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Socio-Economic Impacts of Teesta Riverbank Erosion: Evidence from Lalmonirhat District, Bangladesh

¹ Md Hazrat Ali, ² Farid Uddin Khan

¹ Department of Economics, Ministry of Education, Directorate of Secondary and Higher Secondary, Government of the People's Republic of Bangladesh, Bangladesh

¹ Institute of Environmental Science, University of Rajshahi, Rajshahi-6205, Rajshahi, Bangladesh

² Department of Economics, University of Rajshahi, Rajshahi-6205, Rajshahi, Bangladesh

Corresponding Author: **Md Hazrat Ali**

Abstract

Bangladesh, a disaster-prone South Asian country, is affected by the multiple issues of climate change such as global warming, sea level rise, floods, and riverbank erosion. The purpose of the study is to assess the impact of riverbank erosion on the livelihood vulnerability of the riparian household in the Teesta River. The study area is most vulnerable area of Lalmonirhat District. A questionnaire survey was conducted for the data collection. A total of 70 rural households were interviewed from the Dhubni villages under the Shingimary union of Hatibandha,

Lalmonirhat during March-May, 2023. Apart from the survey data, by means of other methods of data collection such as interactions, and observations were employed in this study. Results show that due to riverbank erosions, households experienced loss of homesteads, loss of agricultural lands, loss of agricultural productions and displacement of their houses. Besides, the riverbank erosion also has long term socio-economic impacts on livelihoods of the erosion-induced households of the river area.

Keywords: Riverbank Erosion, Displacement, Livelihood, Riparian, Households

Introduction

Riverbank Erosion are becoming concern of people's lives in different countries around the world. Bangladesh is a natural disaster country which has affected by multiple disaster, like as Flood, riverbank erosion, cyclone, tornado and drought (Shohel Rana, 2017) ^[15]. It's mainly causes of global warming and climate change (Rahman & Gain, 2020) ^[14]. River bank erosion is one of the major and uncertain problems in the world. The river area peoples are affected by riverbank erosion. In Bangladesh, riverbank erosion is a devastating threat that repeatedly pushes people into poverty (Mollah & Ferdaush, 2015) ^[13]. The country is widely regarded as being one of those most vulnerable to climate change due to disaster-prone geographic location, socio-environmental conditions, over population, poverty, and low economic and technological capacity (Alam *et al.*, 2020) ^[5]. Despite its impact and nature, riverbank erosion is a significant geo-morphological process that occurs frequently in fluvial and coastal environments across the world (Bhuiyan *et al.*, 2017) ^[6]. Bangladesh is acknowledged by the international community as being among the world's most vulnerable nations. The high climate change vulnerability of Bangladesh is caused by a variety of hydro-geological and socio-economic issues, such as vulnerability and resilience lie at the core of the new paradigm governing natural disaster risk management frameworks (A. Ahmed, 2006) ^[2]. Additionally, it is an empirical study of the socio-economic preparedness for natural disasters in a Bangladeshi coastal town vulnerable to tropical cyclones. (Akter & Mallick, 2013) ^[4]. When all people, at all times, have physical, social, and economic access to enough, safe, and nutritious food that satisfies their dietary needs and food choices for an active and healthy life, this is referred to as having "food security." Food security is affected by factors like food access, supply stability, and availability (Akinyele, 2009) ^[3]. Riverbank erosion often hampers arable land and human settlements. It also annihilates huge agricultural crops, blockage road-linkages and breakdown communication infrastructure system of the country. The present study is aimed to find out the socio and economic impact of Teesta riparian households. Considering the above problems this study has been carried out to reveal the actual picture of the adversely affected northern part of the country.

Literature Review

Both direct and indirect repercussions of riverbank erosion on Bangladesh's socio-economic system are present. The current study examined the risk of riverbank erosion in the study region, its effects on the community and livelihood vulnerability due to land loss (Bhuiyan *et al.*, 2017)^[6].

