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RESEARCH ARTICLE

RIVER BANK EROSION AND ENVIRONMENTAL NEO-REFUGEES: A CASE STUDY OF MURSHIDABAD DISTRICT IN WEST BENGAL, INDIA

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ABSTRACT

The district is situated in a flood plain region of moribund delta of West Bengal. River bank erosion is a common environmental disaster in Murshidabad district like any other deltaic region of the World. The district is well drained by a number of river systems such as Padma, Bhagirathi, Jalangi and Bhairab. Murshidabad district is centrally located in West Bengal lying between 23˚43'30"N to 24˚50'20"N and 87˚49'17"E to 88˚46'E. The geology of the district is mainly Quaternary alluvium. The Bhagirathi River is almost divided the district into two equal physiographic divisions. The western part of Bhagirathi River is known as "*Rarh*" and the eastern part of Bhagirathi River is known as "*Bagri*". The rivers in the district have been continuously changing its meandering-geometry actively since second half of the twenty century. But the dimension of river bank erosion has been increased after construction of Farakka Barrage. The recurrent bank failure and displacement of a large number of people make huge environmental neo-refugees in every year. As a result, the encroachment of fertile arable lands; destruction of standing crops, human settlements, roads and communication are the matter of deep anxiety for the riparian people as well as district administration. The aim of the present work is to study river bank erosion and its impact on socio-economic conditions of environmental neo-refugees. Data and information are both collected from primary and secondary sources. The major sources of primary data include observation and questionnaire survey in the selected environmental neo-refugees areas such as Toltoli (Muradpur Mouza), Tekpara (Hasanpur Mouza), Ganje Singeswari, Nirmal *Char*, New Bamnabad and other places. The secondary sources of information are satellite imagery, published reports and articles. The result shows that the displaced people are forced to accept their loss due to bank erosion. Most of the environmental neo-refugees live below poverty line and temporary houses, also lack of health, electricity and sanitation facilities. Most of the male people mainly non workers in these areas are forced to migrate to other states and countries for seeking the jobs. Females are mostly house wife and also engaged in agriculture and *Bidi* cottage industry with minimum wages. Most of the bank protection work is based on engineering, not consider the social dimension. Therefore socio-economic upliftments as well as holistic planning are urgently needed to tackle these problems.

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INTRODUCTION

People migrate from one place to another place either push factors or pull factors. Reasons for involuntary or forced migration are mainly push factors. Push factors are natural disasters, war, communal riot, evacuation due to development activities etc. A forced migrant is often called an internally displaced person when he or she is forced to leave his or her home region because of unfavourable conditions (political, social, environmental etc.), but does not cross any boundary (Das, Halder, Gupta and Sen, 2014). The 64th Round of National Survey mentioned that four percent of the total migrants are forced migrants and nearly twenty-four percent of the total forced migrations due to natural disaster (NSS, 2012). River bank erosion and flood are twin environmental disasters and almost regular phenomena in Murshidabad district. Between these two types of disaster, the loss due to flood is temporary, but the loss of land due to river bank erosion is permanent and have long term effect on economy. Once residential and productive land is lost due to river bank erosion, it can hardly replace. River bank erosion is a recurrent environmental disaster and makes huge environmental neo-refugees in the district.

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The study area

The district Murshidabad has its own heritage and great historical back ground. The name "Murshidabad" reminds us about Murshid Kuli Khan, the great Muslim ruler. It was the capital of undivided Bengal, Bihar and Orissa during the period of Nawab Siraj-ud-dullah. Murshidabad district is centrally located in West Bengal lying between 23˚43'30"N to 24˚50'20"N and 87˚49'17"E to 88˚46'E.In shape, the district resembles an isosceles triangle with its apex pointing to the North-West. The Padma River flows through the entire north and eastern boundary, separating the district from Malda (India) and Rajshahi (Bangladesh). Barddhaman and Nadia district are on the southern and south eastern side while Birbhum district (West Bengal) and Pakur (Jharkhand) are on the western and north-western side of the district (Fig. 1).

