

Extent of population migration from riverbank eroded areas and its rationales: a case study of Dhubri and Dhemaji districts of Assam

Mr. Dimpal Dekaraja, Dr. Ratul Mahanta

¹Assistant Professor, Goreswar College, Assam, India

²Associate Professor, Gauhati University, Assam, India

rmeco@gauhati.ac.in, dimpolde@gmail.com

Abstract

Objectives: The paper examines the extent of migration due to riverbank erosion and its rationale. The paper based on field survey data collected from two districts of Assam, India namely Dhubri and Dhemaji during June – August 2016. Altogether 437 households were interviewed, out of which 194 were from Dhemaji district and 242 from Dhubri district.

Methods: Using multi-stage random sampling method the survey was conducted in high, medium and low eroded villages of both the districts. Data collected were analyzed using descriptive statistical tools such as percentages, mean, standard deviations.

Findings: Migration is found in eroded and non-eroded villages. Large number of short-term migration in comparison to long-term migration found and people migrated more from highly eroded areas than from less eroded areas. It has also been found that migration among non-farmers is higher than farmers. The paper concludes with the findings that the main reasons behind migration are the problems that arise due to riverbank erosion.

Application/Improvement: The study is a contribution to the migration studies. It will be helpful to suggest policy measures to control migration in the riverbank eroded areas.

Keywords: River-bank erosion, extent of migration, rationale for migration, short term and long term migration.

1. Introduction

Although migration theories establish the relationship between population movement and economic factors, in recent times environmental constraints have become a prime cause of migration throughout the world [1-3]. Studies reveal that various types of environmental constraints like climate change and variability [4], land degradation [5], drought [6], River bank soil erosion [7] as well as deforestation [8] force people to move from the affected area to a safer place. Environmental constraints like land degradation and River bank erosion create vulnerability to poverty through affecting the income earning sources of the people [9]. This forces them to move to safer place in search of livelihood. The positive link between environmental degradation and migration has been visible from various studies such as “Linkage between dry land degradation and migration” [6], “Common property resource degradation and migration” [10, 11], “River bank erosion and migration” [9]. Assam, one of the northeastern states of India has been heavily affected by river-bank erosion since 1950. The mighty Brahmaputra River which flows through the state has eroded 12.6 thousand hectares of land displacing 77.8 thousand people in 2014 [12]. To the best of our knowledge, there are a handful of studies which have endeavored to see the relation between river-bank erosion and migration in Assam. It is estimated that the Brahmaputra River wiped out more than 4000sq. km of land and displaced more than 25 thousand villages since 1960 to 2008 [13]. Thus approximately 7.4 percent of Assam valley portion of the Brahmaputra River was lost which led to the displacement of five thousand people [14]. In a study, in the Hajo revenue circle of Assam observed the cause and effects of River bank erosion [15]. All these studies describe about the linkage between riverbank erosion and human migration from the geographical viewpoint. Hence this study tries to focus on the problem from economic viewpoint. In this context, the paper examines the extent of migration (Short and long term) and their rationales through field study. The novelty of our study is that it tries to analyze the rationale

behind migration taking into consideration both short run and long run migration. Besides, the paper also identifies the reasons to stay put even after affected by riverbank erosion.

The rationales here indicate the in-depth study of the problems or detail explanation of the problems associated with migration. The problems (mainly socio-economic problems) arise due to erosion which influences the decision to migrate. Various types of socio-economic problems arise due to riverbank erosion such as displacement, loss of agricultural land and home, psychological effect, poor transportation system and problems in education [15, 3]. All these problems affect income of the victims [9]. Thus the rationales influence the migration decision of the victims. However, some of the victims who have the capacity to manage their income with the help of coping and adaptation strategies (Ex-ante risk reducing strategy, [16]) decide to stay in the erosion affected villages. The coping strategies adopted by the victims are in the form of sale of assets (such as sale of land, sale of livestock), sale of bamboos and woods, sale of homemade produce, changing the crop calendars etc [17, 18]. The structure of the paper has been divided into six sections. The second section discusses the theories behind migration. The third section discusses nexus between river-bank erosion and migration. The fourth section associated with the related literature of the linkage between river-bank erosion and migration and the fifth section represent the methodology part of the study. Sixth section deals with the results and discussion of the study and the paper ends with conclusion and recommendation in the last section.

2. Theories behind migration

Migration theories describe the rural-urban migration that is caused by economic factors. Introducing “Intervening opportunities” concept, it is stated that migration over a distance is directly proportional to the opportunities at the place of the destination while it is inversely proportional to the opportunities at the place of departure [19]. The dual economic theories of [20, 21] consider rural-urban migration as a process of the labour movement from a traditional agriculture to the modern industrial economy due to high wage structure in urban areas. In the cost-benefit model of migration it is argued that migration decision of rural people depends on cost and benefit of the migrants [22]. The rural people migrate when the benefits outweigh the costs. But according to Lee’s theory, migration decision is influenced by factors associated with origin and destination places, which may be positive or negative [23]. The factors are also termed as “Push” and “Pull” factors. The push factors are the negative factors that force the migrants to leave their origin while pull factors are the positive factors that motivate the migrants. Lee also considers environmental degradation as a “Push” factor that forces people to migrate. Similarly, the two-sector model describes rural-urban migration based on the assumption that migration is privately on the rational economic calculation of the individual migrants despite the existence of high urban unemployment [24]. Hence migration decision in response to the differences in urban-rural expected earnings rather than actual earnings. These migration theories view that migration decision is mostly influenced by wage differences, employment opportunities, and better facilities in destination area than in the origin. Later, it is argued that the rural-urban migration in less developed countries as a dynamic spatial process [25]. On the basis of rural potential migrants, it created the model of overall migration flows and interactions, which are affected by various factors in the decision to migrate. In contrast, a new model tries to develop to observe the decision-making process of potential migrants [26].

