IMPACTS OF FLOOD ON THE LIVES AND LIVELIHOODS OF PEOPLE IN BANGLADESH: A CASE STUDY OF A VILLAGE IN MANIKGANJ DISTRICT

A Dissertation for the Degree of Master in Disaster Management

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Abstract

Water induced disaster including flood accounts over 30% of total losses of lives due to natural disaster in Bangladesh. On one hand, spatial variation on geography over short reaches, young and complex geology, and uneven temporal distribution of rainfall contribute significantly to the occurrences of such water induced hazards, Exposure to such hazards and vulnerabilities of people mainly due to poverty, and lack of well preparedness explain the escalating loss of lives and property. The present comprehensive study investigates the impacts of flood on the life and livelihoods of the affected area.

The objectives of the study are to assess the situation, the history, the causes, aggravating factors, extent and effects of the flood, to document the hazard and vulnerability, and various capacities of the community; to study the local knowledge, practices and beliefs in the community; to formulate community based plans for flood mitigation and flood disaster risk reduction. Findings of this phase of study are aimed to be used as input to second phase when a broader framework of community impacts analysis conducted. The study found that there are several causes of flood hazards. They are: construction of infrastructure such as roads, culverts. Without assessing the monsoon flood, narrow drainage capacity of the haphazard channel excavation for irrigation due to the absence of proper irrigation canal system, and poor drainage due to dense settlements.

Flood is found to be a recurrent phenomenon in the study area. In 2000 and 2004 floods have made some devastating impact on the study area. These flood events were unique in a sense that the floods were mainly due to the heavy precipitation in the Padma belt. The flood has damaged the physical infrastructures like houses, schools, sub-health post, hand pumps, culvert etc. as well as productive agriculture land, and livestock. Floods have caused difficulty in mobility, increased risk for living at houses, trends of fear and trauma, and erosion of social assets such as neighborhood, brotherhood and strong bondage of kinship. Likewise, damage of stored grain and spread of water borne diseases are other distresses. Increased health hazards, increased investment in treatment and farming, increase in price of seed, less return from animal husbandry, poor performance of social institutions, changes in cropping pattern and reduction in the crop production are immediate impacts of flood on the livelihood of farmers.

Flood forecasting, early warning system and community based flood management save many lives and properties. People shared with me some of the indicators that forecast flood and those indicators are: position of the cloud in the sky, extent of rainfall in upper catchments and char area, mobility of ants, abnormal fly bite, abnormal crying/voices of animals and birds, intensity of thunderstorm and wind, position of stars, and magnitude of hotness. Strange sounds from river/torrents, muddy smell in the water, rising level of water flow are some indicators perceived as early warning of flood.

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CHAPTER 1
INTRODUCTION

1.1 Background of the study

Regular floods are part of people's lives in various regions of the world, recurring with varying magnitudes and frequencies to which people have adapted for centuries. These floods are generally expected and welcomed in many parts of the world, since they enrich the soil and provide both water and livelihoods. Usually a flood is an overflow of water that submerges land, low-lying villages and towns or an unusual condition affected by inflow of the tide. Flooding may occur as an overflow of water from water bodies, such as a river or lake, or sea or large natural water basins, or it may occur due to an accumulation of rainwater on saturated ground in an aerial flood.

In disparity, flooding resulting from extreme hydro and meteorological events and taking place in unexpected magnitudes and frequencies can cause loss of lives, livelihoods and infrastructure. They can also damage the environment (Integrated flood management tools series flood forecasting and early warning, 2013). In general, it was analyzed that worldwide flood is the most destructive natural hazards causing extensive damage to the built and natural environment, and devastation to human settlements. Economic losses due to the effects of damaging floods have increased significantly around the world (Integrated Flood Risk Management in Asia, 2005).

The frequency of natural disasters has been increasing over the years, resulting in loss of life, damage to property and destruction of the environment (Living with Risk, 2000). Flood losses reduce the assets of households, communities and societies through the destruction of standing crops, dwellings, infrastructure, machinery and buildings, apart from the tragic loss of life. In some cases, the effect of extreme flooding is dramatic, not only at the individual household level, but also in the country as a whole (Integrated Flood Management Concept Paper, 2009). The Fourth Assessment Report (2007) of the Intergovernmental Panel on Climate Change (IPCC) predicts "heavy precipitation events, which are very likely to increase in frequency, will augment flood risk". These floods will affect life and livelihoods in human settlements in all areas, such as flood plains, coastal zones, river deltas and

mountains. Flooding is also increasing in urban areas, causing severe problems for poor and vulnerable people.

In the Asian region, the picture is more serious rather than the developed countries. Floods in South Asia are mainly driven by the unique hydro meteorological and monsoonal influences in the region. Two monsoonal windows are operational in the region: the southwest monsoon that follows the summer months and the northeast monsoon in the winter. The southwest monsoon generally prevails from June to September and accounts for nearly 70-80% of the rainfall in this region. On the other hand, melting of glaciers in the Himalayan-Hindukush region, owing to the visible climate change impacts, may give rise to increase in flash floods in the mountainous regions and those places located at the foothills.

South Asia's geography makes it particularly susceptible to natural disasters. According to the recently published World Risk Report 2011, countries like Bangladesh, India, Nepal and Pakistan exhibit a high level of vulnerability as demonstrated by their lack of coping capacities and adaptive capacities. In evaluating 173 countries for purposes of creating this year's World Risk Index, the report gave the following countries its global risk index ranking: Bangladesh (6), Pakistan (66), India (71) and Nepal (99). As per the Index of World Risk Report, Bangladesh has been declared the second most disaster-risk country in Asia only after the Philippines and sixth in the world after countries like Vanuatu, Tonga and Guatemala. The 2007 South Asian floods had wide scale effects in India, Nepal, Bhutan, Pakistan and Bangladesh which resulted into death toll in excess of 2,000 in addition to affecting nearly 30 million people in the region (SAARC workshop on flood risk management in south Asia, 2012).

Bangladesh is one the countries with a unique settings for flooding. Most part of the country is low lying and 80% of the landmass is flood plain thereby leaving the country highly vulnerable to the threat of repeated floods. Historical and recent data show that during past 50 years, at least 7 major floods have taken place in Bangladesh. These floods are meaning of mention because in each of them 30% or more of the landmass were flooded. The pattern of flooding in the country also points towards an increase frequency of floods in the country.

In the perspective of Bangladesh, Floods are annual phenomena with the most severe appearance during the months of July and August in every year. Regular river floods affect 20% of the country increasing up to 68% in extreme years. The floods of 1988,

1998 and 2004 were particularly catastrophic, resulting in large-scale destruction and loss of lives (Department of disaster management, 2012).Flood and riverbank erosion are two major environmental disasters that the country experiences recurrently and an estimated one million people are displaced every year due to riverbank erosion in the country (Elahi, 1990). This adversity is further worsened when the devastating flood and riverbank erosion together intensify the process of pauperization in rural areas in Bangladesh (Rahman, 1986; Karim, 1990 and Islam, 1999).

The number of people at risk has been growing each year and the majority is in developing countries like Bangladesh with high poverty levels making them more vulnerable to disasters (Living with Risk, 2000). Grunfest (1995) argues that due to high poverty levels, people have become more vulnerable because they live in hazardous areas including flood plains of river and over the embankment.

It is estimated that become of 35% of the total population in Bangladesh live below poverty level having problems in food subsistence (Khandaker et al., 2000; Karim, 2008). The majority of the people in rural Bangladesh do not have access to proper nutrition, housing settlement and healthcare facilities. Poverty situation is further deteriorated because of natural hazards and calamities every year. Flood and riverbank erosion often dislocates cultivable land and human settlements, and it also destroys agricultural crops massively, disrupts road-linkages and communication infrastructure of the country. Because of this critical situation, displaces and victims of natural disasters face multi-dimensional environmental problems. In maximum cases, they have are unable to adapt with the changing conditions of many socio-political, economic and cultural strategies in order to survive in the face of the plethora of problems.

From an academic point of view, many aspects of these environmental issues of Bangladesh have remained understudied. In this view, there are few studies on flood and its secondary effects of riverbank erosion displaces from the livelihood perspective. We do not even know the reasons for flood in the study area. There has a very limited research on the flood and the secondary causes of flood and its effects on the livelihood assets of the community. For that reason, this research has generated data on the flood and riverbank erosion (as the secondary cause of flood) displacement and the impacts of it on the livelihood of the study area. This research specifically generated data on two villages named Gala and Gobinathpur in the Manikganj district. Based on field study, the research provides contextual socio-

economical and cultural data at the experiential level. The general purpose of this study has been to generate data on the impact of flooding on the general lives and livelihoods as well as the riverbank erosion displacement and the impact of these events on the socio-economic status of the people. Survival is the research question and objectives in two different flood prone areas of the country. In every year during rainy session, the rain water and some of the Padma River conduct the flood in these areas. The population on the riverside has increased every year even the flood destroyed their life and livelihood because of the flood they came back to their destination. However, this does not stop affecting their livelihood as well as social and economic factors.

