and TV channels broadcasted recently this catastrophic situations of Chowhali upazilla under Sirajgonj district due to river bank erosion of the mighty Jamuna. The situation of Chowhali upazilla is so alarming that the upazilla parisad office is now sitting in the Chowhali degree college building. Huge loss of infrastructural investments incurred from the governmental fund occurred and thus each year a huge loss governmental allocations are being wasted due to river erosion. Flood and river bank erosion are the two common and major disasters in Bangladesh. It is also known that many of the of upazillas in touch with the big rivers in our country are facing severely the problem of river bank erosion. Similar losses like Chowhali are observed in other river affected upazillas. The aim of the research is to aware and draw attention to all concerned departments of the government and NGO's and advise for save guarding the life and property of the people of these affected upazillas. It will also advise to protect the misuse of public money. I hope this research paper will show a path for solving the problems of the river eroded people and well being of these destitute peoples. I am giving thanks and acknowledgements to the research team for their relentless efforts in completing this research paper.

Khondker Fowze Muhammed Bin Farid
Director
Urban Development Director
Ministry of Housing and public Works

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CHAPTER - 1
INTRODUCTION

Introduction

Different types of hazards are observed to occur in Bangladesh. These are e.g. flood, cyclones and storm surges, tornado, riverbank erosion, earthquake, drought salinity intrusion, arsenic contamination, tsunami, fire, infrastructure collapse, land slide etc. Some of these are localized, the effect may be severe and remain within a certain limited area. But most of these affects a vast area and huge people suffer including loss of life. The impact may be long term or short term. Again these effects may be slow but for a long time or may be rapid and sharp occurring within a short period time. The study area is Chowhali sadar and its surrounding areas of Sirajgonj district. The common and major hazards in the study area have been discussed below in brief. The hazards effects and impacts have been noted. Again among the common hazards discussed below river bank erosion and floods are more responsible for vulnerability of the study area. Therefore the chronological land loss, the factors behind, the impact, the loss of public investment etc. of the study area due to these two natural disasters have been discussed and analyzed to have a look on how a huge public investments are being lost each year due to unwise political decision of making the upazilla headquarter in a vulnerable area in the following chapters. As flood itself is a factor of river erosion therefore mainly the river erosion has been analyzed, discussed and conclusions drawn to minimize its devastations. But before going to the following chapters a brief discussion of the major disasters have been given below.

1. **Floods :** Bangladesh is a country having most of its areas low lying and huge amount of flow enters in the rainy season from India through the big rivers the Padma, the Jamuna, the Meghna. In some years the flow of internal and external water can not drain out easily in to the sea,causing floods to occur. The effects of floods are water logging & inundation of house holds, court yard , streets and institutions in the low lying lands. The impact of flood is wide. Damages settlements , infrastructure, agriculture crops and creates food crisis. The impact is habitation problem, crisis of money, unemployment, insecurity and ultimately lowering the economic status of the country. Severe type of floods occurred in the year 1988 and 1998.

2. **Riverbank Erosion:** Riverbank erosion is also a regular phenomena of disaster in Bangladesh. In the rainy season specially along the sides of the mighty river Jamuna, Meghna, Padma river bank erosion is a usual phenomena. Besides the big rivers, other rivers like Teesta, Dakatia, Gomti also causing river bank erosion along the river sides. People along the river sides become the victims of such disaster. People become shelter less, wealth less and job/work less.

3. **Cyclones and Storm Surges:** The experience of cyclone and storm surge is very much known to the people of Bangladesh. In the monsoon period due to low pressure of air in the sea, cyclone evolves. Cyclone along with storm surges of about 25-35 feet high occurs in the sea side coastal areas. The effect is catastrophic causing sweeping of the old structure and huge loss of lives. The affected people loss their property, become poorer and the impact falls on the national economy. Severely occurred in the year 1970, 2007.

4. **Tornado:** Tornado is usual in Bangladesh. Each year in the early monsoon and in the monsoon period Tornado occurs with high wind velocity. The effect is devastating causing destruction of old structures /temporary structures and loss of lives . Recent tornados occurred in Faridpur, Tangail, Manikgong, Gaibandha (2008) and Brahmanbaria (2003).

6.**Earthquake:** Bangladesh is located in the seismic zone. Sylhet and Chittagong region are specially in the earthquake zone. Bangladesh experiences earthquake of low and medium intensity in nearly every year. The effect of earthquake is serious if the intensity of it is in the range of 7 (seven) and above in the Richter scale. Peoples awareness in this regards should be developed. Structures should be designed and built accordingly so that loss of property and lives remains in an tolerable situation.

7. **Drought:** Drought is very much known to the farmers specially in the north western regional district of Rangpur, Kurigram, Nilphamari, Gaibandha. It is caused due to in adequate and uneven rainfall. It

affects seasonal crops, fruit bearing trees and forestry. The impact of drought is food crisis, poverty, unemployment, arsenic sis etc. To cope with the situation of drought it is essential to use both surface and ground water. Severe types of drought that occurred last in the year 1994.In the years 1957,1972and 1979, drought affected areas were more than 40%.

River bank erosion status of the study area: It is a major disaster throughout the whole world. All sorts of establishments settlements and peoples living by the river sides are affected more or less due to river erosion. In many cases where there are big rivers with no control or protection, settlements besides the river gradually or suddenly become affected and lost in the river in time.

The study area that is Chowhali upazilla head quarter and the surrounding area which has already been severely affected by river erosion and totally washed out and has gone under water in the last 2-3 year, therefore river bank erosion is the main theme of discussion. This paper will discuss, analyze and focus the situation and propose strategies to overcome the effect of river bank erosion. The Chowhali upazilla is one of the twenty three river affected upazillas of Bangladesh, which is severely effected due to erosion of the mighty river Jamuna. Erosion is there so intense that each year a huge amount of land is going under water. Due to river erosion a major part of it has already been eroded and went under water and the remaining areas are going under water gradually. Initiatives and development program for river protection is very poor or nil. The existence of the upazilla is becoming a question whether it will remain in the map or not in future. As a result people of the area are in a big danger. Their miseries are a un depict able. They are homeless, landless, jobless and the teenagers are falling in break of study due to lost of their school in the river Jamuna.
A totally distressed and despaired situation prevails in the whole area. From the secondary sources it is found that a large portion of the people have already been migrated and some are planning to migrate to other suitable places. Those who are still in their land and fighting for their existence with their assets to remain stick to their paternal properties are in a big challenge. Morality of the people's are also going downward day by day. Due to unemployment a section of the people are involved in doing illegal and unlawful activities like thief ting, dacoity, snatching, hooliganism etc. for their survival.

Due to erosion of the river a big effect has occurred in the environmental status of the area. Along with the socio economic degradation a big environmental degradation is also observed in the whole area. Agriculture and forestry has disrupted fully or partially effecting man and animals. Wild animals and birds are fleeing away to other areas. On the other hand all development works like building, roads, bridge, culvert incurring huge amount of government investment have already been lost or in a great danger. National news in the TV channels are broadcasting this grave situations loudly and for developing awareness in this respect. Now the question is coming in front of all concerned about the justifications of these government investment without inquiring the permanencies of the respective works. It is found searching the internet that five district headquarter, thirty two upazilla headquarter and two hundred and seventy numbers of unions along side and in the influence zone of the Jamuna river are more or less affected due to river erosion. If all of these losses are sum up then an alarming scenario will come in front of the nation that each year a huge amount of government money is draining out in vain affecting our national economy. It is now the right time for us to come to take a decision nationally about how to save all these investment and properly utilize all these money for our national building work through formulating effective policy guidelines. Keeping all this points in front, a study program has been planned to have the real scenario of the situation through field survey, investigation, group discussion, analysis and making guidelines.

The primary objectives of the study are to get a glimpse on :

a) Present socio- economic status of the area and effect due to river erosion.
b) Environmental status of the area and degradation due to river erosion.
c) Chronological loss of land from the time Chowhali was declared as an Upazilla.
d) Loss of infrastructural developments constructed from the time Chowhali was declared as an Upazilla.
e) Peoples aspiration for their present and future life and making recommendation about how to improve the status of people of the area.
f) Identifying the affected district, upazilla and union head quarters along side and in the influence zone of Jamuna and getting an idea of the national losses occurring. Also to draw the strategies to be taken.

Picture-1. Chowhali Upazilla Officer's Quarter is collapsing and going under water due to river erosion.

From the secondary sources like BBS, previous master plan (done in 1984) and other sources information of the upazilla in its district context has been written below for having a primary idea of the study area that is the upazilla sadar and its surrounding areas. Physical characteristics, population and its distribution, Economic performances and transport linkages of the study area have been described for getting a basic idea of the study area.

Methodology:

The methodology for performing the research work has been chalked out for approaching the work in a systematic way. Major steps are given below:

a) Step-1:Collecting data and information from the secondary sources.
i) The geographical location of the area and the main features.
ii) Socio-economic status of the area and chronological changes.
iii) Environmental status of the area
iv) Identifying the advantages and disadvantages of the area in respect of resource availability and other opportunities. Collecting mouza maps, information and photographs. Digitization of collected mouza maps.

b) Step-2:Reconnaissance survey

i)To observe the geographical location of the area and the main features.

ii)To observe the Socio-economic status of the area

iii) Personal discussions with selected persons about their problems.

iv) Report writing and submission.

c) Conducting survey through PRA of the study area

i)Conducting 1st PRA session with the local people of the study area. In the PRA session participants would be asked to give information about the present and past geographic, socio-economic and environmental status of the area. Also participants would be asked to provide information about the problems they are facing and the way they think to solve these problems.

ii) Conducting 2nd PRA session with the civil society of the study area. In the PRA session participants would be asked to give information about the present and past geographic, socio-economic and environmental status of the area. Also participants would be asked to provide information about the problems they are facing and the way they think to solve these problems.

iii) Conducting 3rd PRA session with the government officials working in the study area. In the PRA session participants would be asked to give information about the present and past geographic, socio-economic and environmental status of the area. Also participants would be asked to provide information about the problems they are facing and the way they think to solve these problems.

iv) Conducting 4th PRA session with the local peoples of the study area. In the PRA session participants would be asked to give information about the present and past geographic, socio-economic and environmental status of the area. Also participants would be asked to provide information about the problems they are facing and the way they think to solve these problems. for collecting information regarding the socio economic status ,scope of the area and major obstacles for development.

v) A report writing on PRA and submission.

d) Step-3:Identifying and analyzing the effect of river erosion on chronological change of the upazilla boundary

e) Step-4:Identifying and analyzing the impact of river erosion on the socio economic status and public investment losses occurred within the study area.

f) Step-5:Deteminig the strategies: Analyzing all the desire and expectation of the people of the study area for their future development and determining the strategies for future development and existence of the upazilla

g) Step-6: Final report writing and submission: Report writing making recommendation and guidelines for future program development of the area.

CHAPTER - 2
PRESENT STATUS OF THE UPAZILLA

Upazila in it's district context

Physical Characteristics

Location

Chowhali upazila is under the administrative jurisdiction of the newly constituted Sirajganj Zila. It is at a distance of 38 km. (23 miles) from the district headquarter and lies between 24°-01' and 24°-17' north latitude and 89°-59' east longitude. It is bounded in the north by Belkuchi upazila, in the south by Manikganj district, in the east by Tangail district and in the west by Shahjadpur and Bera upazilas. The entire upazila covers an area of about 210.39 sq.km. which is equivalent to 81.6 sq. miles. Presently a large portion of the upazilla has been engulfed by the mighty Jamuna. The upazila consists of 7 unions, 152 mouzas and 203 villages.

Climate

The area has a pronounced tropical monsoon climate. There are three main seasons, the monsoon season from june to October is worm and humid and about 80 percent of the annual rainfall is received; the winter, from November to February, during which very little rainfall occurs and has the lowest temperature and humidity in the year; and the pre-monsoon, from March to May, has the highest temperature and evaporation rates in the year and periodic thunder showers. About 15 percent rainfall of the year occurs during the period.

Mean annual rainfall is 269.24 centimeters (106 inches) as recorded from Pabna. Absolute maximum and minimum rainfall for Pabna were record about 1227 centimeters and 15 centimeters (483 and 6 inches) respectively for the year 1983.

Geology, Landfrom and Soils

The upazila consists of old Ganges floodplain under mature delta physiographic sub-regions. This sub-region lies to the north of the present channel of the Jamuna and receives flood water from the Jamuna. This area does not receive extensive silt deposits any more and more of it is subject to much deluvion. The upazila consists of calcareous dark grey and brown floodplain soils.

Population and it's distribution

Within Zila

According to 2011 population census report, the total population within the newly constituted Sirajganj Zila stood at 3,09,7489 persons. Out of it's 9 Upazilas, the Shahjadpur Upazila has the highest population (5,61,076).

Within Upazila

Population of the upazila as per 2011 census was 160,063, out of which 80,063 are males and 80,000 are females. There are 100 males for every 100 females in the upazila. It is also same for the district. About 6 percent of the district populations live in this upazila in an area of 9.17 percent of the entire district. The population density is 761 persons per sq.km. According to 2011 census, the number of households in the upazila is 39832 and the average family size is 4.01.

Migration

Migration is a significant factor to urbanization. Generally to avail facilities, of employment people concentrate in urban areas. However, no recorded data is available about the past migration pattern in the Zila or in the Upazila Chowhali. However during their sample survey of the study area consultants have found some information about the migration pattern in the study area. Findings of field survey shows the rate of immigration as 27.94.

Economic performances and transport linkages

Employment and Under Employment

From the 1981 population census data it is seen that there were about 12,25,270 no of economically active population in the Sirajganj Zila, which was approximately 65.2% of the then total population of the zila. Farming is the principal occupation where bulk of the labour force is employed. Other occupations are,non-farm wage labouring, industrial labour, trade, service and self-employment. About 39.4% of the total labour force are engaged in household works. There is no information available about under-employment. However, data shows, there are about 18.8% not working population in the Zila.

In Chowhali Upazila, from the last census reports of 2011 it is found that the economically active population of about 64.2%, the economically active population stands at 99,000. Main employment generating sources are same as the Zila. Main employment generating sector is agriculture, employment to above 25% are engaged in self-employment, household work etc. About 18% have been found not working. There is no information available about under-employment in the Upazila.

Income and Expenditure

From a study it is found that main source of income from agriculture 55.89%,from non-agricultural labourer 2.98%, from industry 10.25%, commerce 11.76%,transport and communication 1.90%, service 6.02%, construction 0.72%, religious service 0.23%, rent and remittance 0.22% and others 10.03%. Income and expenditure structure is the determinant of standard of living. Information have been collected from study area through sample survey, about income which will give some indication about the pattern of income and expenditure of the upzila people.

Non-agriculture activities are the most dominating income earning sector of the study area. Data shows that the average annual family income from agriculture sector is tk. 7500 as against tk. 9542 for non-agriculture sector. The total annual average income for the study area comes to Tk. 15037 including both agricultural and non-agricultural sectors. All these information is provided.

Agriculture and Non-Agriculture

About 55 percent of the upazila is arable, inclusive of current fallow of 3.27 percent. Area not available for cultivation includes homestead, orchard, bushes, pond/ditches and other water bodies occupies about 45 percent of the gross area. About 71 percent area is double cropped and 21 percent is triple cropped. The total cropped area of the upazila comes to 15347 hectares (37,908 acres), giving a cropping intensity of percent which is higher to the district average of 135 percent.

Livestock

Reliable statistics on the livestock situation in the upazila area lacking. Those available, are rudimentary in nature. However, available data about livestock population of the area have been collected from the upazila livestock office.

Fishery

Fishery is one of the important primary activities of the upazila. The upazila has an area of 21.5 sq.km. of rivers. The estimated total fishing area (closed and open water) in the upazila is about 2560 hectares. Total estimated production from fisheries in not available.

Industries

The prominent weaving village Enayetpur is situated within the Jurisdiction of this upazila where the number of handloom factories are 325 with 6500 number of looms. The number of total workers engaged in handloom sector is about 8400 persons.

