

AN ASSESSMENT OF THE IMPACT OF RIVER EROSION ON THE LIFE AND ECONOMY OF PEOPLE LIVING IN CHARGHAT, RAJSHAHI

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ABSTRACT

Climate change and natural disasters pose a significant threat all over the world. Rivers play an inseparable role in the life of the people of Bangladesh but due to climate change rivers are changing drastically as a cause and effect of various disasters. Among them, River erosion is becoming more common and severe as a direct effect of climate change, leading to huge losses in terms of human life and economic activity. Comprehensive knowledge about this calamity and how it affects the root level people and their needs can be proven impactful in mitigating the situation. The purpose of this study is to investigate the influence of river erosion on the economy and the life of people living in Chandanshohor village, Rajshahi; and also to discover the coping mechanisms that the residents have developed. This area was selected because it has been prone to river erosion since the last century. Information was collected by applying the Participatory Rural Appraisal (PRA) approach, conducting key informant interviews, participating in focus group discussions, and observing activities in the field. The findings of the investigation indicated, a severe impact of river erosion and also led towards some mitigation strategies in Chandanshohor hamlet. The opinions of the stakeholders and the proposals made by the authors of this paper were combined to work out the most optimal solution to the problem. This study provides a detailed image that can be used as a guide for future programs that attempt to improve their socio-economic position. In addition to that, it acts as a guide for various non-governmental organizations (NGOs) and government bodies.

Keyword: River Erosion, PRA, Flood, Climate Change, Coping Mechanism

1. INTRODUCTION

Bangladesh, known as the "country of rivers," is home to over 700 rivers that vary in type, size, and distribution. The country faces high risks of natural disasters and climate change, making it sensitive to river erosion. Rivers provide water for cultivation and transportation, but they also pose a significant threat to socio-economic lives due to riverbank erosion. Riverbank erosion is a common occurrence in Bangladesh, causing significant land loss, population displacement, and landlessness. Due to Bangladesh's deltaic terrain, riverbank erosion is a common occurrence, forcing people to relocate or move to more susceptible areas. Poor and small landowners in Bangladesh experience more severe and sensitive erosion, impacting their income sources, safety, and shelter. Erosion damages farms, homestead land, and standing crops every year, impacting millions of people. About 5% of Bangladesh's floodplain is directly impacted by erosion. In 2013, river erosion damaged 94 of Bangladesh's 489 Upazilas, with 35 experiencing significant erosion. The Padma River, originating in India's western Himalayas, is a meandering river transitioning to a braided system. The physical properties of the Padma and its distributaries are altering due to oscillations of riverbanks, levee breaches, and mid-channel bars. A participatory rural appraisal (PRA) study has been conducted in Charghat, Rajshahi stated that nearly all the bank line's residents suffered from losing their houses, farms, gardens, and other properties due to riverbank erosion.

Bangladesh faces a growing crisis due to its diverse rivers, climate change, and inadequate institutional response. Addressing these issues is crucial to ensuring the safety and well-being of its citizens.

The objectives of the study are:

- To explore the overall impact of river erosion on the economy and livelihood of the affected community of Chandanshohor village.
- To find out the coping mechanism of the inhabitants of Chandanshohor village because of River Erosion.

River erosion in Charghat has caused thousands of people to become paupers, losing their houses and lands. Research on Meghna riverbank erosion in Bangladesh reveals that over 94% of displaced people became landless, with 27% adopting rickshaw driving as their livelihood. This has negatively affected household size, condition, education, agricultural land, labor force participation, and income. (Islam, M. Z, et al, 2007)

Another study examines flood-resistant strategies employed by individuals living beside rivers, with a particular emphasis on their socioeconomic background and characteristics. It emphasises the usage of pataton, machang, and other protective techniques along with the difficulties associated with water-borne illnesses, tube well submersion, and the availability of safe drinking water. (Islam, M. S, et al, 2012)

Moreover, riverbank erosion in Bangladesh is causing displacement and economic crisis, forcing ten million people to migrate further inland. Factors like high monsoon wind, waves, and currents contribute to the issue. The Brahmaputra-Jamuna River, one of the world's largest, is causing unemployment, landlessness, and poverty, affecting the entire country. (Rahman, MR, et. al, 2013)

The scope of the study is to evaluate how people's lives changed in Chandanshohor due to River Erosion. It will offer a clear picture for future projects which aim at developing their socio-economic condition. And also give directions to Government agencies and as well as different NGOs.

