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Vulnerability Assessment of Socio Economic Condition Due to River Bank Erosion: A Case Study on Khowai River, Tripura, India

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Abstract: *Bank erosion is becoming a major natural hazard in Tripura which is having an immense importance in the socio-economic study. The present study aims to evaluate the socio-economic condition of some selected villages located along the Khowai River where the inhabitants are facing an intense bank erosion hazard in every year. The total area under erosion, from 1975 to 2014, has been estimated. The primary data was collected using questionnaire based on the problems faced by the inhabitants and used ARC GIS 10.1 for mapping and measuring land use and area under erosion respectively. The present study shows that migration due to bank line shifting, land loss, changed livelihood pattern and disrupted societal environment are the most common problems in every village.*

Keywords: *Erosion hazard, Inhabitants, Khowai River, Land use, Socio-economic.*

I. Introduction

Considerably human beings have a tendency to settle in the flood plain area due to better facility. So population displacement due to flood and river erosion is considered as one of the main contributors to landlessness and impoverishment of rural population (Ahmed 1991). River erosion is the wearing a way of bank materials of a river and it is a dynamic process affecting the concave side of the bank, while depositing sediments on the opposite side (Chatterjee 2013). On the other hand, huge population pressure and migration also create a tendency to establish a new colony/village in the open place of the river flood plain. This increasing population unscientifically converse the land of river bank area by developing houses, cultivated land, transport ways etc. and as a result develops a vulnerable area. Improper utilization of land causes impact on the vulnerability status of the existing socio-economic condition of the population (Hamza et.al 1998, Sarthak et. al 2015). Vulnerability to bank erosion and flood is not only more intense by physical forces but also demographic and socio-economic variables which increase the vulnerability of the existing population to such river related hazard (McBean et al 2009, Sanyal et al 2005, Mejia-Navarro et al 1994). The River Khowai is the third longest river of Tripura which is flowing through the Khowai District of Tripura (Fig.1). It emerges from the Longtarai hill range and enters into Bangladesh after flowing a distance of 133 km. The Khowai River basin lies between 23°1′ N to 24°05′ N latitude and 91°30′ E to 91°55′ E longitude and covers 1328 km^2 area. The River Khowai in Tripura experiences massive bank erosion at an alarming rate which contributes to a dominant irreparable loss of farm lands of a very high quality each year, which is easily identifiable from the previous study (Deb et. al 2012). During empirical observation as well as from personal experience in the field, it has been seen that a good number of displaced population has resettled to the neighbouring erosion-free villages. Thus, bank of the Khowai River has created an acute socio-economic problem in the study area affecting thousands of people. The socio-economic dimension of the bank-erosion problem, therefore, needs a fairly thorough treatment.

II. Materials And Methods

The study has been carried out in the five affected villages along the Khowai River where bank erosion has severely modified the socio economic condition of the local people. The villages are Laxmipur, Krishnapur, Moharchara, Purba Kalyanpur and Laxminarayanpur. For the present work, GIS techniques and data collection methods and techniques, mainly household survey and informal discussion with the aged people who had experienced erosion, were applied. The 1975 MSS and 2014 TM satellite imagery, collected from USGS, were used. In the study channel plan form of the River Khowai of 1975 and 2014 were overlaid to calculate the total eroded area of the studied villages and prepared 1975 LULC map to extract eroded agricultural and settled areas distinctly. The study is also based on both the primary and secondary data to find out the effects of river bank erosion. The principal tool for collecting the primary data was the questionnaire that was used during schedule survey carried out among the affected households of the study areas. The secondary information and data were

collected from respective government offices. All the interviews were conducted at the selected study sites over a study period of four months (Januarty-April, 2015).