Bangladesh a riverine country is the most vulnerable country in the world to climate change. Riverbank erosion has a negative impact on people and their way of life by destroying their homes and agricultural land and over time leading to economic, social, and psychological misery (Mamun *et al.*, 2022)^[12]. It is advised to include a social, cultural and psychological context in studies on hazard analysis and mitigation. The poor in Bangladesh resort to religion for solace when faced with difficulties and this in turn has a big impact on how they perceive and react to natural disasters (Hutton, 2003)^[10].

Climate change is a dynamic phenomenon, changes will occur over time, and implications will only be understood in future, it is impossible 'to define a changing climate' that might occur 'within a defined period in future (Isfat & Raihan, 2022)^[11]. Effects of Brahmaputra River bank erosion in Bangladesh. According to a survey, 204 households supplied information on the effects and occupants' perceptions of risk. The populace living along the river's banks has severe socio-economic issues as a result of the river's erosion (Haque, 1988)^[8]. In Bangladesh, river bank erosion is a serious threat. People are permanently uprooted and impoverish. The Jamuna River is found in Bangladesh's northern region. It destroyed everything in their and accreting land (Mollah & Ferdaush, 2015)^[13]. This paper shows that human settlement to riverbank erosion risk in the Teesta floodplain area of Bangladesh (Sultana *et al.*, 2018)^[16].

This paper shows that some of the economic effects of riverbank erosion in Bangladesh. The research was doing in one village over the period 1979-89. About 45 per cent of households were affected during the period (Hossain, 1993)^[9]. The study uses survey data from 380 rural Bangladeshi homes that are vulnerable to riverbank erosion as well as data from focus groups with household heads who reside in extremely vulnerable areas (Alam *et al.*, 2020)^[5].

Riverbank Erosion

River bank erosion occurs when water wears away of the banks of a river of stream and its removal of soil or rock fragments along the banks of a stream channel resulting from high flow after runoff event. When the soil's top layer is loose, the soil particle is more susceptible to being blown away by the natural forces of wind and water away. The low-lying deltaic country of Bangladesh is home to more than 230 rivers, countless canals, and extensive waterways. The process of erosion wears down the banks and riverbed. Additionally, erosion displaces the rocks that rivers carry downstream. Four forms of erosion exist, the force with

which the water crashes against the riverbanks are known as hydraulic action. The pattern and severity of riverbank erosion in Bangladesh are unique. Being a densely populated country, a large portion of population live along the bank of rivers (around 230 rivers in total). Moreover, the country drains a huge amount of runoff due to its geomorphological position (Ahmad & Afzal, 2021)^[1].

Livelihood

A person's means of providing for the fundamental essentials of life-food, water, shelter, and clothing is referred to as their livelihood. A collection of daily tasks carried out over one's lifetime is referred to as one's livelihood. These tasks can involve obtaining water, food, fuel, medication, shelter, and clothing. A person's livelihood depends on their ability to purchase the aforementioned essentials in order to meet their basic needs and the needs of their household. The tasks are typically completed time and time again in a dignified and sustainable manner. For instance, a fisherman's livelihood depends on the availability and accessibility.

As part of their plan to improve their standard of living, households and individuals engage in a variety of activities and allocate their limited resources. A person's source of income is made up of a number of farm and nonfarm activities that combined offer a variety of food and money purchasing options (Dokken, 2015)^[7].

Materials and Methods

This methodological approach depends on primary data. Some supporting data were collected from the secondary sources. These secondary sources are different types of books, journal, newspaper, government and non-government organizations. The primary data was collected through a questionnaire survey and open and close ended questions has been formed here. The primary data collection process by the research team was to identify 70 vulnerable households who had been affected by the riverbank erosion. The survey was conducted among male, female and migrant peoples. The respondents who are illiterate or who do not understand English, the questionnaire was explain in the Bangla language understood by them and answers was being recorded. For analyzing the data SPSS tools version 25 are used. The first part of the questionnaire consisted of demographic and general factors like gender, age and qualification etc. It consisting of various factors about riverbank erosion.