1.2 Objectives of the study

Furthermore, some objectives have been identified to fulfil the study goal, which are:

- To find out the main areas of flood affects in the study area from the literature or historical data sources and also from the local people.
- To find out the impacts or effects of flood and bank erosion on socio-economic status of the respondents of the study area.
- To find out the most vulnerable livelihood assets and also factors influencing to occupational and social migration in the study area cause of regular flood.

1.3 Methodology

This cross sectional narrative study was carried out in the selected village under Manikganj district. A door to door survey was conducted among the villagers to find out the sample group of this study. The survey was carried out for find out the affected populations in flood and river bank erosion of the village. People, whom I got by during a survey, are the samples of this study. The sample selection procedure of this study is purposive. The survey was conducted through a simple self-developed questioner (appendix 01) by researcher. The questioner is adapted in Bangle language and also translated into English to check the possibility of changing the meaning of the questioner. After finding out the sample group, researcher collect data and information about the livelihood effects of flood and riverbank erosion among the sample group through a self-developed semi structural interview of the individual household. The data collection unit was every household among the sample. To complete the interview, observation and recording technique were used to

collect information about flood impacts on their livelihood. The interview was taken from those who fulfilled the inclusion criteria of the study.

Permission was taken from every volunteer participant by using the consent form (appendix 02). At the beginning of data collection, researcher informed every participant about the ethical and confidential issues of this study. It was also informed that participant had right to refuse to answer any question of the research and also had the right to withdraw from any part of the research. All data of the research was used only for the research purpose and it was protected safely.

Dependent variables in this study are the different livelihood assets like household, animal, land etc. These dependent variables were measured by standardized livelihood assets assessment scale. Observation and individual household interview of all the members of the house methods are used for collecting data from participants. The questionnaire was mainly focused on the flood impacts on livelihood assets of the affected population in the study areas. Every domain of the livelihood assets of the household has some sub points which measure the main livelihood factors as with or without any other secondary factors.

The independent variables in this study are the flood and its impacts itself. For these variables, all respondents report the flood situation at the study area as well as the major impacts. The respondents were asked to explain the impacts of the major flood of the recent future. They also asked for any massive disaster or disruptions for the flood and the secondary effects of the flood. For this data collection a semi structural self-developed questioner is developed by the researcher. Some types of short answer were including at that question.

Researcher selects some inclusion criteria for collecting sample from population. That people who are the affected from the flood and associated factors of flood are included in this study. The age level of the sample is one of the most important factors. Researcher considered the age range from 18 to above. The people, who are not directly or partially affected in the flood or its secondary effects, are not included in this study. Those peoples, who are diagnosed as the dementia or any other mental health problems, are being excluded from the study.

A pilot study was conducted with the five number of small sample group, to check the appropriateness of data collection and match the answers to the objectives of the study. The sample size of the study is selected from the total number of population.

In addition, secondary data and information were collected from the relevant organization such as Bangladesh Water Development Board (BWDB), Google Map, Bangladesh Bureau of Statistics (BBS), and Different local NGO's. In this quantitative data, the total population of the village, educational level, main crops, main income source of that village are collected. With the help of the data collection questioner, in-depth interview and key informant interview were conducted with twenty three household in this two study mouzas. Cross check and perfecting the data collection transit walk along with the study area were conducted. For a fruitful and informative data collection, this research used participants' own experience, view, and opinions to accomplish the objectives of this study during the interview. The answers were recorded by a tape recorder which was helpful for the analysis of the participants view appropriately. After collecting the primary data from the study area, all information is coded according to specific individual code number. To analyze the qualitative data, the researcher was used qualitative content analysis. In the qualitative content analysis process, the collected data was accumulated according to the theme of the data. To find out the study results, the researcher had to code the data and find out themes from those data.

1.4 Conceptual framework

The impacts of flood on lives and livelihoods depend on the combination of different types of impact on individual sector. Being essentially agricultural producers, the main consequence of flooding has been the destruction of food crops on farms as well as seeds stores; eventually culminating in a decline in food production. Starvation together with a decline in environmental quality resulting from flood related damage, fuels the desire for migrating out of these rural areas (see in the Figure 1). The reduction in food production resulting from floods also means loss of income for many in these communities which further reduce their ability to purchase food and thereby contributes to increasing the problems of food shortages and starvation within household. In these communities, non-agricultural income opportunities are few. However, social networks can enable residents' to be informed of the existence of opportunities both within and without the communities. Non-agricultural income can contribute to increase household income and thereby reduce starvation that may result from flooding. Such destruction and physical loss is usually accompanied by generalized destitution and sense of grief among people who

have lost loved ones. These together increase the desire of people to move out of these communities in search of safer and more stable means of livelihood. Sometimes, the risks prevailing in the destination of prospective migrants are higher yet, individuals migrate.

Some potential migrants are aware of the risks associated with migration while others are not aware. In the *agricultural impacts*, increase in agricultural labour results in a corresponding increase in agricultural activities (productivity) which in turn amplifies food production. When food production increases, the risk of starvation is minimized. Less starvation suggests that individuals become less susceptible to diseases. More agriculture activities lead to a rise in food production which in turn enhances the likelihood of seed storage as seen in the *livestock impacts*.

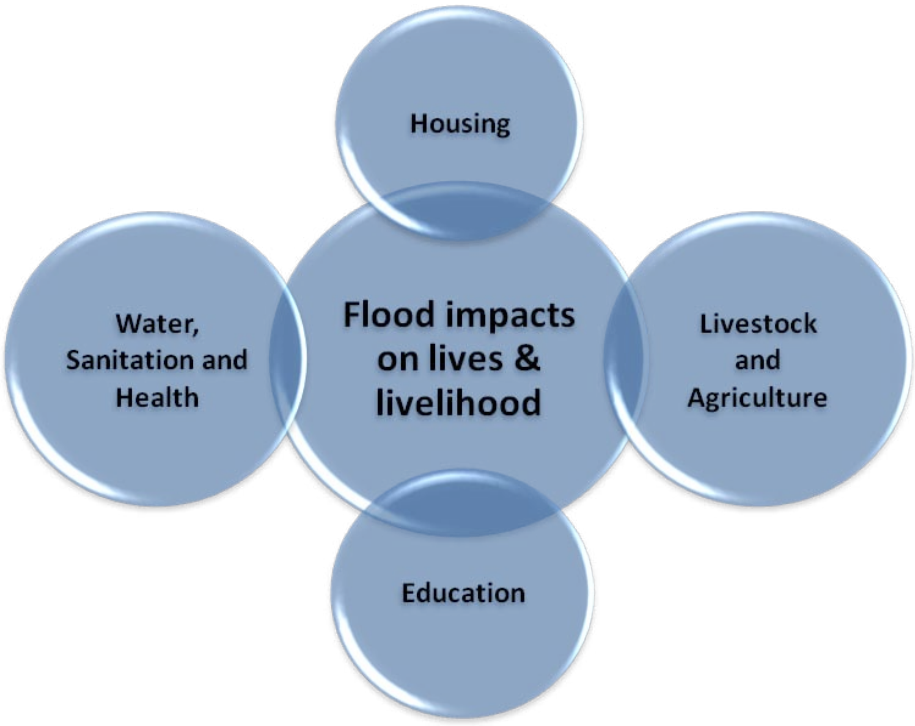

Figure 1.1: Conceptual framework of this study

Food production and non-agriculture income feed into household income which in turn influences the means of livelihood for the communities. When the means of livelihood in the community grinds down, it triggers exodus of community members into urban centres in search of new and better income opportunities; eventually this situation reduces the strength of the ability to reduce vulnerability of the flood as

well as health and social impact. Onset of floods could lead to incidents of disease which potentially could lower the ability to impact of the flood.

Flood has negative impacts on the sector of health and education also. During flood the flood water increases the chances to get different types of water born disease. Especially child and elderly people are more vulnerable to these impacts. For affecting different health problem, these may impact the economic factor for treatment cost.