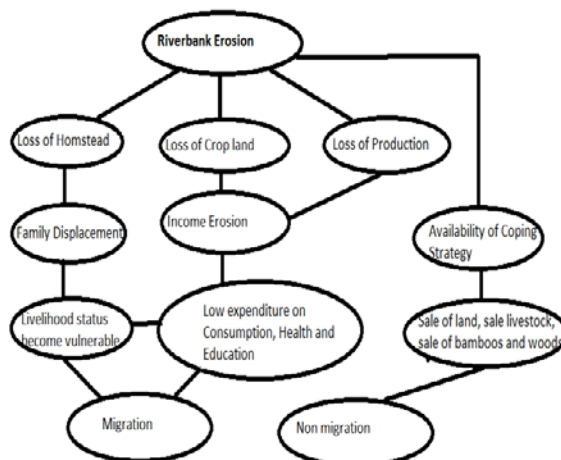
That is, they observed the migration decision of both migrants and non-migrants by applying cost-benefit analysis method. The model used different variables such as earnings in the destination, earnings in the origin, cost of moving, the total number of years in which future returns are expected, the rate of interest used to discount the future returns. The concept of potential migrants is also explained in the value expectancy model [27]. The potential migrant’s migration decision depends on a multiplication of the values of both expected and actual outcomes. If the expected outcomes are greater than actual outcomes, then they will migrate. But, [28] argued that the rural-urban migration depends on two principal variables, i.e. “Urban-rural real income differential” and “The probability of getting an urban job”. Criticising the Harris-Todaro model, it is argued that there are some other factors except wage differences, which affects such migration i.e. expected welfare differences between the rural and urban areas [29]. Expected welfare depends on income as well as working hours. People will migrate if the probability of expected welfare in an urban area is higher than in the rural

areas; because they want to equalize the expected welfare between rural and urban area. Therefore, expected welfare difference also influences the decision to migrate. The dual labor market theory of Priore explains migration as a result of temporary pull factors, i.e. strong structural labor demand in the developed regions [30]. Because there is a primary sector that provides well-paid jobs and secondary sector for unskilled labors. The structural inflation is another important factor that creates demand for labor. Complementary to this, the social system approach argued that migration is a result of resolving structural tensions (power questions) and nominal tensions (prestige questions) [31]. Because migrants expect to achieve their desired status in the country where they want to migrate, that is, instead of reducing tensions are transformed. The linkage between migration decision and impact of migration has also discussed in the New Economics of Labour Migration (NELM) [32]. According to the NELM, a household maximizes joint income, status and minimizes risks. All three aspects contribute to the migration decision of the household. In reference to the classical migration approaches the NELM considers that potentially earning higher incomes matter to potential migrants while adding that relative income (or accordingly relative deprivation) of the household also matters. Finally, NELM can be connected to the risk and poverty linkage [33], where it is stated that migration is a strategy taken by the poor household in an environment of risk and unknown market.

3. Nexus between river-bank erosion and migration

There are various studies that examine the nexus between the terms River bank erosion and human migration [9] the River bank erosion that displaces the people and leads to different types of socio economic impact such as loss of livelihood, social destruction, impact on agriculture and environmental impact [34].

Figure 1. Framework of nexus between riverbank erosion and migration



River bank erosion thus makes people homeless as well as asset-less. The loss of agricultural land and loss of production of crops simultaneously leads to income erosion of the displaced people or economic shocks [35]; because riverbank erosion does not make any room for the affected people, where they can resettle [36]. The study of [36] also revealed that 75 percent respondent suffered loss of their income due to riverbank erosion. Loss of income reduces the expenditure on food, health and education [37]. The erosion also leads to destruction of infrastructural and communication system, that severely affect the livelihood of the victims. As a result of these impacts or shocks, the victims fall in greater poverty in the eroded areas [3, 38]. Thus the shocks create vulnerability to risks and make them poor. Although these risks could be reduced partially through insurance i.e. through ex-ante risk reducing strategies [18], the poor people cannot avail the adequate insurance policy against their risks. Due to poor economic conditions they cannot pay the insurance premium timely. The other problems associated with riverbank erosion are there is no temporary shelter for riverbank erosion victims or no early warning system or no early evacuation process to evacuate the inhabitants of erosion prone areas

[36]. In this way the poor become poorer due to erosion and they take migration as the ultimate decision. But some of the erosion victims don't want to migrate due to availability of coping strategies (such as sale of land and livestock's, sale of bamboos and woods) in the low eroded areas [17]. The coping strategies help the victims to meet their needs temporarily. The ex-post poverty alleviation measures such as government aid, resettlement of the displaced people, and adjustment through coping strategy hinders the migration to some extent [39, 36].

Besides the poverty alleviation measures, institutional measures of the government such as the construction of dams and walls to control River bank erosion can also reduce migration. Thus, both ex-ante and ex-post measures are necessary to reduce migration from the riverbank areas. This whole process of the nexus between riverbank erosion and migration is shown in the framework. The right side of the Figure 1 shows that if the coping strategies are available in the eroded areas then the victims will not migrate and stay in the affected areas. However, this situation may occur in case of low eroded areas only.