Study Area

The study area is located under Hatibandha Upazila Lalmonirhat District. It is bounded by Patgram Upazila on the North and West Bengal State of India. Kaligonj Upazila on the South, West Bengal State of India on the East. Dimla and Jhaldhaka upazila on the West. The main river is Teesta River and it's originated from India.

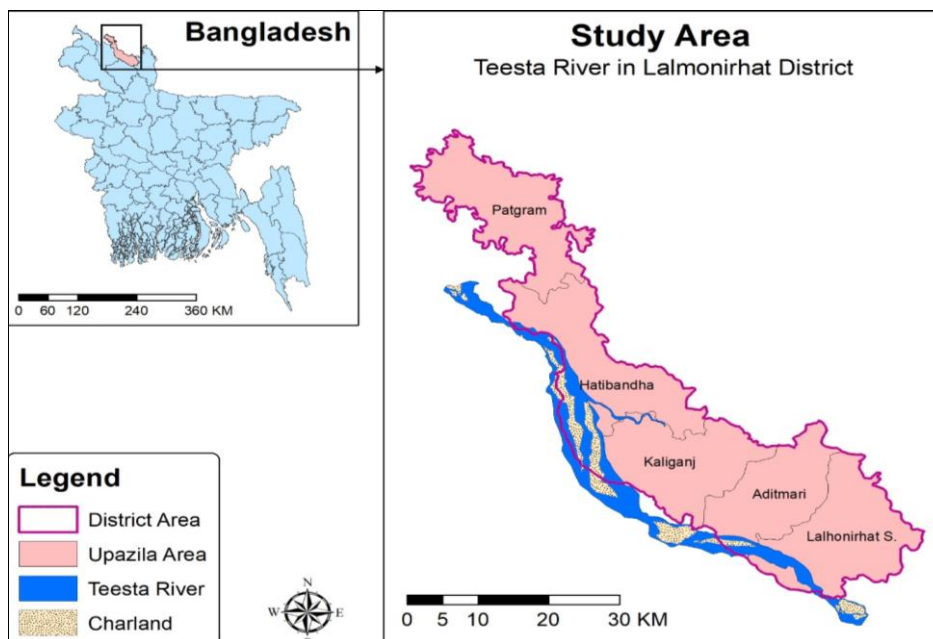


Fig 1: Map showing the location of study area

Outline of the Study

This method deals with research methodology and various steps of study area selection, sample design and procedure, sample size determination, data processing, analysis- for completion of the research. Data collection methods and techniques was mainly household questionnaire survey and informal discussion with the aged people who have experienced in riverbank erosion. A multi-stage sampling technique was employed to collect data from riverbank erosion hazard-prone rural households in Teesta River area of Bangladesh. The Dhubni village, Shingimari union under the Hatibandha upazilla of the Lalmonirhat district was selected, as they represent the most riverbank erosion affected riparian environments in Bangladesh.

Socio-Economic Profiles of the Households

Table 1: Gender distribution

Gender	Frequency (percent)
Male	38 (54.3)
Female	32 (45.7)
Total	70 (100)

The respondents are composed of both male and female. Among the respondents the male is 54% and female is 46%.

Table 2: Age distribution

Age group	Percent
15-24	12.9%
25-34	20%
35-44	4.3%
45-54	28.6%
55-64	14.3%
65-74	11.4%
75-84	4.3%
85-94	4.3%
Total	70 (100)

Among 13% household respondents aged 15-24 years is only 20% and 25-34 years is only 4.3%. The respondents aged groups 35-44 years percentage is 4.3% respondents.

The age groups 45-54 years is comprised is 29% respondents. Aged 55-64 years, the respondent's percentage is 14%. 65-74 years age group is composed of 11% of respondents. Age 75-84 years respondent's percentage is 4.3% and finally age 85-94 years percentage of respondents is 4.3%. The highest number of respondents is between 45-54 years followed by 29%.