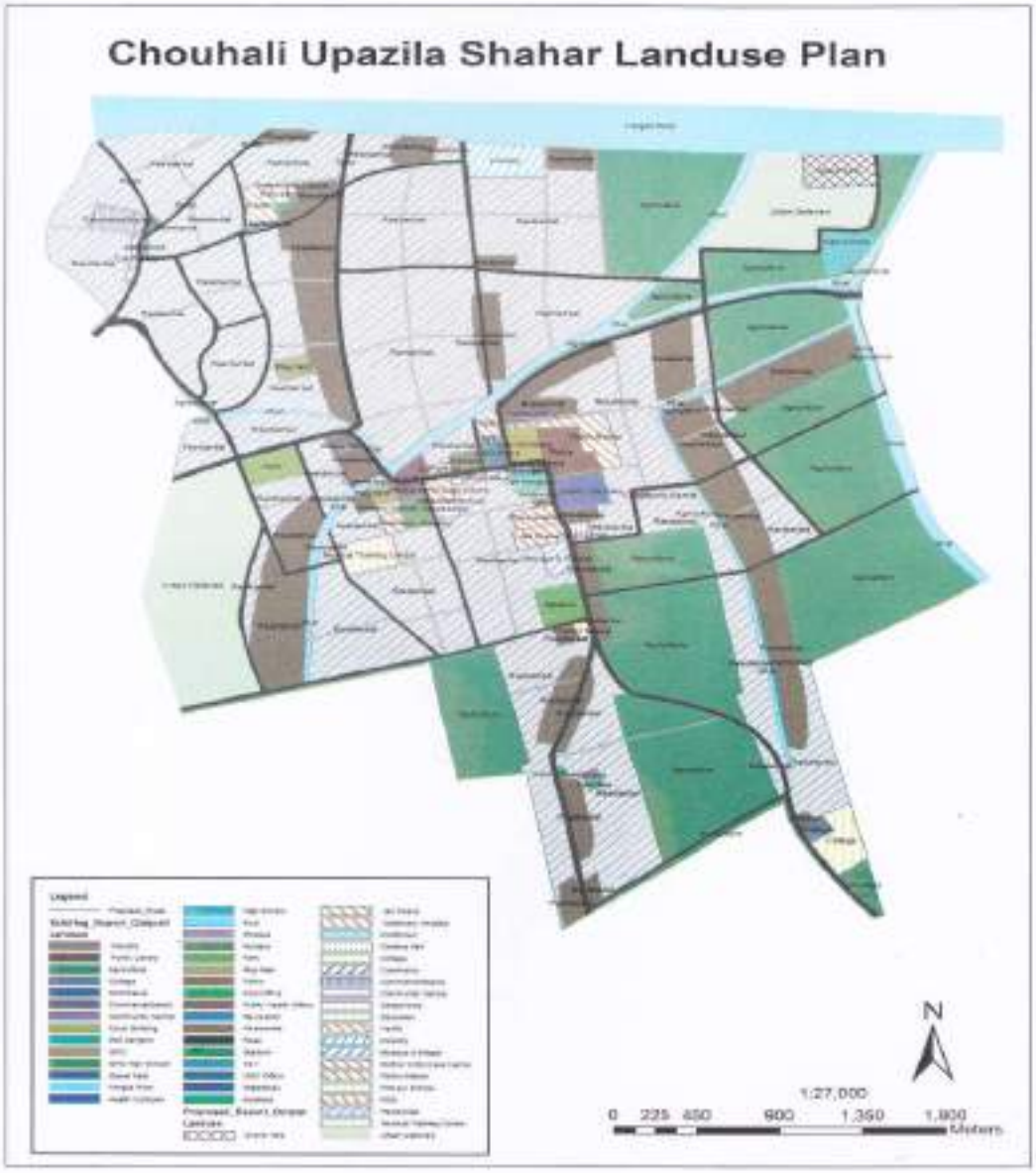
Other than handloom industry, 370 units of rural industries including paddy processing, oil mill, pottery, goldsmith, blacksmith, gur processing etc. exist in the upazila where 838 persons are regularly employed.

Roads and Transport Facilities

Water way plays an important role in the transportation system of the upazila which is due to its proximity to the rivers and canals. There are also sufficient roads in the upazila for internal linkage. For external linkage, waterway plays very important role. It is well connected with zila headquarters and the adjacent upazilas with water ways. The road system is comparatively undeveloped.

Present status of the upazilla headquarters and surroundings areas:

Map-1 about shows the land use plan of UDD prepared in the year 1988. Map shows the location of upazilla Nirbahi officers office, upazilla hospital, thana bhaban, T&T office, BRDB office, Vocational School, School, College, Madrasha and all other institutes. It proposed the location of future growths. Accordingly many other Offices, Institutes, Hat-Bazars and private commercial centers developed. In the last three years almost all the area of the land use plan and the infrastructures developed have gone under water due to erosion of the river. These erosions created a huge irreparable loss of the people of the area.



Map- 1. Showing the land use plan of UDD prepared in 1988, the area of which is totally lost in the river.

CHAPTER-3

CHRONOLOGICAL LOSS OF LAND AREA DUE TO RIVER BANK EROSION

Chronological land loss of the upazilla due to river bank erosion:

A reconnaissance survey was done by a survey team to observe the present socio economic situation of the area, the land loss, protective measures taken from riverbank erosion, relief and rehabilitation program. The survey team comprising two members were Senior planner of UDD Md. Abdur Rahman Khan and Senior Geoghrapher of UDD Mr.Jahangir Ali. The team observed the present status of the land area and other situations mentioned above. On the basis of their observations and other secondary information this chapter has been written. Survey report has been attached as enclosure.

Chowhali Upazilla was declared as Upazilla in the year 1984. Before that it was a thana. Chowhali thana is one of the oldest thana in Bangladesh. Local old people say that originally the river bank was in the west and far away from the upazilla boundary. Upazilla Engineer of LGED informed that at the time of its establishment as upazilla the river boundary was about 9 Km. away of the then upazilla boundary.

Images from Google earth of the river Jamuna in the vicinity of Chowhali upazilla of the year 2008, 2011, 2012 and 2013 have been shown below. From these it is observed that previously there was one channel of Jamuna near the Chowhali upazilla parishad and later on it bifurcated in two sub channels and the sub channel created near the upazilla grew stronger in the last three years and hit the upazilla campus. Consequently a huge land area including the upazilla parishad bhavan, upazilla health complex bhaban and thana bhaban collapsed and went under water.

From the base map of the upazilla master plan map prepared by UDD it is seen that approximately 1/3rd of the upazilla area was in the river and part of the river Jamuna.With the passing of time the river bank moved towards the east.

From the map of LGED of the year 2010 it is seen that about 2/3rd of the upazilla area has changed as water body of the river area and thus turned as part of Jamuna. After the year 2010 in the last three consecutive years river bank erosion became so intense that the main land of chowhali lost more of its area.

The recent maps prepared by LGED shows that only about 20% of its area is left and awaiting for river bank erosion. In the wet season the river becomes full of water and flow of the river turn violent and starts erosion of the river bank. In the last two years river bank erosion was huge. Local inhabitants are therefore very much despaired and suspecting that this year erosion might be more than that of the last year attack. The Three stage of loss land due to river ban erosion has been discussed below.

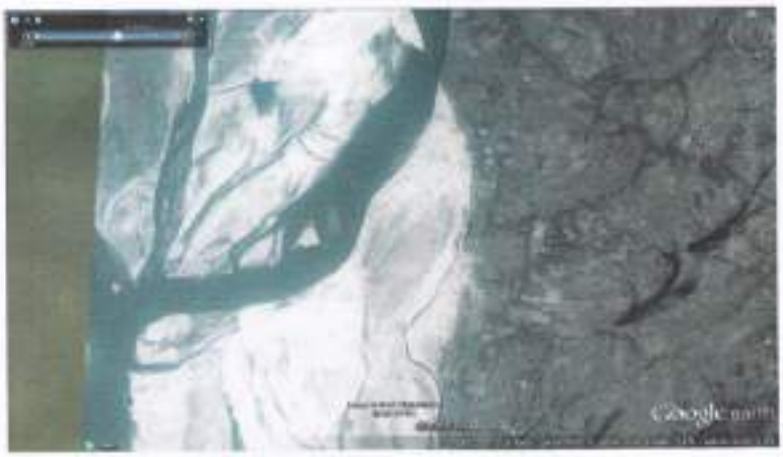


Image - 1. From google earth of the year 2008

Image - 2. From google earth of the year 2008

Image- 3. From google earth of the year 2008

1st stage of land loss due to river bank erosion: Map showing below is the Chowhali Upazilla land use plan map of the master plan of UDD completed in the year of '1988.

In the map it is seen that large portion of about 1/3rd portion of the total mouza map of the upazilla includes water body of the mighty Jamuna. No specific data was found about the mouzas lost fully or partially by river bank erosion. In that time the river was on the western side of the upazilla along the north south direction. All the union were affected but Bagutia union was not affected or lost even a little.

Map-2. Showing the newly formed Chowhali Upazilla land use map in 1988

2nd stage of land loss due to river bank erosion:

In the 2nd stage of land loss due to river bank erosion : Below is shown a upazilla map. This map was prepared and published by LGED in the year 2010. Comparing the landuse/master plan map shown above and the map of Chowhali prepared and published

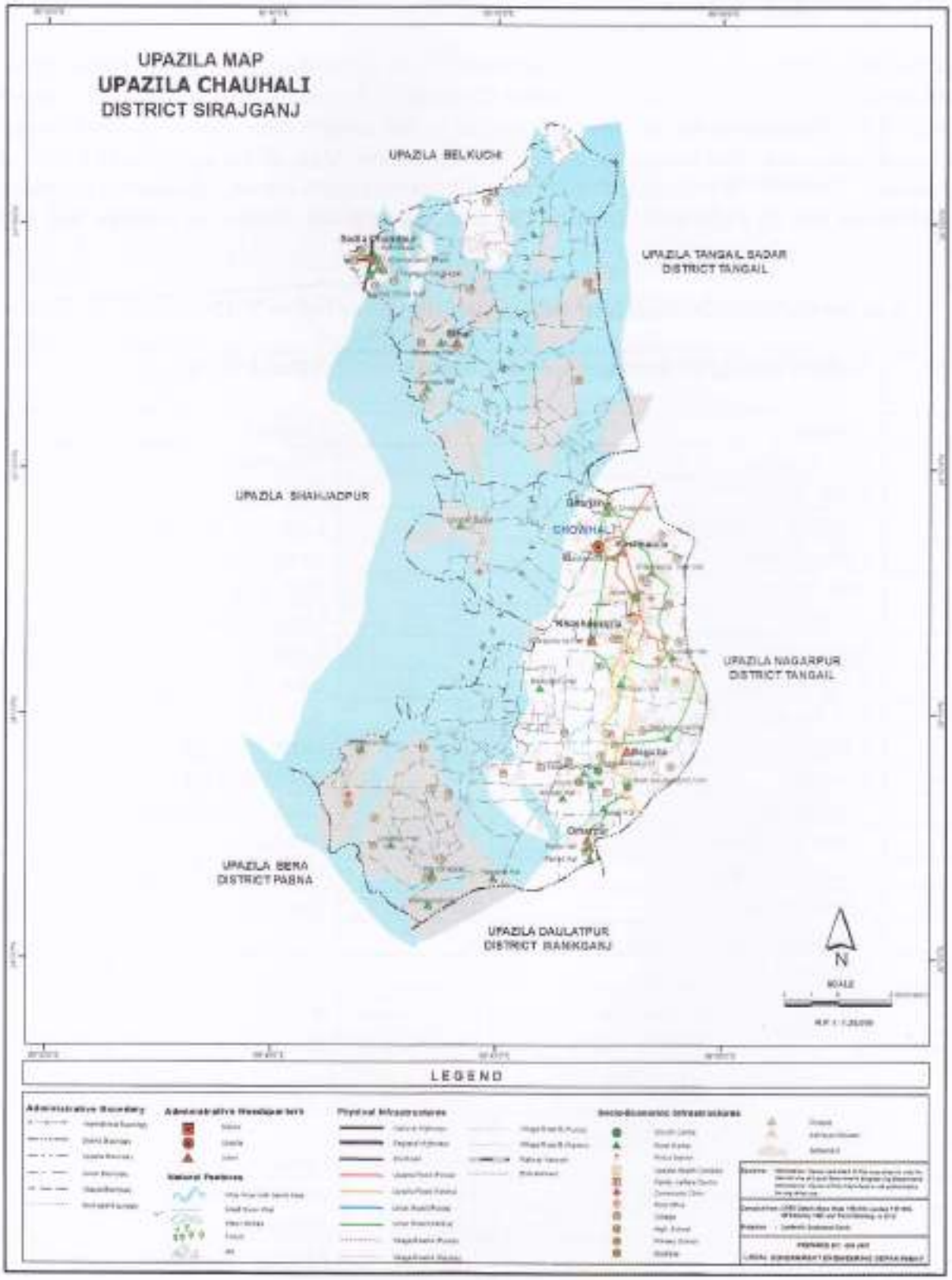
by LGED in the year 2010 it is seen that a huge land loss of Chowhali upazilla occurred due to river bank erosion. It is seen that more or less 2/3rd of the land of Chowhali upazilla is under water and engulfed by the mighty Jamuna.

A list of land loss (fully or partially) has been prepared by the research unit and shown below where it is seen that 4(four) union of the upazilla viz. Sadia Chandpur, Ghorjan, Sthal and Omarpur Union have been affected to a large extent due to river bank erosion by the Jamuna river. Among the four unions two most affected unions are Sthal Union and Sadia Chandpur union. Most of the area seen to be lost in the mighty jamuna. Therefore it is certain that all the settlements, health centre, educational institute have been washed out due to river bank erosion. The two less affected unions are Ghorjan and Bagutia unions.

Table - 1: Showing the lists of mouzas lost(fully or partially) on or before 2010:

Mouja No.	Sadia Chandpur union	Mouja	Sthal Union
28	Sahapur	07	Halbaria
29	Karia pukur	05	Bairabaria
30	Uttar boyla	36	Chauhali
31	Dakshin Barboyla	66	Chhoto Chouhali
52	Char Gopal	57	Longolmura
32	Rasulpur	40	Stalchhar
33	Garabari	65	Uttar tagbari
34	Boilkandi	64	Kuragochha
35	Rehal Mousa	38	Chash Phalsaha
18	Ura Para	39	Khus dshia
17	Ullapara	62	Uttar Hatibari
20	Jorapara	63	Rehal Poistia
19	Sanolashi	59	Lekh Chandrapara
21	Khos Jara para	58	Chaluhara
22	Ramji banpara	60	Rehal mondolbag
23	Ghosherpara	Illegible	Illegible
24	Chandolpara	,,	,,
25	Mouhali	,,	,,
15	Sanorshi	,,	,,
16	Dewantola	,,	,,

G14	Godia	,,	,,
	Ghorjan union	,,	Omarpur union
50	Karuajani survey area	117	Arri Biljal ghar
52	Boropakhio	126	Arkondi
51	Rohal aulia	147	Modhya Simulia
82	Chandpur	Illegible	
81	Ohitpur	,,	



Map-3. Showing the Chowhali upazilla area status(main land, char area, water body, communication network and administrative centres.)

3rd stage of land loss due to river bank erosion:

Below is shown a recent map collected from the net of Google earth . In this map the Chowhali upazilla boundary has been shown. Observing the map it is found that only a small portions of land in the Khaskaulia union, Khaspuuria union, Bagutia union and Sadia Chadpur union are still remaining out of the riverbank erosion. This map shows a huge land loss of Chowhali upazilla due to river bank erosion. It seen that more or less 2/3rd of the land of Chowhali upazilla is under water and engulfed by the mighty Jamuna.

