

Socio - Economic Impact of Erosion along the Right Bank of the Jamuna River in Bangladesh

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ABSTRACT

The socio-economic impact of erosion is discussed in this paper. Four sites were selected for the present study. Shuvogacha is one of the most erosion vulnerable locations. So, the scenario of erosion at Shuvogacha is lightly emphasized in the present paper. The socio-economic impacts of another three locations (i.e. Sirajganj, Betil-Enayetpur and Randhunibari) are also discussed. 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. Riverbank erosion has short-term and long-term impacts. It is evident from the present study that erosion has a great impact on livelihood, agriculture, environment and other sectors.

KEYWORDS: Jamuna River, Erosion, Socio-economic impact

1. INTRODUCTION

Riverbank erosion in the Jamuna River is one of the major problems in Bangladesh. Every year thousands of people become homeless and they lose their homestead and croplands. Mosques, schools, hospitals and other infrastructures are damaged due to erosion into the mighty Jamuna River. The erosion affected people migrate to cities or nearest town and they live in the urban slum areas [3, 4, 5, 9, 15, 18]. A number of erosion affected people take shelter on Brahmaputra Right Embankment (BRE) or live on the permanent or semi-permanent sandbar (*char*). The livelihood of *char* people is described by Schumuck-Widmann [18] and Sarker et al. [17]. Population displacement due to flood and river erosion is considered as one of the main contributors to landlessness and impoverishment of rural population [1]. About 10,000 hectares of land per year is eroded by river in Bangladesh [16]. Detailed studies were carried out on population displacement, resettlement, economic impact and human response to riverbank erosion hazard by different researcher Elahi [5], Halli [9], Haque, [12]. Different structural and non-structural measures have been implemented to reduce sufferings of the riparian population. The rate of erosion along the right bank is higher than the left bank. So, the most of the bank protection works have been constructed along the right bank of the Jamuna River. Massive to soft bank protection structures are constructed along the both

bank of the Jamuna River. Some of them are exposed to main channel and secondary or branch channel. The response of these structures against erosion is different. Some structures are functioning well and some of them have been damaged due to changing morphology, flow phenomena and other reasons [19]. At some locations erosion is being continued as a result of damaging of the bank protection structures. The main aim of the present study is to study on the socio-economic impact of erosion at some selected locations where bank protection structures either performing well or not.

2. SITE SELECTION

To study on socio-economic impact of erosion four sites were selected within 40 km reach along the right bank of the Jamuna River. Shuvogacha under Kazipur Upazila, an erosion vulnerable area, is situated about 25km upstream of the Bangabandhu Bridge. The Sirajganj town is about 8 km upstream of the Bangabandhu Bridge, Randhunibari under Belkuchi Upazila is about 2km downstream and Betil-Enayetpur under Chowhali and Belkuchi Upazila respectively is about 15 km downstream of this bridge. The four study sites are shown in Fig. 1.

2.1 Shuvogacha

Shuvogacha under Kazipur Upazila of Sirajganj district is one of the erosion prone areas along the right bank of the Jamuna River. Shuvogacha is located in between Sirajganj town and Kazipur Upazila. The Jamuna River at

Shuvogacha was very aggressive before construction of two RCC spurs. The bazaar, homestead and valuable agricultural land were being continuously eroded into the river. Two RCC spurs were constructed in the year 1999-2000 under the project “Protection of Meghai Bazar, Shuvogacha and Simla area from Erosion of the Jamuna River”.

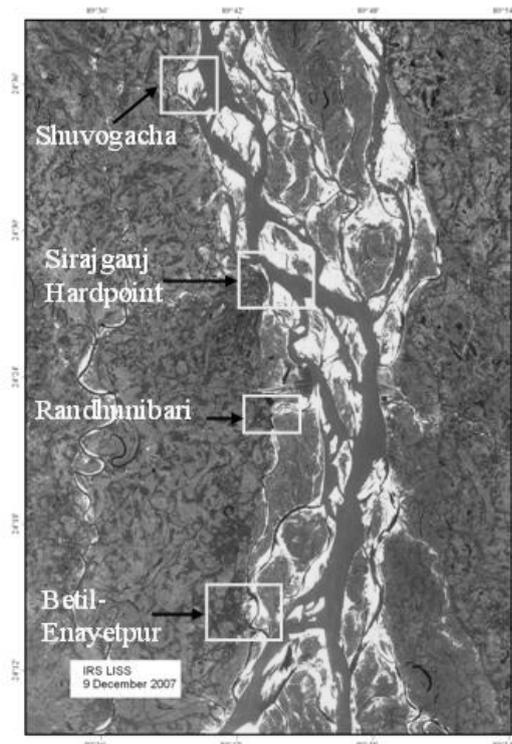


Fig. 1: Study sites.