4. Literature survey

There are various studies that show riverbank erosion as an extreme event, which forces people to migrate by affecting on their income sources. Bangladesh is the most affected country in the world by the recurrent River bank erosion in the deltaic stage of Brahmaputra and Yamuna River [9, 40]. It has been observed that the Yamuna and Brahmaputra rivers in Bangladesh affect and displaces a lot of people by eroding its bank areas and forces people to migrate somewhere else for sustaining their livelihood [35, 9]. Affected people lose their agricultural land as well as properties which affect their income earning sources and make them vulnerable to poverty. Victims of the flood and erosion areas adopt some indigenous survival strategies like the sale of land and livestock, shifting to new char land in Bangladesh [41]. In this respect, appropriate resettlement of land may be one solution to curb migration [39].

While studying the socio-economic impact of River bank erosion by the Jamuna River in Bangladesh, it is found that different types of socio-economic impact arise due to riverbank erosion such as losses of livelihood; generation of vulnerabilities, social destruction, impact on agriculture and impact on the environment [34]. That is, the victims lose their livelihood as a result of the loss of the homestead, cultivable land, trees and plants and other properties. The authors find that almost all the respondents in their field study reported the loss of homestead and cultivable land. The vulnerabilities that are generated from River bank erosion are of different types, viz., homelessness, landlessness, displacement, unemployment, indebtedness, school dropout, child marriage etc. The erosion also impacts on agriculture reducing the fertility of land that reduces the crop production and changes cropping intensity. The impact on the environment was revealed in the form of affected cropland due to erosion, change in water quality, access to safe drinking water, erosion due to low channel depth etc. The socio-economic impact also revealed in a study in India [3]. They observe that the impact of River bank erosion has a long-term effect on human life and because of which victims are compelled to migrate and suffer from social insecurity owing to loss of property. Because in the newly settled area the migrants don't get such a society that they were before the erosion. They face some life-threatening problems in that area. Therefore the author suggests that there should be specific policies to protect civil rights of the victims and it should be gender specific (Especially for female protection).

In the context of Assam, a study in Golaghat district of Assam, India, mentioned about different types of socio-economic impact that arise due to flood and erosion such as displacement, loss of agricultural land and home, psychological effect, poor transportation system and problems in education [17]. For all these various forms of socio-economic impacts that arise due to riverbank erosion, the victims are compelled to migrate in search of livelihood [15]. Moreover, it has found that erosion also has wiped out more than 2500 villages affecting nearly 500,000 people [13]. The study was made to see the erosion and restoration process of the Brahmaputra River in India with the help of geographic information system. Another study related to Assam studied migration due to River bank erosion in the Barpeta district of Assam, India [42]. On the basis of field observation, the study found that the impact of riverbank erosion is too severe. Most of the affected people migrate from the eroded areas as they lose the income source. Agriculture is the main income source for the

inhabitants of River bank areas. Due to loss of cropland in Riverbank erosion, they actually lose everything with which they can support their life. So, they are bound to look for works and employment elsewhere. This is why the victims migrate to different towns and cities where they easily get employment in some small works like pulling the rickshaws, construction works of buildings, roads, etc. From the above discussions, it is found that the victims of erosion suffered in different ways that make them socially and economically insecure and become vulnerable to poverty. Hence the adverse effect of rising of Riverbank erosion compels the people to migrate from one place to another.

5. Research methodology

5.1. The study area

The study covers two River bank eroded districts of Assam, namely Dhubri and Dhemaji. Dhubri district is located in the lower Brahmaputra valley of Assam and Dhemaji in the North Bank of East Brahmaputra valley of Assam. Dhubri district is geographically placed between $90^{\circ}15' E$ to $90^{\circ}20' E$ longitude and $26^{\circ}15' N$ to $26^{\circ}26' N$ latitude. The district is situated at 30 meters above the sea level on average. Total geographical area of the district is 2176 sq km. Mighty River Brahmaputra is flowing through this district from east to west with its tributaries like Champabati, Gourang, Gadadhar, Gangadhar, Tipkai, Sankosh, Silai, Jinjiram etc. Formed by arch shaped Arunachal hills on the north and the east, Dhemaji district emerges from the foot hills and stretches to the Brahmaputra River with Subansiri one side and the river Siang on the other. Geographically, Dhemaji is situated between $94^{\circ}12'18'' E$ and $95^{\circ}41'32'' E$ longitudes and $27^{\circ}05'27'' N$ and $27^{\circ}57'16'' N$ latitudes, the district covers an area of 3237 Sq. Km and is a basically plain area lying at an altitude of 104 m above the Mean Sea Level.

The two districts Dhubri and Dhemaji were selected as study area as they were highly eroded districts of Assam in 2014 according to the information obtained from Revenue and Disaster Management Department, Assam secretariat, Government of Assam. Total area eroded due to erosion in Assam in 2014 was 12,579.13 ha, which is 0.16 percent of the total area of Assam. In Dhemaji and Dhubri total area eroded in 2014 was 8636 ha (2.67 % of district area) and 1608 ha (0.74% of district area) respectively. This erosion displaced 9194 and 12,863 families in Dhubri and Dhemaji district respectively.