Comparing the Chowhali upazilla map of 2010 shown above and the Google earth map shown below a list of land loss (fully or partially) has been prepared by the research unit and shown below where it is seen that 4(four) union of the upazilla viz. Sadia Chandpur, Ghorjan, Sthal and Omarpur Union have been affected to a large extent due to river bank erosion by the Jamuna river. Among the four unions two most affected unions are Sthal Union and Sadia Chandpur union. Most of the area seen to be lost in the mighty jamuna. Therefore it is certain that all the settlements, health centre, educational institute have washed out due to river bank erosion. The two comparatively less affected unions are Ghorjan and Bagutia unions.

Table- 2: List of mouzas losts after 2010 (fully or partially):

Name of Mouza/Union	Before 1988	1988-2010	2011-2015
	Percent (%)	Percent (%)	Percent (%)
Sadia Chandpur Union			
Sahapur	---	100%	---
Karia Pukur	---	100%	---
Uttar boyla	---	100%	---
Dakshit Barboyla	---	100%	---
Char Gopal	---	100%	---
Rasulpur	---	100%	---
Garabari	---	100%	---
Boilkandi	---	100%	---
Rehal Mousa	---	100%	---
Urapara	---	100%	---
Ullapara	---	100%	---
Ljoropara	---	100%	---
Sankolasi	---	100%	---
Khos Jarapara	---	100%	---
Ramji banpara	---	100%	---
Ghosherpara	---	100%	---
Chandolpara	---	100%	---
Mouhali	---	80%	---
Sankorshti	---	50%	---
Dewantola	---	70%	---
Ghorjan Union			
Hulpura	---	---	10
Karuajani Survey area	---	100%	---
Boropakhio	---	100%	---
Rohal Kaulia	---	50%	---
Chandpur	---	65%	---
Ohitpur	---	90%	---
Chandpur	---	65%	---
Ohitpur	---	90%	---
Sthal Union			
Halbaria	---	100%	---
Bairabari	---	100%	---
Chauhali	---	100%	---
Chhoto Chauhali	---	100%	---
Longolmura	---	100%	---
Stalchhar	---	100%	---
Uttar Tagbari	---	100%	---
Kuragochha	---	100%	---
Chash Phalsaha	---	100%	---
Khush Dassika	---	100%	---
Uttar Hatibari	---	100%	---
Rehal Poistia	---	100%	---
Lekh Chandrapara	---	100%	---
Chaluhara	---	100%	---
Rehal Mondol Bhag	---	100%	---
Khas Kaulia			
Survey Area	---	---	45%

Name of Mouza/Union	Before 1988	1988-2010	2011-2015
	Percent (%)	Percent (%)	Percent (%)
Khas Pukuria			
Survey Area	---	---	50%
Omarpur			
Khash Delderpur	---	100%	---
Armasuka	---	100%	---
Delderpur	---	---	100%
Samohudia	---	100%	---
Bahulokte	---	100%	---
Bakulia	---	100%	---
Pukutia	---	95%	---
Hijotia	---	---	100%
Ghushurpi	---	---	100%
Pachha Simulia	---	---	100%
Sambhudig	---	100%	---
Arri Biljal ghar	---	100%	---
Payla	---		95%
Pachha Simulia	---	95%	---
Atia Dhubalia	---	100%	---
Salangi	---	100%	---
Surd	---	---	100%
Goprekhi	---	---	100%
Guyankandi	---	100%	---
Char Pachuria	---	100%	---
Arkondi	---	100%	---
Modhya Simulia	---	60%	---
Bagutia			
Hopania	---	---	100%
Pathrail	---	---	60%
Hatail	---	---	100%
Bagutia	---	---	60%
Mitain	---	---	50%
Bir Boulia	---	---	100%
Bir Musko	---	---	100%
Mitain	---	---	50%

Map-4. Showing the recent map of Chowhali upazilla boundary and the river Jamuna from the net of Google earth (main land, char area, water body)

It is seen that river erosion of Chowhali upazilla and its surrounding has come at a very critical stage. At present the river bank erosion has vanished the Upazplla head quarter and a number government offices including upazilla heaith complex, police station building, BRDB bhavan, girls college,madrsha and a number of residential quarters etc. Besides private settlements, hat bazaars and roads have been destroyed and vanished by the advancing river. It is observed that before the year 1988 nearly 35% of total land lost in a long time. Again next 30-35% of total land lost in the next 20 years and lastly in the last 5 years the erosion of land loss was nearly 15-20 %. It is also known that during the last 2 years the erosion was severe in the eastern side where the upazilla head quarter was situated and presently washed out.

Comments on river erosion: It is seen that Chowhali upazilla is now at stake and the river bank erosion is advancing towards end of the upazilla. The loss of land of the Chowhali upazilla is at a very alarming stage . The land area lost is alarming. Most of the dwellers are in a great danger due to loss of their own house, cattle , agricultural land alld employments. Students lost their educational materials and educational institute and communication network. They are suffering a lot due to waterborne diseases. They are suffering a lot due to lack of medical facilities. All the dwellers who are still un attacked from river ban erosion are counting their days in a great despair when they will also loss their belongings and will be transformed to a beggar like situation. They whole area is demanding an immediate interruption of government for taking permanent measure for flood and river bank protection.

CHAPTER-4

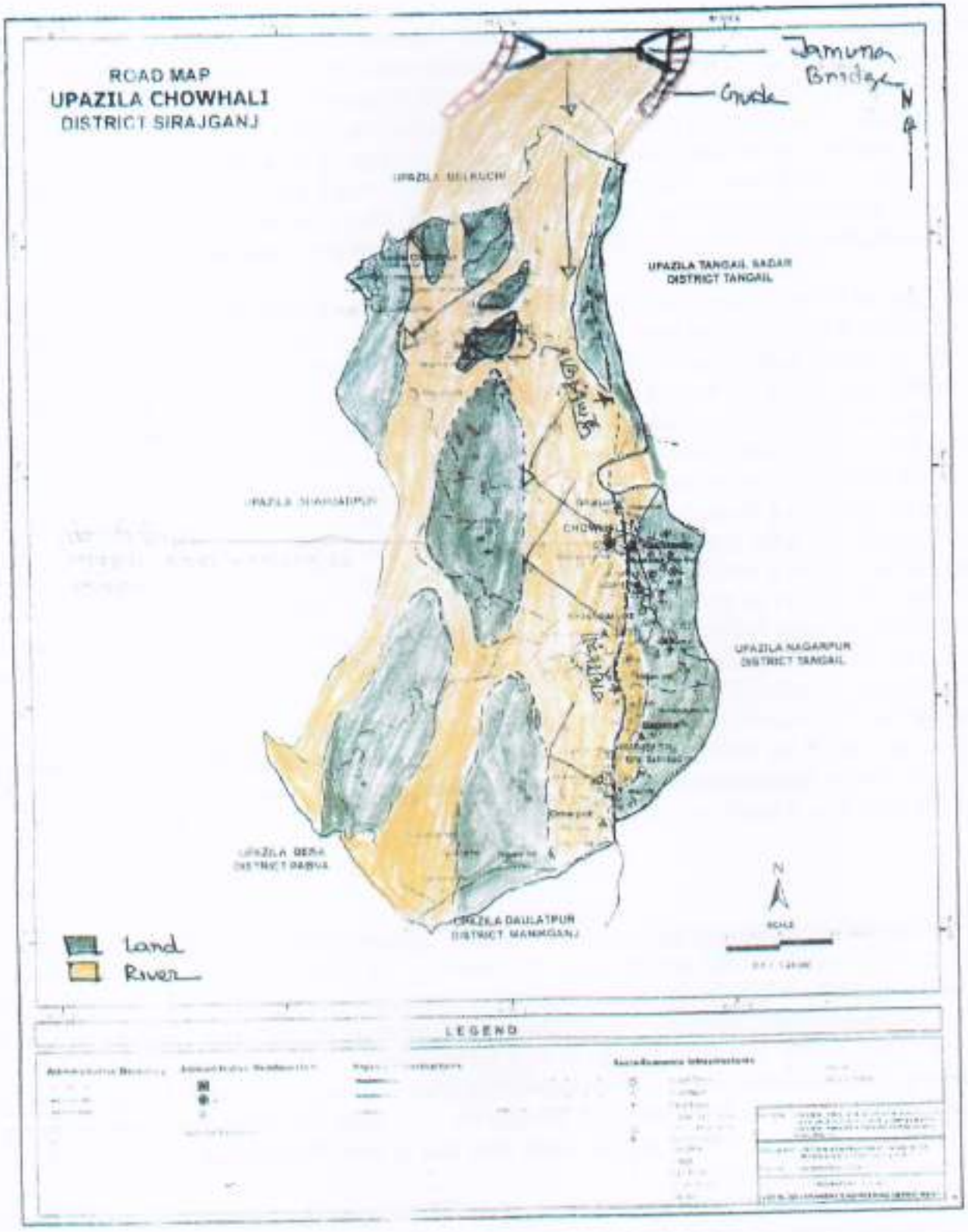
FACTORS CAUSING RIVER EROSION

Factors Causing River bank Erosion:

As this chapter is a more or less technical type therefore it needs technical information from the concerned technical department of government and non government organizations. Efforts were made to get all such information. The upazilla Engineer Mr. Nasir helped a lot providing information including data and maps. From the other secondary source efforts were made to get information. Some important information were collected from talking with the senior and experienced local people and governmental officials through PRA, reconnaissance survey and personal discussions. Participatory Rural Approach (PRA) was done in the month of April at the Chowhali degree college teachers auditorium in the college campus.

There are so many factors acting behind riverbank erosion. When the current of water changes its direction it hits the river bank and this causes river bank erosion. Again when a huge flood occurs it may cause river bank erosion. The geology and the soil characteristics of the riverbank also limits the river bank erosion. River bank with sandy soil is more susceptible to river erosion than the river banks with other sticky soils. Some times geographical change may occur due to earth quake which may also change the river course. Change of climate may cause severe flood and thus effect the devastating situation of river erosion. There are so many reason behind the change of river course effecting riverbank erosion. Here in this chapter an analytical discussion is given for the river bank erosion of diminishing Chowhali upazilla by the mighty Jamuna. Jamuna is a braided river as its width is increasing each year. Its width varies from minimum of 5(five) to maximum 15(fifteen) kilometers. The river jamuna enters from the neighboring country India. Its name in India is Bhrahmaputra which originates from the hilly regions of Assam and Meghalaya. As it originates from the hilly regions of India it carries a huge amount of soils, silt and debris with its current. While water flow faces obstruction the velocity fall down and all these particles deposits and develops char lands. When these chars rises in the river its flow direction changes and several channels develop. Whenever this channels cannot accommodates huge flow of water during wet season water current hits the adjacent land area which causes river bank erosion.

This Phenomenon is seen in the case of river bank erosion of Chowhali upazilla and along its up and down areas. In the recent years the intensity of riverbank erosion in this region is becoming so high and devastating that it needs a research work for this as to how these impact can be minimized to a tolerable limits. Otherwise the map of Chowhai Upaziila will be lost from the Bangladesh map and people of that locality will loss their identity. There is an idea prevailing in the mind of a section of people that after building of Jamuna bridge which has presently been named as Bangabandhu bridge, the river flow has gone down and a number of char land began to rise. Those people think that this is one of the main reason for changing direction of the
flow of the river and the consequent river erosion. There is another idea prevailing in a number of local people participated in the PRA and personal discussions that the flow direction of the river Jamuna has changed after building spar across the river at the up of Khaja Younus Ali Medical College in the west side of Jamuna. Each of the reason mentioned above might have some logic either strong or weak. A base line study has been tried here with the flow map of Jamuna over and by the side of the Chowhali Upazilla collected from the local LGED office. An analytical description has been tried in the next pages.



Map-5: Showing flow directions of water of Jamuna river over and by the side of the Chowhali Upazilla

Justifications of river bank erosions:

The map shows the Jamuna river. At the top of the upstream is the Jamuna bridge. The flow continues in one channel for several kilometers till the beginning of the Chowhali Upazilla. Before entering and flowing over the upazilla the channel has bifurcated into two channels making a large char land in between. The left channel is comparatively less wider than the right channel. It seems that the right channel has turned as the prime channel and the left channel has turned as the 2nd channel. The primary reason for growing of char land is due to sedimentation of sand, silt, debris carried by the water from the up stream and the nature of water current. It is shown in the map that as the flow proceeds the flow direction does not remain straight down wards but hits the river bank alternatively on both sides of the channel. Actually during the monsoon season the river become full of water and show strong current. This strong flow velocity makes the river sluggish in nature and starts hitting alternatively on both sides of the river. This process of alternate hitting both sides of the channel continues for several kilometers. Consequently river bank erosion occurs. As river bank erosion occurs on the eastern and western side of the channel, it seems that the flow direction is changing its direction on both sides. As a result it is seen that in both sides of the river erosion is happening intensively.

The arrow markings are showing the changing flow directions of upcoming monsoon water as it flows down wards during the rainy season. Accordingly it is seen that river flow is hitting and eroding khaskaulia union where the Chowhali Upazilla Parisad and surrounding government offices were in existence in the last year also. But one thing it is alarming and more or less sure that in the coming wet season the un eroded rest of the Khasaulia union in the eastern side might loss its land area to a large extent. Downward and in the same line Khaspuuria union and Bagutia union might have the same fate as the Khaskaulia union. It could be controlled some how if proper flood control measure could be taken. In the last chapter it is seen that river is widening each year in the Chowhali area to a large extent. Jamuna is a braided river and the reason behind it might be the geological condition of the river bed and bank. As these are containing sandy soils so river banks are susceptible to erosion in the wet season. As a result it is widening each year.

In the PRA session held at the Chowhali Degree College which was organized by UDD some participants put objections that after building the Jamuna bridge the downward bank erosions aggravated. Another objections put by some of the participants was that the spur built in the up of Khaja younus Ali Medical College on the western side has changed the flow direction of Jamuna and that's why the flow is hitting on the eastern side. All these might have some basis depending on scientific analysis. This paper is not scientifically researching on these issues but trying to gather information regarding these from other sources. This is rather examining the logics behind all these in view of making policy guidelines for planning purposes. But from general logics it may be argued that due to construction of piers of the bridge some obstruction is being created naturally. To reduce this there might have regular dredging work under river control activities. Similar argument may be made against the construction of spar at the upstream of Khaja younus Ali Medical College on the western side of the river Jamuna. However to establish a minimum level of technical basis of these logics opinions have been taken from the locally concerned technical persons. Their opinions have been evaluated in the table below.

	Geological / Soil condition	Flood in wet season Striking River bamk	Deposition of soil/particles making char and less ening channel width	Due to Dam/Spur on the West side	Due to Jamuna bridge	lack of permanent flood protection	Dredging at Sirajgonj
LGED Engineer	10	6	6	4	5	10	7
BWDB Engineer	10	10	8	5	10	10	10
UDD Planner	8	7	7	5	4	10	8
Average weighted value	9+	8+	7	4+	6+	10	8+

Table-4: Showing the factors causing river bank erosion and weightage given by the experts

From the above table the possible factors for erosion and their weightages given by Mr. Nasir, Upazila Engineer, Chowhali Upazila, Mr. Shahjahan Siraj, Executive Engineer BWDB, Tangail and Senior Planner of UDD were taken separately. Each of the factors weightages given by the Engineers and Officers were sum up and averages were calculated.

Pic.-2.Local UNO addressing in the PRA

Pic.-3.College teacher giving opinion in PRA

CHAPTER-5

IMPACT OF RIVER BANK EROSION

Impact of river erosions:

Socio-economic impact:

In general Bangladesh is a disaster prone country. Severe cyclone, destructive flood and riverbank erosion are common in Bangladesh disaster scenario. Lower level land and costal area of the Bay of Bengal are vulnerable to various types of disasters. The Jamuna flood plain is highly vulnerable because of flooding of its river banks and erosion. Specially the Sirajgonj district is considered as one of the highly vulnerable areas for river bank erosion.

River bank erosion is a perennial problem in Bangladesh. Some time it is very alarming and seen to be more than 1km/year. In that situation it becomes critical for the dwellers
of the flood hit and river bank eroded areas. With the loss of land and all other investments like flood embankment , schools, hospitals, cultural, religious infrastructure washed out. The agricultural land loss and assets virtually make the dwellers to the level of beggars if they have no other alternatives for maintaining their livelihood.