Table 3: Education level of the respondents

Education level	Frequency (Percent)
Illiterate	15 (21.4)
Primary	17 (24.3)
Junior High school	9 (12.9)
SSC*	7 (10)
HSC**	7 (10)
Graduate	6 (8.6)
Post graduate	4 (5.7)
Total	70 (100)

Note: * and ** depict secondary school certificate and higher secondary school certificate respectively.

About 21% respondents are illiterate and 24% respondent's education level is primary school. 13% respondent's educational qualification are junior high school, 10% respondent's educational level are SSC, 10% of the respondent's education level is HSC. The graduate level respondent's education level percentage is 9%. The post-graduate education level is 6%.

Table 4: Occupation of the respondents

Occupation	Frequency (Percent)
Agriculture	21(30)
Labor	19 (27.1)
Business	7 (10)
Service	6 (8.6)
Fishing	5 (7.1)
Van, rickshaw and auto driver	12 (17.1)
Total	70(100)

Among the respondent's major portion (30%) is engaged in agriculture. About 27% are involved in daily labor, 10%

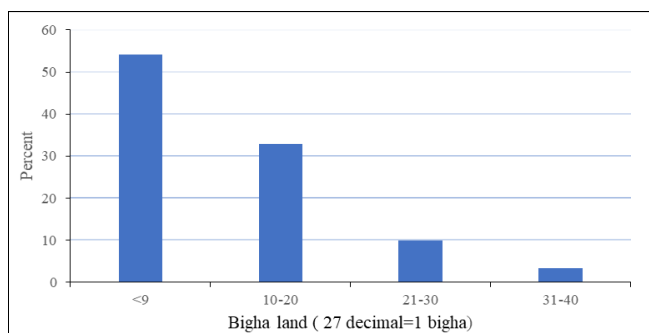
respondents are involved in small business sector, 9% are involved in service sectors, 7% are involved in fishing sectors, and finally 17% respondent's occupation are involved in van, rickshaw and auto driver.

Socio-Economic Impact of Riverbank Erosion

Socio-economic impact of riverbank erosion has created various disastrous socio- economic effects. The majority of those who are impacted by riverbank erosion see it as a natural occurrence but in many cases, they also see it as the will of God. However, riverbank erosion is now considered to be one of the main factors contributing to national poverty (Rahman 2010). The diminution of agricultural lands, which is represented in declining land productivity and as a result, reducing income production from agricultural activities, is a manifestation of the economic effects of river bank erosion. The impact of land loss involves primarily the loss of homestead lands, agricultural lands, agricultural productions, crops and trees. Livelihood status of people of that area has changed due to the impact of property losses.

Result and Discussion

Economic Impact:

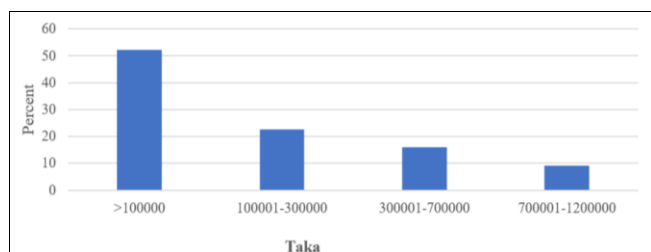


Source: Field survey, 2023

Fig 1: Percent of land by river bank erosion in the study area

The study clearly shows that almost 55 % of the sample respondents of the study area have lost less than 10 bighas land. On the other hand, 33 % respondents in the study area have lost 10-20 bighas land, 10% respondents of the study area have lost 21-30 bighas land, 2% respondents have lost 31-40 bighas land.