Figure 2. Maps of study districts and the sample villages

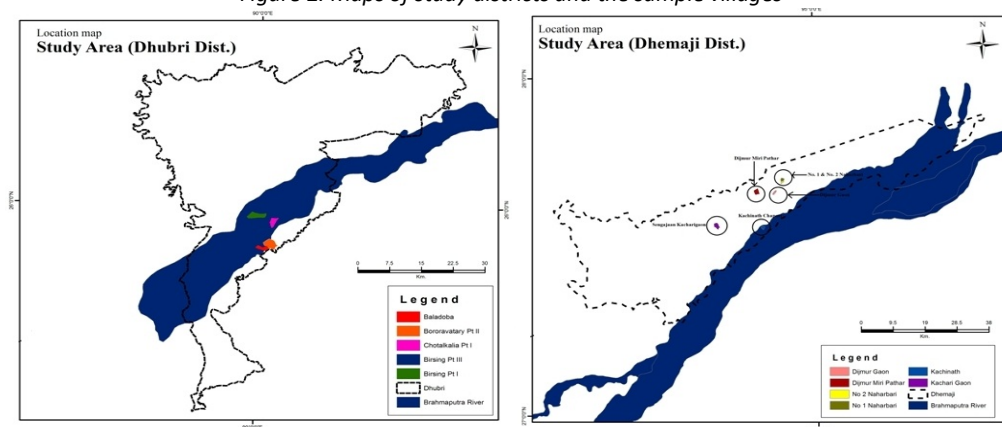


Figure 2 show the districts under study are highly populated as per 2011 census. The total population of the study districts is 2.63 million, of which 1.35 million are male and 1.29 million are female and sex ratio is 953 per 1000 male. Population in both the districts belongs to the different religious group. Majority of the population in Dhemaji district are Hindu, while that of in Dhubri district is Islam. According to 2011 census 95.47 percent population in Dhemaji district are Hindu while in Dhubri, 79.67 percent are Islam. Out of the total population in both the districts SC and ST population are 4.36 and 12.64 percent respectively. The average literacy rate is 83.1 and the density of population is 485 per sq. km (both the districts combined). More than 90 percent population in the districts lives in rural areas and agriculture is the main occupation of their livelihood. Out of the total main

workers of the study districts, 33.01 percent are cultivators and 11.37 percent are agricultural labors. The total cropped area in the districts is 0.29 million ha out of 0.54 (7.21 percent of the state) million ha in 2012-13 and area under high yielding varieties is 0.14 million ha during 2014-15. The total net irrigated area is 1970 ha in 2014-15 and this is only 1.10 percent of the total net irrigated area of the state. Major and medium irrigation is totally absent and the area under minor irrigation is 0.03 million ha in 2014-15, which is 5.23 percent of the state. Both the districts are highly dependent on livestock and poultry farming and hence there are a large number of livestock and poultry populations. As per 2012 livestock census, a number of total livestock in the districts is 1.65 million. Industrially both the study districts are backward. During 2014-15 only 140 (which is 5.33 percent of the state) units of MSME (Micro Small and Medium Entrepreneurs) registered and 821 (4.01 percent of the state) number of workers involved in these MSME units [43] in comparison to the state only 5.33 percent of registered MSME's are found in the study districts and as for industrial workers it is only 4.01 percent. This low industrial and agricultural growth led the districts into far backwardness. From the back side the Dhemaji districts placed into first and Dhubri in the second rank. This backwardness also indicates that poverty rate in the study districts are very high although the state poverty rate is 33.74 percent.

5.2. Research design

Multi-stage random sampling methods have been used in this study. First two districts namely Dhemaji and Dhubri have been selected based on highly eroded criteria. In the second stage, one Development Block (DB) from each district has been selected which are highly affected. Next, from each DB villages are selected on the basis of high, medium and low eroded area criteria and two villages selected from the non-eroded area. From each category, two villages are selected considering similar socio-economic characteristics on the basis of census data, 2011. In each village 10 percent total households are selected randomly. In this way, 194 households from Sissiborgaon DB of Dhemaji district are selected for an interview. Similarly, for South Salmara DB of Dhubri district, 242 households are selected for an interview. Thus altogether 437 households are interviewed. Interviews are conducted with the head of the households when available and otherwise with any other adult member of the household. Focus Group Discussions (FGD) are conducted in the villages to get some village level information. A semi-structured questionnaire comprising the status of riverbank erosion, short term and long term migration with their reasons as well as socio-economic and demographic characteristics of households has been used and it is translated into a local language for better understanding of the respondents. The author conducts the survey with the help of a local data enumerator during the month of June to August 2016.

5.3. Data

Both primary and secondary data are used in this study. Secondary data regarding erosion and population displacement are collected from Revenue and Disaster Management Department, Government of Assam and data regarding village information are collected from the circle office of each selected DB. Primary data are collected through field survey.

5.4. Methods

Data are mostly presented through tables. In some cases, basic statistical tools such as mean, standard deviation, ratio, and percentages have also been used. Analysis of data was conducted using SPSS version 16.0. Some of the variables (e.g. Occupation categorized as farming and non-farming, religion took as Hindu and others, and migration as short term and long term) have been divided into some categories for meaningful analysis.

6. Results and discussion

6.1. Summary of statistics

Table 1 presents the descriptive statistics of socio-economic profile of the surveyed villages. Mean and standard deviation values of all the variables for different types of eroded and non-eroded villages have been calculated. Various theories and studies on internal migration argued that migration among rural and urban areas is common behavior due to differences in various facilities such as income differences, employment

opportunities, education facilities, transport and communication facilities etc. Therefore, migration in both the eroded and non-eroded villages is found. But the fact is that riverbank erosion in the riverbank areas leads to different types of socio-economic problems that lead to migration at a very high rate in the eroded villages [3]. Hence the results indicate that migration in the eroded villages is higher than in the non-eroded villages of the study districts.