Any disaster in short term and in the long run retards the development process. The effect is so complex that some times the dwellers have to leave their beloved paternal area and migrate to other suitable place or have to move to big cities for earning to maintain their livelihoods. The damages are seen in many ways. Homesteads are destroyed, cultivable lands are smashed or wiped out and the employment opportunities are reduced or closed.
An attempt has been made to guess the losses occurred due to river bank erosion of the Chowhali Sadar and adjoining areas. Losses were accounted through the loss of agricultural land and production, loss of homesteads, loss of cattle etc. All this are categorically discussed below.

Impact on Health:

After any disaster like riverbank erosion, flood, cyclone and tornado etc. which are common in Bangladesh specially in the study area of Sirajgonj health sectors turns to be vulnerable due to lack of food, potable water and emergency medicines. Water borne disease like typhoid, malaria, diarrhea, hepatitis and skin diseases are seen to be spread out. Rural people due to their lack of knowledge drink polluted water of pond and lake. Consequently these people suffer from these water borne diseases.

Due to river erosion the Chowhali Sadar upazilla medical hospital collapsed, gone under water and subsequently washed out. Several health sub centers, family planning centers and a number of private medical centers/pharmacy gone under water. The upazilla medical hospital has now been shifted to a new place temporarily with insufficient space and amenities. All the services provided are lower in quality and quantity than that was given earlier in a well organized manner. For that reason critical patients have to go to the Tangail or directly to Dhaka. Due to river bank erosion people are in lack of money and in this situation it is very tough and in some cases impossible for them to go outside and get treatment facilities. Thus people have to suffer a lot due to river bank erosion.

Impact on education:

Natural disaster has always a bad impact on educational sectors. As education is the backbone of a country therefore any disaster happened create direct or indirect effect on educational institutes, students, teachers and all other concerned. After any disaster and calamity some people are very much affected and even become homeless, shelter less, faces lack of food ,and un employment. All these people take shelter in the nearby educational institute and thus the educational institute remains closed till a normal situation come up. Again when these institutions are affected directly by any disaster the

educational institute remains close till the institute is rebuild or repaired. In rural areas of Bangladesh education is hampered very much. Some times it is also seen that many students specially the poor students even drop out their education due to distressed situation of their family.

In Chowhali Sadar it has been seen that so many educational institutes were closed due to river bank erosion and after a long period many of these educational institutes were transferred or shifted to other nearby unaffected places. It is known that a girls college, a senior madrasha, a girls high school, a technical school and a number of primary school collapsed and completely washed out due to last 2-3 years consecutive river bank erosion and flood. Many students at different level dropped out from education.

Impact on property:

Due to last 2-3 years river bank erosion, the dwellers of Chowhali sadar and surroundings were affected most. They lost their home, agricultural land and all their belongings. Thus many people became land less, shelter less, lost their other property and assets. From the previous map it is seen that a number of hat bazaar and business establishments were completely destroyed and washed out due to flood and riverbank erosion. People became jobless and unemployed. It is also known that huge number of cattle's, crops and big trees drowned in the river during the havoc and washed away.

Migration:

It generally happens that whenever any disaster like flood and river bank erosion hit any area some people totally loss their assets and property, their homestead and all other belongings. 'The rapid changes in river courses and lateral movement of the bank destroys valuable agricultural land, homesteads, markets and other establishments, and they become destitute and landless'. Then for survival many of them prefer to leave the place and transfer to other suitable place and hope to have a better opportunity for their employment and shelter etc. for their survival . These people who transfer to other places for employment and shelters are called as migrants and this transfer is plainly called as migration. From the root level survey and discussion with the local people of Chowhali sadar and its surroundings, it is found that a poor number people have migrated. The percentage of people migrated might be only 10 to 15% and not more than that. It is known that most of these people have migrated to Tangail and capital Dhaka. It is very strange and unusual that a poor number of people have migrated in such a river ban eroded area like Chowhali sadar and its surroundings. The reason might be that people of Chowhali are very much habituated and adaptive for survival in any disaster. Also the people are very much cooperative to each other for their well being and employment.

Loss of Agricultural land and production:

For majority of the people of Bangladesh living in the village agricultural land is the main source of income. In Chowhali sadar and its surroundings majority of the people lve on agriculture in terms of both primary and secondary occupation. From the secondary information it is found to be about 68%. It is true that loss of cultivable land throws the poor to a very destitute situation. Therefore impact of loss agricultural land is not one sided, the loss of land means loss of production as well as loss of labor force.

Loss of settlement/ Homestead:

In the last 2-3 years of severe river bank erosion of Chowhali sadar and its surroundings, secondary sources and maps shows that the land loss in Khas Pukuria mouza is much and it is 60% of its original land approximately and khaskaulia mouza lost its 50% of land approximately. Therefore these two mouza lost their settlements/homestead to that percentage approximately. So a huge number of people lost their settlements/ homestead. These are irreparable losses to the affected people. Other unions like Char salimabad, Bagutia and Omarpur also faced river bank erosion to a large extent.

Picture-4.Showing Upazilla Parishad office buildings are going under water due to river erosion in the year-2013.

CHAPTER-6

LOSS OF PUBLIC INVESTMENT

Loss of public investments:

A huge amount of public investment had been incurred in developing Chowhali Upazilla and other government offices after declaring the Chowhali Thana as Upazilla from the government in the year 1988. Bangladesh Water Development Board (BWDB) is the entrusted government agency for developing flood protection embankments and irrigation canals for agricultural development throughout the whole country. In the recent years BWDB invested huge amount of governmental fund for flood protection of Chowhali upazilla and all its establishments. But all these remained in vain because of limited amount compared to its huge requirements. It is known from the reliable sources that recently government has passed a massive project in the pre ECNEC meeting for developing permanent flood protection embankment on the eastern river bank from up at the end of Bangabandhu bridge embankment, Tangail to Arichaghat at down via Chowhalli river banks at a cost of taka 350 (Three hundred and fifty) crores of investment. But the past investment so far invested from the governmental side has gone under water due to continuous riverbank erosion of Chowhali upazilla and surrounding. It becomes a question mark as to why and how these investments were planned. Besides a huge amount of private investments were incurred in developing private buildings, semi pucca buildings with other investments. To get a picture of monetary investment in the public sector an estimation was made with the data collected from the upazilla Engineer's office of Chowhali. The estimation made is presented below for getting an idea.

Table-5.Investments and estimated amount in the public sectors eroded in last 3 years:

Sl.No	Item of work	Amount in Taka
1.	Chowhali upazilla Parishad building	4.00 crores
2.	Residential building 8 nos.	4.00 crores
3	Upazilla Nirbahi Officer's quarter	0.60crore
4.	Upazilla Chairman's quarter	0.40 crore
5.	Offices (Primary education &URC)	1.00 crore
6.	TNT office	1.00 crore
7.	Post Office	0.50 crore
8.	Police Station Complex	8.00 crore
9.	Hospital Complex	10.00
10.	Godown	1.00
11.	BRDB building	2.00

Source: Upa zilla Engineering Office,Chowhali and monitoring cell, BWDB

12	Primary School a)Building 14 nos. b)Semi pucca 50 nos.	 8.00crore 4.00 crore
13.	Secondary and Higher Secondary a) High school 8 nos. b) Madrasha 5 nos. c) College 5 nos.	15.00 crore
14.	River protection	0.50 crore
15.	Pucca road	6.00 crore
	Total= Tk.	66.00 crore

From the above investment table it is seen that Sl. No. 15 is pucca roads developed at a cost of taka 6.0 crores were vanished due to river erosion in the last three years. It is known from a research paper that pucca roads constructed were twenty six kms. in length in the eastern side of the upazilla and now it is only 5-6 km. in length left after devastating erosions. In Sl. No. 14 an investment for river protection measure at a cost of taka 0.50 crore was invested but all in vain due to erosion by the river It is seen in Sl. No. 13 that fifteen crores of taka were invested for building eight nos. of high school, five nos. of Madrasha and five nos.of College. These also have been vanished by river erosion. Besides Chowhali Health Complex built at a cost of taka10.0 crore Police station Complex built at a cost taka 08 crore, Chowhali Upazilla Parishad bhaban built at a cost of taka 04.0 crore, residential quarters for the upazilla officers built at cost of taka 04.0 crores have gone under water due to river erosion. Besides BRDB bhaban, Upazilla Chairman's quarter, Upazilla Nirbahi officers quarter, TNT Office, Post office and Upazilla food godown etc. all have also gone under water. It is known from the upazilla engineering office that a program of shielding the eroding bank with sand bags was taken to save this but all these in return could not give any positive result and lost in the river water during the erosin. An information of a total Tk. 66.00 crores of investment from the upazilla engineering office was given so far in developing buildings, roads and flood control measures. In other words a huge public investment has gone under water due to river bank erosion.

Picture-5. Upazilla Parishad campus is in a big danger due to threatening of the river in early stage of erosion.

Table-6.Investment category and estimated amount in the public sectors in the last 3 (three years):

Sl.No	Financial year	Item of work	Amount in Taka (in crore)
1.	2009 - 10	Protection of Chowhali upazilla from erosion	1.36 crores
2.	2010- 11	Protection through Geo bag supply	10.00 crores
3	2011-12	Protection work of Chowhali upazilla with cc block.	21.00 crore
4.	2012-13	Saving the bazar of Patrail village of Chowhali	34.00 crore
5.	2013-14	Emergency flood protection work of Chowhali	7.50 crore
6.	2014-15	Geobag supply, ceiling dumping to save Chowhali Upazilla Complex, Thana bhaban and Health complex	1.00 crore
		Total = Tk.	**74.86 crores**

Source: Director Processing Section, Monitoring Directorate, BWDB.Dhaka.

It is seen from the table above that a total of about taka 75.00 crores have been invested by the BWDB to protect from erosion but all these have gone under water by river erosion. These investments have been given categorically in the table shown above.

Table-7.Investment category and estimated amount in the public sectors in the last 3 (three years):

Sl.No	Item of work (built by the department)	Number of institute built	Number of institute eroded in the river	Public investments in Taka(in crore)	Loss of public investment in Taka(in crore)
1.	High school	32	20	11.69	3.69
2.	Madrasha	6	3		
3	College	2	1		

Source: Assistant Engineer, Facilities Department, Sirajgonj District.

It is seen from the above table that facilities department of sirajgonj district invested about Tk. 11.69 crores in building high school, madrasha and colleges and more than 50% of these schools, colleges and madrasha have been damaged and washed out due to erosion of the river Jamuna. A total loss of about Tk.3.69 crores have occurred in their investments.

CHAPTER- 7
THE IMPORTANCE OF THE STUDY

The Importance of the study:

This study is an important issue in context of the loss of our national economy. Like Chowhali many other zilla, upazilla and union head quarters along side the river Padma, jamuna and Meghna are in a threatening situation due to flood and river bank erosion. Map-1, below shows the locations of the affected zilla, upazilla and union head quarters alongside the river Jamuna and its main influence zone. It is observed in the map and the table - found from the secondary sources shows that five district, thirty two upazilla and two hundred and seventy numbers of union head quarters are affected due to river erosion along side the Jamuna and in its main influence zone. Geo-referencing and overlaying on the image from the Google earth of the master plan area of UDD, which includes the upazilla sadar and its surrounding areas it is clearly seen that most of the study area has gone and washed out in the river Jamuna due to river erosion in the last the last three years. It has been estimated in the previous chapter that about Taka 145(one hundred and forty five) crores of capital money has been invested in the construction of public buildings, roads, culverts, school, college, godowns and flood protection measures etc. If the said capital money is calculated in terms of its present value the amount would be at least ten times more. That is it would be about 1450 crores of Taka. Besides these a huge amount of private investments in residential, commercial and social sectors had been invested but all these are now a history. Therefore a huge amount of public money as well as private investments have been lost in the water and it is very regretting for us.

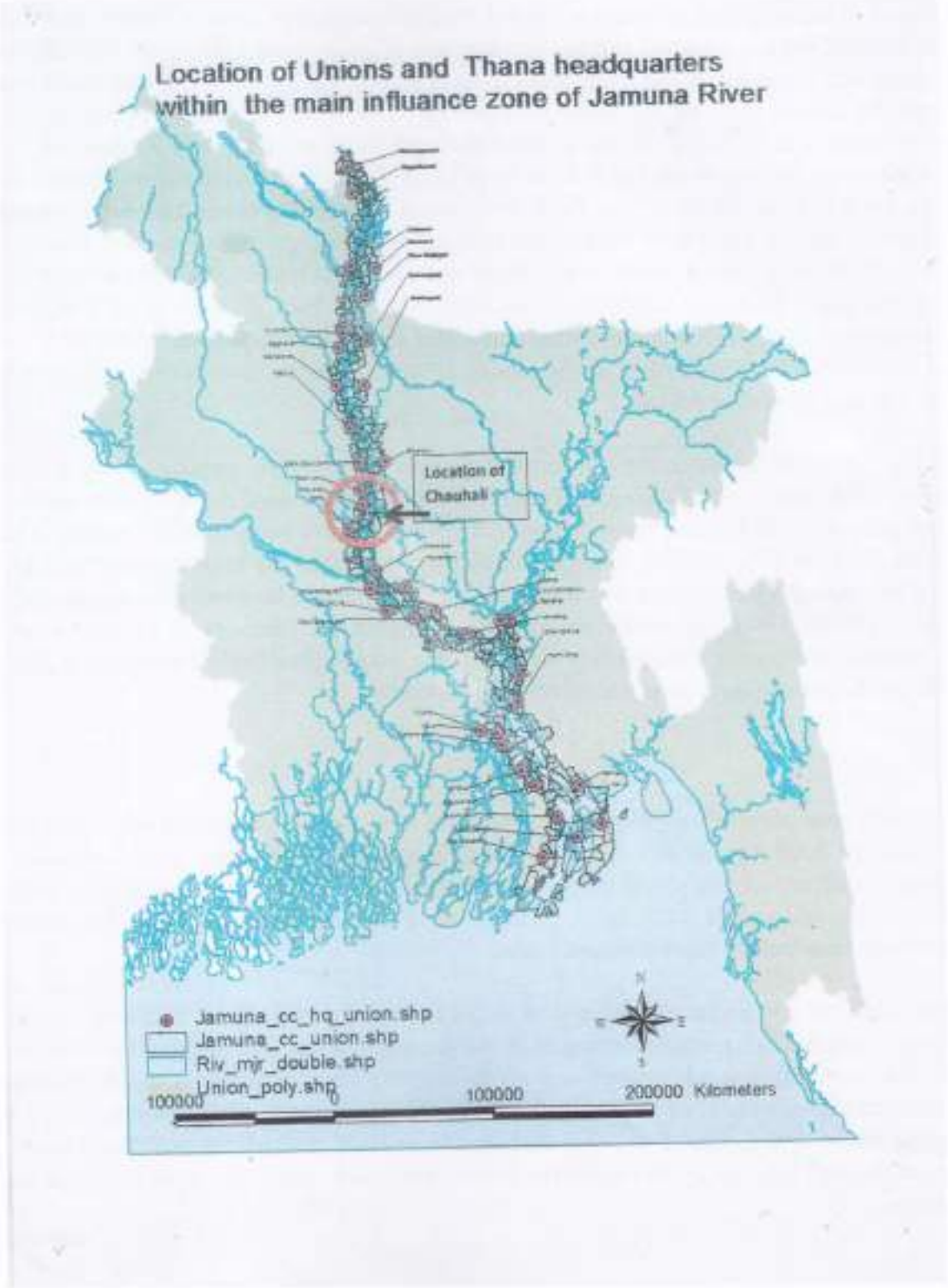
Studying the river width in the past it is found that the course of the river Jamuna is very much changing in its nature. Each year the river changes its course and in the wet season the river sides are flooded and its width becomes 15-16 km and the velocity of the water current become high creating a huge force which attack the river sides causing erosion. But the tragedy is that due to unwise political decision the location of the upazilla headquarter was established in a vulnerable location. And the consequence is a huge loss of public as well as private investments. Similarly the locations of the said other affected districts, upazilla and union headquarters shown in the map were selected wrongly in their present vulnerable positions creating a huge loss of national economy.