Loss of Agriculture Production



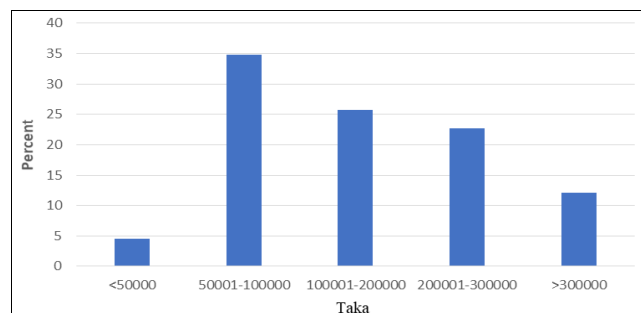
Source: Field survey, 2023

Fig 2: Loss of agriculture production

The majority of people in this nation are either directly or indirectly dependent on agriculture. Bangladesh's primary source of income in rural areas is agriculture. Agricultural land is the vital resource for the people living in rural areas

and those who are living close to the river bank. Most of the people in the study area were engaged in agricultural sector but the situation is totally different. They have lost total agricultural lands which is the main source of earning of their livelihood. The study data shows almost 52% respondents of the study area have faced economic loss less than 1 lakh taka. On the other hand, 23% respondent's opinion is that they have lost 1-3 lakh taka approximately, 16% respondents have lost 3-7 lakh taka, 9% people have lost 7-12 lakh taka. Before riverbank erosion most of the people of the research area was totally dependent on agriculture.

Homestead Land Loss Amounts to Taka



Source: Field survey, 2023

Fig 3: Homestead land loss amounts to taka

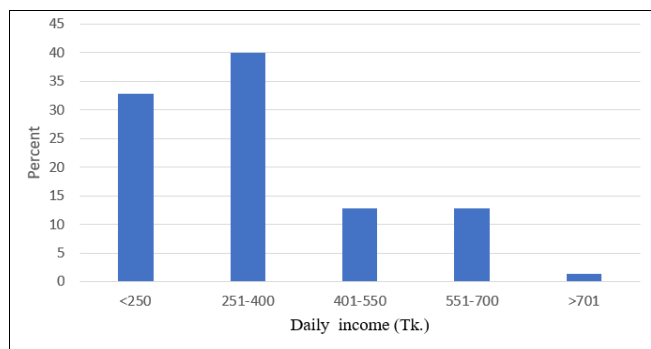
From the field survey it has been found that the sample household respondents have lost huge amount of homestead areas. Maximum respondents said that they had expended their most of the savings to rebuild their house again and again. In spite of knowing that the house which they are rebuilding will not exist after one or two years they are rebuilding their new homesteads near the river because they don't want to move anywhere from their own land. The study data shows almost 4% respondents of the study area have faced homestead land loss less than amount of taka approximately 50 thousand. On the contrary 35% respondent's opinion is that they have lost 50 thousand-1 lakhs taka approximately, 26% respondents have lost more than 1-2 lakhs taka, 23% people have lost more than 2-3 lakhs taka, 12% people have lost more than 3 lakh Taka.

Reduced Family Spending Because of the Erosion of the Riverbank

The result of river bank erosion the source of the income has reduce. The riverbank erosion time and present situation is not same. So present time the study area respondents are totally different.

Daily Income

Maintaining a minimum standard of living is the ability of an individual respondent. But their standard of living is being lowered by lower monthly income and being unable to cope with severe losses due to any natural disaster. The study area data shows that about 33% of the respondents' daily income is less than 250 takas. About 40% respondent's opinion their daily income is 251-400 taka. 13% respondents their opinion is daily income 401-550 taka, 13% respondents their opinion is daily income 551-700 taka of the study area and about 1% respondents have daily income are greater than 701taka (BDT).