Table 1. Descriptive statistics of variables used for analysis

Category	High eroded	Moderate eroded	Low eroded	All eroded	No erosion
Sex, 1=Male, 2=Female	1.05 (0.22)	1.06 (0.24)	1.02 (0.15)	1.04 (0.20)	1.06 (0.24)
Age of the head (in years)	43.56 (9.01)	45.81 (13.18)	44.66 (9.84)	44.59 (10.60)	45.08 (9.67)
Education (in years of Schooling)	5.24 (3.68)	5.36 (4.46)	5.25 (4.24)	5.28 (4.11)	5.08 (4.23)
Religion 1= Hindu, 0= Others	0.37	0.58	0.49	0.47	0.57
Community 1= ST, 0= Others	0.35	0.43	0.32	0.31	0.40
Ethnicity (1= Mishing, 0=Other)	0.21	0.15	0.23	0.19	0.25
Size of family (in numbers)	5.11 (1.70)	5.64 (2.04)	5.63 (1.30)	5.46 (1.68)	5.90(1.94)
Adult members (in numbers)	2.89 (1.27)	3.53 (1.62)	3.33 (1.25)	3.24 (1.39)	3.57 (1.43)
Occupation (1= farmers, 0=non farmer)	0.41	0.47	0.49	0.47	0.54
Total Present land (ha)	0.36 (0.51)	0.42 (0.40)	0.45 (0.47)	0.41 (0.47)	0.57 (0.45)
Livestock (numbers)	5.46 (5.75)	5.71 (5.05)	8.50 (5.64)	6.69 (5.69)	9.18 (4.92)
Irrigation source (in ha)	0.07 (0.39)	0.19 (0.47)	0.12 (0.42)	0.12 (0.42)	0.25 (0.64)
Total income (Rs)	43321.72 (14065.44)	48613.02 (12927.89)	53362.87 (20518.81)	42604.66 (17996.61)	54408.43 (25194.92)
Total area eroded (ha)	0.38 (0.25)	0.21 (0.12)	0.14 (0.09)	0.24 (0.20)	0.00
Loss of livestock income (Rs)	12992.62 (17124.82)	10443.75 (15673.46)	7916.91 (11284.37)	10351.41 (14833.38)	0.00
All migrants (1=Yes, 0=No)	0.66	0.59	0.55	0.60	0.46
Short term migrant (1= Yes, 0=No)	0.42	0.44	0.39	0.44	0.24
Long term migrants (1= Yes, 0=No)	0.33	0.16	0.18	0.24	0.13
Problems (0=no, 1=yes)	0.02	0.03	0.01	0.07	0.02
Impact on family (0=no, 1=yes)	0.57	0.77	0.73	0.76	----
Education problem (0=no, 1=yes)	0.78	0.76	0.76	0.76	----
Transportation problem (1=Yes, 0=No)	0.98	0.95	0.96	0.95	----
Change in occupation (0=no, 1=yes)	0.78	0.75	0.66	0.74	----
Members worked in NREGA (0=no, 1=yes)	0.18	0.39	0.52	0.32	0.50
Loan (0=no, 1=yes)	0.07	0.14	0.21	0.21	0.22
Sources of loan (1=Relatives, 0= others)	0.42	0.34	0.10	0.44	0.52
Bank account (0=no, 1=yes)	0.21	0.16	0.23	0.22	0.28
Survival strategy (1=Shifting, 0=others)	0.34	0.32	0.25	0.30	---

N.B: Values within bracket are standard deviation

Majority of the respondents are farmers with the small size of land holdings in highly eroded villages in comparison to others. The reason for small holdings of land possessed by farmers in highly eroded areas is mainly because of huge erosion of agricultural land of the farmers (on an average 0.38 ha.) Although erosion occurs, a large number of livestock in terms of cow, buffalo, sheep, and goat, as well as the larger percentage of the irrigated area, could absorb more rural people [11]. But it has been seen that in highly eroded areas, farmers have a small number of livestock due to heavy loss of livestock and a lesser percentage of irrigated area in comparison to other areas. Therefore we found total household income in the eroded areas is lower than that in the non-eroded areas. It is also observed that most of the farmers in the eroded villages change their occupation from farming to non-farming activities such as selling of woods, selling off farmland, selling of livestock etc. which is also termed as coping strategy. Most of the inhabitants of the eroded villages have not access to banks and credit facility due to the small size of land holding and access to household savings. Few people in the surveyed villages are seen to have taken a loan at a very high-interest rate from the village money lenders and from Self Help Groups (SHG) and few another borrowing from their friends and relatives; because they cannot take a loan from the banks due to lack of assets for a mortgage. But the bank credits are available for the mortgage of assets. It is observed that the victims adopted different kinds of survival strategies during the time

of flood and erosion such as shifting from the eroded areas, construction of guard wall to control erosion, relocation of the damageable properties, changing the crop calendar and shifting to relief camp [17]. In the surveyed villages, the victims reported that a few of the family members, who lost their properties shifted to a new location for their survival. In this way, some of the victims migrated to other areas.

6.2. Extent of migration

In order to show the extent of migration, the villages are divided into two categories: eroded and non-eroded. It has been seen that farmers' migration is higher in eroded villages than in the non-eroded ones (Table 2). Surprisingly, the non-farmers migration in the non-eroded villages is higher than the farmer's migration in the eroded villages. This suggests that loss of farming land is not only the cause of migration because migration happens in the non-eroded villages also where loss of cropland is absent. The factors other than riverbank erosion are also seen responsible for population migration, i.e. employment in private sector. Because the non availability of work in eroded areas forces people to migrate to towns in search of employment (Table 3).