The RCC spur number one located at Shuvogacha was damaged in June during the 2001 flood. A portion of RCC part of the spur number two was also damaged on 18th September 2000 during its construction. It was reconstructed in 2000-2001.

The earthen shank the RCC spurs was washed away in the monsoon in 2001. The failure event occurred so quickly that there was a little chance to perform repair works without some emergency works. At present the detached RCC part of the spur is standing on the char detached. Due to failure of the earthen shank the main channel started to flow in between bankline and RCC part of the spur since 2001. Consequently, the rate of bank erosion sharply increased. The situation became worse from year 2003 to 2005. The main flow of the Jamuna River directly attacked to the right bank in 2006. At that time, it was observed that the tendency of the main channel of the Jamuna River was gradually shifting its course towards the western direction.

Brahmaputra Right Embankment (BRE) was at a distance about 400m from the bankline of the Jamuna River at Shuvogacha bend in 2008. Some portion of the bank gets inundated during the flood season. At that time, the flow of the river directly hit to BRE. But according to the early practice, the BRE was protected from wind wave action by

erecting bamboo as shown in Fig. 2(a) in 2008. Later, the river side of the BRE was protected by geo-textile with cc blocks as shown in Fig. 2(b) in 2009. The homesteads and crop lands are being eroded into a secondary channel (i.e. Shuvogacha branch channel). Bank erosion and char formation is the regular phenomena at the Shuvogacha bend.



(a) 2008



(b) 2009

Fig. 2: BRE is protected by erecting bamboo or geotextile with concrete block at Shuvogacha.

Three-fourths of the Shuvogacha Union is now inside the Jamuna River. There were about 2900 hectares of land of the Shuvogacha Union before erosion, while at present only about 450 hectares of land is remaining (Table 1). One of the Union Parishad (UP) members of Shuvogacha informed that during the 2001 national election total number of voters of the Shuvogacha Union was 16,500, but during the 2008 national election it was only 7,565. From this information anybody can guess how many people have been affected by erosion. The number of educational institutions and mosques before erosion was 30 and 60 respectively. But after erosion, the number of educational institutions and mosques is 15 and 40 respectively. The capable people have been migrated to nearest towns or cities. Only poor people are living on the char or slope of the BRE. About 67 percent of the total families are poor and ultra-poor (Table 2).

2.2 Sirajganj

The Sirajganj is an old established town in Bangladesh. The urban and peri-urban development has been expanded close to the river bank. It is reported that one kilometer of right bank has already shifted towards westward direction since 1830 [11] at Sirajganj town.

Table 1: Some important information of the Shuvogacha union

Sl. No	Before Erosion	After Erosion
Mouza	9	9*
Number of voter	16,500 (2001)	7,565 (2008)
Land	2900 hectares	450 hectares
Educational Institution	30	15
Mosque	60	40
Graveyard	20	17
Pucca road	-	1km
Kaccha road	-	45km
Literacy rate	-	65 %
Post office	3	2
Registered club	5	2

Source: UP Member

*Most of the mouza (land plots) inside the river

Table 2: Classes of family depending on the property of the Shuvogacha union

Class	Number of Family	Percent (%)
Rich	321	12
Middle class	553	21
Poor	966	37
Ultra-Poor	797	30
Total	2637	100

Source: Proposed budget for 2007-2008 fiscal year of Number 4 Shuvogacha Union Council.

To protect this town a massive hardpoint named Sirajganj hardpoint is constructed in 1998 under FAP 1 [6]. Without this hardpoint Sirajganj town would be washed out several years back. So, this hardpoint play a vital role for the existence of Sirajganj town. Erosion is being continued just upstream of the Sirajganj town due to morphological change.