Bangladesh is a poor country and one of the members of LDC's. Our resources is very much limited. We are investing the hard earned money of the poor people of our country in the affected areas in constructing the infrastructures and in other related investments. These money incurred in these affected districts, upazillas and unions are fully or partially being lost due to river erosion. We should see the matter seriously to safeguard these national losses.

The losses whatever has happened can not be regained or recovered but as next step we can stop or reduce these losses through proper planning? The answer might come as to make projection and forecast the affected scenario of these administrative areas in next fifty years considering the river characteristics of the concerned localities. Thus assessing the projected losses some decisions need to be taken for safeguarding future losses. Therefore some decisions have been chalked out as follows for controlling the losses of the said vulnerable administrative centers along side and in the main influence zone of the river Jamuna.

Decisions which may be taken:

1) How many and which of these administrative headquarters need to be shifted and be merged with the nearby upazillas or unions.
2) How many and which of these administrative headquarters need to be shifted to other places.
3) How many and which of these administrative headquarters need not be shifted to other places.



Map-6. Showing affected district, upazilla and unions within the influence zone of jamuna

CHAPTER-8

SUMMARY AND FINDINGS

Summary:

Chapter -1 is introductory chapter. In this chapter a background of Chowhali about its severe river bank erosion, research objectives and the research methodology has been produced and discussed. In the chapter-2 a description of the upazilla in its district context has been given. Here physical characteristics, population and it's distribution, economic performances and transport linkages etc. have been discussed. In Chapter-3 Chronological land loss of the study area have been discussed. It is seen from the information found that upazilla has lost about 65% of the land area before 2010 due to river bank erosion. River erosion on both sides of the upazilla happened but the erosion in eastern side, specially at the chowhalli upazilla administrative area it is much worser. During the year 2011- 2014 the said area eroded more and in the last two years upazilla administrative area had been totally eroded by the river and now only 15-20% of the total upazill area is remaining intact. In the coming wet season land area might be attacked again and the upazilla land area will diminish further. In the chapter- 4 the factors causing river erosions have been discussed. In chapter- 5 impact of the river erosion has been discussed. In chapter- 6 ;loss of public investments have been discussed and seen that a huge amount of public investments gone under water. Each year some leakage of public investment is happening without giving any result as erosion happens. In the chapter -7. Each year a huge loss of governmental/public funding along side and in the main influence zone of the jamuna river for running the affected district, upazilla and union levels administrations have been discussed and noticed to all concerned for taking a strategic decision in this regards.

Findings from different chapters are given below:

The situation and land loss due to river erosion:

1) The rate of land loss of Chowhali Upazilla due to river bank erosion by the Jamuna is becoming higher each year.
2) Only 15-20% land area on both side of the upazilla is still existing and awaiting for river erosion.
3) If proper flood protection measure is not taken the remaining/developed land area of the upazilla may totally vanish.

Factors causing river erosion:

1) Due to Geological/Soil condition
2) High Velocity striking bank in wet season
3) Deposition of soil/particles making char and less ening channel width
4) Due to dam/Spar on the West side in front of Khaja younus medical college
5) Change of flow direction due to Jamuna bridge.

Impact of river bank erosion:

Socio-economic impact:

1) Severe impact on education sector.
2) Increasing rate of migration.
3) Bad impact on health sector/medical facilities.
4) Huge loss of agricultural land and production.
5) Huge loss of cattle and poultry sector
6) Huge loss of business and commercial sector.

Physical Loss:
1) Loss of land
2) Loss of Infrastructure e.g roads, buildings and bridges.
3) Loss of utility lines e.g. electric lines,
4) Loss of settlements.
5) Loss of flood protections measures.
Loss of Public investment:
1) Collapse and washed out building cost Tk.47.5 crore
2) Collapsed and washed out river protection measures Tk.0.50 crore
3) Collapsed and washed out road infrastructure 6.0 Tk. crores

Findings from PRA:

1st PRA session with the local people:

Held on: 7/4/15
Venue: the teachers auditorium of the Chowhali Degree College.
No. of participants: 15 (Fifteen) participants.
Major problem noticed: very much affected firstly by the flood and consequently by river erosion by the mighty Jamuna.
How they want solution of major problems: They immediately want government interventions for construction of permanent flood protection embankment along the river side before the coming wet season.

Other facilities wanted for better for better life & environment:

These are:
1) To revive the fallen educational environment through making barrier to river bank erosion and developing educational institute as before.
2) To revive the health care facilities through building permanent medical hospital complex as before.
3) To rebuild the government offices at permanent and stable places.
4) To build alternative roads to improve the damaged communication systems.
5) To reconnect the electric lines.
6) Social forestation through government initiative to improve the loss of plantation situation
7) To develop irrigation system, providing loan facilities for improving less advancement of agricultural productions.
8) All the participants acknowledged that a huge amount of government investment including building, roads, embankments and other establishments have gone under water due to river erosion. In this circumstances they were asked about merging to the adjacent Nagorpur Upazilla of Tangail district. In this session a mixed opinion was found about merging of the Chowhali upazilla.

2nd PRA session with the civil society:

Held on: 07/04/15
Venue: at the teachers auditorium of the Chowhali Degree College.
No. of participants: 15 (Fifteen)
Type: College teachers, senior school teacher, local leaders from different localities Major problem

noticed: Flood and river erosion.
Information about demand of people:
1) Participants wanted immediate government interventions for construction of permanent flood protection embankment along the river side before the coming wet season starts.
2) They also want other facilities for their better environment.
3) In this session a majority of the participants opined for merging with the adjacent Nagorpur upazilla keeping identity of the upazilla as before.

3rd PRA session with the Government Officials :

Held on: 08/04/15
Venue: teachers auditorium of the Chowhali Degree College.
No. of participants: 25(government officials from different offices and college teacher)
Major problem noticed: Flood and river erosion.
Solution proposed better life and environment:

1) Construction of permanent flood protection embankment along the river side. Dredging of river bed and making embankment.

2) Nearly all of them opined for merging of the eastern part of the upazilla with the adjacent Nagorpur Upazilla and the western parts like enayetpur, Sadia chadpur to be merged with the Shahajadpur Upazilla

4th PRA session with the local people:

Held on: 08/04/15
Venue: Teachers auditorium of the Chowhali Degree College.
Number of participants: 15 (Fifteen) from different localities attended the sessions.
Major problem noticed: Flood and river erosion.
Solution proposed better life and environment:
1) They immediately want government interventions for construction of permanent flood protection embankment along the river side before the coming wet season.
2) They also want other facilities for their better environment.
3) In the prevailing circumstances they were asked about merging with the adjacent Nagorpur Upazilla of Tangail district. In this session a majority of the people did oppose and vehemently reacted about merging with the adjacent upazillas.

CHAPTER-9

CONCLUSION AND RECOMMENDATIONS

Conclusions :

This chapter is the concluding chapter of this research paper. This chapter is depicting in brief the previous scenario of the upazilla status, gradual erosion of banks by the mighty Jamuna, engulfing and vanishing of land, buildings, road, bridge culverts and destroying all flood control activities, the lack of flood control activities, the consequent impact and lack of proper activities taken from the governmental side and NGO's, loss of public investments and need of policy formulation for well being of the upazilla and its dwellers. It also describes the limitations, the problems and obstacles faced throughout the whole process of information collection in writing.

In the mid Eighty's Chowhali Upazilla was a calm and quiet, a prosperous and healthy urban rural area, with a charming and riverine sceinic beauties. The river was a few kilometer west of the upzilla bhaban. In the lst three years the rate of erosion of Jamuna increased to higher level. It had a well organized and well planned upazilla administrative campus with a big two storied upazilla parishad bhaban comprising departmental offices, government quarters, a large police station bhaban and its campus, a big Upazilla health complex bhavan and its campus. It is lso known that there were a Girls college, a technical institute, a senior madrasha and many of the primary school of the upazilla. All these simply collapsed and washed out due to river erosion. Besides all the settlements, cattle's, agricultural land , hat bazaars, and business enterprises developed in the vicinity of the upazilla parishad washed out due to river erosion.

From the geological information it is known and observed that soil condition of the river bed and banks are all sandy in nature. As a result the pattern of the river does not remain static in nature. Its position and pattern both changes rapidly with time. These are the nature and charcteristics of braided river. Previously the river was comparatively narrow about 5-6 kilometer in width across the Chowhali upazilla. Presently it is nearly 14-15 km in width at this point. Due to geological reason it is very tough to control and the braided rivers. For example if the dredging of the river bed is done for maintaining channel depth, after certain time it is observed that the river depth become shallower again . It is because of the sandy soil. That is soil quickly fills the river bed.

Again as the flow of water coming from the up carries huge particles of soil, sand and debris therefore these particles deposit where it faces obstacles and create char lands which actually reduces the capacity of channels and thereby flow velocity increases. In the wet season this flow velocity become much higher and river turns sluggish. Consequently the river at some points starts striking the river banks and subsequently erosion occurs. The erosion occurs much if the soil of the banks are sandy. Similar is the situation in case of Chowhali upazilla. Chowhali upazilla is in a grave situation because of erosion of the river. BWDB has taken certain limited measures with sand bags although these were not appreciable. People of the locality also tried bamboo piling. But these temporary measures showed a little effectiveness. Therefore all class of people are demanding permanent flood control measures for saving their dear land inherited from their ancestors. BWDB Tangail office informed that a big project of permanent flood control costing Tk. 350 crore has been planned and already passed in the ECNEC meeting of the planning commission. This project should be given top priority for its allocation of money and implementation.

The erosion of the river has fallen a great miseries to the people of Chowhali upazilla sadar and its surroundings. It is known from discussion with local people and the participator of the PRA program that people suffering a lot. They became landless, shelter less, lack of food and drinking water, unemployed etc. A massive program of rehabilitation was mandatory for the affected people but a little was done for the people from the government and NGO's.

From the geographical map of the Chowhali upazilla it is seen that the administrative head quarter of the upazilla that is Chowhali upazilla parishad, Police station, upazilla health complex and all other government offices are situated on the eastern side of the upazilla. The district is Sirajgonj and communication with the district head quarter is so tough that in the direct path people have to go by boat to the western side and then they have to use road way to reach the district headquarter. Due to this sort of problem people of the eastern part of the upazilla use the roadway of adjacent Nagorpur upazilla to Sirajgonj via Tangail. Now time has come to the people of Chowhali about keeping their identity. Whether they will merge with the adjacent Nagorpur upazilla and enjoy all administrative facilities from Tangail as their district. PRA participants in this respect showed a mixed response.

Considering all these some recommendations have been proposed. These are given below:

1. On the basis of scientific examination a suitable and permanent river bank protection mechanism should be adopted immediately. It should be monitored by a strong committee headed by the local minister/ MP.
2. The adopted river bank protection should extend from up at Tangail side of Bangabandhu bridge to down at Aricha ghat point .
3. Dredging of river bed should be opened as regular phenomenon from up at sirajgonj point to down at Aricha ghat point so that effective channel is maintained for controlling the river.
4. Chowhali upazilla should be divided in two parts viz. 1.Chowhali Purbo and 2.Chowhali Poschim. Chowhali Purbo should be merged with nearby Shajadpur upazilla and Chowhali Poschim should be merged with the adjacent Nagorpur upazilla of Tangail district.
5. Program for rehabilitating and facilitating the affected people should be strengthened, widened and monitored by forming a strong committee headed by the local MP.
6. Drop out student should be listed and be supplied with books and other educational materials. Temporary stipend may be given to them for running their education.
7. Technical and vocational training should be given to the affected young men and women so that they can stand up on their own foot. They should be given small credit on simple conditions.
8. Political decisions need to be taken for controlling the losses through investing or not investing public fund to vulnerable other said district, upazilla and union level head quarters and surrounding areas from river erosions.

Annexure-1

Report on PRA program and activities performed during the PRA field visit

As part of research work Participatory Rural Appraisal (PRA) was done for the research work on 'Environmental degradation of Chowhali Upazilla'of Sirajgonj district. A three member team comprised of Senior Planner, Planner of UDD, Rajshahi and Geographer of
head office of UDD visited Chowhali Upazilla from 5th to 9th April'2015. After reaching the team visited the temporary Upazilla Nirbahi Office and other government offices at the Chowhali degree college premises. The team also visited physically the existing residential and commercial areas and observed the vast erosion of land by the mighty Jamuna in the last two wet seasons. In the last year the mighty Jamuna engulfed the big campus of Upazilla Parishad, Upazilla Medical campus, Girls college campus and, thana bhaban and other government offices, settlements, hat bazaars. A huge number of primary and high school were also effected due to erosion and shifted to existing land area.

It may be mentioned that now a days 'Participatory Rural Appraisal (PRA)' is a customized practice as an integral part of a development planning related proposal or research work. PRA is a modern technique for collecting information and proposals from the stakeholders for future planning of a development planning proposal. It becomes much easier to plan when a PRA is accomplished through participation and dialogue between the planners or organizers and the stakeholders. PRA programs were launched at Chowhali upazilla of Sirajgonj for determining the effect of river erosion, to identify categorically the problems, obstacles faced by the people and the solutions from their end. In this connection the opinion of the stakeholders about how these were tackled and what should be the better options for handling these. PRA for Chowhali upazilla of Sirajgonj was planned to be completed in four sessions with three different categories of people viz two sessions with local people in two groups, one session with civil society and the rest with the government officials. Accordingly two sessions of PRA with the local people, one session with civil society and one session with government officials were launched. Again Each PRA was accomplished through four stages viz. listing the problems, solutions and social mappings activities.

As mentioned before PRA is participatory program with the stakeholders, therefore at the beginning of five days of program the team were engaged in first two days for preparing and organizing the stakeholders and in the last three days PRA sessions with the stakeholders were done . To organize the PRA the team contacted and sought cooperation of the Upazilla Chairman,the respective Upazilla Nirbahi Officer (UNO), local leaders, local people and government officials. The venue for PRA sessions was set at the teachers auditorium. Principal of the Chowhali degree college arranged and gave cooperation in this respect. Upazilla Nirbahi Officer of Chowhali Upazilla gave cooperation for conducting PRA sessions. It was a very tough job for organizing such a program only in two days. The participatory group or stakeholders were very spontaneous in their participation. They were very much open in their discussions and requested strongly to produce their distressed situation mainly by the river erosion .The team with utmost effort accomplished the job successfully. Below is given the chronological description of the four sessions of the PRA.

Inaugural session:

The inaugural session of the PRA was held on 7/4/2015. Upazilla Nirbahi Officer of the Upazilla Mr. Rezaul Bari inaugurated the session and gave his valuable speech to the participants hoped the session will bring positive results for protecting and planning for future development of the Upazilla. He expressed his concern about the devastating erosion of land by mighty Jamuna and told that if this erosion is not controlled in coming wet season the river might engulf the degree college campus through flood and erosion. He also hoped due to geographical reason that this Upazilla inhabitants might think of their decision for remaining with their existing district or with the adjacent district.

Picture-1. UNO addressing in the PRA

Picture-2.Senior Planner addressing in the PRA

1st PRA session with the local people:

1st PRA session was held on 7/7/15 at the teachers auditorium of the Chowhali Degree College. 15 (Fifteen) participants from different localities attended the sessions. In the beginning of the session Senior Planner in formed them about the mission of the research work . The participants were asked to give their opinion about their major problems, solutions and how they want to see their area with future planning for their area and overall environment. Nearly all the participants noticed and informed through their paper work that they are very much affected firstly by the flood and consequently by river erosion by the mighty Jamuna. They immediately want government interventions for construction of permanent flood protection embankment along the river side before the coming wet season.

Picture-3. PRA participants showing problems.