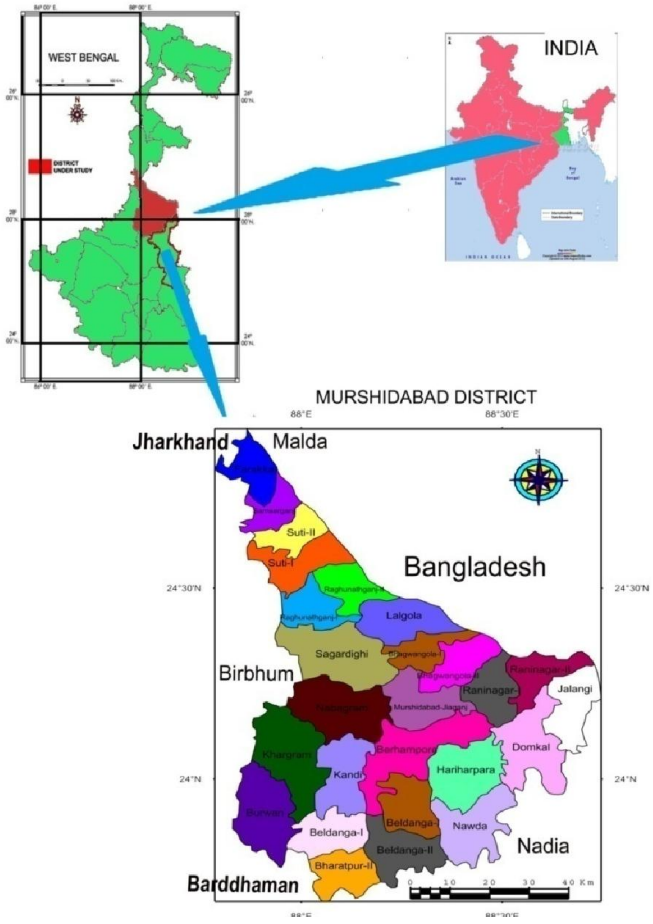

Fig. 1. Location map of the study area

The district comprises of 5sub-division, 26 blocks and 7 municipalities. The area of the district is 5324 Sq. Km and population 7,10,3807 with high population density (1334 population/sq.km.). The literacy of the district is 66.59 % (69.95% male and 63.09% female). Due to high level of unemployment (63.55% non-workers) of the district, youth has forced to migrate to other states and countries (Census of India, 2011). The district has nearly 80% rural and 20% urban population. More than 60% people of the district are Muslim religion. In 2006, Govt. of India has identified the district as economically backward district (250 out of the total 640).

Geomorphologically, the area is featureless plain and younger deltaic plain. The river Bhagirathi divided the district into almost two equal parts and forms two broad physiographic regions. i) The western part has stiff clay soil, reddish in colour and undulated topography which is continuation of Chhotanagpur plateau. This region is known as "*Rarh*". The elevation of this region is about 15 to 30 metres and characterised by rolling topography. The rivers in this part originate from hill torrents and they are prone to overflowing due to sudden rain. "*Hijal*" is a small tract within Rarh, situated in the south-west of the district near the confluence of the Mor and Dwarka. During the rainy season, this area is inundated with water. In winter season, a large portion of it is cultivated with Rabi crops. ii) The eastern part of the Bhagirathi River formed by Gangetic alluvium deposit is known as *Bagri*. The elevation of this region is about 12 to 15 metres and characterised by featureless flat plain. It is younger than *Rarh* area and lies between the Padma, the Bhagirati and the Jalangi River. This area has experienced of seasonal inundations due to low altitude resulting in fresh silt deposits and hence it is very fertile. The *Kalantar bill* is a continuation of Bagri are in the south-eastern corner of the district and receives the drainage of the swampy rivers.