The destruction of crops by the floods makes it imperative for the community members to shift dependence on agriculture income to non-agriculture income or diversify their agricultural livelihoods. In the *non-agricultural income*, flood events simultaneously trigger reduction in income level production (farms of fish or cow are destroyed and agriculture lands become inundated and unsuitable for cultivation for most of the staple foods within the study area leading to reduction in household income). It must be emphasized that existing bad sanitation practices within the communities also feed into the outbreak of the disease. Infected individuals in most cases lack the capacity to contribute to non-agriculture labour. The total process of this cycle is depending on one another. Within this circular process if any part is affected the other part automatically get affected.

CHAPTER 2
LITERATURE REVIEW

Considering the global picture of disaster, particularly in the flood event, the various rolling Vulnerability Assessments conducted in different countries indicate that the last two decades have seen an increase in the frequency and occurrence of climate-induced hazards such as floods and drought in the countries (Concept Note on the Vulnerability Assessment and Analysis Survey for Zambia, 2006). According to Nott (2006), the causes of floods can be broadly divided into physical, such as climatologically forces, and human influences such as vegetation clearing and urban development.

The most common causes of floods are climate related, most especially rainfall. Prolonged rainfall events are the most common cause of flooding worldwide. These events are usually associated with several days, weeks or months long of continuous rainfall. Human impacts on river catchments influence flood behaviour. Land use changes in particular have a direct impact on the magnitude and behaviour of floods all over the world. Deforestation results in increased run-off and often a decrease in channel capacity due to increased sedimentation rates.

Borrows and De Bruin (2006) indicated that among natural catastrophes, flooding has claimed more lives than any other single natural hazard. In the decade 1986 to 1995, flooding accounted for 31% of the global economic loss from natural catastrophes and 55% of the casualties. The damaging effects of flooding are likely to become more frequent, more prevalent and more serious in the future. Carey (2005) argues that human populations worldwide are vulnerable to natural disasters. Certain conditions such as geographical location or people's income level can affect the degree to which natural disasters impact people's homes and livelihoods. A study of Nott (2006) correctly points out that a normal level of flood event is not considered to be a natural hazard unless there is a threat to human life or property. The most vulnerable landscapes for floods are low-lying parts of floodplains, low-lying coasts and deltas, small basins subject to flash floods. Rivers offer human respondents populations transport links, a water source, recreational amenities, fertile plains and are an attractive place for settlements. Floods then become a major natural hazard because of the high human population densities that inhabit these lands.

He indicated that the direct impacts of a flood are closely related to the extent of affected area and depth of floods water. The extent of a flood has a direct relationship

with the recovery times of crops, pastures and the social and economical dislocation impact to populations of a country. Floods are the most costly and wide reaching of all natural hazards. They are responsible for up to 50,000 deaths and adversely affect some 75 million people on average worldwide in every year. Disease occurrence is common especially in less developed countries. Malaria and Typhoid outbreaks after floods in tropical countries are also common. It has been estimated that in India and Bangladesh 300 million people live in areas that are affected by floods (Nott, 2006). Physical damage to property is one of the major causes for tangible loss in floods. This includes the cost of damage to goods and possessions, loss of income or services in the floods aftermath and clean-up costs. Some impacts of floods are intangible and are hard to place a monetary figure on. Intangible losses also include increased levels of physical, emotional and psychological health problems suffered by flood affected people.

In a study of Know Risk (2005), it is observed that the economic impact of natural disasters shows a marked upward trend over the last several decades worldwide. The hazards tend to hit communities in developing countries, increasing their vulnerability and setting back their economic and social growth, sometimes by decades. The floods have led to loss of human life, destruction of social and economic infrastructure and degradation of already fragile ecosystems and social structures. The study indicates that social impacts include changes in people's way of life, their culture, community, political systems, environment, health and wellbeing, their personal and property rights and their fears and aspirations. In this study it was suggested in the results that, social impacts are linked to the level of well being of individuals, communities and society. It includes aspects related to the level of literacy and education, the existence of peace and security, access to basic human rights, systems of good governance, social equity, positive traditional values, knowledge structure, customs and ideological beliefs and overall collective organizational systems. Some groups are more vulnerable than others, mainly those less privileged in society (Living with Risk, 2002).

In UK, flood risk represents a significant threat to many communities. Around 1.8 million households and 140,000 commercial properties in England and Wales are located in floodplain areas, affecting at least 4-5 million people. The researcher further points out that a range of flood risk management activities are undertaken by operating authorities. These include emergency planning, awareness raising,

provision of flood warning and creation of flood storage areas as well as the construction and maintenance of both conventional and innovative flood defences. Crossman, M. et al. (2006) suggests that in the face of such increases in risk, the provision of reliable information and public awareness is essential.

A study by the International Flood Initiative (2003) suggests that floods are the most taxing of water related natural disasters to humans, material assets as well as to cultural and ecological resources affecting people and their livelihoods and claiming thousands of lives annually worldwide. According to a study experience, the emotional behaviour of many flood victims was shocking. Follow-up studies of the same experience found that the flood and the secondary effect of the flood have a serious emotional trauma. Factors that contributed to the non-recovery included the severity of the flooding, the degree of the resulting financial hardship, age and socio-economic status. Poor people on low income houses are mostly flooded in maximum years (Flood Management in Australia, 1998). Thus, a severe flood can impose a range of economic costs on flood victims and many of them are quite severe. Moreover the economic effects may linger for years after the event. Flood aware communities can be expected to suffer less social and financial disruption than communities with a low level of flood awareness (Flood Management in Australia, 1998). Lindsell and Prater (2003) argue that social impacts can cause significant problems for the long term functioning of specific types of households and businesses in an affected community. A proper contingency plan is needed in order to readies the impact of the flood and to protect the livelihood.

Ariyabandu and Wickramasinghe (2005) observed that some groups are more vulnerable to floods than others are especially in the developing countries. Vulnerability is not increased for poverty, but also the poor tend to be the most vulnerable due to their lack of choices. The influences of both poverty and development process on people's vulnerability to disaster are now well established. Class, ethnicity, gender, disability and age are some of the factors increase the affecting people's vulnerability. It is estimated that, poverty does not equal vulnerability but being poor makes people more vulnerable to disasters because poor people have lack of resources (physical, social and knowledge based) to prepare them for and respond to such threats and shocks as natural hazards. Poor people often get locked in a cycle of vulnerability. As they are vulnerable; they are at great risk in the face of a natural hazard, leading to disaster. Close analysis of disaster impact

shows that the vulnerability of men and women to disaster, their capacities, and the options available to them differ in character and scale to their gender which may have a close link with the level or severity of disaster event (Ariyabandu and Wickramasinghe 2005). In this same study Ariyabandu and Wickramasighe (2005) suggest that, although women are often more vulnerable to disasters than men they are not just helpless victims as often represented. The impact of disasters is usually measured in quantifiable ways, such as adding up the number of the dead and injured, and estimating the physical damage to housing, land, livestock, agriculture, stores and infrastructure. However attention is not necessarily paid to how disasters impact on different categories of people, men, women, children, aged people, etc in socially and economically. Disasters affect men and women differently because of the different roles they occupy and the different responsibilities given to them in life and because of differences in their capacities, needs and vulnerabilities (Ariyabandu and Wickramasighe 2005).

Sinclair and Pegram (2003) stated that floods cannot be prevented but their devastating effects can be minimized if advance warning of the event is available. With large increase in population and increasing urbanization there are more people living in informal settlements, which are often on flood plains as this is the only underdeveloped land available near cities. The people living in these settlements are those who are most at risk, not only due to their geographical location in the flood plain but also because they do not have the financial resources to recover from the damage caused by flooding. According to Smith and Ward (1998), there is more evidence that the flood problem is getting worse in terms of the damage caused by flooding. Despite massive expenditure on flood defence, flood damage losses continue to rise in many countries. Although most floods are more or less natural phenomena, the flood hazard is largely of human origin. Most floods results from moderate to large events, occurring within the expected range of stream flow. Floods constitute a “hazard” only where human encroachment into flood prone areas has occurred. African Wildlife (2000) also points out that the cumulative impact of human activities without regard for nature has turned the recent floods from a natural phenomenon into a man-made disaster of epic proportions. When severe floods occur in areas occupied by humans, they can create natural disasters which involve the loss of human life and property plus serious disruption to the on-going activities of large urban and rural communities. Flood losses are therefore essentially human

interpretations of the negative economic and social consequences of natural events. The impact of the flood hazard will, in part be determined by the magnitude of the events and the duration of the event. However the true significance of the flood disaster will depend primarily on the vulnerability for the local community. The relationship between physical exposure and human vulnerability is highly dynamic and can change through time (Smith and Ward, 1998). Smith and Ward (1998) also argued that direct losses to floods occur immediately after the event as a result of the physical contract of the flood waters with humans and with damageable property. However, indirect losses which are less easily connected to the flood disaster and often operate on-long time scales, may be equally, or even more important. Depending on whether or not losses are capable of assessment in monetary values, they are termed tangible and intangible.