Picture-4.PRA participants showing priorites

They also wanted other facilities for their better environment. They acknowledged that a huge amount of government investment including building, roads, embankments and other establishments have gone under water due to river erosion. In this circumstances they were asked about merging to the adjacent Nagorpur Upazilla of Tangail district. In this session a mixed opinion was found about merging

2nd PRA session with the civil society:

2nd PRA session was held on 08/04/15 at the teachers auditorium of the Chowhali Degree College. 15 (Fifteen) respected participants including college teachers, senior school teacher, local leaders from different localities attended the sessions. At the beginning of the session Senior Planner gave a brief speech about the mission of the research work, aim, objectives and expected output from the PRA session.

The participants were asked to give their opinion about their major problems, solutions and how they want to see their area with future planning for betterment and wellbeing of their livelihood and environment. Nearly all the participants noticed through their paper work that they are very much affected firstly by the flood and consequently by river erosion by the mighty Jamuna. They immediately want government interventions for construction of permanent flood protection embankment along the river side before the coming wet season.

They also informed that a project 350 crore taka has been passed by the ECNEC for constructing flood protection embankment but with no allocation of fund. They also want other facilities for their better environment. They acknowledged that a huge amount of government investment including building, roads, embankments and other establishments have gone under water due to river erosion. In this circumstances they were asked about merging to the adjacent Nagorpur Upazilla of Tangail district. In this session a majority of them opined for merging keeping the identity of the upazilla. A few of them differed on this and wanted to remain as usual as an upazilla of Sirajgonj district.

Picture-5. Showing 2nd PRA session

Picture-6.Showing participants in the PRA

3rd PRA session with the Government Officials :

3nd PRA session was also held on 08/04/15 at the teachers auditorium of the Chowhali Degree College. 25 (Twenty five) respected participants including government officials from different offices of the Upazilla,college teachers from different localities attended the sessions. The UNO of the Upazilla was

present and put forward his idea. He mentioned that if stern measure is not taken the college might be affected this year if flood occurs as before. He also informed that an eighty crore taka project of sand sack was started but due to no further allocation the work is running.

Picture-7. Showing 2nd PRA session

Picture-8. PRA participants showing problems

Before the coming wet season it should be allocated fully and the work must start. Senior Planner discussed in brief about the mission of the research work, aim, objectives and expected output from the PRA session. The participants were asked to select and prioritized the major problems of the area, solutions and how they want to see the area with future planning for betterment of the people, for betterment of their livelihood and environment. Nearly all the participants noticed through their paper work that area is very much affected mainly the flood and consequently by river erosion by the mighty Jamuna. They also immediately want government interventions for construction of permanent flood protection embankment along the river side before the coming wet season. Upazilla Engineer informed that the soil of the area is totally sandy and sand layer is also deep. Therefore during flood scouring of river bed may go up to 50 feet of depth. Therefore flood protection measures can not sustain.. They acknowledged that a huge amount of government investment including building, roads, embankments and other establishments have gone under water due to river erosion. In this circumstances they were asked about merging to the adjacent Nagorpur Upazilla of Tangail district.Nearly all of them opined for merging of the upazilla with the adjacent Nagorpur Upazilla and the western areas like enayetpur, Sadia chadpur with Shahajadpur Upazilla.

4th PRA session with the local people:

4th PRA session was held on 08/04/15 at the teachers auditorium of the Chowhali Degree College. 15 (Fifteen) participants from different localities attended the sessions. In the beginning of the session Senior Planner in formed them about the mission of the research work. Planner Mr.Fahrul Islam described the working procedure of the PRA and the four stages of listing ,solution and social mappings.

The participants were asked to give their opinion about their major problems, solutions and how they want to see their area with future planning for their area and overall environment. Nearly all the participants noticed and informed through their paper work that they are very much affected firstly by the flood and consequently by river erosion by the mighty Jamuna.

Photo-9.PRA participants showing problems.

Photo-10.PRA participants showing priorites

They immediately want government interventions for construction of permanent flood protection embankment along the river side before the coming wet season. They also want other facilities for their better environment. They acknowledged that a huge amount of government investment including building, roads, embankments and other establishments have gone under water due to river erosion. In this circumstances they were asked about merging to the adjacent Nagorpur Upazilla of Tangail district. In this session a majority of the people did oppose and vehemently reacted negatively about merging with the adjacent upazillas .

Annexure-2

নগর উন্নয়ন অধিদপ্তর
রাজশাহী আঞ্চলিক অফিসঃ 0001 0001

পত্রের নং ৪১৭ তারিখ ০৪/১২/১৪		
এ শাখা	[illegible]	দিন গ্রাম
০৪/১২/১৪	৪/১২/১৪	

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
নগর উন্নয়ন অধিদপ্তর
৮২, গোলবাগিচা, ঢাকা-১০০০
Web site: www.udd.gov.bd
Fax: 9557868
E-mail: director.udd1965@gmail.com

স্মারক নং ২৫.৪৫.০০০০.০০০.২৩.১৭৮.১৪- তারিখ: /১২/২০১৪

প্রাপক : সিনিয়র প্ল্যানার
রাজশাহী আঞ্চলিক অফিস
সপুরা, রাজশাহী।

বিষয় : চৌহালী উপজেলা এর উপর গবেষণা প্রতিবেদন প্রস্তুত প্রসঙ্গে।

উপরোক্ত বিষয়ের উপর একটি গবেষণা প্রতিবেদন প্রস্তুত পূর্বক নগর উন্নয়ন অধিদপ্তরের প্রধান কার্যালয়ে জরুরী ভিত্তিতে প্রেরণের জন্য নির্দেশক্রমে অনুরোধ করা হল।

উল্লেখ্য, সিনিয়র জিওগ্রাফার (রিসার্চ) তার ইউনিটের অন্তর্গত জিওগ্রাফার, সোসিওলজিস্ট, ইকোনোমিস্ট এবং গবেষণা কর্মকর্তাকে নিয়ে কাজটি যৌথভাবে করে যথাযথভাবে সম্পন্ন করবেন।

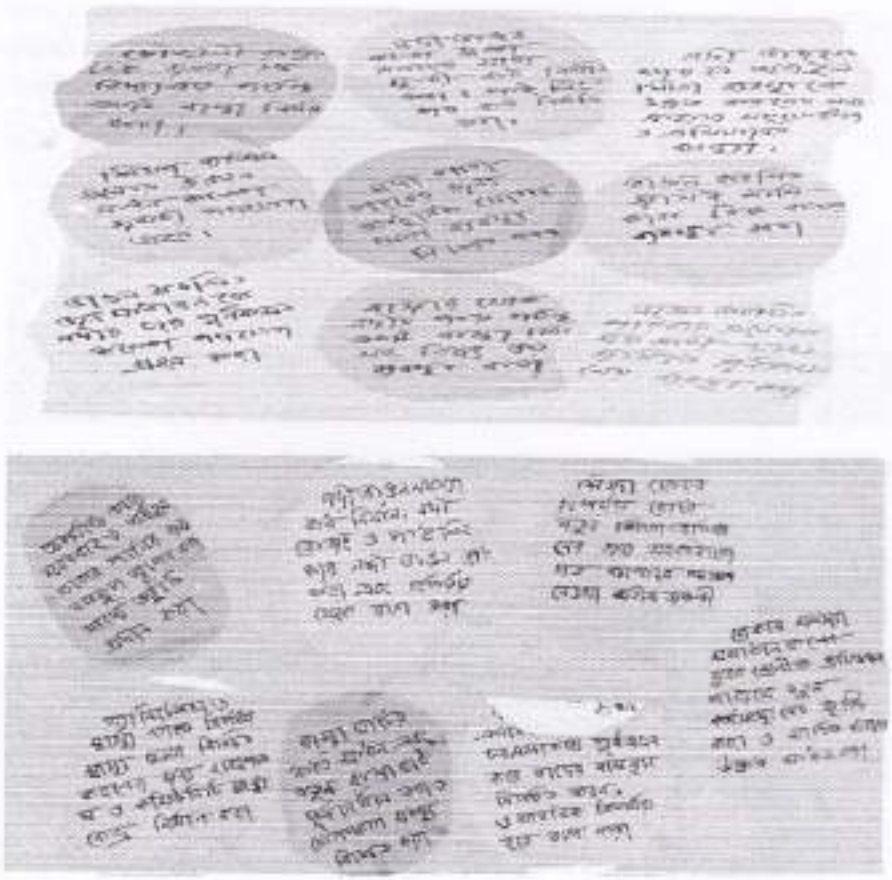
(ড. মো: জেড হোসেন তৌফিক)
উপ-পরিচালক (গ ও স)
নগর উন্নয়ন অধিদপ্তর, ঢাকা।
☎: ৯৫৬৪৭৫৫

স্মারক নং ২৫.৪৫.০০০০.০০০.২৩.১৭৮.১৪- ২৮৯/৭(৮) তারিখ: ৭/১২/২০১৪

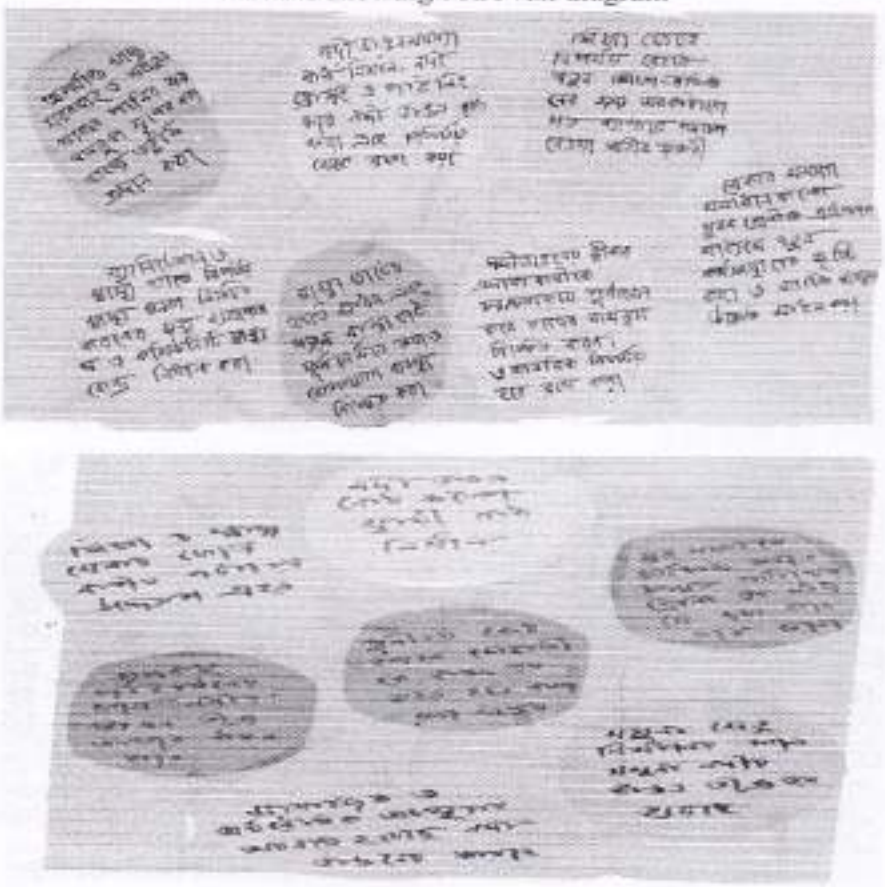
অনুলিপি সদয় অবগতির জন্য:
১। উপ-পরিচালক (পরিবেশ ও সমন্বয়/পরিকল্পনা), নগর উন্নয়ন অধিদপ্তর, ঢাকা।
২। মো: বাহাদুর আলি সিনিয়র জিওগ্রাফার, নগর উন্নয়ন অধিদপ্তর, ঢাকা।
৩। শফিকুল ইসলাম খান, সমাজ বিজ্ঞানী, নগর উন্নয়ন অধিদপ্তর, ঢাকা।
৪। মো: মোকসেদুর রহমান, অর্থনীতিবিদ, নগর উন্নয়ন অধিদপ্তর, ঢাকা।
৫। ইশরাত জাহান, গবেষণা কর্মকর্তা, নগর উন্নয়ন অধিদপ্তর, ঢাকা।
৬। খাইরুউদ্দিন আহমেদ, অর্থনীতিবিদ, নগর উন্নয়ন অধিদপ্তর, ঢাকা।
৭। পরিচালকের মাষ্টার ফাইল।
৮। জোনাল পয়েন্ট কর্মকর্তার মাষ্টার ফাইল।