Some drawbacks are also found during this research is the authors can't overcome by their design which is river erosion is a natural disaster. There's no way to fully stop river erosion, or to clarify exactly when it is going to happen or predict it. Globalization, which ultimately results in climate change, makes the situation more complex to apprehend the existing condition. People can somewhat predict the future by applying new and modern technology, but no satisfaction can be reached because, ultimately, it is a natural hazard. And conclusion is also hard in this criterion.

2. METHODOLOGY:

The study has been done with a hierarchical methodological approach. Some steps were taken comprehensively to have a meaningful data analysis. Data was collected through primary sources.

Site Selection and Visit:

Chandanshohor village, located in Pirojpur union under Charghat Upazilla, is home to around 700-800 people. The village was named "shohor" due to its beauty and amenities but has disappeared due to river erosion. The surrounding hamlet, 'English Para', is chosen as the study area. Houses inside Kaccha road are somewhat protected from river erosion, while the rest are waiting to be swallowed by the river. Site visits revealed several structural and natural problems in Chandanshohor village, including broken roads, poor erosion mitigation systems, weak road networking, poor housing facilities, and a scarcity in fulfilling basic rights. The study aims to understand the challenges faced by the village and its residents in addressing these issues.

Reconnaissance Survey:

On the first day of the site inspection, a reconnaissance survey was conducted, involving interviews with various individuals to gather crucial information about the region.

Setting up Goals and Objectives:

The study established a goal and objectives through extensive research by the authors, followed by a detailed survey to ensure the objectives were met.

Data Collection:

The Participatory Rapid Appraisal approach, a direct discussion method, was used in a survey, where stakeholders were asked to state their problems and recommend possible solutions, thereby enhancing the overall survey process.

Selection of Stakeholders and Focus Group Discussion:

The PRA method was used for a focus group discussion, involving eight people affected by river erosion. The group included people aged 60-80, including senior citizens, children, and young men. Four were female, and five had firsthand experience with the erosion. The eight individuals acted as a sample of the entire Chandanshohor hamlet community, which has a population of 700-800.

Selection of PRA Tools:

PRA techniques have been selected based on location, time, interpersonal connections, data, or sketching. For this inquiry, six tools were necessary: Social Map, Resource Map, Seasonal Diagram, Timeline Exercise, Cause and Effect Diagram, Impact Diagram, and Dream Map. These tools can be completed with one or two tools.

3. DATA ANALYSIS

3.1 Location of the structures:

A social map, which shows the locations of homes, businesses, schools, houses of worship, and other institutions, aids in understanding both the social and physical features of a neighborhood. Tin is used to build homes nearer to the river, while more sophisticated homes are located farther away. Thirty semi-pucca dwellings may be discovered, and about 110 squatter cottages built of tin. Although there are two main roads in Chandanshohor hamlet—one bituminous and one brick—and an earthen route linking the hamlet to Tali Gramme, the road system is not up to par. The community has three single-story brick-built mosques, and the lone elementary school, "Pirojpur II Primary School," is located beside the river and the brick-built road. There is an open area at the border of a drain to the south of the settlement that channels river flow.

3.1 Major Changes through Time:

The timeline exercise was used to learn about the history of the erosion of that area. The timeline provides some important information, like the times of the floods and the structural and natural losses.

