

Bank Erosion Induced Socio-Economic Vulnerability in Kaliachak-III Block of Malda, District, West Bengal

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ARTICLE DETAILS

Article History

Published Online: 07 August 2018

Keywords

River bank erosion, losses of residents, socio economic status, economic & survival migration, Human Vulnerability. Human's adjustability

ABSTRACT

Bank erosion is becoming a major natural hazard in Malda district, West Bengal. The present study aims to evaluate the socio-economic condition of some selected mouzas (Sultanganj, Palgachhi, Babupur, Jaganathpur and Baishnab Nagar) located along the Ganga River in Kaliachak-III blocks of Malda district where the inhabitants are facing an intense bank erosion hazard in every year. The present study is mainly focused on those people who are harmfully affected by river bank erosion. It tries to show that how people combat with dynamic nature of river in each year and how they lead their life with facing this problem. A semi-structured questionnaire survey was conducted for data collection. The information on losses of livelihoods, generated vulnerabilities, social destruction, impacts on agriculture, impacts on environment, relief and benefit for erosion victims and livelihood dependency on the river were collected through semi-structured questionnaire survey. The present study shows that migration due to bank line shifting, land loss, changed livelihood pattern and disrupted societal environment are the most common problems in every village.

1.1 Introduction:

Riverbank erosion is a "geo-morphological process of alluvial floodplain rivers". Simply it is defined as the process of wearing of the banks of a stream river. It is because of bank adjustment, bank trampling, and changes in bed elevation and topography in reaction to modified flow conditions or bank resistance. Bank erosion is a natural process; without it rivers would not meander and change occurs. River erosion is the wearing a way of bank materials of a river and it is a dynamic process affecting the concave side of the bank, while depositing sediments on the opposite side (Chatterjee 2013). Considerably human beings have a tendency to settle in the flood plain area due to better facility. So population displacement due to flood and river erosion is considered as one of the main contributors to landlessness and impoverishment of rural population (Ahmed 1991). On the other hand, huge population pressure and migration also create a tendency to establish a new colony/village in the open place of the river flood plain. This increasing population unscientifically converse the land of river bank area by developing houses, cultivated land, transport ways etc. and as a result develops a vulnerable area. Improper utilization of land causes impact on the vulnerability status of the existing socio-economic condition of the population (Hamza et.al 1998, Sarthak et. al 2015) This increasing population unscientifically converse the land of river bank area by developing houses, cultivated land, transport ways etc. and as a result develops a vulnerable area (Bhowmick, 2016). Vulnerability to bank erosion is not only more intense by physical forces but also demographic and socio-economic variables which increase the vulnerability of the existing population to such river related hazard (McBean et al 2009, Sanyal et al 2005, Mejia-Navarro et al 1994).

River banks are particularly vulnerable to this type of failure and it causes bank undercutting, bed degradation, and basal clean-out. Channel down cutting rate is determined by

weathering, breakdown and transportation of boulders (Seidl et al, 1997). Gravitational failure includes shallow and rotational slides, slab and cantilever failures, and earth flows and dry granular flows. It is the process of detaching sediment primarily from a bank and transporting it fluvial. Unlike other rivers of India the rivers of the Sub-Himalayan North Bengal region experience massive bank erosion. These rivers cause bank erosion every year during the monsoon season. People suffer a lot due to the bank erosion of these rivers (Karmakar, ISSN NO: 2348 – 537X). However the present study first describes the nature of bank erosion of these rivers and then it proceeds to describe the impact of bank erosion on the human life with case studies. The study ends with an account of some preventive measures to reduce the severity of bank erosion. Natural hazards are those events which cannot be prevented from occurring but their impacts can be reduced if effective measures are taken to reduce their severity, frequency and possible size. River bank erosion are dynamic and natural processes which have an adverse impact on livelihood as homesteads are destroyed, cultivatable lands are wiped out and employment opportunities are reduced (Konwar, 2013). Migrating streams tend to erode the banks and widen the channels by undercutting and bank caving the eroded material is then washed away by the flow. Bank erosion may also occur when a streams shift laterally along the dip of the rocks leading to concentrated erosion on one of the channel banks. The textural and stratigraphical characteristics of the material, as well as the presence of vegetation determine the bank resistance and stability (Baishya, 2013). The obstruction of the normal flow of the river Ganga caused due to construction of Farakka Barriage which promoted the clogging of huge amount of sediments and formed bars, shoal, and emerged char land on the river bed and have changed the direction and flow velocity of the river (Mandal, 2016).

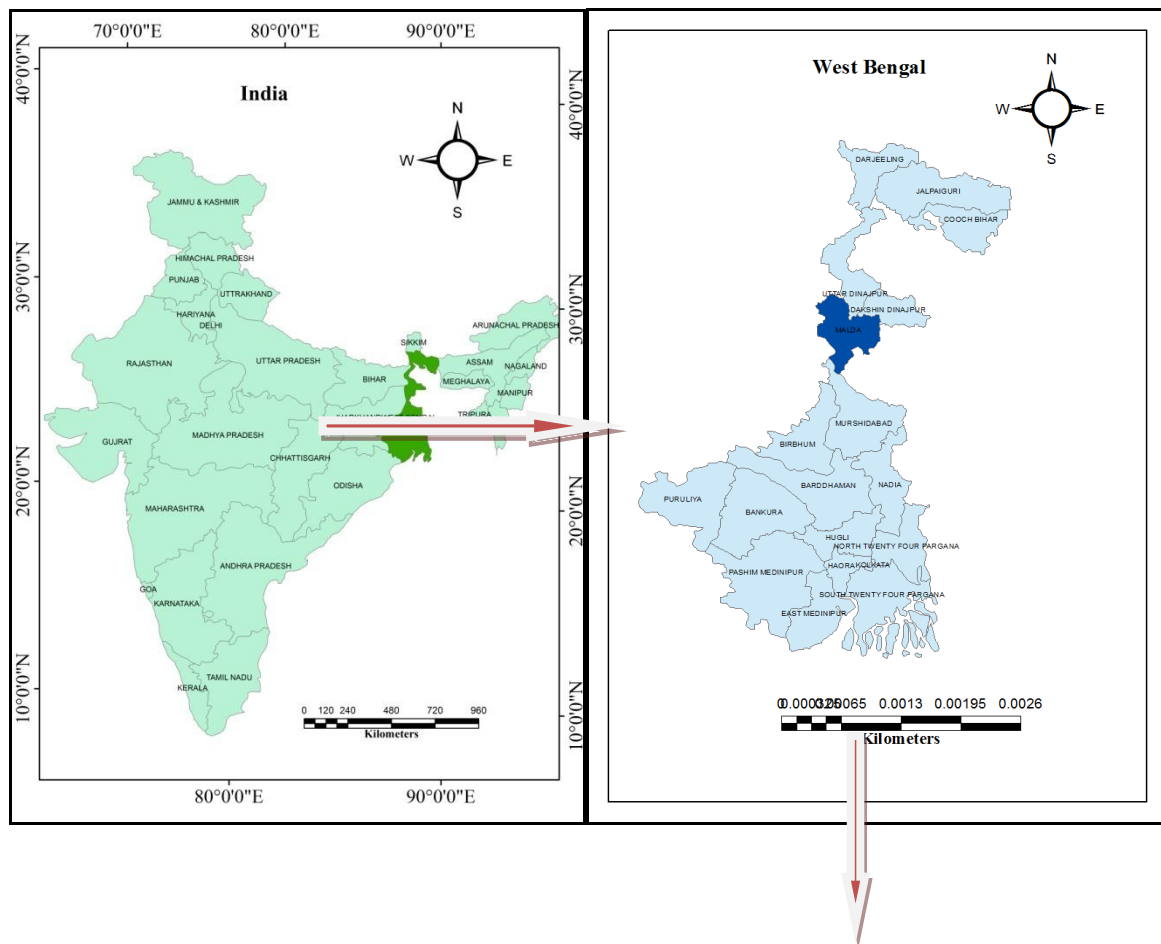
River bank erosion of Ganga River is one of the major problems in Malda district. Every year almost thousands of people become homeless and they lose their homestead and cropland Mosques, schools, hospitals and other infrastructures are damaged due to erosion into the mighty Ganga River. The erosion affected people migrate to nearest town or villages and they live in the urban slum areas (Nazimuddin & Rahman, 2011).