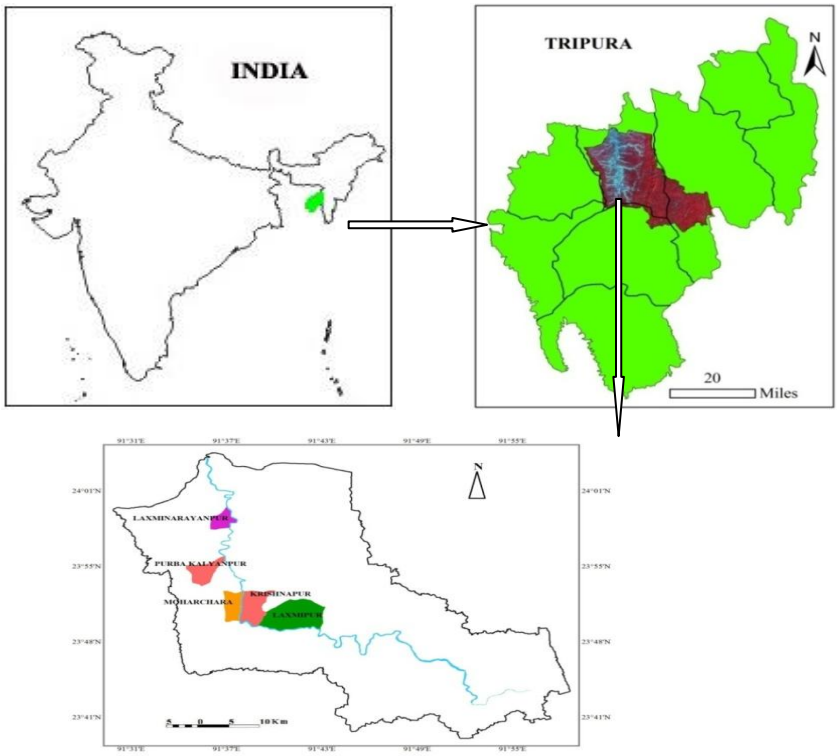

Fig1: Location map of the study area.

III. Results And Discussion

1.1 Status Of Bank Erosion:

The definition of bank erosion maintains that bank erosion tremendously affects mainly cultivated land and the settlements near to the river. The study areas also have faced such type of effect which have changed the villages' socio-economic conditions and created a pathetic condition by eroding away their living places and agricultural lands. Fig. 2 analyses the 2014 and 1975 channel plan form of the Khowai River and 1975 LULC of the study areas affected by bank erosion hazard. Among the five study villages, Moharcharra has already lost 164 acre land whereas Krishnapur, Laxminarayanpur, Purba Kalyanpur and Laxmipur had lost about 88.64 acre, 83.9 acre, 70.90 acre and 48.6 acre respectively (Fig.3). The study indicates that the loss of cultivated land was significant in Moharcharra (137.81 acre). For other villages it ranges from 33.49acre – 80.12 acre. In case of loss of settled area the values range from 9 acre--21.10 acre (Fig.4). The Laxmipur village experiences comparatively less loss due to the presence of some hilly portions along the river (Fig.2A).

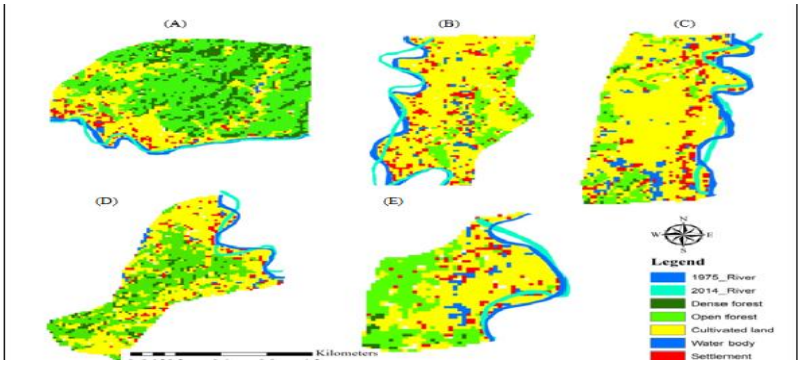

Fig 2: Past and present position of the Khowai River in 1975 and 2014 (A. Laxmipur, B. Krishnapur, C. Moharcharra, D. Purba Kalyanpur, E. Laxminarayanpur).

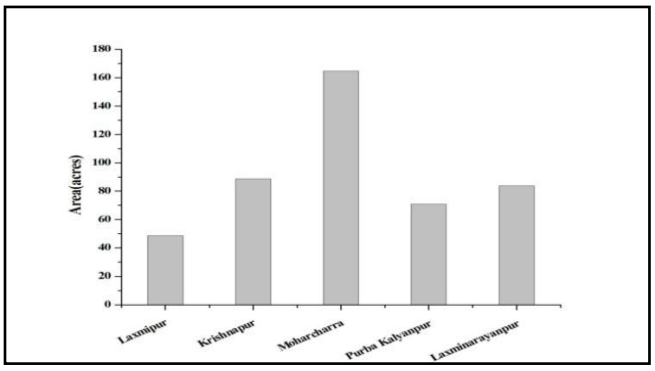

Fig 3: Total area lost from 1975 to 2014 period of the five study villages.