Table 2. Migration among farmers and non-farmers

Category	Farmers (Mean)			Non-farmers (Mean)		
	Short	Long	All	Short	Long	All
Eroded	0.30 (0.46)	0.24 (0.44)	0.60 (0.49)	0.27(0.45)	0.21 (0.41)	0.47 (0.50)
Non-eroded	0.13(0.34)	0.09(0.29)	0.27(0.45)	0.53(0.51)	0.18(0.39)	0.68(0.47)

N.B: Values in parentheses represents standard deviation

Other reasons of migration include small business, education purpose and for living in the relative's house. Because, in the surveyed villages educational facility and market to do business is not available according to their needs; for which they have to migrate to urban area. Along with other reasons, migration in the eroded villages is very high due to riverbank erosion (table 3). Therefore, riverbank erosion can be called as one of the main reasons of migration. The level of migration among farmers is higher than that of non-farmers in the eroded villages. This is because the farmers are severely affected by river-bank erosion as it displaces them from their land and agricultural activity. They don't get any other options except to shift from the original place. Hence in order to survive their life, the farmers migrate from the eroded areas to a non-eroded area or urban area.

Table 3. Level of migration in the eroded Villages

Reasons	High		Moderate		Low	
	Short term	Long term	Short term	Long term	Short term	Long term
River bank erosion	66.00	58.00	66.67	53.33	58.49	50.00
Govt. Service	---	2.56	---	---	3.77	10.00
Pvt. Service	18.00	12.82	14.28	20.00	18.87	12.00
Marriage	---	5.13	---	6.67	---	12.00
Business	6.00	7.69	7.14	6.67	7.54	---
Others	8.00	12.82	11.90	13.33	11.32	8.00
Total	100.00	100.00	100.00	100.00	100.00	100.00

Source: Calculated by authors from primary data

6.3. Rationale for migration

It has already been seen that the level of migration is different among the various categories (i.e. High, moderate and low) of eroded villages. The rationales for migration can be explained with the help of the problems that arise due to river-bank erosion; because, the problems directly forces the people to move. Different types of problems which arise due to flood and erosion such as loss of land and livestock, loss of property, problems in health and education, transportation and electricity problem etc[9, 41-44]. These problems or impacts are categorized as social (homelessness, migration and identity crisis), economic (loss of productive land, loss of occupation and risk of poverty) and other impact (Improper care of health, lack of educational attainment and criminal activities) [3]. Because of these problems some people are compelled to

migrate and some others stay in the affected area [36]. Most of the victims move to nearby areas and to the outside of the eroded area. It is therefore seen that loss of crop land is higher than that of the other types of land in the villages (Table 4). The farmers losing large area due to erosion are compelled to migrate. Apart from the crop land the households also reported that they lost some livestock assets, which are alternative source of income for them. Therefore, shocks like loss of crop land as well as loss of livestock assets directly affect their incomes, for which their expenditure on food and health shrinks. As a result of this problem migration occurs among the erosion victims. On the other hand if the loss of livestock assets is lower, then the erosion victims may not migrate although they lose crop-land or other types of land; because as already mentioned presence of livestock assets hinders the migration decision. The results indicate that among livestock assets, loss of ducks or hens is higher than the others. But in terms of value loss of cow and buffalo is higher than the value of duck or hen. Hence it is seen that loss of cow is higher than the other livestock's and loss of these assets make the households more vulnerable to poverty. Thus loss of livestock assets also forces the household member to migrate for their livelihood. An important fact is that in some cases, loss of land and livestock assets are higher among the non-farmers. It is found because of changing the occupation from farming to non-farming (FGD).

Table 4. Loss of assets by the respondents of the study area

Loss of land by type (Mean size in hectare)			Loss of livestock (Mean size in numbers)		
Category	Farmers	Non- Farmers	Type	Farmers	Non- Farmers
Homestead	0.047	0.048	Cow	0.480	0.870
Crop land	0.159	0.176	Buffalo	0.040	0.130
Forest land	0.024	0.023	Goat/sheep	0.390	0.600
Leased in land	0.001	0.000	Pigs	0.310	0.140
Leased out land	0.001	0.002	Duck/ Hen	2.850	2.060

Source: Calculated by authors from primary data

Another important fact also observed is that not only the farmers but also the non-farmers migrate due to erosion. This may be due to the less-availability of income earning sources in the eroded areas. The non-farmers reported that the wage laborers don't get daily wage earning jobs due to erosion that force them to move in search for work. Moreover, the non-farmers in the non-eroded areas that got private or government jobs outside their villages, shifts to the new location completely. In addition to loss of assets, other problems arising from flood and river-bank erosion are: education and transportation problem and health related problems in the eroded areas. These problems too have significant impact on the erosion victims. Thus, to meet their educational and health needs, the victims decided to migrate into a new location. The results from field survey analysis indicate that almost all the respondent face the education and transportation problems as the erosion broke the road connectivity that creates the problem of communication between the rural and urban areas. In the group discussion, the respondents reported that most of the students leave their education at the primary level and some other stop education as they cannot go outside due to transportation and economic problems. The reason for these problems is due to the regular flood and erosion in the studied villages that lead to migration of the affected people to somewhere else.