The River Ganga has to carry millions of tonnes of sediment load and deposit on the river bed environment. Such deposition of sediment creates some problems like the decrease in the river depth which influences the direction and velocity of flow. The changes in the flow character as a result of siltation and sedimentation as well as variation in discharge invite bank erosion in Malda (Mandal, 2016). The construction of Farrakka Barrage plays a significant role in the clogged of sediments on the river bed and problems of river bank erosion in Malda. The construction of Farrakka Barrage was started in 1962 and completed in 1971. The 2.64 km barrage was constructed was established to divert 40, 000 cusecs water towards Bhagirathi River to flush the sediments into the deepest part of the estuary to improve the navigational status

of the Kolkata Port (Rudra, 2004).The obstruction leads to the river to make of her own way inducing the continuous shift and erosion in the upstream of Farrakka barrage. Mainly two districts Malda and Murshidabad were being affected by river bank erosion (Banerjee and Chakraborty 1983; Banerjee 1999).

The changes in the flow character as a result of siltation and sedimentation as well as variation in discharge invite bank erosion in Malda. The construction of Farrakka Barrage plays a significant role in the clogged of sediments on the river bed and problems of river bank erosion in Malda district. The present study will examine the impact of land erosion on the people and their livelihood. The land loss and displacements will be considered. Some demographic parameters will be discussed including flood and erosion induced out-migration of those people who are residing along the riverbank of the Ganga in the district of Malda. Malda has been chosen because its people have so often been a victim of land erosion. The study will try to show that how the nature of bank erosion and land erosion happened displacement of people, poses their poverty and livelihood and what kind of government strategies have been taken for affected people.

1.2 Study Area



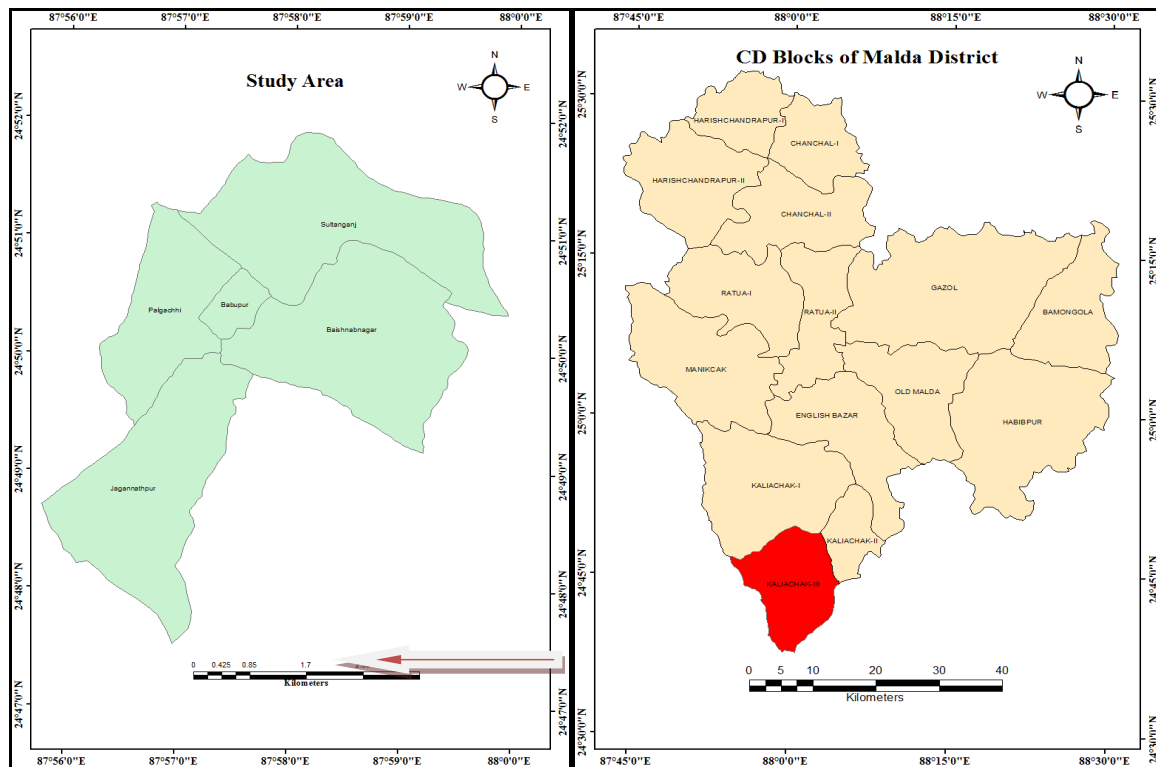


Fig.1 Location of Study Area (Jaganathpur, Palgachhi, Sultanganj, Babupur and Baishnab

Malda district also spelled as Maldah or Maldaha is a district in West Bengal, India. It lies 347 km (215 miles) north of Kolkata, the state capital. Spreading over an area of 3733 sq.km with a population of 32.91 lakhs according to 2011 census, the district of Malda covers 4.2 percent of the total landmass of the state of West Bengal and is home to 4.1 percent of the total State population. Located between latitudes 24°40'20"N and 25°32'8"N, and longitudes 87°45'50"E to 88°28'10"E, the district is bounded to its due south by the district of Murshidabad across the river Ganga, by Bangladesh and Dakshin Dinajpur district to its east and northeast, by Uttar Dinajpur district to its direct north and by the states of Bihar to its direct west and Jharkhand across the Ganga to the southwest.

For the present research work of riverbank erosion, Sultanganj, Palgachhi, Babupur, Jaganathpur and Baishnab Nagar area in Kaliachak III block have been selected. Sultanganj, Palgachhi, Babupur, Jaganathpur and Baishnab Nagar area in Kaliachak-III block is one of the Bank erosion affected area of Malda district because these area is situated beside the bank of river Ganga. The latitudinal and longitudinal extensions of these areas are 24°47'30"N and 24°52'00"N and 87°56'00"E to 88°00'30"E respectively. It belongs to Jalpaiguri division. It is located 22 km towards south from District Head Quarters English Bazar and 325 km from state capital Kolkata. At first time in 1963, this region, almost 30 km upstream of the Farakka barrage, came under the threat of erosion when the reach between Rajmahal and Farakka was straight, the river started meandering towards the left bank.

1.3 Problems of Study Area:

The study area faces so many problems such as bank erosion, floods, job crisis, robbery etc. The most dangerous problem of the study area is bank erosion and its harmful effect

on the people. Many of them become homeless, landless, jobless and become helpless.

1.4 Objective of the Study Area:

River bank erosion is one of the major natural calamities of Malda district that took place in almost every year. The effect of this disaster is widespread. The main aim of the study is to find out socio-economic vulnerability in Kaliachak-III block of Malda district for river bank erosion induces. Some objectives have been identified to fulfill the study goal, which are:

1. To understand nature and extent of River bank erosion.
2. To assess the socio economic status of river bank erosion affected people.
3. To analysis river bank erosion induced human vulnerability.