Some of the most important direct consequences of flooding such as loss of human life or the consequent ill health of the survivors and also the economic losses are intangible. Indirect and intangible consequences of flooding are probably greatest in Least Developed Countries (LDCs), especially where frequent and devastating floods create special impacts for the survivors. Primarily losses of any disaster like flood can be high in rural areas where most of the damage is sustained by crops, livestock and the agriculture infrastructure, such as irrigation system, levees, walls and fences. In other words, primary losses relate mainly to the disruption of economic and social activities, especially in urban areas, immediately after a flood (Smith and Ward 1998).

According to Lind, *et al*. (2008:143), the loss in case of flooding has many dimensions. In addition to economic loss and loss of life and injury, there may be irreversible loss of land, of historical for cultural valuables and loss of nature or ecological valuables Kundzewicz, *et al.* (2002) argues that floods are natural phenomenon for which the risks of occurrence are likely to continue to grow, increasing levels of exposure and insufficient capacity among the factors responsible for the rising vulnerability. Water related events such as floods have been a major concern since the dawn of human civilization. They continue to hit every generation of human beings, bringing suffering and death as well as immense and still growing, material losses.

Economic development of flood prone areas in developing country is a factor that increases flood risk. Population pressure and shortages of land cause encroachment

into flood plains. Mushrooming informal settlements often form enlargement zones around mega cities in developed countries (Kundzewicz, *et al*. 2002). In a study of south Asian region Bank off (2003) states that, in Philippines, flooding is not a recent hazard but one that has occurred throughout the recorded history. On the one hand, it is related to a wider global ecological crisis to do with climate change and rising sea levels but on the other hand, it is also the effect of more-localized human activities. A whole range of socio-economic factors such as land use practices, living standards and policy responses are increasingly influencing the frequency of natural hazards such as floods and the corresponding occurrence of disasters. He also mentioned in his study that, Municipality has its basis in a complex risk of inter-relating factors that emphasize how the nature of vulnerability is constructed through the lack of mutuality between environment and human activity over time. Statistical trends suggest that floods have become more numerous and more devastating in recent years. Certainly the frequency of events and the number of people affected have increased steadily as human related activities such as deforestation; overgrazing and urbanization aggravate environmental conditions, making communities more vulnerable (Bank off, 2003).

Hanson, *et al*. (2007) state that, reduce poverty is one of the great challenges faced all over the world. Over half of the world's poor live in rural areas. Poverty worsens when natural hazards destroy vital rural infrastructure. Asia is struck by 70% of all floods in the world and the average annual cost of floods over the past decade is approximately 15 Billion USD. Economic losses and impacts have remained high and constitute a large developmental burden. It was suggested from this study that there is a need for new types of strategies in order to cope with the financial burden from hazardous events. One of the largest deltas in Vietnam is seriously threatened by floods. Lives and property are threatened by annual flood events which impose a substantial burden on the community. The area has experienced increased flooding due to its dense ad increasing population and its location in a low land.

A study conducted on poverty, Vulnerability and the Impact of flooding in the Limpopo province in South Africa argues that while disasters may affect everyone and play an important role in increasing vulnerability, poor people are made more vulnerable from a web of circumstances that make them prone to the effects of disasters (Khandlhela and May, 2006). In this study, they established that the varying impact of floods on households and the community showed that vulnerability to the

effects of a flood disaster is indeed an outcome of the interaction between socio, economic and political process. Douben (2006) states that since early times, people have settled in flood prone areas due to favourable geographic conditions which facilitate economic growth, such as accessibility (transportation) and food production (fertile land). This fact forces societies all over the world to protect vulnerable assets against flooding. Nevertheless, flooding is still the most damaging of all natural disasters and more than half of all victims are flood related. Flood mitigation policies and measures should therefore be implemented in order to enable societies to increase their resilience to flood hazards. According to Mustafa (2002), despite Pakistan's massive investment in its water sector, it still remains vulnerable to the flood hazard. Pakistan suffered major floods in 1950, 1956, 1973, 1976, 1988 and 1992, each affecting more than 10 thousand lives. The 1992 floods cost the country more than 3 percent of its total GDP. According to the study undertaken in four villages in Central Pakistan, the people attributed their vulnerability to floods to poverty, God's will, socio-economic powerlessness and Government (Mustafa 2002). Gao, *et al.* (2007) states that although water shortages often grab the headlines, floods continue to be the most serious natural disaster in China. This is despite enormous efforts to construct structural engineering projects for flood control.

Dixit (2003) stated that in Southern Nepal, flooding leads to large scale disruption of social and economic lives. The rivers bring large sediments whose deposition on agricultural lands harms productivity. The poor mostly live in these floodplains (vulnerable zones) because they have no opportunity to live in less hazardous areas. In Nepal, every year floods cause death, cultivated fields and irrigation, bridges and rural infrastructure. He argues that policy makers, donors and relief and development agencies treat flood disaster as isolated events that break the continuity of the normal way of life. According to Dixit (2003), research shows that disasters are the outcome not only of natural hazards but also of socio-economic structures and political process that make individuals and families vulnerable. Dixit further points out that vulnerability is the condition of a person or group in terms of their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard. Even in normal times people live in vulnerable conditions. Vulnerable conditions and families find it hardest to reconstruct their livelihood following a disaster. Families live in conditions that are vulnerable to disasters out of ignorance about the hazards or their erroneous perceptions of risk. Also, most have little freedom to choose how

and where they live. Vulnerability, therefore, is not static but a dynamic process that depends upon the social, economic and political contexts that change overtime, which will consequently affect the probability of loss. On the other hand, he suggests that strengthening social resilience capacity would reduce vulnerability. These social, political and economic conditions and their interrelationships during normal "times" determine why certain sections of the societies are more vulnerable to disasters than others.

According to Mohapatra and Singh (2003), among all natural disasters, floods are the most frequent to be faced in India. On an average, floods have affected about 33 million people between 1953 and 2000. This figure may have risen due to population growth. From the global level outlined above, it is clear that floods have had adverse impact on people's lives and livelihoods. The number of reported homeless persons following floods is particularly high because of the vulnerability of dwelling on rain and flood. Floods frequently cause major infrastructure damage including damage of roads, railway lines, airports, electricity supply systems, water supply and sewage disposal systems. Bridges over rivers are particularly exposed to damage and disruption of transportation systems follows. The economic effects of flood are often much greater than the flood itself (Parker, 2000).

Floods had several socio-economic and political implications which caused a wide range of complex issues. Some of the immediate consequences included the displacement of people, the destruction of infrastructure such as houses and roads, damage to farms and crops and loss of cattle and livestock. The destruction of roads and other infrastructure delayed on-going development initiatives and political processes (Theron, 2007). Floods also caused loss of soil fertility which lessened future harvests. In the long-term, affected areas had to deal with the spread of infections and water borne diseases, cholera, dysentery and diarrhoea which increased the need for safe drinking water and the provision of water purification tablets.

Flood is more or less a recurring phenomenon in Bangladesh, and often within tolerable limits. Bangladesh is a land of many rivers, and heavy monsoon rains. Therefore, the country is subject to inundation by overflow due to drainage congestion, rainfall run-off, and storm-tidal surges. Some 30 to 35 percent of the total land surface is flooded every year during the wet monsoon (Milliman *et. al.,* 1989). These normal floods are considered a blessing for Bangladesh-providing vital

moisture and fertility to the soil through the alluvial silt deposition. Only abnormal floods are considered disastrous at the peak flow season (July, August and September). Most of the rivers overflow their banks, and deposit silt on the flood plains - providing vital moisture and fertility to the soil. Extensive studies by various authors have shown that the area of flooding at different times at Bangladesh varied from 31 percent to 85 percent of the total area of the country (Choudhury and Hossain 1981, Matin and Hussain, 1988, Pramanik 1988 and Rashid and Pramanik, 1990). Occasionally, it becomes devastating. In 1997, 1988, 1998, and 2000, Bangladesh faced unprecedented floods, causing massive loss of life and property. During 1987 an area of 57,270 sq. km was inundated, whereas in 1988 an area of 81,831 sq. km was inundated.

Brouwer, *et al*. (2007) states that, Bangladesh is a highly flood prone country. Eighty (80) percent of the country consists of floodplains and several other minor rivers. These floodplains sustain a predominantly poor rural population. Once every ten (10) years roughly one-third of the country gets severely affected by floods while in catastrophic years such as 1988, 1998 and 2004, more than 60% of the country was inundated. Floods caused social disruptions and resulted in scarcity of drinking water as surface water got contaminated.