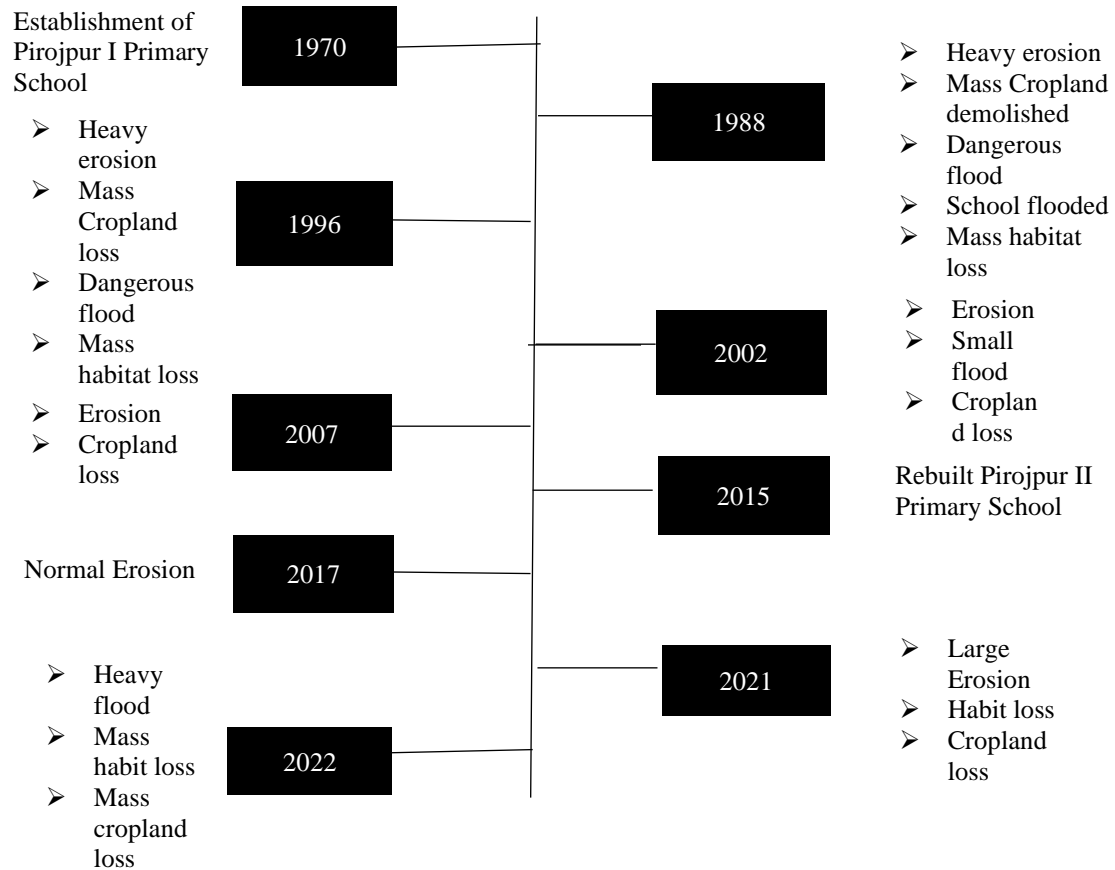


Figure 6: Timeline exercise

The figure indicates that Pirojpur I Primary School was founded in 1970. However, after the 1988 great flood, the school was submerged in the river. Bangladesh saw the worst flood in its history in 1996. The settlement of Chandanshohor was also affected by the water. Between 2002 and 2007, there were minor erosions. There were lost crops. The primary school was reconstructed and renamed Pirojpur II Primary School in 2015. Normal erosion occurred in 2017. However, the erosions struck heavily in 2021 and 2022, resulting in significant losses.

3.2 Causes of River Erosion & its Effects:

A cause-and-effect diagram aids in comprehending the reasons behind an issue and their effects. The diagram below outlines the causes of river erosion, highlighting the significant impacts that have led to its dangerous state.

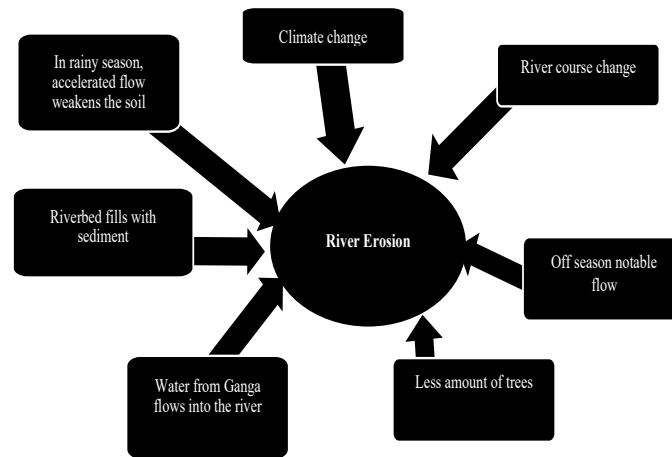


Figure 7: Cause-and-effect diagram (causes)

A number of variables contribute to river erosion, such as shifting river courses, the absence of trees along the riverbank, and climate change. Erosion is also caused by silt flooding the riverbed and more Ganga River flow. Erosion danger is increased by rapid flow during the rainy season. When there are fewer trees, the soil becomes weaker, which undermines the riverbank. The Padma River receives additional flows from the Ganga River in India, which causes significant erosion and a big flow to the riverbank. River erosion eventually results from the monsoon season's increased water levels weakening the soil. The problem has been made worse by the 2022 faster flow.