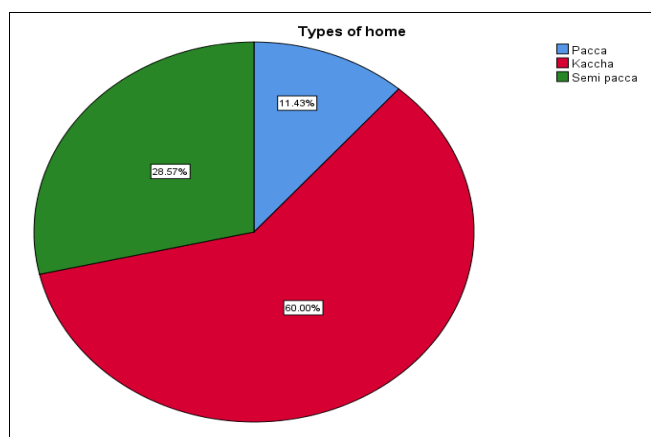
Source: Field survey, 2023

Fig 4: Daily income

Socio Impact

Respondents Housing Pattern

The structure of the house pattern is more fragile because of bank erosion. The study area people think that their house any time evacuated. Due to the fact that they constructed their homes using materials that can be moved within short time periods natural disaster.



Source: Field survey, 2023

Fig 5: Housing Pattern

The study area data shows that about 60% of the respondents there is Kacca house, 29% respondents their house is semi -pacca and 11% respondent’s opinion their house is pacca but it’s not completed. The severe impact of bank erosion is the loss of homesteads that makes the population more vulnerable to live a decent life. When erosion strikes, people have no option to leave behind except bearing the losses. They never change location of their homestead before the erosion takes place. The main reason behind such behavior is that they have little earnings that never allow them to replace their homesteads before it is totally collapsed.

Moving Home from Original Location

The riverbank erosion people’s main problem is repeated moving home from original place. Due to their sorrow knows no bounds. They spend a lot of money behind their repaired house.

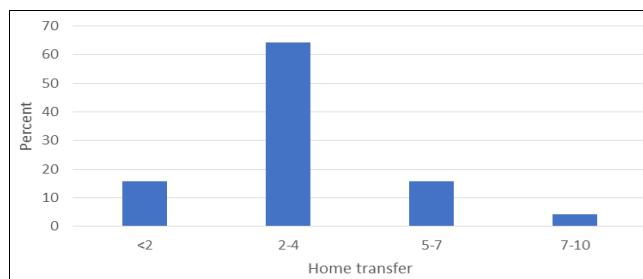


Fig 6: Moving home from original location

Nearly 16% of respondents in the research area experienced an impact of less than twice. However, 64% of respondents felt that they had been relocated 2-4 times in the region. Only 16% of respondents thought they were impacted five to seven times. Only 4% of respondents believed they were impacted 7-10 times. The erosion makes it nearly impossible for them to support their way of life.

Getting Food during Erosion Period

When the river broke, the affected people had many problems in getting food. When rivers break almost everything is lost in the river so there is not much left for food. The study data shows that about 79% of the respondent’s mention that the people faced trouble in getting food and 21% respondents there had no problem to getting food during the riverbank erosion period. In riverbank erosion affected people had bad experience to getting food.

Conclusion

This study shows that river erosion has adversely affected in Bangladesh. The marginalized population in the village are suffering from adverse effects of riverbank erosion. Climate issues and solutions in developing countries like Bangladesh need to attract the attention of policy makers who deal with it. In-depth analysis of the difficult problems rural Bangladeshi households face including rising water levels, erosion along riverbanks and the resultant loss of agricultural land, has been done in this study. These circumstances have led to food insecurity in these households and taken together, they pose significant barriers to Bangladesh's advancement in both the economy and society. Additionally, this study conducted fieldwork to get information on how severe this problem is from the homes themselves in putting this analysis together, the researcher has generated reliable results using industry-standard methodologies and procedures for a thorough knowledge of the livelihood vulnerability and food security status of the riverbank erosion hazard-prone rural families in Bangladesh. Additionally, the river and water management issue could be resolved by the governments of Bangladesh and India working together. Additionally, it's critical to lower the current rates of rural unemployment, poverty, and illiteracy. By the researchers can provide new knowledge and insights for policy makers as well as practitioners and academics in poverty reduction and livelihoods enhancement.