A study carried out in 2005 in Southeast Bangladesh confirms the positive relationship between environmental risk, poverty and vulnerability. Poorer segments of society live closer to the river and therefore face a higher risk of flooding and are thus more vulnerable. Environmental risk exposure also goes hand in hand with income inequality and access to natural resources (Brouwer, *et a*l.2007). Families living nearer to the river seem to have fewer opportunities to engage in multiple economic activities which make them more vulnerable to natural disasters and may keep them trapped in a poverty cycle (Brouwer, *et al*.2007). Despite the overwhelming nature of disasters, there is growing evidence to suggest that coping may significantly affect the outcome for those involved (Smith 2008). Rashid (2000) described the 1998 floods that hit Bangladesh as the worst in the last century. Almost two-thirds of the country was submerged under water and millions were affected. A total of 33 million people were marooned of whom 18 million needed emergency food and health services in 52 districts. The floods continued for more than 65 days. Those floods destroyed basic infrastructure like roads and bridges as well as houses, crops, animals and cattle. The most damaging aspect of the flood was the destruction

of people's means of livelihood. The response to the floods included distribution of food, medicine and clothing for the poor.

According to Rashid (2000), women and children are the most vulnerable during the disasters. During the 1998 floods, the women shared stories about the difficulties they faced in gaining access to basic sanitation as most of the latrines were submerged by the floodwaters. They resorted to a number of desperate measures to cope with the predicament. Some of the women admitted walking long distances with female relatives or planned trips together by boat to other less flooded areas to use the latrines. Ninno, *et al*. (2003) stated that the 1998 floods in Bangladesh caused severe damage to the rice crop and threatened the food security of tens of millions of households. Government food transfers to the affected people helped limit the impact of the flood on household access to food. The flood led to major crop losses, losses of other assets and lower employment opportunities and thus affected household income as well as market prices.

From the literature reviewed, it is clear that the increasing population of our planet is leading to the increasing exposure of people and property to hazards of flooding. This declaration is in line with the findings of the research which has confirmed that the population living along the river banks in the study area has increased over the years and has made them susceptible to the flooding and consequent increasing the vulnerability. With the increased population on our planet, it may be expected that the effects of climate change will further aggravate this. At present, there are no sufficient and effective measures globally to limit the growing chance and consequence of flooding. The evidence is that flood risk is increasing and continuing alertness is needed to ensure that existing systems are maintained and improvements are introduced. It is imperative that human society adopts a risk management approach if there is to be harmonious coexistence with floods. In practical terms, the chance of flooding can never be eliminated entirely. However, the consequences of flooding can be mitigated by appropriate behaviours and actions. Successful flood risk management is dependent upon the active support of all on whom the effects of flooding may impact.

The literature suggests that socially vulnerable or disadvantaged households have lower levels of disaster preparedness. Flood risk is expected to increase substantially in coming years as a result of both climate change and continued socio-economic development. Further, it is clear that most flood studies acknowledge that floods have

had negative impact on people. However, the studies have tended to address the subject matter depending on the objective of the study. This literature review suggests that the documentation of longer-term flood impacts on communities vary markedly specially on socio-economic sector.

CHAPTER 3
THE STUDY AREA

3.1 Geographic location and Socio-economic Aspects

The study area is a low-lying, severely flood prone area beside the Padma river. Most of the communities targeted in the area are located along the Padma River which flows through Manikganj district. The main source of livelihood in the study area is agriculture. Apart from this, seasonal labour, services and businesses are other sources of maintaining the livelihood. Most of the population of this area depend on the seasonal agriculture and animal husbandry. Rice, potato, Jute etc; are the main products of that area. Total population of this area is 14095. Literacy rate of this area is 37.19% where men were 41.33% and women 32.84% (BBS, 2011).

Figure 3.1: Map of the study area
Source: Google map

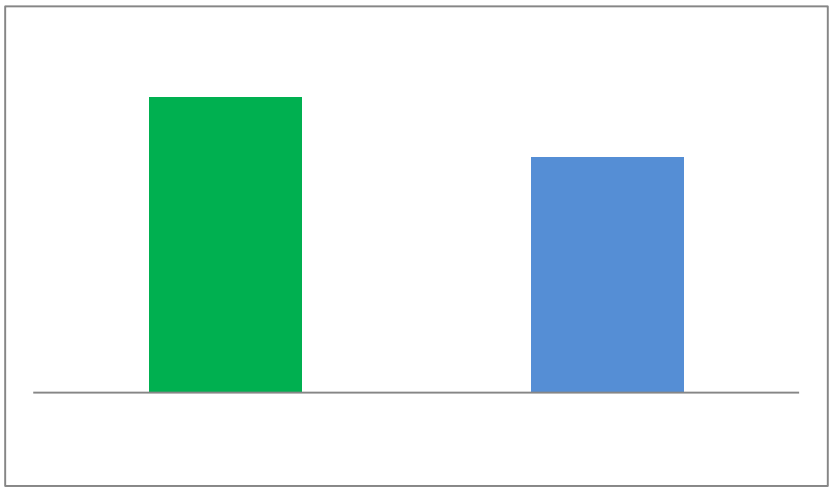

Figure 3.2: Literacy rate of the study area
Source: Bangladesh Bauru of Statics

Almost every year people of this area experienced riverine flood. On average, the flood length was 10-15 days found from the respondents. The study respondents and local NGOs show evidence of flood impacts in this area. According to interview of the village people of the study area, it seems that the presence of a beel, inside of the union, is one of the main causes of regular flood. Data found that, 12 primary schools, 3 high schools, one collage, 5 mosques and 2 more madrasas are located in this area. Almost all educational institutes are used as a flood shelter during flood situation. Day by day the river bed is reduced, so that, the total amount of water carried by river, is also being reduced. For these regions the surrounding area of the river suffers from the negative impacts during the rainy session.

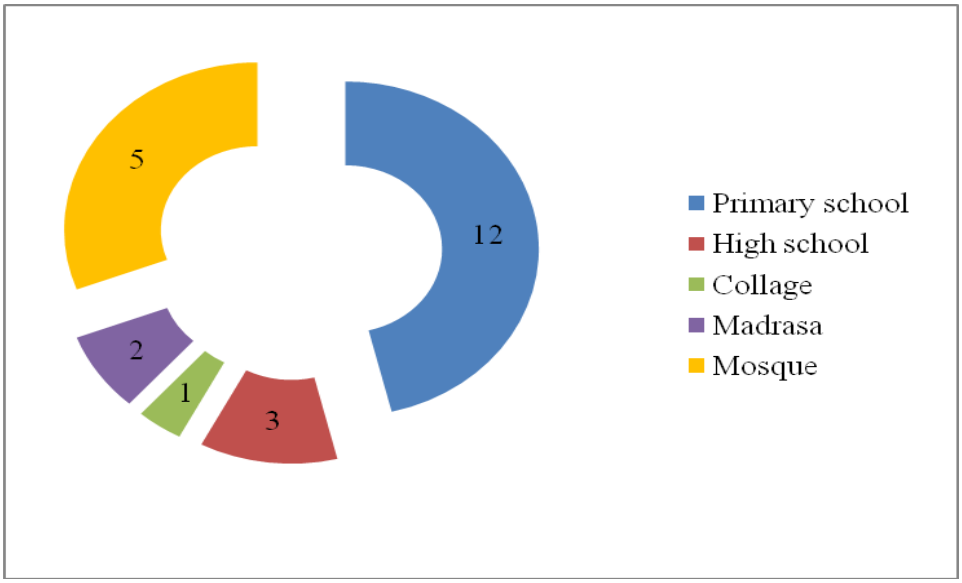

Figure 3.3: Different educational institutes in the study area
Source: Union council office, Gopinathpur

3.2 Food Sufficiency

The level of food sufficiency is miserable. On an average, one-third of total population has food sufficiency for year round. On the other hand, more than half of the population has food not enough for even a season. The number of months with food sufficiency is said to be decreasing with the increasing flooding and deluge problem in the study area. The level of food sufficiency of the farmers who reside along the Padma riverbank is particularly very poor.

3.3 Seasonal Migration

It was shared that after the heavy flood of 2004, people started to migrate seasonally in seeking alternative income sources. Since then, seasonal migration has become a common practice. While this secures a certain level of income and therewith food security, the earning is not impressive as it does not even suffice to pay back loan and run the family and house reconstruction after flood. Seasonal migration normally peaks during October – January in most of the years, after harvesting the paddy fields and broadcasting of the winter crop. Some go even early before the monsoon crops plantation. As far as possible, male family members opt to stay at home to attend to rebuilding or securing their houses before the seasonal migration. Maximum male family member went to nearby districts or the main town of the Manikganj for find out a job.