2.3 Betil and Enayetpur

Betil and Enayetpur are handloom enriched area. The bankline has shifted towards west by 5 km since 1914 ([11]. In this reach the bank moves towards western direction at an average rate of 100 meter per year. The Jamuna River is adjusted to a new morphology after construction of the Bangabandhu Bridge. A big permanent char is formed

downstream of the Bangabandhu Bridge. But a branch channel is flowing in between bankline and the char. A lot of erosion affected people living near the bankline and on the adjacent char. To protect government and private land and property, two spurs were constructed at Betil and Enayetpur in 2000-2001. The total length of the Betil and Enayetpur spurs are 801m and 1050m, respectively. The Betil and Enayetpur spurs are effectively protecting the bankline. But problem is that the structures itself are facing failure related problem.

2.4 Randhunibari

Randhunibari is also a handloom enriched area. A secondary or branch channel is passing nearby Randhunibari market. This same channel is also passing near Betil and Enayetpur. The intake of this channel is closed by the western approach road of the Bangabandhu Bridge during its construction. The river morphology is affected by the construction of this bridge with river training works as a part of bridge construction [2]. It is already stated that the morphology of the Jamuna gradually adapted to the new situation. Consequently, a large char has developed downstream of the Bridge along the west bank of the Jamuna. Flow coming from old upstream channel towards Randhunibari has been stopped. But during monsoon, a part of flow from the main channel (downstream of the Bangabandhu Bridge) comes towards the Randhunibari channel. The bankline erosion occurs at Randhunibari market place due to oblique flow towards bankline. People are living densely very close to the bankline. A lot of people, who were previously displaced by erosion, are now living on the newly formed char.

3. METHODOLOGY

About 30 bank protection structures are constructed along both the banks of the Jamuna River. Multi-stage sampling technique is adopted to select four sites for the present study. The selected four sites are: (i) Area near to the damaged Shuvogacha spur; (ii) Adjacent area of the Sirajganj hardpoint; (iii) Nearby area of the Betil and Enayetpur spurs; (iv) Adjoining area of the recurrent bank protection structures (bandal structure) at Randhunibari. To assess the socio-economic impact of erosion a semi-structured questionnaire was prepared. In preparing the semi-structured questionnaire the issues included were the loss of livelihood, generated vulnerabilities, social destruction; the impact on agriculture, the impact on the environment; livelihood dependency on rivers, etc. Among the erosion affected people mainly farmers, fishermen, loom workers, day laborers, rickshaw and van pullers, boat owners and boatmen etc. were selected for semi-structured questionnaire survey. The survey was conducted on 75 numbers of people. Among the total sample 20, 25, 15 and 10 were from Shuvogacha, Sirajganj, Betil-Enayetpur and Randhunibari, respectively. Some information was also collected through Key Informant Interview (KII) with Union Parishad (UP) member.

4. RESULTS AND ANALYSIS

4.1 Losses of Livelihood

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 cent percent of the respondents have lost their homestead and living houses (Table 3). About 90%, 84%, 87% and 100% of the respondents of Shuvogacha, Sirajganj, Betil-Enayetpur and Randhunibari areas had cultivable land. But during erosion they lost their cultivable land. Many of the erosion-affected people live near their eroded place for reemergence of the land. About 50% of the respondents go back to their reemerged land on Char Konabari (very close to Randhunibari Market). They built houses several years back on char Konabari. At present they are living there. Some of the respondents of the Randhunibari area have lost their loom factory due to erosion. 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, dug well, tube well and latrine.

Table 4 provides the information about the eroded cultivated land area. Most of the erosion affected people had cultivated land up to 2ha. On an average one fourth of the victims had cultivated land ranging from 2ha to 4ha. A few of the respondents had land area more than 4ha.