1.5 Data Source and Methodology:

The entire study has been done by the help of both primary and secondary data. Primary data has been collected from the field survey on Sultanganj, Palgachhi, Babupur, Jaganathpur and Baishnab Nagar mouzas in Kaliachak-III block in Malda district. The secondary data have been collected from the google earth software.

Primary data are generated by interviewing people upon property, livelihood and life style desire village schedule and household based questionnaires through intensive field survey and also our personal observations. River shifting status are also tried to understand through the discussion with village people because they are regular observers.

On the other hand year wise flood related secondary data are collected from Census of India and some existing flood or bank erosion related literatures. For represent the socio-economic profile of flood affected people and different aspects

related effect of flood on those people, I used some tables and Maps. The maps were generated through the help of modern technique, Arc GIS 10.3 software. Source of most of the tables in our study are our field survey and very few amount of table are taken from the topic related existing literature.

For the Primary data data was collected and analysis by following ways:

Field survey:

The survey has been started southern part (Jaganathpur) and finished North-Western part (Sultanganj) of my study area.

Data type	Methods of collection	sources
Surrounding environment of the study area	Observation and people's perception	Primary field survey
Estimation economic condition of the study area	Observation and people's perception	Primary field survey
Extent of river bank erosion	Google Earth	Secondary data
Shifting of river Ganga	Observation & Google Earth Software	Primary field survey & secondary data
Socio Economic Condition of effected populations	Household survey	Primary field survey
Human Vulnerability	Household survey	Primary field survey

Post field study:

Data Which Has Been Collected From the Field Survey Is Been Analysis by Following Methods

Calculating Eroded Area

To calculate the eroded area of the study area, modern technology (i.e. Geographical Information System) was used. Data were collected from the Google Earth maps. Those data were analysed using systematic procedures of Arc Map 10.3.

Socio Economic Status of bank erosion effected people:

Primary data were generated by interviewing people through intensive schedule field survey. The survey was

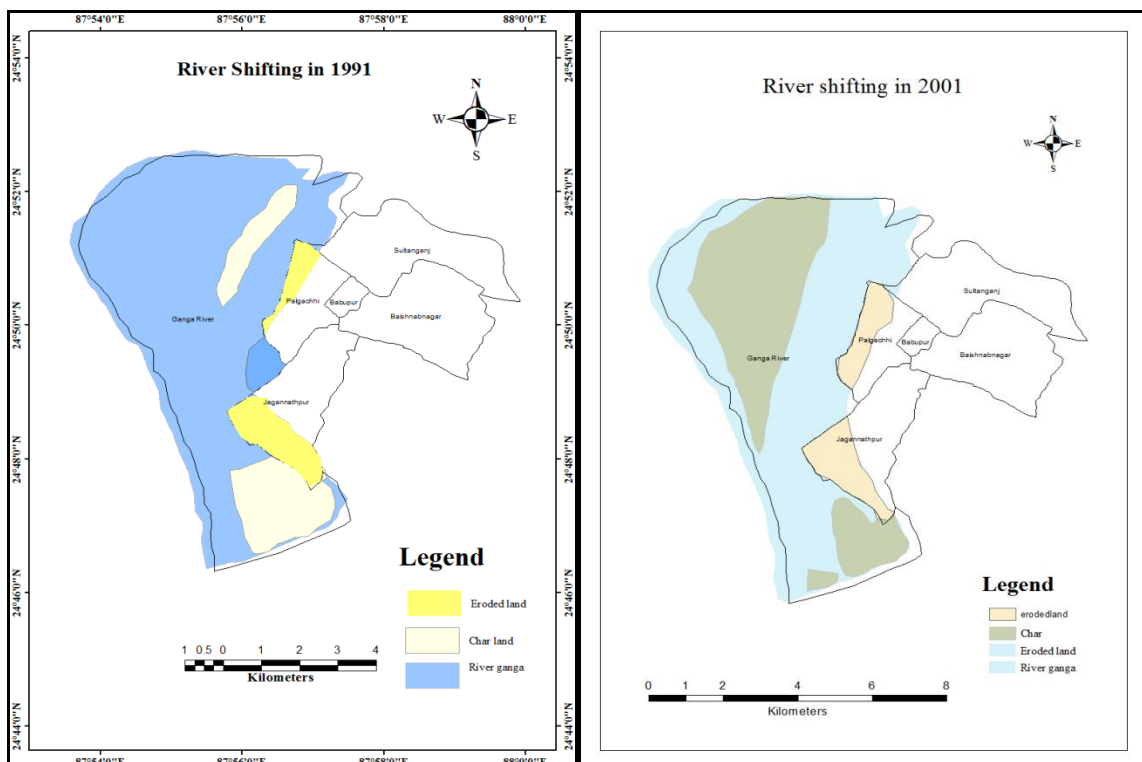
Land eroded through river shift:

Pre field study:

At first I prepared semi-structured questioners and going to my study area, Sultanganj, Palgachhi, Babupur, Jaganathpur and Baishnab Nagar mouzas and collected primary data.

carried out from 2nd May to 7th June, 2017. For examining the severe effect of river bank erosion on the lives of the people of Jaganathpur, Palgachhi, Sultanganj, Babupur and Baishnab Nagar Mouzas 250 affected people were interviewed.

The sample population were mainly chosen where the erosion of river bank is very high. The data were collected for obtaining the information on profession wise distribution of the displaced people, kinds of properties lost and people's perception about the erosion. Finally several protective measures like structural and non-structural measures have been mentioned. Finally some maps were originated by the help of Arc GIS 10.3 software. A literature review has also been done based on available books on river bank erosion.



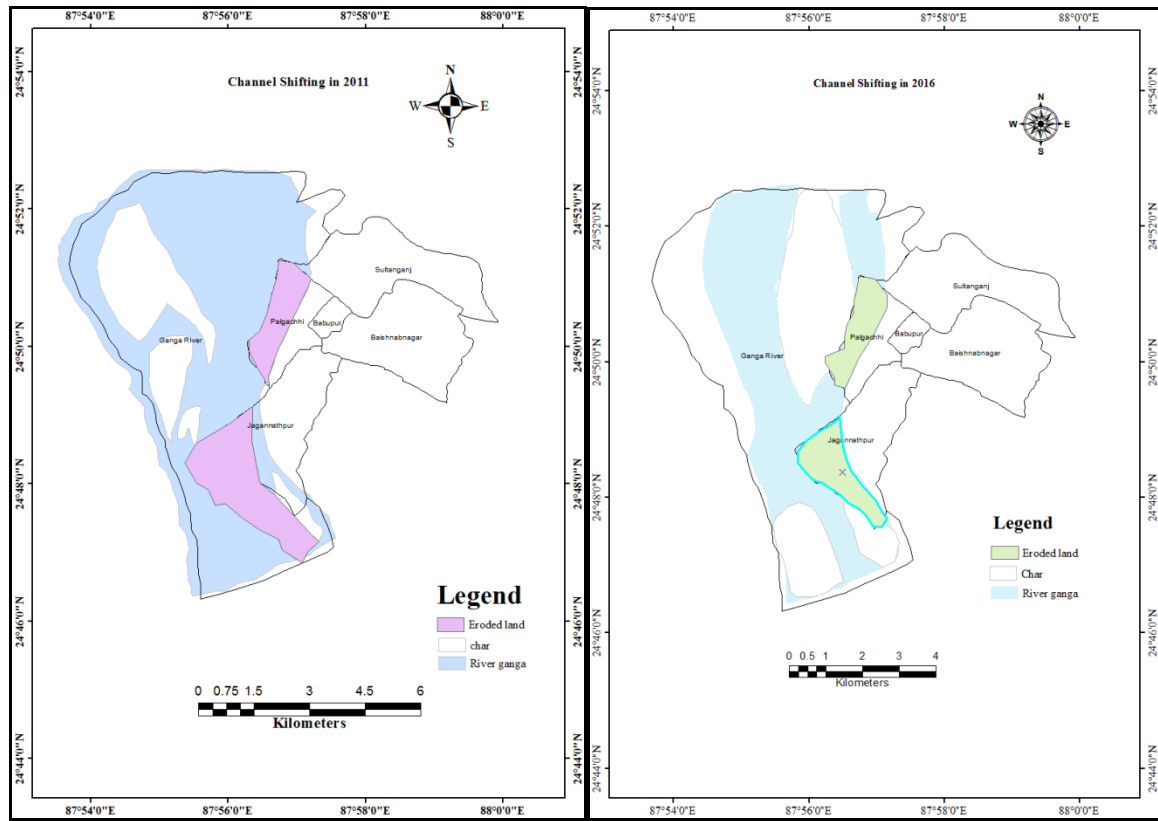


Fig.2 Land eroded through river shift

Table.1 Eroded land through river shifting of the study area (1991-2016)