In search of alternative employment opportunities many people and mostly the youth are forced to go outside the village and work in nearby cities, leaving women, children and old-aged people at home. In such situations, these groups of people become further vulnerable from flood disaster especially in safety issues and health problems.

3.4 Infrastructure

Most of houses are made with the tin and mud. Therefore, in every year monsoon period the house gets some sow of damages. After monsoon period, it needs to be repaired which mean need a lot of money. After a focus group discussion, it was clearly understood that after the flood, most of the year river bank erosion is one of the most common secondary effects in this area. No building made by bricks is seemed near the southern point of Padma River. It took a long time to construct of main three bridges linking Manikganj district and the eastern part of study area.

Another one major bridge links the two parts of the Gopinathpur. The bridge connects two part of Bhatsala beel. Without bridge, the study areas south part is totally isolated from Gopinathpur union as well as Manikganj district. This isolation is felt more during monsoon when there is inundation all around and there is risk of travelling across the river in boat because of the overflow on the bridge.

There are old and new earthen roads in the study area which have been found to have inadequate cross drainage structures. A number of culverts and cross drainage structures have been found to be dysfunction due to silting up of the torrents. In general, most of the earthen roads in the areas become out of order during monsoon. There are some parts of the study area where there have no electricity, although some electric poles without wire could be seen extending from north to south part of the area. During the heavy flooding, damage of one single electric pool can cause a lot of problems. The area in general can be said to have been less privileged in terms of infrastructure. Very few flood protection activities have been carried out in the study area. There have been some initiation at the community level, but most of those initiations have either failed to be materialized or did not bring the effect as desired, known from local people.

3.5 Occupation

Different occupational population lives in the study area. Agriculture is the most common occupation in this area. Thirteen out of twenty three respondents of this study are directly involved with the agriculture for their main earning source. Professional migration is very common phenomenon in this study area. Seasonal business is another common type of earning source. Shop keeping is the main source of income for four respondents of this study. Two study respondents said that, animal husbandry was the main income source for their family. Rest of the respondents of this study includes teaching, housewife, student and local NGO worker.

CHAPTER 4
FLOOD IMPACTS ON LIVES AND LIVELIHOODS

Recurrence of flood is common during the monsoon season. It is learnt that the area under inundation and flooding is increasing in the study area since last ten years. The flood damage situation is further divided into two parts: damage of physical assets and social assets. People in the study area shared that there is increasing trend of different secondary effects due to flood in the study area.

In this part of the finding, describe the flood impacts on different non-productive but much more important in social life. People during the Focus Group Discussions (FGDs) and Key Informer Interview (KII) stated that, flood recurrently damages physical infrastructures like houses, schools, road, culverts, shops, gabion embankments etc. Flood also damages the productive agriculture land, and livestock.

4.1 Impacts on housing

The damage of houses is more visible and prominent. The extent of damage to the houses depends on the roofing and wall structures. It was found that unlike roofs with CGI sheets, straw roofs exhibited water leakage after continuous rain. Further, mud walls that soak water were reported to collapse easily. The sustainability of water protection capability is very low for this mad-made house. Therefore, during the monsoon period continuous rain water makes the house wall softer and loos. The thatched houses are severely damaged after flooding whereas houses with cemented pillar, brick wall and concrete houses are partially damaged from the flood.

4.2 Impacts on agriculture

Agriculture is the mainstay of the study area's economy. Almost 85% people directly depend on agriculture for their livelihood. For majority of the people, there is hardly any surplus land since the size of the landholding is very small. Very few well-off farmers have switched from domestic to commercial farming as a large area of agriculture land is being swept away or made unproductive by the flood through river erosion, sedimentation and inundation. It was seen that mostly the villages along the Padma River and at the lap of Bhatsala Beel are suffering from river erosion whereas other villages are suffering from flooding, inundation and sedimentation. Four major crops paddy, maize, wheat and vegetable are reported to be damaged by the flood. The highest damage is seen in paddy and the lowest in vegetable. The estimate made

by the community suggests that crop production has gradually reduced in recent years when compared to the production some 10 years ago. As per their estimate, the land productivity for paddy in the inundated area has reduced by over 40%. The land productivity has been reduced for almost all types' of crops in all these communities at the study area. The production of paddy was reported reduced due to river erosion, inundation, flooding and sand deposition whereas that of the vegetable is due to dampness and late cultivation. The delay in cultivation of paddy hampered and delayed the cultivation of winter crop; flooding and inundation resulted into the land damp and made it difficult to plough for broadcasting of winter crops.

4.3 Impacts on livestock

The flood also caused losses of the livestock like goat/sheep, chicken, buffalo, and cow/oxen. As the animal husbandry is the second largest income of livelihood after agriculture, sweeping of some of the livestock and deaths by flood of many others from unidentified diseases after the flood had impact on the livelihood of the people. While chicken suffered maximum health related problems, buffalo suffered the food crisis in the last and recent years' floods. Food crisis of the livestock is one of the major problems during any floods in this study area. When the water level of flood was increased day by day, the livestock was shifted in the higher place of the house as well as some respondents said they also shifted their animal to the nearest embankment. The maximum wetlands of the study area were under the water during the flood period and for this region food for livestock as well as shelter was a great problem according to the respondents.

During flood time the livestock suffer from different types of health related problems very frequently, and it is very difficult to manage the medical service for sick livestock. Sometime these cattle need to be shifted at animal hospital far from the locality.

4.4 Impacts on road and transport

The flood has damaged the existing cannel for water pass. People reported that the road situation during monsoon is very poor due to continuous flooding, erosion and sedimentation. It is estimated that the flood damaged roughly most of the road in the study area in 2004. Almost in every year, during the monsoon period, heavy rainfall enhances a massive damage in all local roads and drainage system in the study area. Therefore, the rain water could not flow from the locality to the outside. There are a

few Char at the mid of the union. The people of that char totally depend on the local village bazar and the weekly village market (called Hat) for their income as well as to lead there live. The people living in the char use the local market to buy and sell their products. During monsoon period or flood period the village market is closed most of the day in a week because of overflow of water at the market place.

From the individual household interview it was found out that during the flood period all of the roads were overflow by the flood water. Boat was the only vehicle to maintain social communication as well as to go to any place from house. The maximum people of the study area are poor therefore, most of the people were unable to manage or buy a personal boat. For this regions transport and social communication were much more difficult.

4.5 Impacts on health

From all respondents of this study, it was found that during the flood period health facilities were most commonly affected. All types of health centre remain closed as flood water go inside those centre. During this period, different water born diseases like diarrhoea, cholera, jaundice and skin related health problems are most commonly seen. Especially, children and aged people are most commonly suffered from these types of health related problems. Primary treatment sometime might not be possible due to lack of accessibility of basic health facilities. Medicine facilities become a difficult service during any flood, said by the respondents of this study.

On the other hand, flood is a staid affect the pregnant mother health. The pregnant mother could not get any types of health facilities during the flood time. For any types of health facilities could get very far from the flood prone area which was said by the local people of the study area. They also complained that the flood water is entire all over the area and the water is contaminated by different bacteria and poisonous substances, so that by the contact of this water could be harmful for human health but they are bound to use this water in different daily activities because of the lacking of safe water.

4.6 River channel migration and its impacts on study area

The Padma River channel at the study area is learnt to be frequently migrating particularly in the southern region of the study area. Such migration clearly creates a risk to the settlements and farmland in the vicinity of the river. It was found that the

westward movement of the river in recent years. From the local people, over last ten years the channel has migrated over one kilometre. Recent flooding in the Lower north Padma River Basin and the study area has shown that the upstream/downstream and upland/lowland linkages have great significance on designing any comprehensive flood management plan. Consideration of such linkages will help address the root causes of flooding which was suggested by the locality.

In the study area, there is a common perception among local administrators, researchers and local people in general that the extent of flooding has increased since the construction of different industry at the area. This is also observed in the present study as it suggested that, the backwater effect of the increased flood discharge in the Padma River has been reported by the locals, affecting the drainage of inundated area. Moreover, based on the general hydraulic principle, it can be said that the construction of industrial zone is expected to cause aggradations upstream of these structures. Such aggradations reduce the conveyance capacity of the river channel resulting into inundation due to bank overtopping.