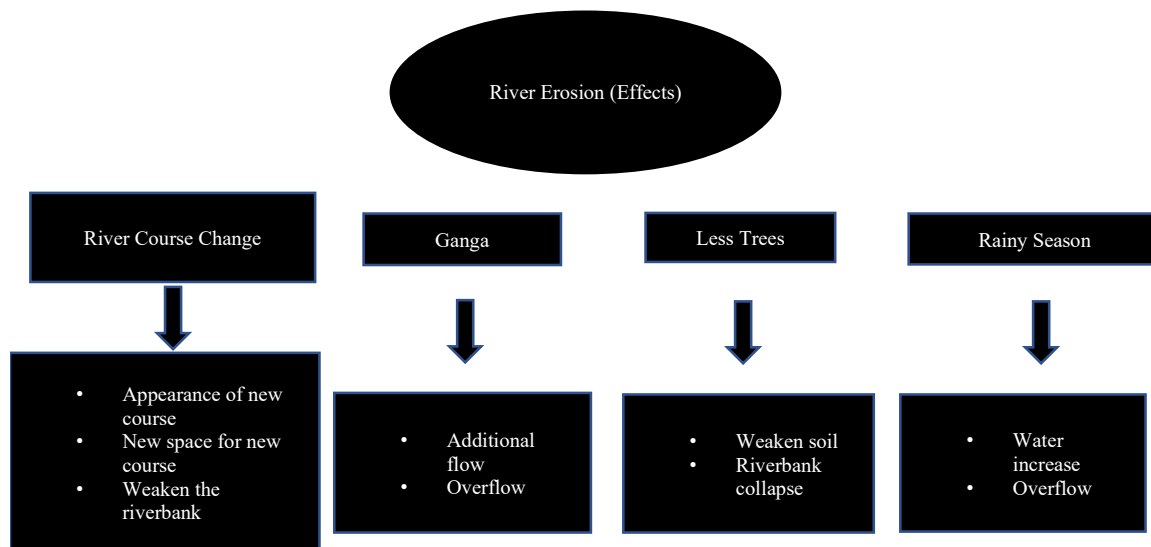


Figure 8: Cause-and-effect diagram (effects)

3.3 Negative Impact of River Erosion:

The study's impact graphic illustrates the detrimental effects of a natural catastrophe, with particular attention paid to the destruction of homes, farms, animals, and educational facilities. The road networking infrastructure was buried by the river, which made communication extremely dangerous. In 1988, Pirojpur I Primary School vanished, and in 2015, Pirojpur II Primary School was constructed, but this time on the bank side, increasing the risk. Because of erosion, social life became chaotic, which caused some people to move to Rajshahi or Natore City. Some lost eight to ten bighas in one night, while others lost twenty to thirty bighas. This is a startling circumstance.