Table 1. Minor Physiographic Division of Murshidabad District

Physiographic Division	C.D. Blocks covering maximum area
"*Rarh*" Region	Khargram, Burwan,Nabagram and Sagardighi
Hijal	Kandi,Bharatpur-1 & Bharatpur-II
Strip of low-lying land	Suti-I, Suti-II, Samserganj and Farakka
"*Bagri*"	Hariharpara, Berhampore, Domkal, Beldanga-1,Jalangi, Raghunathganj-I,Raghunath-II, Raninagar-I, Raninagar-II, Murshidabad, Jiagunj, Lalgola, Bhagawangola-I and Bhagawangola-II
Kalantar	Beldanga-II, Nowda

Source: Compiled by author from Murshidabad District Gazetteer, 1997 & 2003 and other sources

The geology of the district is Early Quaternary old alluvial plain in western part and Late Quaternary alluvial plain in eastern part. The geology of the district is mainly characterized by older alluvium & lateritic clay of Pleistocene to Recent in western part of the district and recent alluvium in the Eastern part of the district. Older alluvium in the western part is characterized by stiff clay, gravels and calcareous nodules called *ghuting* in the junction of the alluvium and higher grounds on the west of Bhagirathi. In the north-west of the district are isolated clay hillocks. Recent alluvium in the eastern part is characterized by sandy clay and sand along the course of the river and fine silt to consolidated clay in the plain region.

Table 2. Geological Formations

Period	Geological Formation	Area of the district
Jurassic	Rajmahal Trap	Northern part
Pleistocene to Recent	Older alluvium & Laterite clay	Western part
Recent	Alluvium	Eastern

Source: Compiled by author from Murshidabad District Gazetteer, 1997 & 2003 and other sources

The river system of the district are characterised by the Padma/ Ganga, Bhagirathi, Jalangi, Bhairab, Bansoli, Babla, Dwarka, Babla, Brahmani, Mayurakshi, Kuiya. The Feeder canal (man-made canal, length 2.64 km) is originated from the upstream of Farakka Barrage and falls into the Bhagirathi downstream of Jangipur Barrage (Fig. 2). The main *bills* (natural reservoir) of the district are Bhandardaha, Ahiran, Bhakuri, Baro, Kalyanpur, Hizole, Gobindapur, Salua, Bishnupur bills etc. These *bills* act natural reservoirs and reserve the excessive rain water during rainy season. Many bills are the remnants of old river valley. Many bills are shrinkage and reduce the water holding capacity due to sedimentation and human activities.

Murshidabad district has tropical monsoon wet and dry climate. The average annual rainfall of the district is 1400 mm. The maximum temperature during summer season is about 40°C and minimum temperature during winter season about 10˚C. Floods and river bank erosion are the twin natural hazards affect almost every part of the district.

Objectives of the study

The river bank erosion is more prominent where river is meandering in nature. The following objectives of the study are given below:

i) To study and explain the sequence of river bank erosion events.
ii) To study the causes of river bank erosion and its impact on riparian people.
iii) To explain the preventive measures and human preparedness
iv) To explain the socio- economic condition of the environmental neo-refugees.

MATERIALS AND METHODS

Data and information are both collected from primary and secondary sources. Map of the river systems in Murshidabad district is prepared in GIS using LANDSAT data. The major sources of primary data include observation and questionnaire survey in the selected displaced household settled in new areas such as Toltoli village (Muradpur Mouza), Tekpara village (Hasanpur Mouza), Nirmal *Char,* New Bamnabad (old Bamnabad is washed away by bank erosion) and other places. The secondary sources of information are satellite imageries, old records, published reports and articles. The sequence of river bank erosion events have been studied from old records, published reports and articles, questionnaire survey during field visit and observation. The result shows that the environmental neo-refugees are forced to accept their loss due to bank erosion. The majority of environmental neo-refugees are displaced two to three times in their life.

RESULTS AND DISCUSSION

Rivers are always dynamic in nature and deltaic rivers change their courses in long width. River systems in the district are mostly meandering as well as braided in nature. Rivers are systems in dynamic equilibrium. When river channels are altered under naturally dynamic hydrologic conditions, the river readjust itself with respect to dimension, profile and pattern to reach its former balance or equilibrium (Couture, 2008).