The upstream catchments contribute significantly to the Padma River dry and wet period flow. The determination of time of concentration of several sub-catchments and flow routing in the main channel are necessary for the proper design of any flood forecasting system. Such study has implication for proposing specific watershed management activities in the sub-catchments with rapid rainfall-runoff response. The hydrological linkage between upstream and downstream is the main cause to reduce the water flow capacity of the study cannel area. The upland and lowland linkage is clearly observed in the study area. A number of rivers like Padma originating from the Indian range carry huge amount of sediments which get deposited in the farm land reducing the productivity of the land. While harnessing these rivulets is necessary for water security for irrigation purposes in the study area, their proper management is necessary to reduce the flood and associated hazards (inundation, bank cutting, and sedimentation). This upland and lowland linkage is true in the whole Padma River also. It is widely believed that, the increased erosion in the upland areas and debris flow have caused increased sediment in the Padma River resulting into reduced conveyance capacity of the river channel and thus causing flooding and bank cutting problems.

4.1.7 River erosion

Erosion is one of the major secondary impacts after any flood was complained by the local people of the study area. From the group discussion and key informant interview of the sample group it is noticed that, the river erosion after any flood is a most common phenomenon of the study area. Local people of this area complained that, two villages of this union already being destroyed for river erosion. Local data suggest that, the erosion rate of the Padma River is higher in the study area at the Horirampur Thana. The participant said that almost one kilometre area near by the Padma River is already under the Padma River. Some of the participants of this study complained that, they already lost their cultivation land for the river erosion. They also said that they are forced to change their income generating activity from farming to business or day labour. Participants said that, after every big flood the river erosion was seemed to be a dangerous secondary negative impact. Contentious river erosion bound the local people to migrate the local market place from beside Padma River.

Figure 4.1: river erosion and loss of cultivation land of the study area
Source: Google Image

From the transit visit of the study area it was found that, river erosion is a continuous process for this area. The river bank is curve so that the water force can easily break the bank. It is also found from the local people and the union Parishad office there because of bank erosion and the river channel migration, two villages are already destroyed and one char has replaced these two. The local aged people said that for the river migration and erosion two unions under Harirampur Thana named Kanchanpur and Sutalari were almost destroyed from the Harirampur Thana map. On the other hand, one new char is raised named Char Bhadrasan. Local statistic shows

that, migration rate is increase day by day from the study area to another part of the Manikganj due to river erosion.

From the secondary data source of the study, it was found that there are few NGO's working to reintegrate people who become landless because of river erosion. However there was no Government Project or any NGO activities to reduce or mitigate river erosion in this study area.

4.8 Impacts on local society

Similar to damage of physical assets, the flood has also eroded the social assets like: neighbourhood, brotherhood and strong bondage of kinship. The rate of erosion of social assets is continuing in the recent years. It was shared that when a community is hit by flood, many families are forced to evacuate in safe places for some period of time - some days to several weeks. As a result, all the social institutions are likely to be affected during this period. Indeed, the entire social fabric that defines a population as a community is seriously weakened. People are compelled to relocate, some permanently, hence neighbourhoods are destroyed, friendships are severed, support networks are broken and domestic relationships come under greater stress.

Schools, social groups and families are apt to never be the same after the flood. After big flood, family roles and responsibilities undergo considerable change with worsened economic hardship and living conditions. It was also found that during the relocation, people are unable to adopt with the new environmental system to ease the situation in the study area. The flood-affected families were reported to be living with relatives, some as welcomed and some as unwanted guests hence creating some crack in social milieu of kinship. The careful analysis of time line and trend analysis of the study area revealed that the effects of flood are on increase. The flood damage is contributing in pulling the poor farmers in the vicious circle of poverty. Before 1988, there was only the problem of flood but now there is a problem of droughts, river erosion and erratic rainfall even in inappropriate season. It has caused the damage of crops that is ready to harvest, or sometimes there is complete crop failure or low production. Sometimes, the rainfall in inappropriate season has caused the delay in cultivation and reduction of winter crop production. The resource of water borne disease was the common phenomenon in the recent years.

4.9 Impact of flood on farming

In the study area almost 85% people are directly or indirectly depend on the agriculture and from the local level interview it was clearly found that during any flood the most impacted sector is agriculture. There are number of impacts of flood in the peoples' live and livelihood as shared by the local people during the discussion. Some of the important impacts on agricultural sector as well as the different challenges in the farming process after flood are discussed below.

4.9.1 Increased Expenses in farming

Taking other's land as sharecropping and on rental basis (to cultivate on annual basis) are the common practices in the study area. It is estimated that about two-forth population of the flood affected areas are landless who mostly earn their livelihood either by cultivating other's land or by daily wage labour. In order to invest on farming, they take loan from local moneylenders on an exorbitantly high rate. The consecutive flooding like that of 2000 and 2004 put them in trouble.

4.9.2 High price of seed

Floods also damage stored seeds and grains of cereals and vegetables. The price rate is higher for the seeds and is mostly procured from outside the locality. The poor farmers are obliged to use the wet seed which results in less germination.

4.9.3 Less return from animal husbandry

High mortality rates of livestock are reported due to sudden attack of diseases in pre- and post- flood situation. Also, due to poor food management, it is difficult to keep the livestock healthy and manage their appropriate feed during this time.

4.9.4 Poor performance of social institutions

The social networks and institutions, which are considered as the assets community, are eroded as people have no time to discuss and promote these networks and institutions. People become more individualistic to run their livelihood. With poor social networks, they are not able to secure the resources from outside. In fact, the social institutions have poor performance which results in poor resource mobilization.

4.9.5 Changes in cropping pattern

Flood also impacted cropping patterns. Due to flooding and inundation, in majority of the cases, farmers were unable to transplant paddy on time. This delayed the harvesting of paddy as well as plantation of winter season crops. The increased

dampness is also responsible for the change in the cropping pattern. The change in cropping pattern often reduces the total crop production.

4.9.6 Increase the rate of lone amount

Overall after any types of flood the poor and landless people of the affected area are mostly suffered from a huge amount of loan from different sectors of the livelihoods. The mental stress increases day by day and the lifestyle also changes after any flood situation. It takes two to three months to set back to the previous one.

4.10 Flood management activities in the study area

After talking to local people, relevant stakeholders and Union Parishad offices, I came to know about the flood management activities in the study area. From the discussion, it is learnt that there is an active Union Natural Disaster Relief Committee (UNDRC) in the Gopinathpur union under Manikganj district which meets before monsoon for general planning and preparedness, and obviously after the floods for rescue and relief activities. Under the coordination of the district administration office, the committee has focused on three main areas, namely: immediate rescue and relief operation, general relief works, and epidemic and other health risk control just after the disaster. In the immediate rescue operation team, Community police, Local volunteer, Armed Police Forces (APF) and different NGO workers have been actively involved in the last years. For relief operations such as providing food, clothes, water and other utilities, there are coordinated efforts under the coordination of the district Red-Cross and Red Crescent office. Similarly, District Public Health Office (DPHO) has coordinated post disaster health risk and epidemic controls in the flood prone areas. In the pre-disaster preparedness phase, a number of survey and training works have been also conducted by the DPHO. A number of other government and non-government organizations have been actively involved in these sub-committees. A high level committee of government also exists for resolving the problems caused by the construction of afflux bunds and barrage. The committee has, however, not been effective on resolving the issues due to differences of opinions and power imbalance.

4.11 Local Knowledge on Flood Issues

Flood forecasting, early warning system and community based flood management can save many lives and properties during and after the flood. During the field work, community in the study areas shared their local knowledge on flood forecasting, early warning and flood management practices. This knowledge is mainly of experimental nature acquired over the years of struggle with flood disasters and in some instances this are the transmitted ones through poems and songs. It is necessary that any comprehensive flood management plan should take into account the existing local knowledge of flood affected communities on local physical condition, history and trends of the flood, local flood forecasting and warning approaches, and various other aspects of flood management.

This is necessary as people know the local context, the physical set up, the problems of floods and possible solutions better than the outsiders. While it is important to study existing local beliefs and practices for forecasting, early warning, and flood management, in the operational phase it is equally important to ascertain that they are useful and appropriate, and can be integrated in the disaster management plan. There are diverse ethnic groups and subgroups within the study area including groups of local and outsider origins. Thus the local knowledge is not same everywhere in all communities. Nevertheless, the study tried to cover the whole area for documenting the local knowledge for various aspects.

4.12 Local early Warning Practices

There is no formal early warning system in the study area. However people try to assume and correlate their proven knowledge to mark for early warning. There is a general practice that people living in the areas along or near the river banks get voluntarily involved in the monitoring of flood and warning others especially during the daytime in the monsoon season. Some of the examples of local knowledge on early warnings documented during the field study are given below:

4.12.1 Strange sounds from river

Community people assess the strange sound (rumbling sounds) from the Padma and other small rivers. They identify the sound of heavy flood upstream, based on their prior experiences. If it is confirmed that there is a flood upstream, there is a general

practice of shouting in loud voice to notify other people. Accordingly, people decide either to stay inside the house taking some precautions, or to go to safer places for staying.