Table 3: Losses of livelihoods

Sl. No.	Item	Shuvogacha	Sirajganj	Betil-Enayetpur	Randhunibari
		(%)	(%)	(%)	(%)
1.	Homestead	100	100	100	100
2.	Houses	100	100	100	100
3.	Cultivable land	90	84	87	100
4.	Pond	35	32	13	10
5.	Dug well	25	16	7	10
6.	Tube well	15	12	20	-
7.	Trees	90	72	67	70
8.	Latrine	30	20	27	60
9.	Factories (loom)	-	-	-	50

Table 4: Losses of cultivated land

Sl. No.	Cultivated land (ha)	Shuvogacha N=20	Sirajganj N=25	Betil-Enayetpur N=15	Randhunibari N=10
		%	%	%	%
1.	0-2	70	60	53	80
2.	2-4	25	28	33	20
3.	4-6	5	12	13	-
4.	6>	-	4	-	-

Though this percentage is very few but they become poor overnight by losing everything [18]. 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.

4.2 Generated Vulnerabilities

Different types of vulnerabilities are generated as a result of erosion (Table 5). They became homeless by losing their original homestead and houses. Temporarily they built huts on the sloping side of BRE 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 Dhaka. Hossian [10] mentioned that the displaced 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 Sirajganj town have migrated as a result of erosion. On an average, about 40% of the respondents have changed their occupation. In the Shuvogacha area, a number of respondents are now van drivers or wage laborers. 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 Sirajganj town. Most of the respondents of Betil and Enayetpur areas are working in the hand loom industry or as wage laborers.

A number of respondents are working in the hand loom industry and also work as wage laborers at Randhunibari area. Some people run up debts due to erosion. There is also evidence of school dropouts and child marriage.

arrange transport like boat or other vehicle during an emergency situation.

Table 5: Generated vulnerabilities

Sl. No.	Item	Shuvogacha	Sirajganj	Betil-Enayetpur	Randhunibari
		(%)	(%)	(%)	(%)
1.	Homeless	90	72	73	30
2.	Landless	90	76	93	50
3.	Displacement	100	100	73	30
4.	Indebted	10	16	22	10
5.	Unemployed	-	12	11	-
6.	School drop out	10	16	33	-
7.	Child marriage	5	-	22	10
8.	Change of occupation	40	32	53	50
10.	Asset selling	-	-	-	20

Table 6: Social destruction

Sl. No.	Item	Shuvogacha	Sirajganj	Betil-Enayetpur	Randhunibari
		(%)	(%)	(%)	(%)
1.	Broken social bondage	95	80	53	87
2.	Broken family relation	95	72	27	33
3.	Occupational change	25	56	67	50
4.	Migration to city	50	56	-	-
5.	Disruption to social services	10	12	60	100
6.	Broken social network	65	44	47	75
7.	Degradation of social status	55	33	33	53
8.	Ruin of peace	35	28	27	53
9.	Increase of social injustice of the poor by the power and rich group	-	8	-	13

4.3 Social Destruction

The social damage has been created as a result of bank erosion (Table 6). Highest percent (95%) of the respondents of the Shuvogacha area opined that social bondage and family relation have been broken down due to erosion.

Many people are compelled to change their occupation as a consequence of erosion. It is already discussed that many people have been migrated to urban areas for searching shelter, employment and food. A good number of respondents said that social services and social network have been broken down as a result of erosion. The people, who are living on charland, are deprived of medical services in the emergency situation. It is very difficult for them to

The mainland people called the charland people as *choura* [18, 20]. They express its meaning as inferior status of the char people. Some of the respondent informed that their peaceful life has been shattered completely.

4.4 Impact on Agriculture

Riverbank erosion has a great impact on agriculture [18]. The impact on agriculture as a result of erosion is shown in Table 7.

On an average, seventy percent of the respondents opined that the cropping pattern is changed as a result of bank erosion. It also affects the crop diversity. Rice growing fertile cultivable land is becoming unsuitable for rice cultivation due to sand deposition.

The fertility of the land is reduced as a result of erosion and sand deposition, the yield of the land is declined. The people produce maize, dal, til, groundnut, etc on the newly formed charland. It is evident that the crop diversity is changing. Not all the emerged lands are suitable for crop production. Therefore, the crop intensity is also changing. About seventy percent of the respondents said that the crop is severely damaged during erosion.

4.5 Impact on Environment

The impact on the environment due to bank erosion is shown in Table 8. On an average, sixty five percent of the respondents express their view that the crop land is affected by sand deposition. As a result, the crop production is disrupted. Bank erosion and char formation are ongoing process in the Jamuna River. The depth of the river is gradually decreasing.