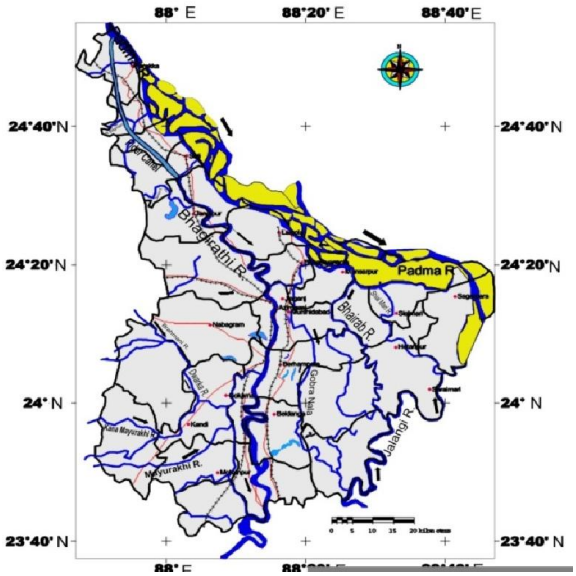

Fig. 2. River systems in Murshidabad district based on LANDSAT Image 2014

Free flowing river is always adjusting the equilibrium condition through erosion, transportation, and deposition processes. When deposition process is active in one side, erosion process is active in another bank side. Mid channel bar or char formation is restricted to mid channel flow pattern and flow concentrated to bank side, as result of severe bank erosion.

Most of the dams in India are constructed due to irrigation purposes, but construction of Farakka Barrage is different purposes. The Farakka Barrage (2.64 km long) was designed to divert 40,000 of Ganga water towards Bhagirathi River through feeder cannal to save the Kolkata port. The interface of the Ganga regime by construction of the Farakka Barrage give many hydrological and morphological changes such as changes of water level, discharge, sediment movement, bed slope character etc. Prior to the constructon of Farakka barrage, the Bhagirathi River is originated from the Padma River near Mithipur and water flows from Padma to Bhagirathi River. After construction of Farakka Barrage and feeder cannel, small amount water from Bhagirathi River flows toward Padma River through small channel (Plate I).

Plate I. Confluence of Padma and Bhagirathi River at Mithipur

Now it is well accepted that the intensity of the Ganga-bank erosion in West Bengal has increased after construction of Farakka Barrage (Rudra, 2010). Official records show that on an average 8 sq. km. of land are engulfed annually by the river of West Bengal. After construction of barrage, bars are formed on the right side and deep channel shifted to the left above the barrage and erode severely on left bank. On the other hand, downstream on the left, there was a big alluvial fan which, moving up gradually before the construction of Farakka Barrage, resulting flow concentration on the right and with the deep channel passing close to the right bank, eroded it. The fan extended up to about 30 km below Farakka; old Dhulian and Aurangabad town on the right were also severely eroded (Parua, 2010). The emergence, submergence and re-emergence are the continuous process during erosion and deposition of a meandering river. This phenomenon has been explained as follows: "accumulated silt leads to the rise of a sand-bed in the interfluves (the region of higher land between channels); being obstructed by this bed the river then divides into two channels with the sand-bed in between. This makes the flow oblique. The flow gets obstructed with the river-bank eventually causing river bank erosion. The eroded silt and sediment is carried by the river which again accumulates to form a new sand-bed and cycle continues" (Mukherjee, 2011). The sequence of erosion events in the district are given below:

Sequence of erosion events in the district along Padma and Bhagirathi River bank

1. The right bank of river in the district below Faraka barrage have been undergoing heavy erosion since 1930 prior to the construction of barrage (barrage commissioned in 1975) as per available record of Central Water and Power Research Station, Pune(CWPRS).
2. In 1939 erosion between Farakka to Dhulian has been specially recorded and the railway line between Barharwa and Nimta has been abandoned.
3. During the period from 1945 to 1950, eroded about 3.2 km width of land near Dhulian.
4. During 1952-53 the old Dhulian town was completely washed away by the river. The present Dhulian town is at a distance of more than 1.6 km from the location of the old town and again severe erosion near Dhulian town and Suti police station after 1967.
5. It has been observed that since the beginning of construction of the Farakka Barrage in 1962, the intensity of erosion has been increased. Dhulian and its adjoining areas were severely affected in mid 1970s when about 50,000 people became homeless. The present site of Dhulian is reportedly the fourth site. The encroaching river wiped out 50 mouza and engulfed about 10,000 hectares of fertile land. A large part of the interfluves, lying between the Bhagirathi and Padma with an area of about 77sq. km between Nayansukh and Giria, disappeared for ever between 1925 and 1974**.** During 1968 to 1978 the entire reach between Beniagram and Nimtita was under severe attack. Erosion is also continuing in this region.
6. After commissioning of Farakka Barrage in 1975, the dry Bhagirathi River (summer season) was rejuvenated and river bank erosion along Bhagirathi River and flood both increases in different parts of Murshidabad district. As for example, Mahispur and Balagachi mouza were washed away and displaced people are forced to migrate at Ganja Sinheswari mouza. Bhaghirathi River formed new point bar (*char land)* and excessive meandering pattern and widen river channel in this area. Bhagirathi river meander cut-off may be occurred in near future.
7. Erosion along Bhagirathi River in different places is also associated in devastative floods in the year 2000 in Murshidabad district. The part of earthen embankment in Ajodhya Nagar near Bermhampore is destroyed. Erosion is also observed right bank of Bhagirathi along Berhampore town. Arable land is also encroached by Bhagirathi River at Shaktipur area.
8. During1977 - 1980 the reach further down between Biswanathpur and Giria just upstream of barrage across the Bhagirathi near Jangipur was severely attacked and agricultural lands were affected (Parua, 2009).
9. According to the old records, the erosion is very active in 1939 and in 1968 in the reach between Hanumantnagar and Akhriganj (about 4.5 km). After silent of erosion of two decades, erosion again very much active from 1989 to 1997 at Akhiriganj. Akhiriganj town, surrounding villages, state highway, market complex, school building was severely affected. Now erosion is less active at Akhiriganj region due to flow concentrated towards left bank i.e. Bangladesh side. According to Rudra, K. (2005), " The erosion has been the cause of major distress of the people living along the river front of Murshidabad district for the last two centuries, and the ravages caused by mighty Padma at Akheriganj in 1989 and 1990 surpassed all previous records. Akheriganj, which literally means the last settlement, virtually disappeared from the map. The disastrous erosion engulfed 2,766 houses and left 23,394 persons homeless. Many erosion-victims migrated to the newly emerged Nirmal *char* along opposite bank. The southward encroachment of the river reached the limit of meander belt in 2002 when principal flow started to migrate towards opposite side".
10. In the reach between Bamnabad to Rajnagar (about 4 km) active erosion started during floods of 1996. Many villages, state highway, agricultural land and school building had been affected. During field survey in March 2015, Ajabul Sardar, one of the inhabitants of Bishpara village told us that Bamnabad, Nalbona, Lalkup, Jagirpara and part of present Bishpara villages are washed away due to erosion of Padma River. Hospital, Madrasa was also washed away. Neo-refuges are resettled at New Bamnabad, Bishpara, Sibnagar and other villages. Now River shifted towards Bangladesh side and new *charland* was emerged. People live this *charland* temporarily for grazing purpose of their animals. This is locally known as *Bethan* (Plate II). Border Security Force Outpost is also situated in this *char.*
11. From 1978 to 1987, severe river bank erosion at Fazilpur downstream of Jangipur Barrage and the gap between Ganga and Bhagirathi is reduced by 200m. Thereafter the erosion stopped and present distance stable at 1.20 km.
12. At Jalangi Bazar, about 3km stretch of river bank (before the river enters into Bangladesh) is severely affected due to erosion from 1994 due to development of central *char land* and construction of 15 km long concrete bund for protecting Rajsahi town of Bangladesh. Five villages near

Jalangi Bazar town have been completely washed away and Jalangi town has been severely affected. Now this area is more or less stable due to flow concentrated towards left bank of Bangladesh side.