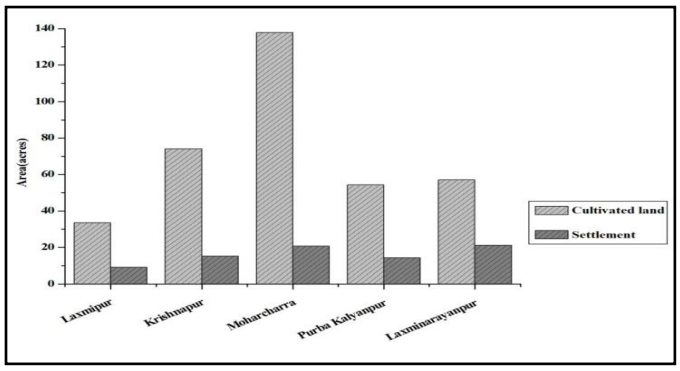

Fig 4: The lost cultivated land and settled area from 1975-2014.

1.2 Displacement Of Human Settlement:

The severe impact of flood and erosion is the loss of homestead that makes the people more vulnerable to live a decent life (Mili et. al 2013). Sometimes the displaces move to one of the several places viz (i) to nearby rural areas, (ii) to the flood protection embankments, (iii) to emerged char land and (iv) to nearly urban area (Hossain 1991). Out of the total victims of bank erosion of Laxmipur, Krishnapur, Moharchara, Purba Kalyanpur and Laxminarayanpur sites, the total number of migrated families were 33%, 50%, 91%, 90% and 71% respectively (Fig.6). Moreover, among these migrated families, more or less in all the study sites, people had to shift mostly for two times. The experience of first time displacement is very common and sometimes they get uprooted for the second, third and even for the fourth time, though their number is less (Fig. 5 and 7). Under such circumstances, rebuilding of houses becomes a difficult issue for the victim's. Maximum time they have migrated either to the nearby villages or towards the urban areas. Some respondents have again built their houses in vulnerable areas, near the river bank, knowingly that in near future they will again suffer from the same hazard. So Khowai River become hazardous in respect of impact of bank erosion on socio-economic condition as the local people has been losing their houses every year.

Fig 5: The vulnerable position of the houses along the Khowai River at Moharchhara

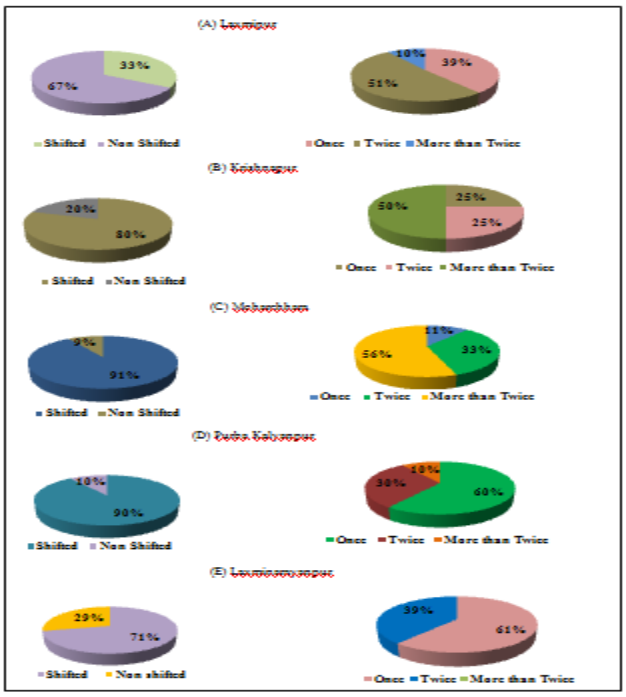

Fig 6: The condition of shifting of the local people for bank erosion of the Khowai River. at (a)Laxmipur (b)Krishnapur (c)Moharchhara (d) Purba Kalyanpur (e) Laxminarayanpur.

Fig 7: The vulnerable position of the houses along the Khowai River at Purba Kalyanpur.