The channel near the bankline dried up so fish are usually unavailable in this channel. Only 36% of the respondents gave information that the fish are now available during the dry season. About 70% of the respondents have expressed their opinion that they have access to safe drinking water. About seventy five percent of the respondents believed that the shallowness of the Jamuna River is one of the main causes of erosion.

About 40% of the respondents of Betil-Enayetpur and 75% of the respondents of Randhunibari areas have expressed their opinion that the river water is polluted through discharging waste water to the secondary channel from the handloom industry.

4.6 Relief and Benefit for Erosion

The relief and benefit are received by the victims of erosion presented in Table 9. It is found from this Table that only one fifth of the respondents received relief during the emergency situation. At present some NGOs are working on the char. They are helping the charland people in raising their homestead to be safe from high flood. Erosion and deposition are the synchronized process. Therefore, erosion causes at one place and deposition or char formation occurs at another places. They get their original land through

formation of a new char. Thus, sometimes they indirectly are benefited through bank erosion.

4.7 Livelihood Dependency on River

A number of the respondents are dependent on the Jamuna River for different purposes as washing, bathing, cleaning, fishing, crop cultivation, transportation, recreation and livestock at almost all the study sites. Table 10 provides the livelihood dependency of the erosion affected people on the Jamuna River.

About 84% of the respondents of Sirajganj town are dependent on the river for washing, bathing and cleaning. About 60% of the respondents use river for fishing. About 70% of the respondents are dependent on the river for transportation purposes at Betil, Enayetpur and Randhunibari areas. Especially those people, who are living on the charland, are solely dependent on boat as transport to go to the mainland. About 25% of the respondents of the Randhunibari area use river water for crop cultivation. About 75 % of the respondents of the Betil, Enayetpur and Randhunibari areas use the river for livestock purposes.

5. CONCLUSION

From the above discussion it is clear that the erosion has a great impact on the livelihoods of riparian population, agriculture, and environment. Different types of vulnerabilities are generated as a consequence of erosion. Family relation and social bondage have been broken down, and the social status has been degraded. The social services and the social networks have been disrupted. Therefore, structural measures and at the same time non-structural measures should be adopted for reducing socio-economic impact.

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Table 7: Impact on agriculture

Sl. No.	Item	Shuvogacha	Sirajganj	Betil-Enayetpur	Randhunibari
		(%)	(%)	(%)	(%)
1.	Impact on agriculture	90	84	73	100
2.	Changed cropping pattern	70	80	60	80
3.	Decline of production	65	72	67	60
4.	Change in crop diversity	50	64	53	50
5.	Impact on cropping intensity	75	52	60	60
6.	Damage of crop	65	76	67	80

Table 8: Impact on environment

Sl. No.	Item	Shuvogacha	Sirajganj	Betil-Enayetpur	Randhunibari
		(%)	(%)	(%)	(%)
1.	Cropland affected by sand deposition	75	72	67	60
2.	Fish available in dry season	35	32	47	10
3.	Water quality	35(not affected)	40 (not affected)	40 (affected)	75(affected)
4.	Access to safe drinking water	75	76	65	70
5.	Erosion due to low channel depth	75	80	73	80

Table 9: Relief and benefit of erosion victims

Sl. No.	Item	Shuvogacha	Sirajganj	Betil-Enayetpur	Randhunibari
		(%)	(%)	(%)	(%)
1.	Received relief service	20	20	33	-
2.	Shelter on embankment	20	16	-	-
3.	Development services from NGOs	10	-	33	25
4.	Land from accreted char	5	8	33	100
5.	Aid in raising homestead	-	-	33	50

Table 10: Livelihood dependency on river

Sl. No.	Item	Shuvogacha	Sirajganj	Betil-Enayetpur	Randhunibari
		(%)	(%)	(%)	(%)
1.	Washing, bathing, cleaning	45	84	80	70
2.	Fishing	45	60	67	60
3.	Transportation	20	24	67	75
4.	Cultivation of crop	-	4	-	25
5.	Recreation	10	12	20	10
6.	Livestock	15	16	73	80

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