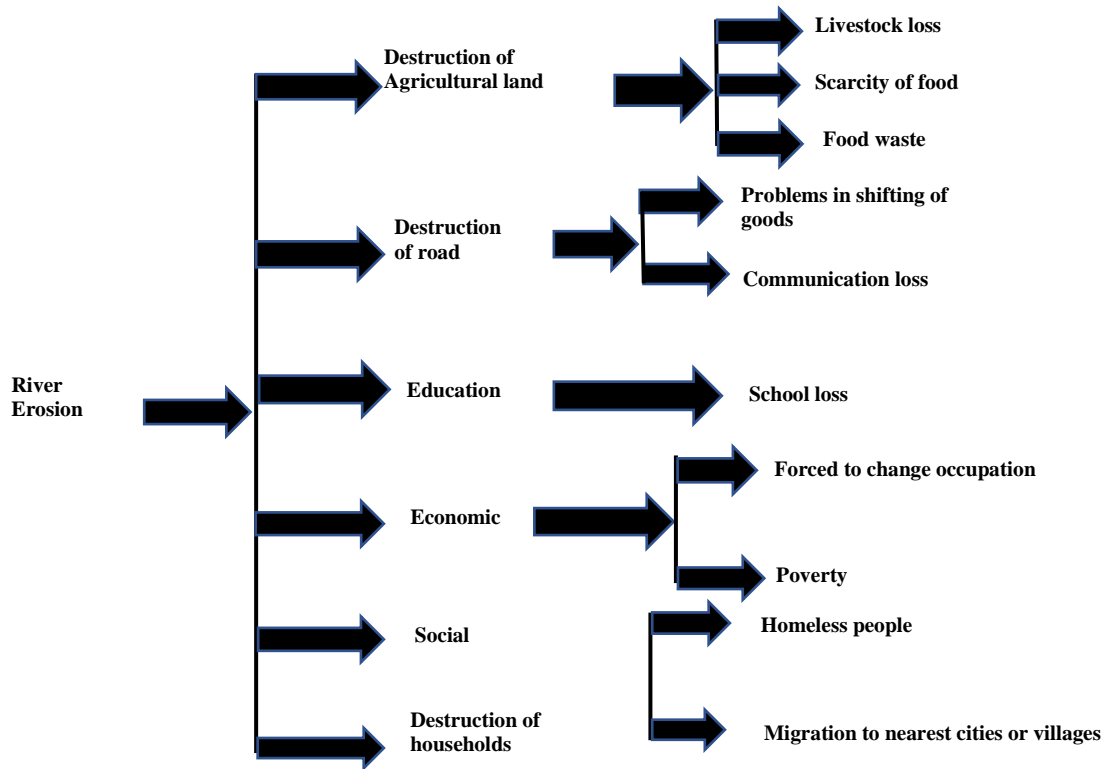


Figure 9: Impact Diagram

Poverty has hit the village so hard that the people who were very rich and solvent a long time ago, nowadays they are starving for food. No major crops grow in that area as the fertility is down due to the flood.

3.4 Severity of the River Erosion Faced by Villagers:

The severity of the erosion is indescribable in sentences. Some of the affects includes loss of lands both agricultural and livable, loss of infrastructure, lack of food and pure drinking water, migration of people, lack of employment and outbreak of diseases. In 1988 and 1996 as there were two most dangerous floods happened in Bangladesh, the river erosion of the mighty Padma was also disastrous in nature. The extent of the loss of land along with infrastructures, employment, drinking water and food was very noticeable back then. More or less the same extent of land loss was also noticed in 2022. People were forced to migrate from their ancestral land towards the urban areas to live in slums or squatters. Villagers also suffered from the outbreak of many water-borne diseases. The matrix below shows the severity of the river erosion against different time periods.

Criteria	1970	1988	1996	2002	2007	2015	2017	2021	2022
Loss of Land	○ ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○	○ ○	○ ○	○ ○ ○ ○	○ ○ ○ ○ ○
Loss of Infrastructure	○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○	○ ○ ○			○ ○	○ ○ ○
Lack of Food	○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○	○ ○	○		○ ○	○ ○
Scarcity of Drinking Water	○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○ ○	○ ○	○ ○	○	○	
Migration		○ ○	○ ○ ○ ○	○ ○	○ ○	○		○ ○	
Stamina-tion Death		○ ○	○ ○ ○ ○		○				
Lack of Employment	○ ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○ ○	○ ○			○	○ ○
Disease	○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○		○ ○	○			○

*Infrastructure = Roads, mosque, school, houses etc.
 *Livestock, gold, silver- utensils, assets etc.
 Participants: Md. Giasuddin, Abdul Haque, Momin, Romiz, Jyoti Selina, Probita.

Figure 10: River Erosion Severity Matrix

3.5 Dream of the Affected People:

Many croplands are owned by the inhabitants in a certain area; however, they are solely used for particular crops like rice, wheat, maize, onions, garlic, jackfruit, guava, mango, water apple, and other fruit trees. They reside in two-story family houses, tin-shed residences, and semi-pukka housing. They have suggested making structural and physical changes, including building a dam, barrage, or dam beside the riverbed, to solve river erosion. They have also suggested designing the 'char' (fodder) area carefully to accommodate the growth of popular crops like rice, vegetables, and seasonal fruit trees. In order to support themselves, they also want unlimited access to the river and new arable land for frequent fishing harvests and sales.