Year	Eroded area in Square Meter				
	Jaganathpur	Palgachhi	Sultanganj	Babupur	Baishnab Nagar
1991	2315203	9388845	0	0	0
2001	2388708	1710251	0	0	0
2011	2347946	1959974	300	0	0
2016	4774496	2054807	500	0	0

Source:Google Earth

Table.2 Losses of Land through river shifting (1991-2016)

Year	Eroded area in Square Meter				
	Jaganathpur	Palgachhi	Sultanganj	Babupur	Baishnab Nagar
1991-2001	32743	7334038	0	0	0
2001-2011	40762	249723	0	0	0
2011-2016	2385788	344556	200	0	0

Source:Google Earth

Table1 & 2 shows the eroded area of the study area by the bank erosion of Ganga River. It has noted that jaganathpur and palagachi mouza have the most affected area by river bank erosion. The area is almost 32743 sq.meter, 40762 sq.meter, 2385788 sq.meter during 1991-2001, 2001-2011 and 2011-2016 respectively. In jaganathpur mouza. Palagachi mouza is also affected harmfully by bank erosion. Its eroded area is almost 7334038 sq.meter, 249723 sq.meter and 344556 sq.meter during 1991-2001, 2001-2011 and 2011-2016 respectively .In palagachi mouza. Sultanganj mouza is affected by bank erosion during 2011 to 2016 and the area is almost

200sq.meter. Babupur and vaisabnagar mouza has no affected area, because these mouzas are the far behind from the river bank. From above explanation it may be outlined that the channel width is changing in higher magnitude over time. One cause may be that due to the sedimentation and high discharge the lateral bank failure become high. These maps are indicating that the bank erosion rate is very high of the study area. The river increasing his length almost in every year, that's why the given mouza's peoples are losses their land, home as well as their identity



Fig.3 River Bank erosion at Jaganathpur & 4. River Bank erosion at Sultanganj Mouza



Fig.5 River Bank Erosion at Palgachhi & 6. Revetment at Palgachhi Mouza

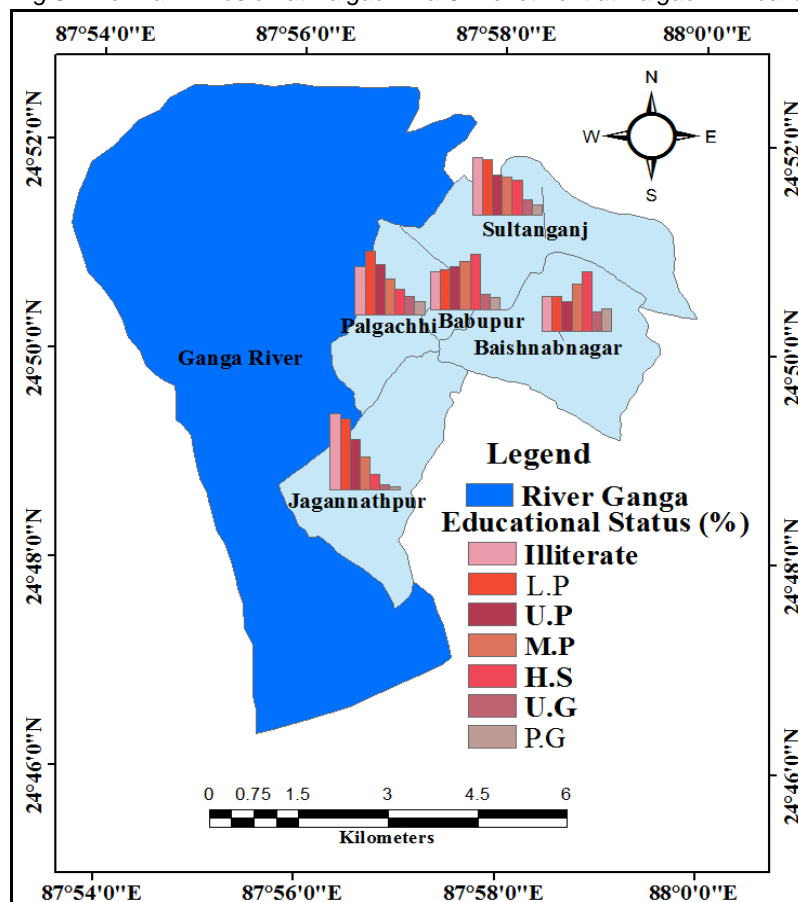


Fig.7 Educational Status of the Study area

For the present study, we have done the field survey on some selected villages of the study area. The villages are Jaganathpur, Palgachhi, Sultanganj, Babupur and Baishnab Nagar Mouzas. From the field survey, I got Educational Status of different mouzas. I have done 250 household surveys from selected five mouzas. Among the total number of household it is found that major percentage of peoples is illiterate. The highest illiterate persons are found Jaganathpur mouza (30%) and then Sultanganj (23%), Palgachhi (19%), Babupur (15%) and Baishnab Nagar (14%) respectively. The highest Lower Primary persons is found also in Jaganathpur Mouza (28%) and then Palagachhi(25%), Sultanganj (22%), Babupur (16%) and Baishnab Nagar respectively. The highest upper primary populations are found Jaganathpur and Palgachhi Mouzas

(20%) and then Babupur (17%), Sultanganj (16%) and Baishnab Nagar (12%) respectively. The highest MP populations are found Baishnab Nagar and Babupur Mouzas (19%) and then Sultanganj (15%), Palgachhi(14%) and Jaganathpur (13%) are respectively. The highest Higher Secondary person is also found in Baishnab Nagar Mouza(24%) and then Babupur (22%), Sultanganj (14%), Palgachhi (10%) and Jaganathpur (6%) are respectively. Highest under Graduate populations are found in Baishnab Nagar Mouza (8%) and then Palgachhi (7%), Sultanganj (6%), Babupur (6%) and Jaganathpu(2%)r are respectively. The Post Graduate populations are found in Baishnab Nagar Mouza (9%) and Babupur and Palgachhi (5%) are same and then Sultangaj (4%) Jaganathpur (1%) mouzas are respectively.

Table.3 Educational Status of the Study Area in Percentage (%).

Mouza	Illiterate	L.P	U.P	M.P	H.S	U.G	P.G
Jaganathpur	30	28	20	13	6	2	1
Palgachhi	19	25	20	14	10	7	5
Sultanganj	23	22	16	15	14	6	4
Babupur	15	16	17	19	22	6	5
Baishnab Nagar	14	14	12	19	24	8	9

Source: Field Survey

From the above results it is revealed that large amount of people are illiterate and moderate educational status are observed in the area .Insecurity of life due to bank erosion affect on the educational structure. Hence, Jaganathpur,

Palgachhi and Sultangaj are highly vulnerable zone rather than Babupur and Baishnab Nagar, thats why illiterate and moderate educational persons are mostly found in that area.