1.3 Loss of cultivated land Agricultural land is the main source of income for the riparian people. Among the effected people of the

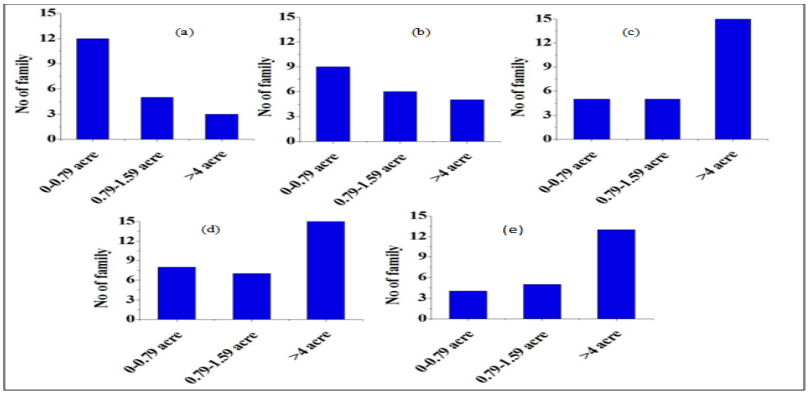

Fig 8: The loss of cultivated land in the villages. (a) Laxmipur (b) Krishnapur (c) Moharchhara (d) Purba Kalyanpur (e) Laxminarayanpur.

present study sites almost every population depends on agriculture. So the loss of cultivated land causes heavy impact on people dependent on agriculture. In all the study sites almost all families have lost their agricultural land due to bank erosion. Fig. 8 shows that in Laxmipur and Krishnapur most of the victims have lost lesser amount of area (0-0.79 acre) in comparison to Moharchhara, Purba Kalyanpur and Laxminarayanpur where maximum victims have lost > 4 acres land due to flood and erosion hazard. Regarding these losses, the percentage of double cropped land was more in comparison to other crop lands.

1.4 Impact Upon Livelihood

River erosion severely affects the livelihood of the riparian population and many farmers become poor overnight. They have lost farmhouses, houses, cultivated land, trees and other properties. Among the victims of the study areas all respondents had cultivated land but due to bank erosion they had lost it. Many of the erosion-affected people are still living near theiralready eroded places with a hope of re-emergence of new land. In case of all the study sites maximum respondents said that their family status has been changed as their main financial source has been lost. The affected victims were bound to change their occupation abruptly from agriculture to daily labourer. In Laxmipur and Krishnapur about 86% and 89% population are still engaged in agricultural work respectively and the rest were compelled to become daily labour. On the other hand, in Moharchara, Purba Kalyanpur and Laxminarayanpur only 58%, 55% and 65% victims are still engaged in agriculture whereas 29%, 24% and 22% respectively become daily labour (Table 1).

Table 1: Recent Occupational Status

Occupation	**Laxmipur**	**Krishnapur**	**Moharchara**	**Purba Kalyanpur**	**Laxminarayanpur**
	%	**%**	**%**	**%**	**%**
Agriculture	86	89	58	55	65
Non-agriculture	4	2	8	15	7
Daily labour	7	6	29	24	22
Employee	3	3	5	6	6

1.5 Effect On Road Network

As human civilization is established near river so transportation lines are also there which gradually get affected by channel shifting hazard. Among these areas Assam–The National Highway 44, the life line of Tripura, is mostly affected

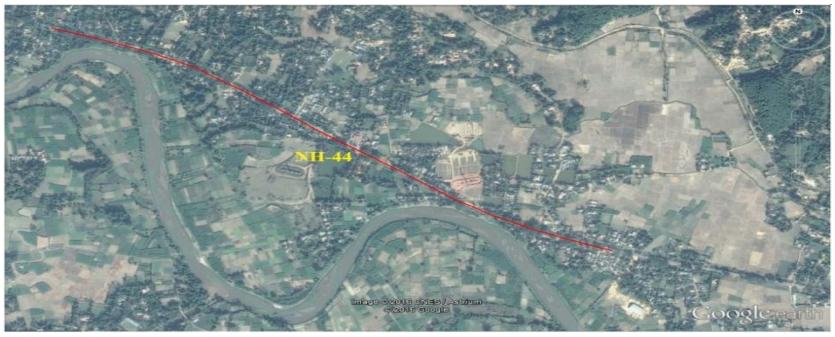

Fig 9: NH-44 (Assam-Agartala Road) has been captured by Khowai River near Laxmipur village.

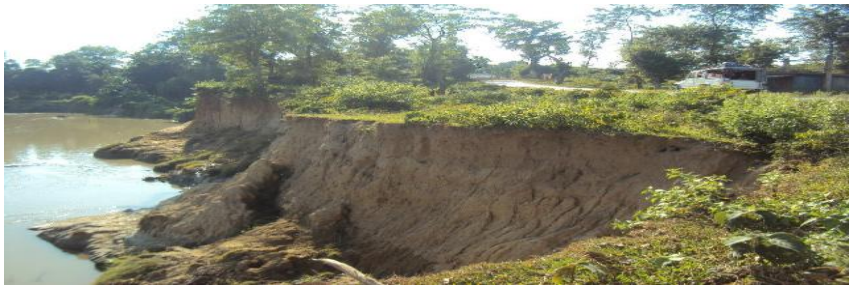

Fig 10: Teliamura-Khowai State Highway occupied by the River Khowai at Purba Kalyanpur.

due to this hazard (Fig. 9). The previous reports show many cracks on this road and some steps had been taken by the government. But the process of channel shifting is continuously going on. The channel shifting also influences another road from Teliamura to Khowai (Fig. 10). This road had to rebuild for three times but again the Khowai River is flowing only few meters away from the road. Maximum respondents have said that in this season the road may be captured by the river. Except these roads several metalled and unmetalled, katcha road have been damaged by the river.