6.4. Decision to stay put

Although natural hazards like Riverbank erosion force the people to migrate, sometimes victims have no willingness to migrate if they are able to earn the minimum necessary income to manage the survival of their family in the affected areas [6]. The substitute livelihood options or the availability of coping strategies in the low eroded areas may resist the decision to migrate to some extent [18, 16]. Similarly, the rehabilitation policies of the government also can influence the migration decision [45-47]. These are the reasons that explain the non-migration from the affected areas. The non-migrated households in the surveyed villages reported that they are still able to survive by earning family manageable income adopting some coping strategies in the erosion-affected areas (mainly in low eroded areas). The coping strategies they adopt are found as the sale of land, the sale of livestock, sale home forest products, livestock farming, changing crop calendars etc. All these coping strategies help the non-migrants to manage the survival of their families. Some of the households who face less erosion are still living on agricultural farming. Out of total household in the eroded villages 39.8 percent

households reported that they have sufficient income from farming and other activities to maintain their present standard of living. Some of the non-farmers reported that they are able to survive adopting some non-agricultural activities like small business (such as selling of homemade products) and livestock farming. Thus improving the management of livestock farming and entrepreneurship works to some extent may control migration. But it is not true for all, especially for those who completely lose their cropland and homestead area and totally displaced. These severely affected people compelled to migrate. The coping strategies help the victims to manage their cost of living to some extent. The victims in the eroded villages also adopted these different forms of coping strategies. With these coping strategies, the farmers and non-farmers earn much income to survive their family. Availability of these facilities discourages the migration decision of the victims.

Table 5. Reasons for non-migration

Coping strategy	Farmers	Non farmers
Cultivation/Farming	30.3	---
Agricultural labor	---	31.3
Sale of land	30.3	26.3
Sale of livestock	18.2	30.3
Sale of home forest products	19.7	9.1
Others	1.5	3.0
Total	100.0	100.0

Source: Calculated by author from primary data

It is observed that a large number of farmers still depend on farming; because they can cultivate seasonal crops in the low eroded areas. Some of the farmers reported that they adopt some coping strategies like the sale of livestock and homemade products and others to survive their livelihood. Among the coping strategies it is observed that farmers adopt coping strategies like the sale of homemade products and lands; actually, it happens only when they cannot cultivate and among the farmers who change their occupation to non-farming. Similarly, non-farmers also adopt some coping strategies like working in the farmer's house, the sale of livestock to maintain their living conditions i.e. to meet their food and health expenditures. In this way, some of the erosion victims are still living in the erosion-affected areas. Thus, the people who are able to maintain their livelihood conditions are still living in the erosion-affected areas as shown in Table 5.

7. Conclusion and recommendations

The results and discussion above revealed that migration is prevalent in all the eroded and non-eroded villages. But it has also been found that both short and long-term migration was higher in the eroded villages than in the non-eroded. Looking at the reasons, it has been observed that migration due to River bank erosion is too high in eroded villages. Moreover, migration due to other reasons such as lack of education and business, to some extent, also leads to migration from the eroded villages. In comparison to non eroded villages, we can say that economic reasons or the pull factors directly influence the migration decision. While discussing the rationale for migration; it has been observed that economic problems mainly arise owing to erosion. Hence, River bank erosion, which is a type of environmental degradation, may be called as an indirect cause of population migration. If the economic problems can be solved through some government schemes and if the River banks could be protected by constructing dams and guard walls, then people will stop migration. The non-migrant reported that they are able to manage their livelihood with the help of some coping strategies, such as livestock farming and some small businesses. Some of the victims also resettled in the nearby char area which is constructed by the river through its deposition process. Hence it can be say that if the government implements some institutional measures to rehabilitate and resettle the displaced households and grants them financial assistance to engage in business and livestock farming, then also migration can be controlled. According to SENDAI framework awareness and the local government support is much more important for the victims that help them to adjust with the natural hazards. Awareness through the education and training system about the natural hazards can reduce the hazard risk which in turn controls the migration.