4.3Occupational Structure:

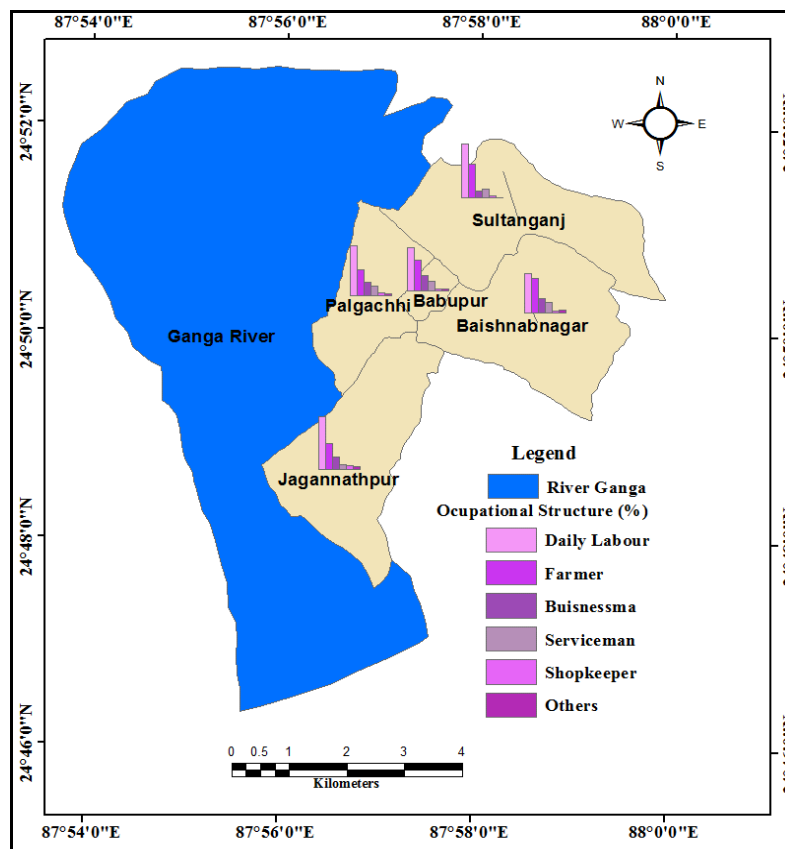


Fig.8Occupational Structure of the study area ((in %)

Above Fig.10 shows the presents Occupational Structure of the study area. It is found that most of the persons are belongs in daily labour and then Farmer, Businessman, Serviceman, shopkeeper and others respectively. Mostly daily labour is found Sultanganj Mouza (52%) and then Jaganathpur(51%), Palgachhi(48%), Babupur (42%)and Baishnab Nagar (38%) are respectively. Among the given mouzas mostly farmers are belongs inBaishnab Nagar Mouza (33%) and then Sultanganj (32%), Babupur (30%) and Jaganathpur and Palgachhi (25%) are respectively. Mostly businessman is found in Babupur Mouza (15%) and then

Baishnab Nagar (14%), Palgachhi (13%), Jaganathpur (12%) and Sultanganj respectively. The major percent serviceman of this regions are belongs in Baishnab Nagar Mouza (10%) and Lowest belongs in Jaganathpur mouza (5%). Palgachhi and Sultangaj mouzas are found same percent serviceman that is 9%. Mostly shopkeeper is found jaganathpur mouza(4%) and others mouzas are almost same percent shopkeeper populations belongs. Here fisherman, driver etc are also found. Which I catagorized Others populations, which is mostly found in Jaganathpur and Baishnab Nagar mouzas.

Table.4 Occupational Structure of the Study Area in Percentage (%).

Mouza	Daily labour	Farmer	Buisnessman	Servic e	Shopkeeper	Other s
Jaganathpur	51	25	12	5	4	3
Palgachhi	48	25	13	9	3	2
Sultanganj	52	32	6	8	2	0
Babupur	42	30	15	9	2	2
Baishnab Nagar	38	33	14	10	2	3

Source: Field Survey

So it can be said that the study areas population are very poor. Mostly peoples of the study area are belongs in daily labour and farmers.

4.4 Agricultural Status:

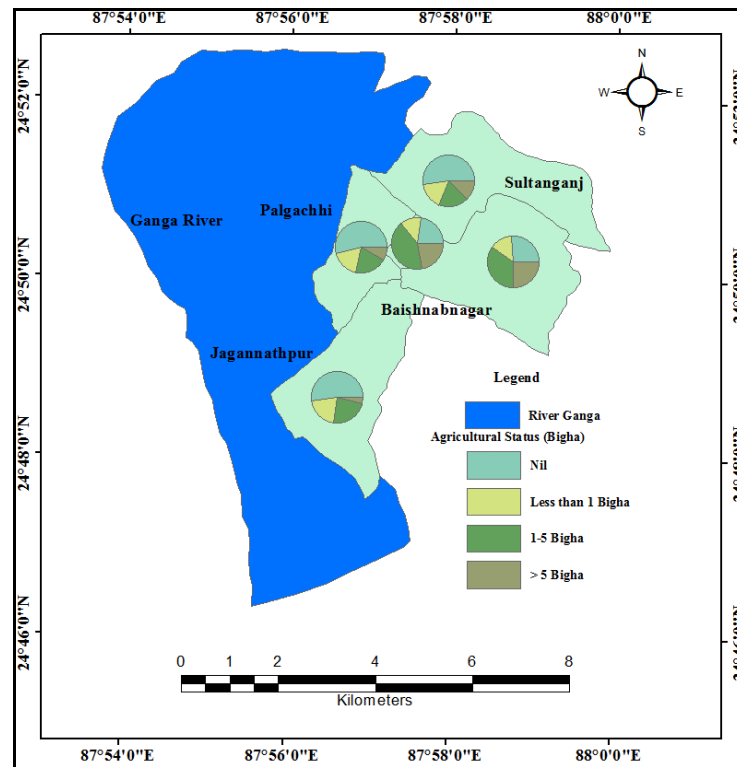


Fig.9 Agricultural land status of the study area

The above Fig.9 shows the the agricultural status of the study area. It is revelled that mostly populations are does not have agricultural land due to river bank erosions. But it is very sad full that a few time ago they have many agricultural land and for the bank erosion the villagers are losses their land. Less than 1 bigha land are mostly found in Jaganathpur mouza

(21%) and then Palgchhi (18%), Sultanganj (17%), Baishnab Nagar (14%) and Babupur (13%) mouzas are respectively. 1 Bigha to Bigha land are mostly occurs in Babupur mouza that is 42% and then Baishnab Nagar mouza (35%). Others mouzas are almost same agricultural land. Above 5 Bigha land is mostly found in Baishnab Nagar mouza(25%) and then

Babupur (22%), Sultanganj(12%), Palgachhi (8%) and Jaganathpur (4%) mouzas respectively.

Table.5 Agricultural Status of the Study Area.

Mouza	Nil	Less than 1 bigha	1 bigha -5 bigha	above 5 bigha
Jaganathpur	52	21	23	4
Palgachhi	54	18	20	8
Sultanganj	52	17	19	12
Babupur	23	13	42	22
Baishnab Nagar	26	14	35	25

Source: Field Survey

So it is revealed that Jaganathpur , Palgachhi and Sultanganj mouza are majorly loss their agricultural land rather than Baishnab Nagar and Babupur Mouza. Because of this mouzas are belonging near to river where bank erosion is the

mostly occur in every year, whereas Baishnab Nagar and Babupur mouza belonging away to the river bank that's why the peoples of this area low effect by the bank erosion.