(মোঃ মোক্তার আলম)
প্রশাসনিক কর্মকর্তা

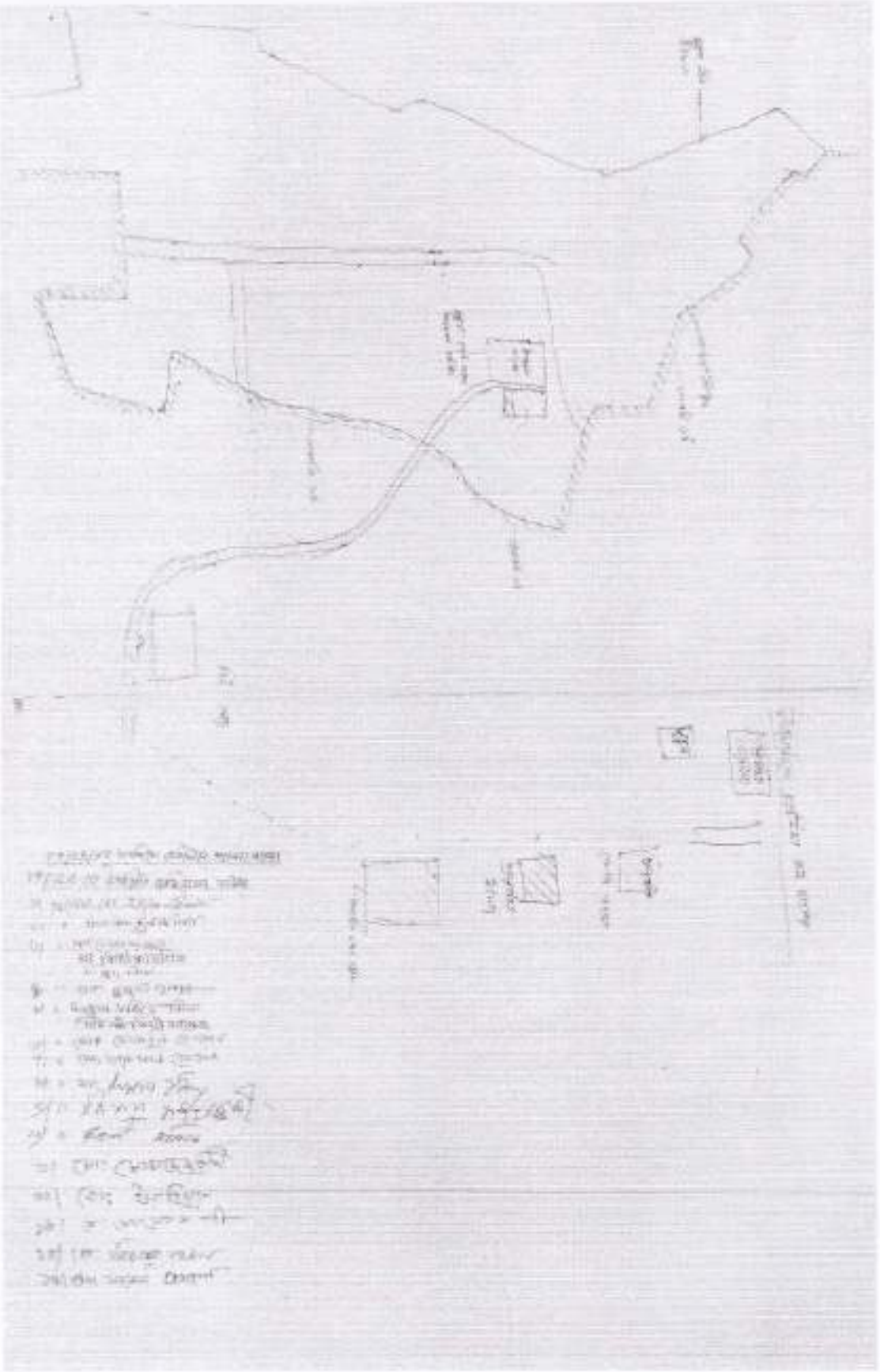
Annexure-3



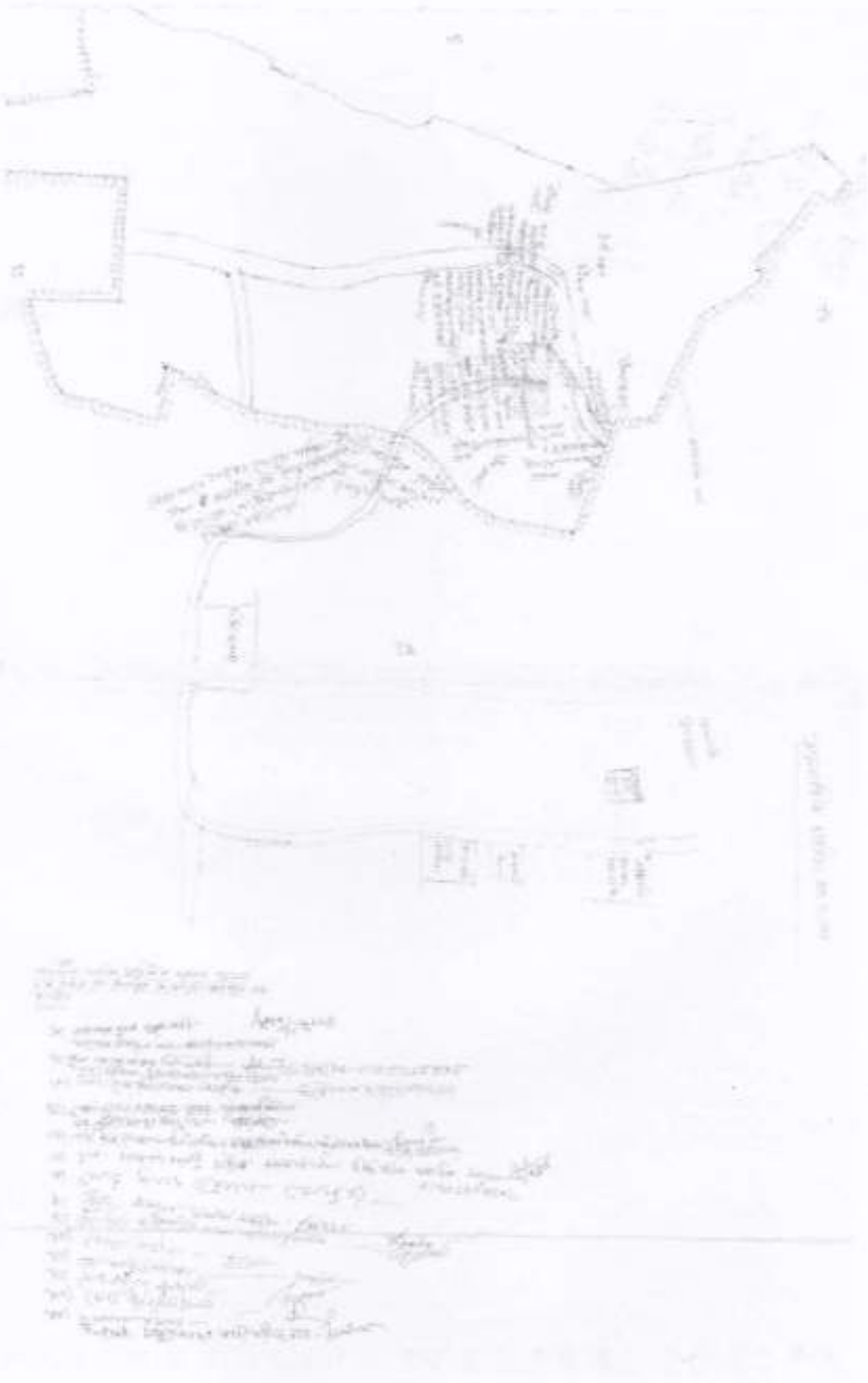
Posters showing PRA van diagram



Posters showing PRA van diagram



Social mappings of PRA

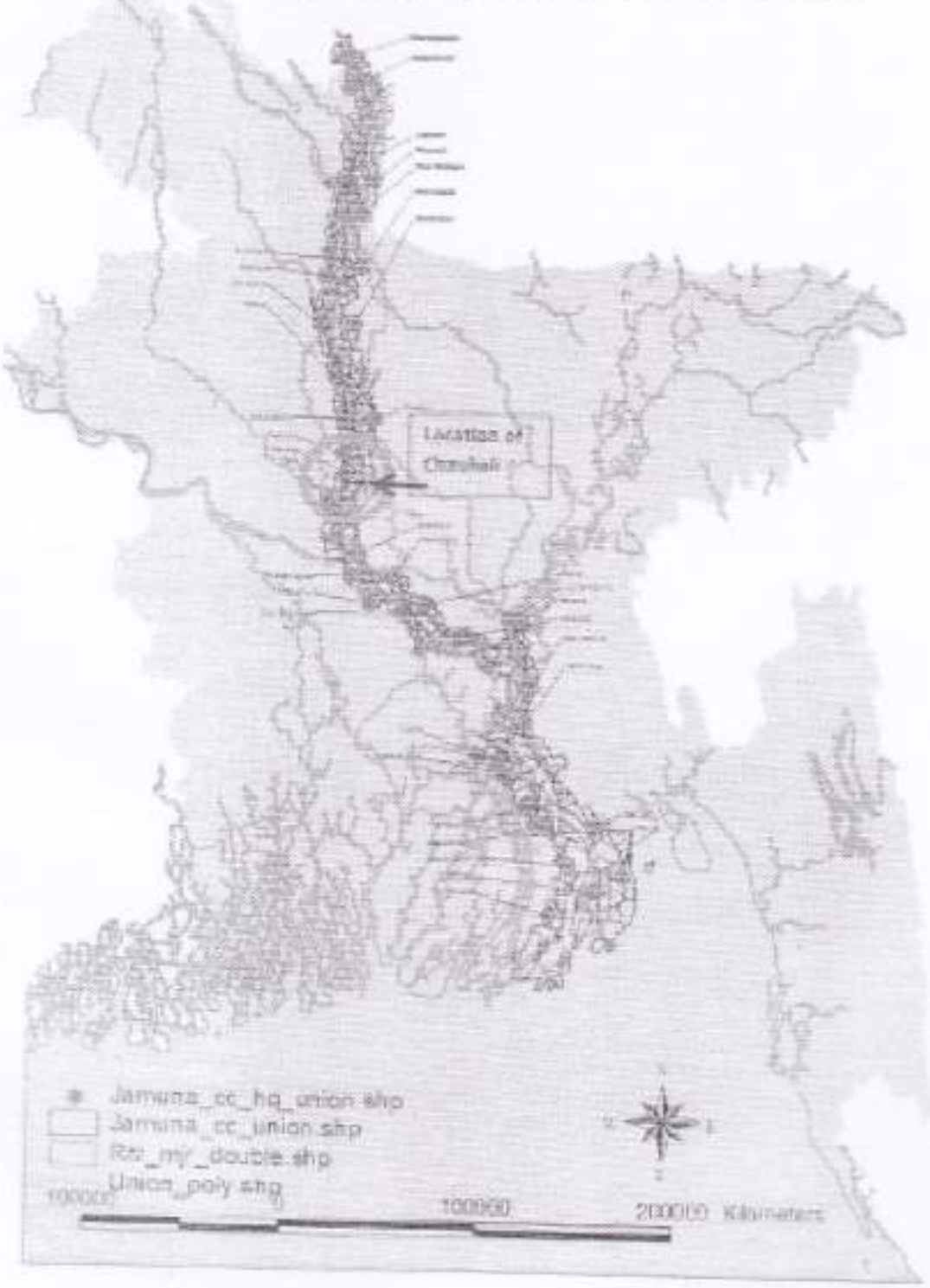


Social mappings of PRA

Social mappings of PRA

Social mappings of PRA

Location of Unions and Thana headquarters
within the main influance zone of Jamuna River



THANA_HQ_I	S/N	DISTNAME	THANA_NAME	TYP	TYPE	TYPE_D
168	1	KURIGRAM	BHURUNGAMARI	2	THQ	Upazila Headquarters
173	2	KURIGRAM	NAGESHWARI	2	THQ	Upazila Headquarters
171	3	KURIGRAM	CHILMARI	2	THQ	Upazila Headquarters
175	4	KURIGRAM	RAUMARI	2	THQ	Upazila Headquarters
170	5	KURIGRAM	CHAR RAJIBPUR	2	THQ	Upazila Headquarters
125	6	JAMALPUR	DEWANGANJ	2	THQ	Upazila Headquarters
162	7	GAIBANDHA	FULCHHARI	2	THQ	Upazila Headquarters
166	8	GAIBANDHA	SAGHATTA	2	THQ	Upazila Headquarters
119	9	BOGRA	SARIAKANDI	2	THQ	Upazila Headquarters
127	10	JAMALPUR	MADARGANJ	2	THQ	Upazila Headquarters
107	11	SIRAJGANJ	KAZIPUR	2	THQ	Upazila Headquarters
65	12	TANGAIL	BHUAPUR	2	THQ	Upazila Headquarters
103	13	SIRAJGANJ	SIRAJGANJ	1	DHQ	District Headquarters
104	14	SIRAJGANJ	BELKUCHI	2	THQ	Upazila Headquarters
105	15	SIRAJGANJ	CHAUHALI	2	THQ	Upazila Headquarters
91	16	PABNA	BERA	2	THQ	Upazila Headquarters
249	17	MANIKGANJ	SHIBALAYA	2	THQ	Upazila Headquarters
252	18	MANIKGANJ	HARIRAMPUR	2	THQ	Upazila Headquarters
243	19	RAJBARI	GOALANDAGHAT	2	THQ	Upazila Headquarters
352	20	FARIDPUR	FARIDPUR	1	DHQ	District Headquarters
437	21	DHAKA	DOHAR	2	THQ	Upazila Headquarters
356	22	FARIDPUR	CHAR BHADRASAN	2	THQ	Upazila Headquarters
267	23	MUNSHIGANJ	GAZARIA	2	THQ	Upazila Headquarters
266	24	MUNSHIGANJ	MUNSHIGANJ	1	DHQ	District Headquarters
475	25	MUNSHIGANJ	LOHAJANG	2	THQ	Upazila Headquarters
287	26	CHANDPUR	CHANDPUR	1	DHQ	District Headquarters
289	27	CHANDPUR	HAIM CHAR	2	THQ	Upazila Headquarters
458	28	BARISAL	HIZLA	2	THQ	Upazila Headquarters
381	29	BARISAL	MULADI	2	THQ	Upazila Headquarters
380	30	BARISAL	MEHENDIGANJ	2	THQ	Upazila Headquarters
383	31	BHOLA	BHOLA	1	DHQ	District Headquarters
386	32	BHOLA	DAULATKHAN	2	THQ	Upazila Headquarters
308	33	LAKSHMIPUR	RAMGATI	2	THQ	Upazila Headquarters
389	34	BHOLA	TAZUMUDDIN	2	THQ	Upazila Headquarters
303	35	NOAKHALI	HATIYA	2	THQ	Upazila Headquarters
388	36	BHOLA	MANPURA	2	THQ	Upazila Headquarters
385	37	BHOLA	CHAR FASSON	2	THQ	Upazila Headquarters

Table-8. Showing district and upazilla headquarters affected due to river erosion in the influence zone of the river Jamuna.

S/N	UNIONNAME	THANANAME	DISTNAME	ACRES	HECTARES
1	Shilkhuri	Bhurungamari	Kurigram	619.67	250.77
2	Pathardubi	Bhurungamari	Kurigram	516.26	208.92
3	Tilai	Bhurungamari	Kurigram	423.42	171.35
4	Char Bhurungamari	Bhurungamari	Kurigram	438.85	177.60
5	Bhurungamari	Bhurungamari	Kurigram	665.24	269.22
6	Bangasonahat	Bhurungamari	Kurigram	516.48	209.01
7	Paiker Chhara	Bhurungamari	Kurigram	546.04	220.98
8	Boldia	Bhurungamari	Kurigram	572.01	231.48
9	Andhari Jhar	Bhurungamari	Kurigram	626.91	253.70
10	Kedar	Nageshwari	Kurigram	577.69	233.78
11	Roygonj	Nageshwari	Kurigram	524.65	212.32
12	Bamandanga	Nageshwari	Kurigram	484.85	196.21
13	Kachakata	Nageshwari	Kurigram	611.11	247.31
14	Ballabher Khas	Nageshwari	Kurigram	719.62	291.22
15	Berubari	Nageshwari	Kurigram	461.20	186.64
16	Narayanpur	Nageshwari	Kurigram	1304.33	527.85
17	Kaliganj	Nageshwari	Kurigram	529.61	214.33
18	Noonkhawa	Nageshwari	Kurigram	822.93	333.03
19	Ghogadaha	Kurigram Sadar	Kurigram	624.76	252.83
20	Jatrapur	Kurigram Sadar	Kurigram	1599.93	647.47
21	Saheber Alga	Ulipur	Kurigram	2313.36	936.19
22	Begumganj	Ulipur	Kurigram	1101.16	445.63
23	Buraburi	Ulipur	Kurigram	904.31	365.96
24	Hatia	Ulipur	Kurigram	720.43	291.55
25	Bandaber	Raumari	Kurigram	1358.52	549.78
26	Raniganj	Chilmari	Kurigram	584.66	236.60
27	Nayernat	Chilmari	Kurigram	1307.73	529.22
28	Ashtamir Char	Chilmari	Kurigram	1720.75	696.37
29	Ramna	Chilmari	Kurigram	483.32	195.59
30	Chilmari	Chilmari	Kurigram	613.50	248.28
31	Haripur	Sundarganj	Gaibandha	792.82	320.84
32	Kapasia	Sundarganj	Gaibandha	1503.61	608.49
33	Chandipur	Sundarganj	Gaibandha	496.41	200.89
34	Kodalkati	Char Rajibpur	Kurigram	595.27	240.90
35	Mohanganj	Char Rajibpur	Kurigram	1290.73	522.34
36	Kamarjani	Gaibandha Sadar	Gaibandha	724.43	293.17
37	Moliar Char	Gaibandha Sadar	Gaibandha	754.07	305.16
38	Gidari	Gaibandha Sadar	Gaibandha	537.73	217.61
39	Erendabari	Fulchhari	Gaibandha	2065.91	836.05
40	Fazlupur	Fulchhari	Gaibandha	1717.30	694.97
41	Kanchi Para	Fulchhari	Gaibandha	631.82	255.69
42	Uria	Fulchhari	Gaibandha	557.14	225.47
43	Gazaria	Fulchhari	Gaibandha	643.97	260.61
44	Chikajani	Dewanganj	Jamalpur	807.45	326.76
45	Fulchhari	Fulchhari	Gaibandha	1145.53	463.58
46	Chukaibari	Dewanganj	Jamalpur	642.56	260.04
47	Kulkandi	Islampur	Jamalpur	654.82	265.00
48	Belgachha	Islampur	Jamalpur	848.68	343.45
49	Haldia	Saghatta	Gaibandha	1084.57	438.91

Table-9 Showing district and upazilla headquarters affected due to river erosion in the influence zone of the river Jamuna.