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References

- Ahmad D, Afzal M. Flood hazards, human displacement and food insecurity in rural riverine areas of Punjab, Pakistan: Policy implications. *Environmental Science and Pollution Research*. 2021; 28(8):10125-10139. Doi: <https://doi.org/10.1007/s11356-020-11430-7>
- Ahmed AU. Bangladesh Climate Change Impacts and Vulnerability: A Synthesis. In *Change*, 2006, p49.
- Akinyele IO. Ensuring Food and Nutrition Security in Rural Nigeria: An Assessment of the Challenges, Information Needs, and Analytical Capacity. *International Food Policy Research Institute*. 2009; 18:1-90.
- Akter S, Mallick B. The poverty-vulnerability-resilience nexus: Evidence from Bangladesh. *Ecological Economics*. 2013; 96:114-124. Doi: <https://doi.org/10.1016/j.ecolecon.2013.10.008>
- Alam GMM, Alam K, Mushtaq S, Sarker MNI, Hossain M. Hazards, food insecurity and human displacement in rural riverine Bangladesh: Implications for policy. *International Journal of Disaster Risk Reduction*. 2020; 43:p101364. Doi: <https://doi.org/10.1016/j.ijdrr.2019.101364>
- Bhuiyan MAH, Islam SMDU, Azam G. Exploring impacts and livelihood vulnerability of riverbank erosion hazard among rural household along the river Padma of Bangladesh. *Environmental Systems Research*. 2017; 6(1). Doi: <https://doi.org/10.1186/s40068-017-0102-9>
- Dokken D. 13-Livelihoods and Poverty (Issue May 2017), 2015. Doi: <https://doi.org/10.1017/CBO9781107415379.018>
- Haque CE. Impacts of river-bank erosion hazard in the Brahmaputra-Jamuna floodplain: A study of population displacement and response strategies. Ph.D. thesis. 1988; 988(c).
- Hossain M. Economic Effects of Riverbank Erosion: Some Evidence from Bangladesh. *Disasters*. 1993; 17(1):25-32. Doi: <https://doi.org/10.1111/j.1467-7717.1993.tb00485.x>
- Hutton D. Patterns of Coping and Adaptation among Erosion-Induced Displacees in Bangladesh: Implications for Hazard Analysis and Mitigation, 2003. Doi: <https://doi.org/10.1023/A>
- Isfat M, Raihan A. International Journal of Research Publication and Reviews Current Practices, Challenges, and Future Directions of Climate Change Adaptation in Bangladesh. *International Journal of Research Publication and Reviews*. 2022; 3(5):3429-3437. www.ijrpr.com
- Mamun A Al, Reza A, Islam T, Alam E, Pal SC, Alam GMM. Assessing Riverbank Erosion and Livelihood Resilience Using Traditional Approaches in Northern Bangladesh. *Sustainability*. 2022; 14:23-48. Doi: <https://doi.org/10.3390/su1404234>
- Mollah TH, Ferdaush J. Riverbank Erosion, Population Migration and Rural Vulnerability in Bangladesh (A Case Study on Kazipur Upazila at Sirajgonj District). *Environment and Ecology Research*. 2015; 3(5):125-131. Doi: <https://doi.org/10.13189/eer.2015.030502>
- Rahman MS, Gain A. Adaptation to river bank erosion induced displacement in Koyra Upazila of Bangladesh. *Progress in Disaster Science*. 2020; 5:p100055. Doi: <https://doi.org/10.1016/j.pdisas.2019.100055>
- Shohel Rana M. Impact of Riverbank Erosion on Population Migration and Resettlement of Bangladesh. *Science Journal of Applied Mathematics and Statistics*. 2017; 5(2):p60. Doi: <https://doi.org/10.11648/j.sjams.20170502.11>
- Sultana MR, Hassan Z, Paul SK. Mitigation of Erosion-Induced Disaster through Indigenous Practices: Evidence from Rural Community of Teesta River Bank. *Journal of Life and Earth Sciences*. 2018; 13:22-31.