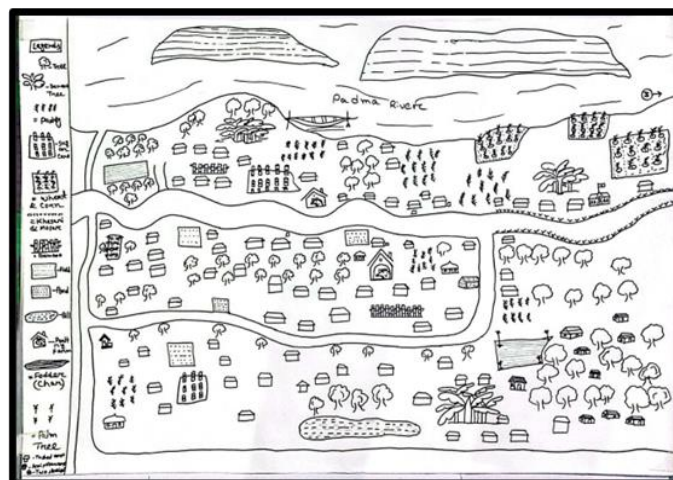


Figure 11: Existing Map

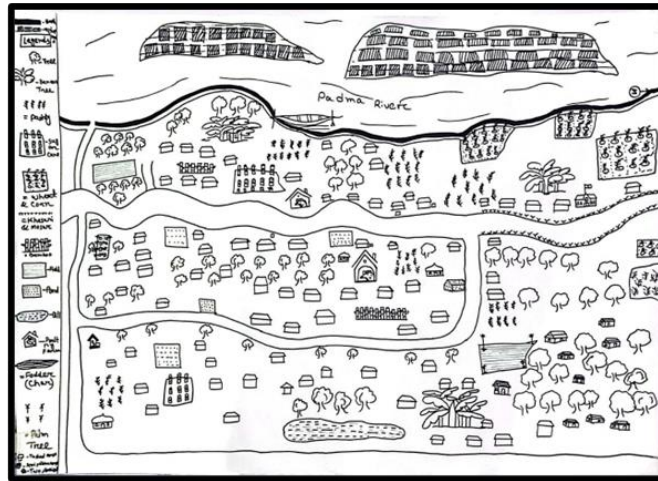


Figure 12: Dream Map

3.4 Findings

The findings analyzed from the PRA tools can be categorized into major problems and coping mechanisms. Following the major problems that ultimately affect the economy of the people of Chandansohor.

Major Problems:

- Loss of cultivable lands: Annual loss of agricultural land negatively impacts the economy, leading to insufficient food production, joblessness, and displacement, leaving residents uncertain about their future and causing displacement.
- Loss of homesteads: Chandansohor residents fear losing their homes and their gardens due to the river's potential to sweep away their dwellings.
- Loss of food and livestock: Loss of agricultural land leads to food loss, but livestock income is a source of income for Rajshahi residents, while Chandansohor residents face anxiety about land ownership.
- Loss of educational institution: The flood swept out the lone elementary school in the region. Around 2015, the new elementary school was constructed.
- Poverty hits in full swing: Poverty arises from the loss of agricultural land, homes, cattle, and fruit gardens, necessitating individuals to find new living methods.
- Mental disturbance: The situation leads people to question their existence, seeking new neighborhoods, homes, and jobs to continue living.

Coping Mechanism:

- ❖ It includes how people of that area are adapting to the problems stated above.
- ❖ Migration: People are migrating from ancestral homes to Tali Gram, Rajshahi, and Natore to protect themselves from river erosion and relocate from the bankside area.
- ❖ Plantation: People are increasing tree plantation along the river to reduce losses and prevent soil weakening, with the Forest Department playing a crucial role in this effort.
- ❖ Channelization: A drain is being built to divert the river's surplus water or flow in a new direction. to prevent the increased flow from damaging the riverbed.
- ❖ Cultivation: Additionally, throughout the winter, when the water flow is reduced, residents cultivate the soil. These are the areas that are permanently submerged during the monsoon.