8. References

1. C.L. Gray. Environment, land, rural out-migration in the southern Ecuadorian Andes. *World Development*. 2009; 3(2), 457–468.
2. C.L. Graya, V. Mueller. Natural disasters and population mobility in Bangladesh. 2012.
3. K.T. Das, H.K. Halder, Ivy D. Gupta. River bank erosion induced human displacement and its consequences. *Living Review in Landscape Research, SSRN*. 2014.
4. K.T. Das, H.K. Halder, I.D. Gupta. Forced migration: consequences of River bank erosion in India. *Social Science Research Network*. 2013; 1-19.
5. E.C. Penning-Rowsell, S.J. Priest. Sharing the burden of increasing flood risk: who pays for flood insurance and flood risk management in the United Kingdom. *Mitigation and Adaptation Strategies for Global Change*. 2015; 20(6), 991–1009.
6. S. Gupta, R.K. Sharma. Land degradation – its extent and determinants in mountainous regions of Himachal Pradesh. *Agricultural Economics Research Review*. 2010; 23, 149-156.
7. A. Shah. Land degradation and migration in dry land region in India. *Environment and Development Economics*. 2005; 10-05.
8. M.H. Khan. River erosion and its socio-economic impact in Barpeta district with special reference to Mandia development block of Assam. *International Journal of Engineering and Science*. 2012; 1(2).
9. D.López-Carr, Jason Burgdorfer. Deforestation drivers: population, migration, and tropical land use. *Environment*. 2013; 55(1), 1-7.
10. A.F.M.A Uddin. J.K. Basak. Effects of Riverbank erosion on livelihood, Unnayan Onneshan. *Centre for Research and Action on Development*. 2012; 1-39.
11. K. Chopra, S.C. Gulati. Migration, common property resources and environmental degradation: inter linkages in India's semi-arid regions. *Sage Publication*, New Delhi. 2001, 1-164.
12. R. Mahanta, Daisy Das. Common property resource degradation and migration: a study of Assam. *Journal of Human Ecology*. 2012; 38(3), 223-230.
13. Government of Assam. Information on River bank erosion. 2014.
14. A. Phukan, R. Goswami, D. Borah, A. Nath, Chandan Mahanta. River bank erosion and restoration in the Brahmaputra River in India. *Clarion: Multidisciplinary International Journal*. 2012; 1(1), 1-7.
15. D. Goswami. Brahmaputra River Assam, India, physiographic, basin denudation and channel aggradations. *Water Resources Research*. 1985; 21(7), 959- 978.
16. S.J. Baishya. A study on River bank erosion by the river brailling Melkipara village of Hajo revenue circle, Kamrup District, Assam, India. *International Journal of Scientific and Research Publication*. 2013; 3(9), 1-10.
17. A.Y. Daramola, O. Timothy Oni, O. Ogundele, A. Adesanya. Adaptive capacity and coping response strategies to natural disasters: a study in Nigeria. *International Journal of Disaster Risk Reduction*. 2016; 15, 132–147.
18. N. Mili, S. Acharjee, S.M. Konwar. Impact of flood and River bank erosion on socio-economy: a case study of Golaghat revenue circle of Golaghat district, Assam. *International Journal of Geology, Earth & Environmental Sciences*. 2013; 3(3), 180-185.
19. S.H.M. Fakhruddin, Juma Rahman. Coping with coastal risk and vulnerabilities in Bangladesh. *International Journal of Disaster Risk Reduction*. 2015; 12, 112–118.
20. S.A. Stouffer. Intervening opportunities: a theory relating to mobility and distance. *American Sociological Association*. 1940; 5(6): 845–867.
21. W. Arthur Lewis. Economic development with unlimited supplies of labor. *The Manchester School*. 1954; 22, 139–91
22. G. Ranis, J.C.H. Fei. A theory of economic development. *American Economic Review*. 1961; 51, 533-565.
23. L.A. Sjaastad. The costs and returns of human migration. *Journal of Political Economy, Supplement*. 1962; 70, 80-93.
24. E.S. Lee. A Theory of migration, population association of America. *Demography*. 1966; 3 (1), 47-57.

25. J.R. Harris, MP Todaro. Migration, unemployment and development: a two-sector analysis. *American Economic Association*. 1970; 60(1), 126-142.
26. A L. Mabogunje. Systems approach to a theory of rural-urban migration, geographical analysis. 1970; 2, 1-18.
27. A. Speare. A Cost-Benefit Model of Rural to Urban Migration in Taiwan. *Population Studies*. 1971; 25(1), 117-130.
28. C.C. Almeida. Emigration, espaceet sous-development. *International Migration*. 1973; 11(3), 112–117.
29. M.P. Todaro. Internal migration in developing countries: a review of theory, evidence, methodology and research priorities. *American Economic Association*. 1976; 59(1), 138-148.
30. K.B. Bhatia. Rural-urban migration and surplus labor, oxford economic papers. *Oxford University Press*. 1979; 31(3), 403-414.
31. M.J. Piore. Birds of passage: migrant labor and industrial societies. *Cambridge University Press*. 1979.
32. H.J. Hoffmann-Nowotny. A sociological approach toward a general theory of migration. *Global Trends in Migration New York*. Centre for Migration Studies. 1981; 64-83.
33. J.E. Taylor, P.L. Fletcher. Remittances and development in Mexico: the new labor economics of migration: a critical review. *Rural Mexico Research Project*. 2001.
34. S. Dercon. Insurance against poverty. *Oxford University Press*. 2005.
35. M.R. Rahman. Impact of River bank erosion hazard in the Jamuna floodplain areas in Bangladesh. *Journal of Science Foundation*. 2010; 8(1&2), 55-65.
36. L. Ersado, Harold Alderman, Jeffrey Alwang. Changes in consumption and saving behavior before and after economic shocks: evidence from Zimbabwe. *Economic Development and Cultural Change*. 2003; 52(1), 187-215.
37. F. Islam, A.N.M. Rashid. River bank erosion displaces in Bangladesh: need for institutional response and policy intervention. *Bangladesh Journal of Bioethics*. 2011; 2(2), 4-19.
38. T.H. Mollah, J. Ferdaush. River bank 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.
39. D.J. Kalita. Impact of flood and River bank erosion in majuli, Assam (India) and its restoration measures. *Multidisciplinary Indexed E-Journal*. 2016; 3(5), 21-30
40. C.E. Haque, Z Hussain. River bank erosion in Bangladesh. *American Geographical Society*. 1988; 78(1), 20-31.
41. P. Sen. River bank erosion and protection in gangetic Delta. 2000.
42. A.H.M.Z. Karim. Flood and River bank erosion displaces: Their indigenous survival strategies in two coastal villages in Bangladesh. *Canadian Center of Science and Education*. 2014; 1(4).
43. S.F. Ahmed. Impact of disasters caused by River bank erosion by Brahmaputra under barpeta district, Assam- a case study. *Imperial Journal of Interdisciplinary Research*. 2016; 2(8), 1213-1217.
44. Statistical Handbook. Information on agriculture, industries and livestock population. *Government of Assam*. 2015.
45. R. Black, W. Neil Adger, Nigel W. Arnell, Stefan Dercon, Andrew Geddes, David S.G. Thomas. The effect of environmental change on human migration. *Global Environmental Change*. 2011.
46. Sendai framework for disaster risk reduction 2015–2030. United Nations. 2015; 1-37.
47. D. Byerlee. Rural-urban migration in Africa: theory, policy and research implications. *International Migration Review*. 1974; 8(4), 543-566.

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