4.5 Status of Domestic Animals:

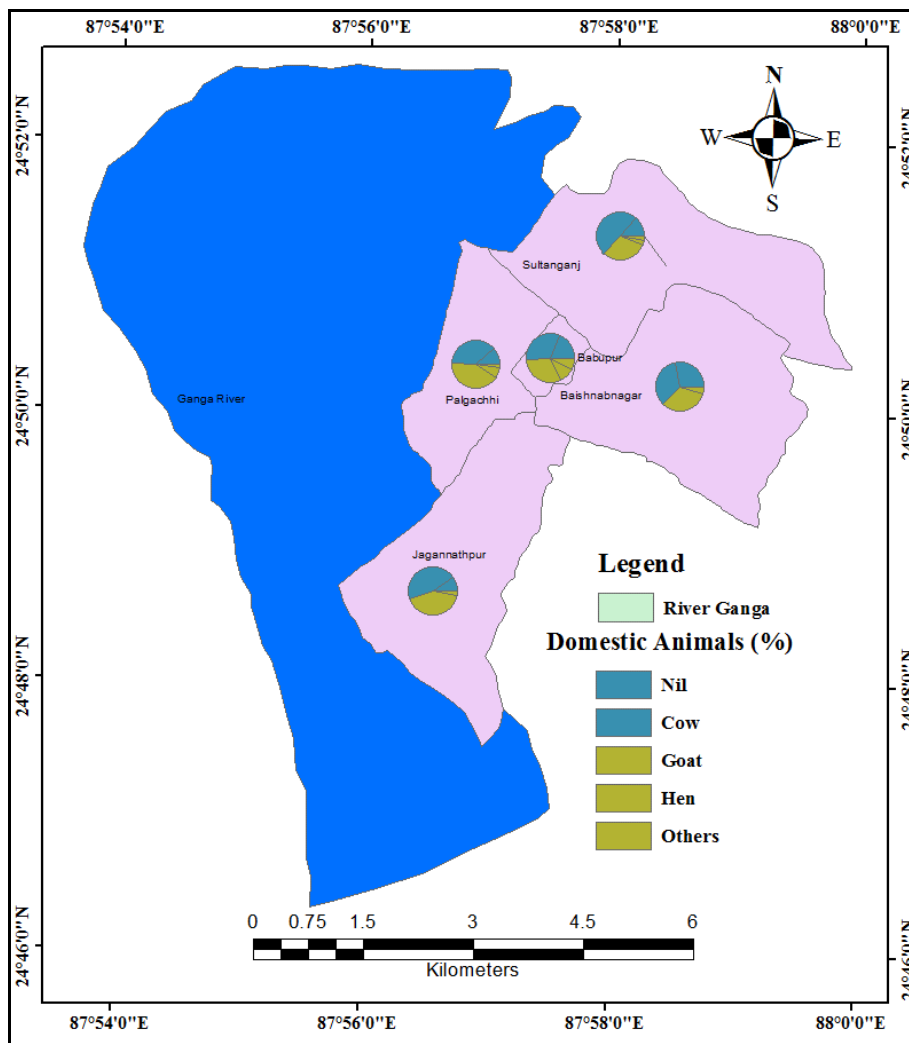


Fig.10 Domestic Animals of the study area (in %)

Table.6 Status of Domestic Animals of the Study Area in Percentage (%).

Mouza	Nil	Cow	Goat	Hen	Others
Jaganathpur	10	45	42	3	0
Palgachhi	13	41	36	8	2
Sultanganj	14	49	31	3	3

Babupur	19	32	31	10	8
Baishnab Nagar	28	34	32	5	1

Source: Field Survey

The above Fig.12 shows the status of domestic animals of the study area. The villagers of the study area have different kind of domestic animals such as Cow, Goat, hen, Buffalo, Pig, and Hen etc. Hence they loss their agricultural land and others occupational structure due to river bank erosion they have various kind of livestock's. The cow anml is found mostly in Sutanganj(49%) and then Jaganathpur mouza (45%),

Palgachhi (41%), Baishnab Nagar(34%) and Babupur (32%).the animals of Goat in found also in Jaganathpur (42%) and then Palgachhi (36%), Baishnab Nagar(32%) and sultanganj and Babupur (31%) respectively. The livestock of hen is found in Babupurmouza that is 10% and others mouzas are almost same found.

4.6Housing Status:

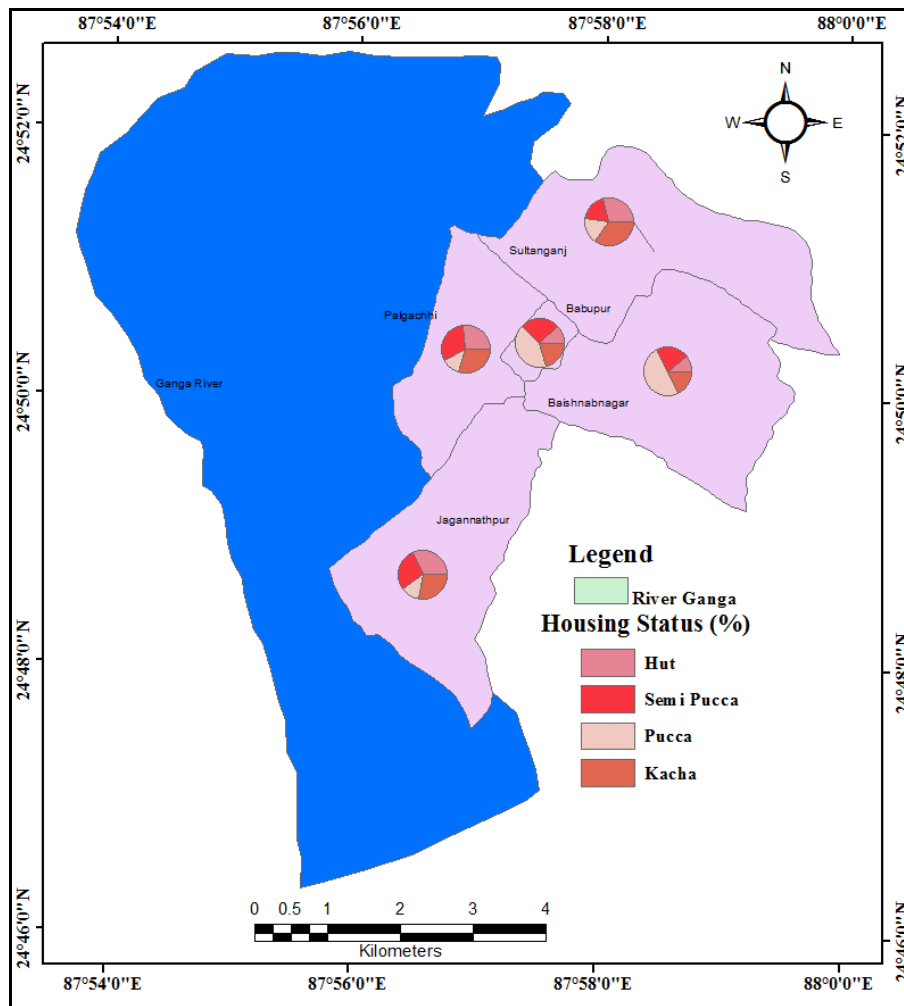


Fig.11Housing types of Study area (in %)

Table.7 Housing Status of the Study Area in Percentage (%).