3.5 Data Validation:

Key Informant Discussion: Md. Rahman Ali, a 72-year-old representative of Chandansohor village, provided valuable insights to the surveyors. He acknowledged the problems the focus group had mentioned, including land loss due to river erosion, loss of livestock, and poor living conditions. He

also acknowledged the lack of government assistance, resulting in the village suffering. His knowledge and time were invaluable in addressing these issues.

4. RECOMMENDATION:

Individuals are working to address erosion, but more steps are needed to restore living conditions. A flowchart was developed using expert opinions, villagers' opinions, and research paper suggestions, with a list of potential proposals presented to villagers.

Following is the framework:

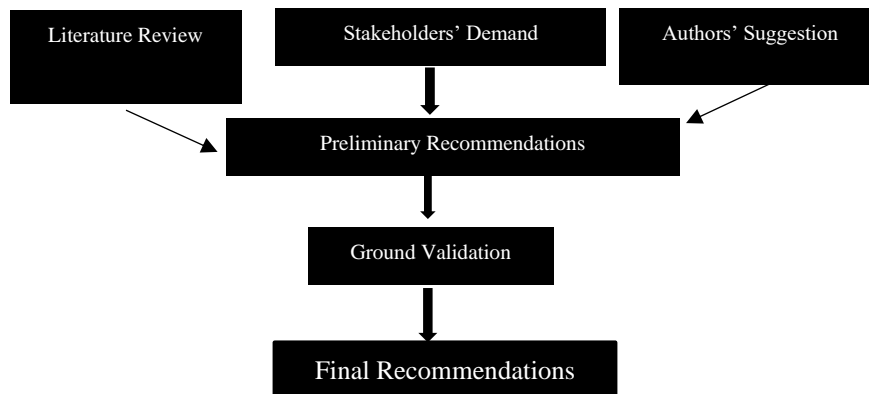


Figure 13: Recommendations Framework

These are briefly discussed below:

Related Research: Dam, river channelization, floodways, storage reservoir, channel improvement etc. can be the possible solutions.

Stakeholders' Demand: Construction of a dam, getting compensation from the government, reconstruction of the main road, providing restriction-free access to the river for fishing purposes, cultivation in the 'char' area, effective channelization.

Authors' Suggestion: A dam, effective channelization, storage reservoir, river dredging.

Preliminary Proposed Recommendations: After careful consideration of three suggestions from three sources, recommendations to reduce the impact of river erosion may include dam construction, reservoir construction, channelization, and planting.

Ground Validation: The authors validated draft suggestions with stakeholders in Chandanshohor, obtaining their assistance. Locals responded to recommendations but rejected our river dredging proposal due to road reconstruction and government compensation requirements.

Final Recommendations: After analyzing PRA tools, Chandanshohor should consider:

- ✓ A dam,
- ✓ road reconstruction,
- ✓ storage reservoir,
- ✓ channelization, and
- ✓ government compensation as optimal solutions.

The reasons we only select these were described in the section prior to this one and are as follows:

A dam will ensure the safety of inhabitants by providing a storage reservoir and floodways to reduce river flow during high river erosion. Road renovation will also protect dwellings. Deepening riverbeds and cultivating 'char' would be impractical but economical and efficient. Government compensation will help people rise to their feet as soon as possible. The local government must constantly monitor the

quality of life of its citizens and address the issue, regardless of its size. The government must not disregard the issue.

5. CONCLUSION:

River erosion in Bangladesh negatively impact ecological and socio-economic conditions as well as the overall livelihood of the affected people which was the main focus of this paper. People had to move from the land of their ancestors resulting in migration followed by the loss of different financial assets. The existing condition of the village are analyzed including the vulnerable areas and as well as their strength using PRA methods: Social map, Resource map and Trend Analysis. It is apparent from the output of the research that the areas that are in close proximity with river are more vulnerable than the others. The majority of homes in the riverfront neighborhood are made of clay, bamboo, thatch, and CI sheets. People use various strategies to mitigate damage, relocate, and migrate, while agricultural production decreases due to loss of farmland. But still these measures are not sufficient which is seen from the impact and cause effect diagram. The recommendations provided in this article will help to mitigate the damages of river erosion that has undermined their economy and stability. The methods can also be applicable for other areas that also face the same problems, and the solutions can also be followed by the Government and other policy makers and NGOs to help the overall condition of the affected areas.

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