Plate II. Temporary settlement for grazing purposes, locally known as *Bethan*

13. Severe erosion started at Maya in 2011 &2012, about 30 houses have been washed away in a single day. Erosion is also rejuvenated in February, 2015 after silent of two years.
14. Mango garden is eroded in 2013 at Mithipur area (Plate III). This area is also eroded during previous three to four years. Early time this area is also affected by bank erosion.

Plate III. Mango garden at Mithipur washed away due to Padma River bank erosion

15. Erosion also affected in 2014 at different places such as Banamalipur village (Baldanga-I block), Shaktipur region, Khos bagh (Lalbagh) and other places along Bhaghirathi River, Rajanagar char (Raninagar II Block) along Padma River.

Probable Reasons for Bank Erosion

1. The river channel in moribund deltaic region varies from braided to meander with limited straight channel. In the meandering reach, the river course is sinuous and deep channel cuts one bank and deposits materials to other banks.
2. Stratigraphy of bank composed of micaceous unconsolidated sand at bottom and thin silt clay at top causes severe bank erosion (Plate IV).

Plate IV: Unconsolidated sand at bottom and thin silt clay soil at top at Mithipur area

3. Fluctuation of river water discharge like the Ganga where discharge fluctuation ranges from 1,100 cumecs to 76,000 cumecs. Fluctuation of discharge as well as fluctuation of water level (10 to 12 metres) causes alternately drying and wetting of river bed. As a result, bank materials are dislodged and bank erosion accelerated.
4. Seepage of ground water towards river leads to liquefaction and flowage of basal development of cracks ultimately accelerated bank erosion.
5. Sediment load of the river water also plays important role in bank erosion. Fine sediment in river water will increase the viscosity of flow, increase the tractive force, decrease the bed irregularities and bed form roughness and thus enhance the instability of river bank and bank.
6. Current and wave action are also important factor in bank erosion. River current is turbulent in nature and acts along the bank obliquely and undercut the lower portion of the river bank. As a result, unconsolidated bank materials of the upper part are collapsed. If the velocity, discharged and depth of river water increase, the current and wave action are more concentrated along the river bank. That is why river bank erosion is more in rainy season.
7. Anthropogenic activities along bank side such as digging of the land for preparation of brick, furrowing of land for cultivation, construction for habitation etc. also accelerate the process of river bank erosion. Brick field are concentrated in different parts of Murshidabad district along the bank side of the Padma and Bhagirathi River (Plate V). Digging of land on the river bank at Dhulian and Maya and other places by land mafia. Apart from the 2.64 km. long Farakka which was built across the river during 1962-1971, bank revetment with boulders, construction of the spurs to deflect the impinging current, the flood control embankment, excessive withdrawal of ground water are all combine causes for river bank failure.

Plate V. River bank erosion and brick field along Padma River bank at Maya

Consequences of river bank erosion

Consequences of river bank erosion are many folds such as environmental, social, economic and sometimes political. The first and foremost impact is social i.e. homelessness and landlessness due to river bank erosion which compels people to migrate. After force migration, people face firstly identity crisis as many people change their administrative boundary. The border dispute due to the Ganges bank erosion in Murshidabad district is related the inter-country border between India and Bangladesh. They also face economic problems due to loss fertile land, property and loss of jobs. As a result they deprive from basic human needs such as education, food, proper shelter, job, proper health care facility, sanitation, safe drinking water etc.

River bank erosion causes continuous forced migration in the following manner:

River bank erosion ⇨ submergence of river bank area &Forced migration ⇨ Resettlement in new land area or emerged deposited sand bar area (*char land)* ⇨ Again bank erosion & forced migration or displacement. Data of Socio-economic conditions of the displaced people are collected through household survey. The results are explained below: About 50% people of the displaced people are illiterate. The illiteracy rate is also increases to *char land* .About 60 % people are illiterates at Mahishmara *Char* (Nirmal *char*). The literate people are mostly below Madhyamik pass such as Tekpara village (Hasanpur Mouza) about 46%, Muradpur mouza (Toltolly) about 33% and Nirmal char and Ganja Sinheswari about 80% to literate people. Due to lack of educational institutions and economic distress, education has least priority among these displaced people. It has been observed in these areas that many children and even youths have never been in school and remain as illiterate.