Mouza	Hut	Semi Pucca	Pucca	Kacha	total %
Jaganathpur	32	28	12	28	100
Palgachhi	27	31	12	30	100
Sultanganj	29	19	17	35	100
Babupur	12	26	41	21	100
Baishnab Nagar	11	22	49	18	100
Total %	22.2	25.2	26.2	26.4	100

Source: Field Survey

The Fig.11 shows the housing pattern of the study area. According to my field survey 22.2 % houses are Hut, 26.4 % houses are kacha, 26.2 % houses are pucca and rest 25.2% houses are mixed type that's mean semi pucca . Hut types house are mostly found in Jaganathpur mouza that is

almost 32 %. The kacha house type are found mostly in Sultanganj mouza that is 35%, The pucca house type are mostly found in Baishnab Nagar mouza that's is 49 % and rest semi pucca houses are mostly found in Palgachhi mouza that's is 31 %.

5.2 Nature of Population's Displacement:

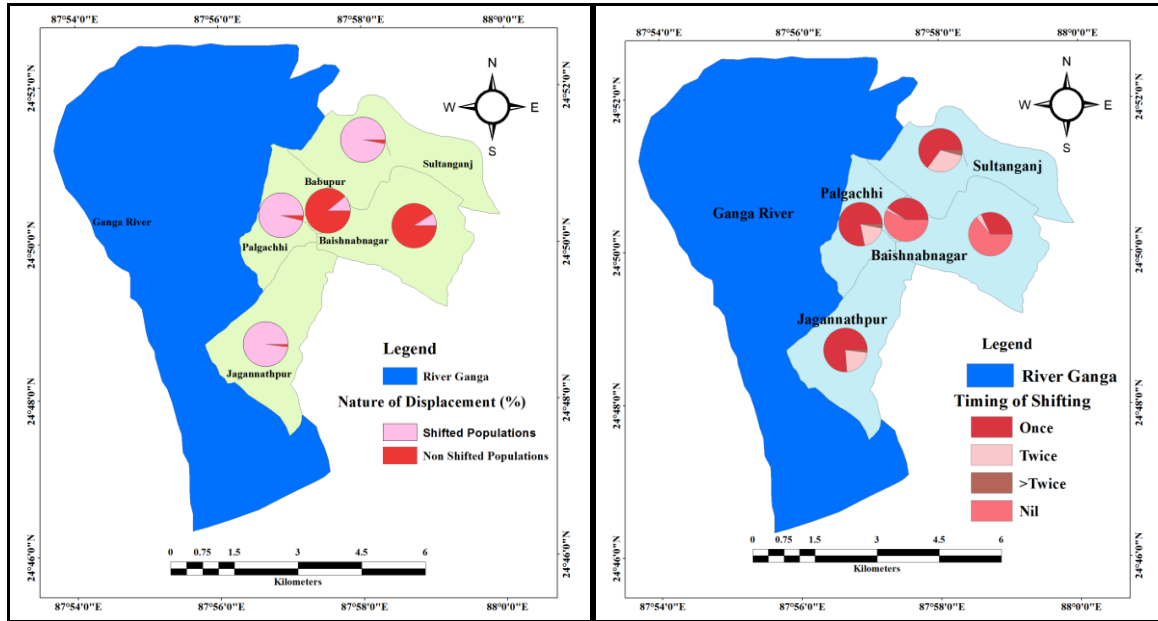


Fig.12&13 Nature of Population's Displacement in percentage (%). Period of Shifting of the Populations

Table.8 Nature of Population's Displacement in Percentage (%).

Mouza	Nature of Displacement	
	Non Shifted	Shifted
Jaganathpur	2	98
Palgachhi	4	96
Sultanganj	3	97
Babupur	89	11
Baishnab Nagar	91	9

Source-Field survey

The above Fig.12 shows the nature of displacement, which means how the populations are shifted and non-shifted due to river bank erosion. It is found that most of the people in Jaganathpur, Palgachhi and Sultanganj mouzas were shifted to another place due to river bank erosion. But in case of Babupur and Baishnab Nagar mouzas are very poor percent populations

are shifted to another areas rather than other vulnerability mouzas. It is why because of Jaganathpur, Palgachhi and Sultanganj are located beside the bank of river Ganga. On the other hand Babupur and Baishnab Nagar mouzas are located away from the river.

Table.9 Period of Shifting of Populations.

Mouza	Period of Shifting			
	Once	twice	More than twice	Nil
Jaganathpur	76	22	2	0
Palgachhi	78	19	3	0
Sultanganj	65	31	4	0
Babupur	41	2	0	57
Baishnab Nagar	32	4	0	64

Source-Field survey

The above Fig.13 shows the timing of shifting of the populations in the study area due to river bank erosion. It is found that all the mouzas are mostly shifted only once a time.

But Sultanganj(31 %), Jaganathpur (22%) and Palgachhi (19%) mouzas are also twice time.

5.3 Losses of livelihoods:

Table.10 Losses of livelihoods of the Study Area in Percentage (%).

Item	Jaganathpur	Palgachhi	Sultanganj	Babupur	Baishnab Nagar
Homestead	100	100	100	60	40
Houses	100	100	100	11	9
Cultivable Land	90	84	87	43	36
Tubewell	15	12	20	0	0
Trees	90	72	67	70	55

Source: Field Survey

River erosion seriously affects the livelihood of the riparian population. Due to riverbank erosion, many farmers become poor overnight. They lose homestead, houses, cultivable land, trees and other properties. It is found that at all places almost cent percent of the respondents have lost their homestead and living houses. About 90%, 84%, 87%, 43% and 36 % of the respondents of Jaganathpur, Palgachhi, Sultanganj, Babupur, and Baishnab Nagar areas had cultivable land. But during

erosion they lost their cultivable land. Many of the erosion-affected people live near their eroded place for re-emergence of the land. Before erosion, when they can guess that there is a possibility of erosion of their homestead, they follow a strategy that first they cut their big trees. They keep only the small trees and wait for erosion. Some of the respondents have also lost their pond, tube well and latrine also. Though this percentage is very few but they become poor overnight by losing everything.

5.4 Losses of cultivated land:

Table.11 Losses of cultivated land of the Study Area in Percentage (%).

Cultivated Land (Bigha)	Jaganathpur	Palgachhi	Sultanganj	Babupur	Baishnab Nagar
<5	42	41	51	70	73
5-8	28	31	17	21	16
8-10	18	14	22	11	8
>10	12	14	10	2	3

Source: Field Survey

Table.9 provides the information about the eroded cultivated land area. Most of the erosion affected people had cultivated land up to 5 Bigha. On an average one fourth of the victims had cultivated land ranging from 5 bigha to 8 bigha. A few of the respondents had land area more than 10 bigha.

Though this percentage is very few but they become poor overnight by losing everything. The cultivated land is the main source of income of most of the rural people. The heart of a man would be affected observing their distressed situation.

5.5 Generated Vulnerabilities:

Table.12 Generated Vulnerabilities of the Study Area in Percentage (%)

Item	Jaganathpur	Palgachhi	Sultanganj	Babupur	Baishnab Nagar
Homeless	100	100	100	43	36
Landless	98	96	97	11	9
Displacement	100	100	100	43	36
School dropout	91	84	76	59	43
Change of Occupation	100	95	97	39	34