50	Chinadulli	Islampur	Jamalpur	552.22	223.48
51	Sapdhari	Islampur	Jamalpur	792.69	320.79
52	Chaluabari	Sariakandi	Bogra	1453.41	588.18
53	Noapara	Islampur	Jamalpur	945.21	382.52
54	Tekani Chukainagar	Sonatola	Bogra	363.07	146.93
55	Pakulta	Sariakandi	Bogra	543.37	219.89
56	Kazla	Sariakandi	Bogra	1563.19	632.60
57	Hat Sherpur	Sariakandi	Bogra	636.45	257.57
58	Balijuri	Madarganj	Jamalpur	1003.51	406.11
59	Sariakandi	Sariakandi	Bogra	579.91	234.68
60	Karnibari	Sariakandi	Bogra	1289.33	521.77
61	Jorekhali	Madarganj	Jamalpur	940.68	380.68
62	Kutubpur	Sariakandi	Bogra	438.70	177.54
63	Bohail	Sariakandi	Bogra	1431.49	579.30
64	Chandan Baisha	Sariakandi	Bogra	297.33	120.33
65	Kamalpur	Sariakandi	Bogra	503.81	203.89
66	Khas Rajbari	Kazipur	Sirajganj	958.67	387.96
67	Char Girish	Kazipur	Sirajganj	1615.32	653.70
68	Bhandarbari	Dhunat	Bogra	528.19	213.75
69	Maijbari	Kazipur	Sirajganj	432.66	175.09
70	Natuar Para	Kazipur	Sirajganj	721.48	291.97
71	Kazipur	Kazipur	Sirajganj	629.35	254.69
72	Nishchintapur	Kazipur	Sirajganj	703.63	284.75
73	Aona	Sarishabari	Jamalpur	748.13	302.76
74	Tekani	Kazipur	Sirajganj	902.71	365.32
75	Pingna	Sarishabari	Jamalpur	852.00	344.80
76	Subhagachha	Kazipur	Sirajganj	674.46	272.95
77	Mechhra	Sirajganj Sadar	Sirajganj	1206.12	488.10
78	Arjuna	Bhuapur	Tangail	915.22	370.38
79	Chhangachha	Sirajganj Sadar	Sirajganj	621.44	251.49
80	Kaoakola	Sirajganj Sadar	Sirajganj	739.99	299.46
81	Gabsara	Bhuapur	Tangail	1773.00	717.51
82	Khoksabari	Sirajganj Sadar	Sirajganj	451.03	182.53
83	Paurashava	Sirajganj Sadar	Sirajganj	434.67	175.91
84	Gobindasi	Bhuapur	Tangail	536.42	217.08
85	Nikrail	Bhuapur	Tangail	1025.90	415.17
86	Kalia Haripur	Sirajganj Sadar	Sirajganj	746.75	302.20
87	Saidabad	Sirajganj Sadar	Sirajganj	715.69	289.63
88	Durgapur	Kalihati	Tangail	1324.65	536.07
89	Rajapur	Belkuchi	Sirajganj	667.04	269.94
90	Kakua	Tangail Sadar	Tangail	923.81	373.85
91	Belkuchi	Belkuchi	Sirajganj	629.07	254.58
92	Bara Dhul	Belkuchi	Sirajganj	670.42	271.31
93	Hugra	Tangail Sadar	Tangail	642.15	259.87
94	Sadia Chandpur	Chauhali	Sirajganj	1085.79	439.41
95	Katuli	Tangail Sadar	Tangail	1208.51	489.07
96	Sthal	Chauhali	Sirajganj	1022.04	413.61
97	Jalalpur	Shahjadpur	Sirajganj	379.10	153.42
98	Kaijuri	Shahjadpur	Sirajganj	661.20	267.58
99	Bhara	Nagarpur	Tangail	858.75	347.53

Table-10. Showing district and upazilla headquarters affected due to river erosion in the influence zone of the river Jamuna.

100	Gharjan	Chauhali	Sirajganj	761.98	308.36
101	Sonatani	Shahjadpur	Sirajganj	723.86	292.94
102	Mirkutia	Chauhali	Sirajganj	1369.40	554.18
103	Gala	Shahjadpur	Sirajganj	667.29	270.04
104	Paurashava	Bera	Pabna	417.29	168.87
105	Omarpur	Chauhali	Sirajganj	1363.86	551.94
106	Haturia Nakalia	Bera	Pabna	732.09	296.27
107	Nutan Bharenga	Bera	Pabna	996.12	403.12
108	Char Katari	Daulatpur	Manikganj	528.12	213.72
109	Bachamara	Daulatpur	Manikganj	822.46	332.84
110	Puran Bharenga	Bera	Pabna	615.10	248.92
111	Jotsakhni	Bera	Pabna	774.04	313.24
112	Baghutia	Daulatpur	Manikganj	1100.53	445.37
113	Ruppur	Bera	Pabna	674.92	273.13
114	Teota	Shibalaya	Manikganj	1458.44	590.21
115	Masundia	Bera	Pabna	674.67	273.03
116	Dhalar Char	Bera	Pabna	991.48	401.24
117	Shibalaya	Shibalaya	Manikganj	497.42	201.30
118	Daulatdia	Goalandaghat	Rajbari	1539.81	623.14
119	Debagram	Goalandaghat	Rajbari	571.06	231.10
120	Arua	Shibalaya	Manikganj	449.16	181.77
121	Gopinathpur	Harirampur	Manikganj	406.74	164.60
122	Chhota Bhakla	Goalandaghat	Rajbari	315.49	127.67
123	Ujan Char	Goalandaghat	Rajbari	1122.51	454.27
124	Kanchanpur	Harirampur	Manikganj	519.11	210.08
125	Boyra	Harirampur	Manikganj	366.78	148.43
126	Ramkrishnapur	Harirampur	Manikganj	359.36	145.43
127	Harukandi	Harirampur	Manikganj	396.87	160.61
128	Lesraganj	Harirampur	Manikganj	982.15	397.46
129	Uttar Channel	Faridpur Sadar	Faridpur	1426.83	577.42
130	Dhulsunra	Harirampur	Manikganj	384.54	155.62
131	Char Madhabdia	Faridpur Sadar	Faridpur	619.38	250.66
132	Sutalari	Harirampur	Manikganj	366.91	148.48
133	Azimnagar	Harirampur	Manikganj	612.82	248.00
134	Nayabari	Dohar	Dhaka	305.69	123.71
135	Kushumhati	Dohar	Dhaka	411.86	166.67
136	Decreerchar	Faridpur Sadar	Faridpur	544.24	220.25
137	Roypara	Dohar	Dhaka	220.12	89.08
138	Char Harirampur	Char Bhadrasan	Faridpur	1178.74	477.02
139	Joypara	Dohar	Dhaka	171.18	69.27
140	Char Jhaukanda	Char Bhadrasan	Faridpur	464.36	187.92
141	Sutar Para	Dohar	Dhaka	359.64	145.54
142	Mahmudpur	Dohar	Dhaka	1061.27	429.48
143	Narisha	Dohar	Dhaka	414.16	167.60
144	Char Bhadrasan	Char Bhadrasan	Faridpur	732.49	296.43
145	Muksudpur	Dohar	Dhaka	336.07	136.00
146	Paurashava	Munshiganj Sadar	Munshiganj	358.19	144.95
147	Gazaria	Gazaria	Munshiganj	441.72	178.76
148	Baghra	Sreenagar	Munshiganj	414.29	167.66
149	Narikelbaria	Sadarpur	Faridpur	1330.94	538.62

Table-11 Showing headquarters affected due to river erosion in the influence zone of the river Jamuna.

150	Imampur	Gazaria	Munshiganj	569.16	230.33
151	Akter Char	Sadarpur	Faridpur	746.97	302.29
152	Char Kewar	Munshiganj Sadar	Munshiganj	559.28	226.33
153	Bhagyakul	Sreenagar	Munshiganj	372.24	150.64
154	Char Nasirpur	Sadarpur	Faridpur	646.92	261.80
155	Dheukhali	Sadarpur	Faridpur	575.42	232.86
156	Char Janajat	Shib Char	Madaripur	1032.19	417.71
157	Kanaksar	Lohajang	Munshiganj	178.84	72.38
158	Satnal	Matlab	Chandpur	440.24	178.16
159	Medini Mandal	Lohajang	Munshiganj	374.76	151.66
160	Adhara	Munshiganj Sadar	Munshiganj	782.06	316.49
161	Haldia	Lohajang	Munshiganj	208.11	84.22
162	Bejgaon	Lohajang	Munshiganj	186.02	75.28
163	Gaodia	Lohajang	Munshiganj	346.70	140.31
164	Kumarbhog	Lohajang	Munshiganj	251.59	101.82
165	Sangar Char	Matlab	Chandpur	429.96	174.00
166	Mohanpur	Matlab	Chandpur	847.34	342.91
167	Kalma	Lohajang	Munshiganj	291.14	117.82
168	Kanthalbari	Shib Char	Madaripur	923.20	373.61
169	Lohajang	Lohajang	Munshiganj	264.36	106.98
170	Bandarkhola	Shib Char	Madaripur	314.70	127.36
171	Teotia	Lohajang	Munshiganj	286.23	115.84
172	Dhaida	Lohajang	Munshiganj	289.67	117.22
173	Matbarer Char	Shib Char	Madaripur	496.46	200.91
174	Char Manair	Sadarpur	Faridpur	409.26	165.62
175	Hasail Banari	Tongibari	Munshiganj	377.32	152.70
176	Char Silai	Munshiganj Sadar	Munshiganj	701.52	283.90
177	Purba Naodoba	Zanjira	Shariatpur	585.60	236.99
178	Sannyasir Char	Shib Char	Madaripur	431.80	174.74
179	Paler Char	Zenjira	Shariatpur	1079.21	436.74
180	Dighir Para	Tongibari	Munshiganj	165.65	67.04
181	Kalakanda	Matlab	Chandpur	344.60	139.46
182	Naodoba	Zanjira	Shariatpur	379.92	153.75
183	Kutubpur	Shib Char	Madaripur	341.07	138.03
184	Noapara	Naria	Shariatpur	1102.80	446.29
185	Kunder Char	Zanjira	Shariatpur	922.31	373.25
186	Eklaspur	Matlab	Chandpur	619.47	250.69
187	Kachikata	Bhedarganj	Shariatpur	1715.02	694.05
188	Jahirabad	Matlab	Chandpur	343.20	138.89
189	Farajikandi	Matlab	Chandpur	528.87	214.03
190	Char Atra	Naria	Shariatpur	489.52	198.10
191	Gharisar	Naria	Shariatpur	606.53	245.46
192	Rajrajeshwar	Chandpur Sadar	Chandpur	1615.10	653.61
193	Bishnupur	Chandpur Sadar	Chandpur	696.09	281.70
194	Kedarpur	Naria	Shariatpur	226.70	91.74
195	Kalyanpur	Chandpur Sadar	Chandpur	541.11	218.98
196	Tarabunia	Bhedarganj	Shariatpur	1451.74	587.50
197	Tarpur Chandi	Chandpur Sadar	Chandpur	256.22	103.69
198	Paurashava	Chandpur Sadar	Chandpur	146.63	59.34
199	Ibrahimpur	Chandpur Sadar	Chandpur	857.09	346.85

Table-12 Showing union headquarters affected due to river erosion in the influence zone of the river Jamuna.

200	Sakhua	Chandpur Sadar	Chandpur	342.33	138.54
201	Hanar Char	Chandpur Sadar	Chandpur	409.64	165.78
202	Gariber Char	Gosairhat	Shariatpur	885.39	358.31
203	Nilkamal	Haim Char	Chandpur	1442.18	583.63
204	Gazipur	Haim Char	Chandpur	280.03	113.33
205	Kodalpur	Gosairhat	Shariatpur	1361.82	551.11
206	Haim Char	Haim Char	Chandpur	560.21	226.71
207	Char Bhairabi	Haim Char	Chandpur	490.62	198.55
208	Harinathpur	Hizla	Barisal	2025.50	819.69
209	Hizla Gaurabdi	Hizla	Barisal	2854.36	1155.12
210	Char Bangshi	Roypur	Lakshmipur	2113.50	855.31
211	Memania	Hizla	Barisal	832.58	336.93
212	Guabaria	Hizla	Barisal	679.71	275.07
213	Bara Jalia	Hizla	Barisal	778.83	315.18
214	Shak Char	Lakshmipur Sadar	Lakshmipur	2265.37	916.77
215	Gobindapur	Mehendiganj	Barisal	1343.39	543.65
216	Dhulkhola	Hizla	Barisal	663.81	268.63
217	Char Ekkaria	Mehendiganj	Barisal	983.98	398.21
218	Ulania	Mehendiganj	Barisal	567.83	229.79
219	Rajapur	Bhola Sadar	Bhola	2781.18	1125.51
220	Chandpur	Mehendiganj	Barisal	446.89	180.85
221	Mehendiganj	Mehendiganj	Barisal	794.19	321.40
222	Madanpur	Daulatkhan	Bhola	2555.56	1034.20
223	Char Kalkini	Ramgati	Lakshmipur	877.58	355.14
224	Gazipur	Bhola Sadar	Bhola	443.48	179.47
225	Illisha	Bhola Sadar	Bhola	1418.34	573.98
226	Char Falcon	Ramgati	Lakshmipur	862.94	349.22
227	Kachia	Bhola Sadar	Bhola	401.80	162.61
228	Bapta	Bhola Sadar	Bhola	429.90	173.98
229	Dhania	Bhola Sadar	Bhola	463.60	187.61
230	Medua	Daulatkhan	Bhola	2216.47	896.98
231	Char Alexandar	Ramgati	Lakshmipur	1393.20	563.81
232	Char Shibpur	Bhola Sadar	Bhola	304.00	123.02
233	Char Algi	Ramgati	Lakshmipur	710.68	287.60
234	Paurashava	Bhola Sadar	Bhola	53.51	21.65
235	Char Abdullah	Ramgati	Lakshmipur	2667.24	1079.40
236	Alinagar	Bhola Sadar	Bhola	281.92	114.09
237	Char Ramiz	Ramgati	Lakshmipur	526.25	212.97
238	Bhabanipur	Daulatkhan	Bhola	421.48	170.57
239	Hajipur	Daulatkhan	Bhola	982.47	397.59
240	Char Pata	Daulatkhan	Bhola	526.43	213.04
241	Uttar Joynagar	Daulatkhan	Bhola	448.93	181.68
242	Bara Kheri	Ramgati	Lakshmipur	483.93	195.84
243	Char Khalifa	Daulatkhan	Bhola	439.59	177.90
244	Saidpur	Daulatkhan	Bhola	582.98	235.93
245	Char Gazi	Ramgati	Lakshmipur	464.49	187.97
246	Chandnandi	Hatiya	Noakhali	2420.36	979.49
247	Harni	Hatiya	Noakhali	5194.13	2102.00
248	Bara Malancha	Tazumuddin	Bhola	1506.03	609.47
249	Sonapur	Tazumuddin	Bhola	4365.23	1766.55

Table-13. Showing union headquarters affected due to river erosion in the influence zone of the river Jamuna

250	Hassan Nagar	Burhanuddin	Bhola	535.51	216.72
251	Sukh Char	Hatiya	Noakhali	1212.14	490.54
252	Chandpur	Tazumuddin	Bhola	856.76	346.72
253	Chanchra	Tazumuddin	Bhola	1032.65	417.90
254	Manpura	Manpura	Bhola	2862.81	1158.54
255	Char King	Hatiya	Noakhali	2459.49	995.32
256	Char Ishwar	Hatiya	Noakhali	1562.92	632.49
257	Dhali Gaurnagar	Lalmohan	Bhola	1175.85	475.85
258	Lord Hardinje	Lalmohan	Bhola	2521.15	1020.28
259	Tamaruddin	Hatiya	Noakhali	2153.40	871.45
260	Hajirhat	Manpura	Bhola	2683.48	1085.97
261	Aslampur	Char Fasson	Bhola	789.48	319.49
262	Sonadia	Hatiya	Noakhali	1459.43	590.61
263	Jinnaghar	Char Fasson	Bhola	681.59	275.83
264	Char Manika	Char Fasson	Bhola	7612.50	3080.68
265	Char Madras	Char Fasson	Bhola	1233.41	499.15
266	Hazariganj	Char Fasson	Bhola	2103.17	851.13
267	Sakuchia	Manpura	Bhola	4682.86	1895.10
268	Nalchira	Hatiya	Noakhali	1494.72	604.89
269	Burir Char	Hatiya	Noakhali	2078.28	841.05
270	Jahajmara	Hatiya	Noakhali	3589.89	1452.78

Table-14.Showing union headquarters affected due to river erosion in the influence zone of the river Jamuna.