Medical facility in the neo-refugees areas is very worst. Most of the areas have even no primary health centre. Most of the children suffer from malnutrition, and there are several reports of children death due to malnutrition. Immunizations programmed of children are not properly done in many resettled areas. Sometimes deaths of pregnant women were reported because of their delayed arrival at hospitals.

The large numbers of environmental neo-refugees are non-workers. In Tekpara (Hasanpur mouza), about 66% male and 91% are non-workers. Among these workers, maximum workers are cultivators and agriculture labour (52% male &40% female), followed by constructional and other labour (39% male and 50% female) and others (9% male & 10% female). In Toltally village (Muradpur Mouza), about 35% male non-worker and about 90% are female non-workers.

Table 3. Ganga Bank Erosion in Murshidabad District downstream of Farakka Barrage

Year	Total length affected(km)	Maximum width of erosion(m)	Approx loss of land(ha)	Approx maximum discharge('000 cumecs)	Approx Maximum water level(m)
1931-1978	-	-	28,290	-	-
1979	5.0	200	100	41.60	22.60
1980	6.0	250	100	72.20	24.60
1981	4.0	200	80	55.90	23.40
1982	5.0	200	90	66.90	24.30
1983	5.0	250	105	59.90	24.40
1984	22.0	700	635	60.50	24.20
1985	10.0	250	245	56.10	23.90
1986	10.0	200	180	48.60	23.70
1987	8.0	150	105	73.20	25.0
1988	9.0	300	255	67.40	24.90
1989	12.0	150	175	35.60	22.60
1990	10.0	150	120	54.30	23.80
1991	9.0	200	115	59.0	24.90
1992	6.0	200	115	45.30	23.60
1993	10.0	400	270	53.50	23.80
1994	33.0	1400	2585	66.90	24.60
1995	8.0	150	270	48.90	23.80
1996	10.0	1000	465	69.90	24.80
1997	4.0	100	40	46.60	23.90
1998	40.0	250	500	74.90	25.30

Source: Parua, P.K. 2009

It is observed from the Table 3 that maximum land erosion occurred in the year 1984, 1985, 1988,1993,1994,1996 and 1998. The average land loss from 1931 to 1978 is 28, 280 hectares. The average annual loss of land is more than 200 hectares.

Among these workers, maximum workers are cultivators and agriculture labour (65% male & 46% female), followed by constructional and other labour (32% male and31% female), others (3% male and 23%). In Ganja Sinheswari, contribution of non- workers are maximum about 72% and worker about 28%. Among the workers, about 33% are cultivators, 63% labour and 4% business and other. Many females are either house wife or engaged in *Bidi* cottage industry at minimum wages (Rs.100/1000 *bidi*). Therefore large numbers of displaced people have lost their job. Many male people particularly youth are forced to migrated Kerala, Bangalore, Kolkata, Saudi Arab for getting jobs.

People in environmental neo-refugees areas are very poor as they are lost their jobs. Most of the environmental neo-refugees have annual family income below Rs.60, 000/. The annual family income of three environmental neo-refugees areas are represented in pie diagram (Fig. III, IV & V).

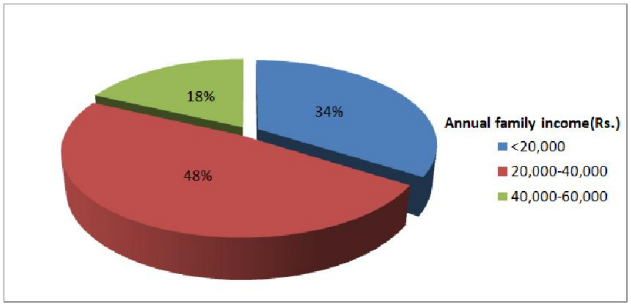

Fig III. Pie Diagram showing annual family income of displaced people of Tekpara village (Hasanpur Mouza) near Akhriganj