Source: Field survey

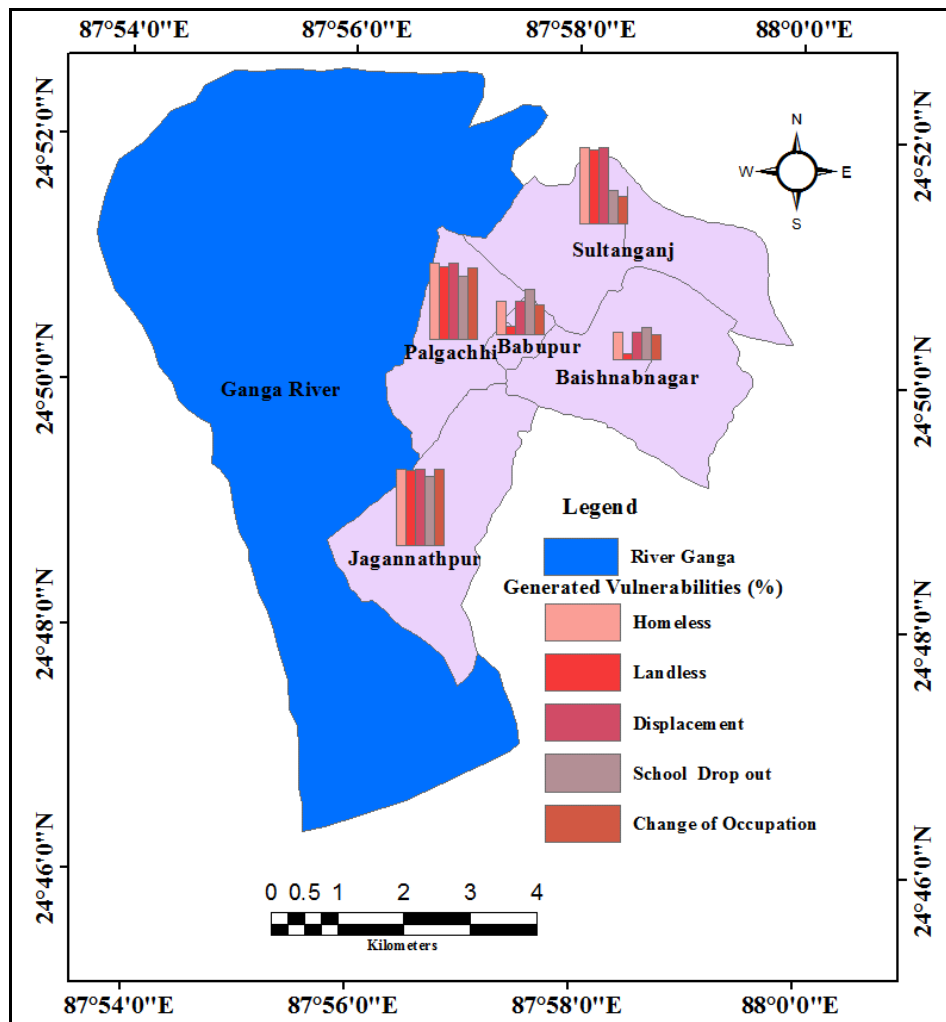


Fig.14 Vulnerabilities of the study area (in %)

Different types of vulnerabilities are generated as a result of erosion (Table.12). They became homeless by losing their original homestead and houses. Temporarily they built huts on the sloping side of river or they purchase a piece of land to build houses for living. Sometimes their relatives or other people help by giving a piece of land for building huts. Many of the victims migrated to the nearest town or big city like Malda, Murshidabad etc. Hossian mentioned that the displacees move to one of the several places viz. (i) to nearly rural areas, (ii) to the flood protection embankment, (iii) to emerged charland, and (iv) to nearly urban area.

In the present study about cent percent of the respondents of Jagannathpur, Palgachhi and Sultanganj have homeless as a result of erosion. 435 and 36% of the respondents of Babupur and Baishnab Nagar mouzas respectively. On an average,

about 98% of respondents have landless at Jagannathpur mouza and then Sultanganj (97%), Palgachhi(96%), Babupur (11%) and Baishnab Nagar(9 %) respectively. Before, they used to cultivate their own land to grow crops. A number of respondents are now doing small business on roadside or others are working as masons or boatmen in Kaliachak town. Most of the respondents of the study areas are working in the hand loom industry, bidi industry or as wage laborers. In the above table it is found that almost all the mouzas residents have change their occupation majorly Jagannathpur (100%), Palgachhi (95%) and sultanganj (97%) due to bank erosion of river Ganga. There is also evidence of school dropouts and child marriage. It is revealed that major percentages of peoples have been dropout due to bank erosion. The highest school dropout populations are found in Jagannathpur Mouza that is almost 91 %.

5.6 Social Destruction:

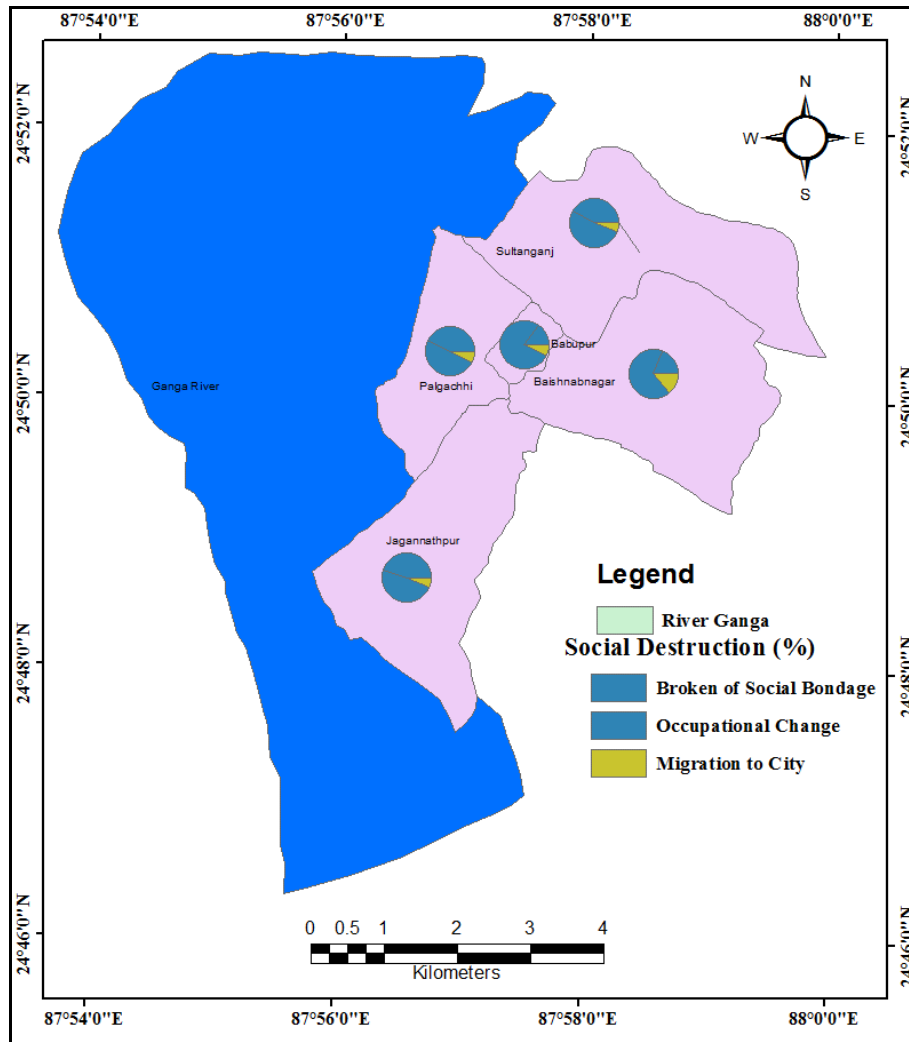


Fig.15 Social Destruction (in %)

Table.13 Social Destruction of the Study Area in Percentage (%)

Item	Jaganathpur	Palgachhi	Sultanganj	Babupur	Baishnab Nagar
Broken of social bondage	91	84	79	10	12
Occupational Change	100	100	100	54	43
Migration to city	12	14	11	5	9

Source: Field Survey

The social damage has been created as a result of bank erosion (Table.13). Highest percent (100%) of the respondents of the Jaganathpur area opined that changes of occupational

pattern. It is also found social bondage (91%) and family relation has been broken down due to erosion.

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