1.6 Effect On Society

Due to the effect of bank erosion on the local people, many bad impacts have been emerged in the society. When people are economically dependent on agricultural activities and bank erosion destroy their land, they had to change their occupation. As a result, an economic problem had started and the societal environment has been disrupted as they become engaged with the anti-social works. Some affected people opined that social bondage and family relations have been broken down due to this erosion. It is already discussed that many people had migrated to urban areas in search of shelter, employment and food. A good number of respondents informed that social services and social network have been depleted as a consequence of erosion. The people living on char lands are deprived of medical services in the emergency situation. It is very difficult for them to arrange transport like boat or other vehicles during an emergency situation as the road network also broken down. The villagers also mentioned that the deposited lands in opposite bank are captured by the people of that bank but when the victims want to capture that newly deposited land, some rivalry evokes between two villages. Some of the respondents mentioned that their peaceful life has been shattered completely due to the bank erosion of the Khowai River.

IV. CONCLUSION

Present study has highlighted the overall scenario of bank erosion and its impacts which are very depressing and consequently people of the study area had to displace and migrate and risk of securities in different forms emerges. These are leading to deprivation, impoverishment, weakness and more vulnerability to all the affected families. Due to this hazard many families are losing their houses, livestock, standing crops and a significant amount of agricultural lands and have to rebuild their houses which are again under extreme and moderately high risk zones. Although in Laxmipur and Krishnapur some protection measures have been implemented but those are insufficient. On the other hand, Moharcharra, Purba Kalyanpur and Laxminarayanpur are yet to have any single protection measures. Therefore, proper measures to be taken by the government to protect the people of all the bank erosion affected areas along the Khowai River to give the people a stable and peaceful life.

References

[1]. K.S. Ahmed, Distance Between two Populations: Displaced and Non-Displaced in Flood and Erosion Hazard Areas, Dhaka, River bank Erosion Impact Study Jahangirnagar University, 1991.
[2]. S. Chatterjee and B. Mistri, Impact of River Bank Erosion on Human Life: A Case Study in Shantipur Block, Nadia District, West Bengal, International Journal of Humanities and Social Science Invention, 2 (8), 2013, 108-111.
[3]. M. Hamza and R. Zetter, Structural adjustment, urban systems and disaster vulnerability in developing countries, Cities, 15(4),1998, 291-299.
[4]. K. Sarthak, V. Ripple, M. Sanyukta and T. Manthan, A vulnerability assessment of human settlement on river banks: a case study of Vishwamitri River, Vadodara, India, Journal of Environmental Research and Development 9(3), 2015, 1015-1023.
[5]. G. McBean and I. Ajibade, Climate change related hazards and human settlements, Current opinion in environmental sustainability, 1(2), 2009, 179-186.
[6]. J. Sanyal and X.X. Lu, Remote sensing and GIS based flood vulnerability assessment of human settlements : A case study of Gangetic West Bengal, India, Hydrological Processes., 19(18), 2005, 3699-3716.
[7]. M. Mejia-Navarro, E.E. Wohl and S. D. Oaks, Geological hazards, vulnerability and risk assessment using GIS: Model for Glenwood springs, Colorado, Geomorphology, 10(1), 331-354, 1994.
[8]. R.R. Deb and N. Das, A Study On Temporal Change In Bank Line Of River Khowai At Alepsha, Khowai District, Tripura, International journal of scientific research 1(4), 2012
[9]. N. Mili, S. Acharjee and M. Konwar, Impact of flood and river bank erosion on socioeconomic: a case study of Golaghat revenue circle of Golaghat district, Assam, International Journal of Geology, Earth & Environmental Sciences. 2013, 3(3), 180-185.
[10]. M.Z. Hossain, Displacees of Riverbank erosion in Urban Squatter Settlements in Sirajgan: The Process of Impoverishment, Dhaka, River bank Erosion Impact Study Jahangirnagar University, 1991