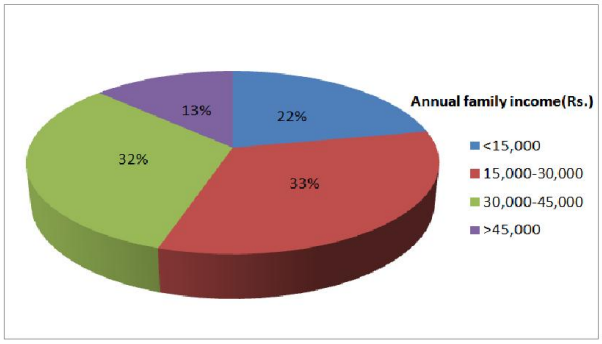

Fig. IV. Pie Diagram showing annual family income of displaced people of Toltolly village (Muradpur Mouza) near Jalangi

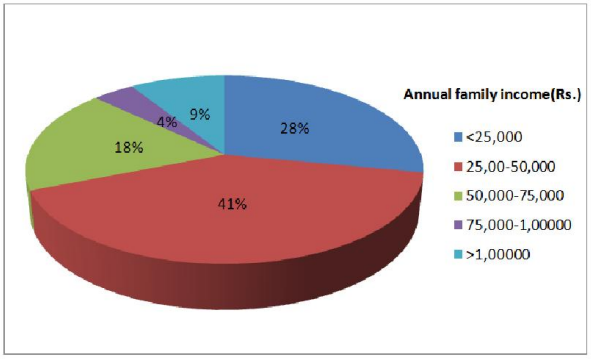

Fig. V. Annual family income of Ganja Sinsheswari Mouza on the bank of Bhagirathi River

The environmental neo-refugees of two villages such as Tekpara and Toltolly are due to Padma river bank erosion and Ganja Sinheswari is due to Bhagirathi River bank erosion. Pie diagrams show that the economic condition of the displaced people of Ganja Sinheswari is better than Tekpara and Toltolly village.

Most of the environmental neo-refugees live in temporary houses and *Kaccha* houses, mostly thatch type.

There is a mixture of Hindu and Muslim population, but Muslim dominated population. Many environmental neo-refugees areas have a lack of electricity particularly *char land* such as Nirmal *char*. This areas have absent proper sanitation, medical, market and even drinking water facility. The country boats are the main mode of conveyance while on land bicycle andbull-carts (Plate VI). This area particularly *char* lands are also flooding almost every year.

Plate VI: People on the way of Nirmal *char* by country boat

Displaced people particularly char dweller shifted their houses two to three times in their life. Pulses, vegetables and turmeric etc. are the main agricultural product and natural pasture help to rear cattle and goat (Plate VII).

Plate VI. People on the way of Nirmal *char* by country boat

Plate VII. Cattle rearing at Bamnabad char land

Conclusion

It may be concluded that environmental neo-refugees areas in Murshidabad district have faced a multi-dimension problems

and have lack of basic amenities for survival. In these circumstances, the following preventive measure and human preparedness may be undertaken to control the river bank erosion, simultaneously to provide basic amenities of environmental neo-refugees to uplift the socio-economic condition of these people.

Preventive Measures and Human preparedness

1. River bank erosion must be control as far as possible to protect the environmental neo-refugees through engineering measures such as concrete spurs, sand filling bags, boulders with weir nets etc (Plate VIII).

Plate VIII. Padma River bank protection through boulders with weir nets

2. The minimum facilities for living like sanitation, drinking water, electricity, school, medical facilities etc should be provided to the erosion victim.
3. Arrangement of more elevated flood shelter is absolutely necessary on *char* land or temporary settlement along the river bank.
4. Displaced persons may be granted their rights (*pattas*) without any delay on *char* land or vested land.

The revetment of banks with boulders did not ensure protection, rather proved futile in many cases (Plate IX).

Plate IX. Bank protection by boulder washed away along Padma River bank at Maya (Lalgola)

The attitude of the Government is largely based on the engineering which never taken into social dimension. Therefore better preparedness and scientific resettlement strategies as well as holistic planning may improve the socio-economic status of the thousands of erosion victim.

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