4.12.2 Muddy smell of the water of the river

Muddy smell in the water is considered as another indicator of the flood. Generally big flood carry fresh soil/mud along with water and its smell is different than the normal one. According to the local people, colour of river water is also another indicator of flood which is described by the local people of the study area.

4.12.3 Presence of dry leaves, mud and other materials in river water

When the water level increases, and flood carries dry leaves, mud and other materials along the river course. These are taken as indications of increasing water level. It is also reported that if number of fishes in rivers suddenly starts increasing, then this is considered as an indication of possible flooding in the immediate future. If there is a big flood coming nearby, dead bodies of animal and snake can be seen flowing at the surface of the water these statements are collected from the local fishing community of the study area.

CHAPTER 5

RESULTS AND DISCUSSIONS

The study area is one of the most vulnerable areas of flooding in that region. In every year flood occurred a vital impacts especially on the livelihood sectors. Most of the people directly depend on the agriculture sector in this area. Flood of this area mostly affect the agriculture sector. Most of the respondents of the study said that the agriculture product as well as livestock was the mostly affected during the flood.

5.1 Housing sector

From the field study researcher observed that the most of the house is made with jute stick and bamboo. Floor of maximum house is made from mud and the roof of the house is tin sheet. Among the twenty three (23) sampled households, more than 90% respondents indicated that their houses collapsed due to excessive impacts of floods while the rest had their houses intact. Furthermost, mainly the people whose houses collapsed due to floods, said that the flood water enter their houses every year.

Figure 5.1: Flood affected house
Source: Internet

About less than half of the respondents complained that their houses were impacted by floods and they were forced to relocate to other alternative areas while the remainder continued to stay within their home.

All respondents of the study said “the flood water enters in their house and the level of water rises day by day”.

Seven respondents out of twenty three said “preparing meal and make fire was the most difficult task at flood”.

Almost all the respondents of all the householders are said “we need to raise on bed and others furniture for flood water as well as need to prepare a hanging platform to keep the valuable objects”.

Half of the total respondents said “lots of money is needed just after the flood to reconstruct or prepare house to live”.

The respondents discussions revealed that some displaced households sent their children to stay with other relatives during flood. This in a way disrupted their pattern of life and social networks.

For increasing the flood water level respondents shifted from ground to higher place inside the house temporarily. They said that the most difficult work was to manage the cooking fire place during the flood. Therefore, respondents complain that they suffer a lot while preparing their meal. Discussion with these households indicated a positive will to move permanently to safer havens with alternative fertile land relevant authorities. It is worth mentioning that some households have shifted to a new area altogether.

Figure 5.2: people take place on the house roof
Source: Google Image

Some of the respondents said that they lost their house for the river erosion as the secondary effect of the regular flood at this area. They also informed that there were two villages under this union which is now under the Padma River. Two respondents complained that they are bound to migrate their occupation because of loss of their agricultural land for river bank erosion at just after the flood of the previous years. Most of the respondents and local people said that the flood water stayed at least 10 to 15 days, as a result the water makes mad more soft and fragile. So therefore, after the flood the bank erosion destroyed house, school as well as agricultural lands. In a study of Bangladesh it is found that the flood has maximum advance effects on housing and infrastructure in the livelihood for the socio-economic sector (Ashraf. S, Iftikhar. M, et al. 2013). In a study it is found that, some of the participants have noticed that in their housing the living room and the kitchen were the most affected parts.

5.2 Livestock sector

One Half of the population is dependent on their livestock as their supporting income source. Cow, duck, chicken and goat are several types of livestock at the study area. Some families from the study sample group totally depend on the income from their cattle farm. During flood, the cattle and other household animals suffer a lot Damage of the animal house one of the major problems for the flood. Food crisis during flood was the main complaint of the respondents. Different types of impact information's were adapted from the households.

Eight respondents from twenty three said that "they suffer a lot to save their cattle from flood water. Some time they sent their cattle to the embankment".
They also said that "to manage food for the cattle was a very challenging issue, because the open field and grassland were under the flood water".
To collect food for cattle and make a safe place for them to stay were not only the main problem but also carrying those cattle from one place to another were during flood. Some literature showed the evidence that people do go to the flood shelter because they are concentrated about their safety their cattle of home. In the study area some of the households said the same. They said that "the flood water rises day by day and they suffer a lot to maintain cattle food for they do not become goes to the flood shelter because the flood shelter does not allow them to take their cattle".

Different water inherent disease for the animal is increased during flood and it is difficult to manage the medicine. Some time these diseases spread from one animal to others. Death rate is higher among the farm animal, for any long lasting flood, said by the respondents of this study. The poultry farms are severely affected during the flood. The daily production from these poultry farms is severely reduced due to the attack of different life threatening disease of the hen as well as the fluctuating environment and temperature.

Figure 5.3: flood impacts on livestock
Source: Google Image

In a study it was found that some of the participants noticed that food and shelter for pet animals are most difficult areas. During the flood, some of households complained that their cattle suffer from different diseases for the low quality food and water born factors. Some respondents said that they are bound to sell their livestock because lacking of the safe and suitable places to stay as well as food.

5.3 Agriculture/business sector

Most of the sampled households indicated that their crop fields were damaged by floods. It was also evident that of the crops which were damaged by floods, most of it was the main staple crop. The sustainability of the flood water was the main problem, said the respondents. Most of the respondents complain that, the main staple crop was under the flood water during the flood time.

All respondents of households said that “flood water entre into the crop land and cause large damages of the cash crops”.

Some of the responder’s main occupation was shop keeping and they said that the flood water entire into their shops and they are bound to close their shop during the flood period. Economically they suffer a lot because of the loss of crops and business.

One-fourth respondents said that “sometime flood happened suddenly and they could not collect their main staple crop in due time. As a result the total crop production goes to be damaged”.

There were some businessman in the sample group; their main occupation was fish production and selling. During flood, the maximum ponds were the over flown by the flood water as a result fish production was totally destroyed and all of the fishes were to the open flood water.

Seven out of twenty three respondents said that “fish production was totally destroyed due to sudden flood last year. A severe economic crisis was occurred during and after flood”.

Shop keeping is one of the major parts of income source. During flood, people bound to close their shop due to water logging in front of the shop. Sometimes, water enters the shop and most of the products are damaged. Most of the ponds are over flown by the flood water so that, the fish business are destroyed due to insufficient fish in the pond. Severe economic losses happened for the fish businessmen.

Figure 5.4: Water logging in front of the shop due to flood

The main negative impact of the flood on the agriculture is sustainability of the water in the crop land. Every crop has specific time duration to survive against water logging, but when this duration is over then the production of crop gets affected severely. It is well known that flood is a long lasting type of disaster. Therefore the duration of water logging becomes longer for any crop production. That is why maximum cash crops are very easily damaged by any flood. Every responder said

that previously there were some kinds of signs before any flood. However now a days, flood comes without any notice or early signs. Therefore, it is difficult to protect their cash crops from the flood. Not only the cash crops are affected by this negative impact but also the vegetable gardens are affected for flood. Food crises for human and cattle is one of the problematic issues during flood, which is created from these sow of causes.

Therefore, the all respondents of the household informed that two-third production was destroyed during flood. The vegetable garden was also affected by the flood water. The respondents who work as vegetable seller suffer a lot to lead their life because of the loss of vegetable garden. Out of the twenty three sampled households one-third indicated the experience of food stock losses due to floods. The research also revealed that within the households whose crops and food stocks were damaged by the floods, two-third resided in the flood prone area at Gopinathpur village under Manikganj District.

5.4 Water and sanitation sector

The sampled communities showed a lot of diversity on the type of drinking water sources they had. In this study, the water and sanitation were the severely affected area, which was said by the respondents.

All respondents from all households said that “their water sources were severely affected by the flood water. The tube-well is contaminated by the flood water as well as the ponds are over flown. The main source of water was the flood water during that time”.

Maximum respondents said that “they collected their drinking water from the tub well very far from the house but water for other household and self-care work was flood water”.

Furthermore, among the sampled households, two-third of the respondents indicated that their common water sources for drinking were affected by floods. Most of the respondents complained that, during the flood time almost every tube well or the drinking water source were affected. Therefore it was very difficult to manage the safe drinking water. Most of the respondents said that, they collected water far from their residence or drank the flood water affected boiling it. Due to this unsafe flood

water, most of the respondents complained that their family members, especially children suffered from different water born skin diseases.

In one study, it was found that, water and sanitation supply were showing medium extent damage in the study areas (Starkey et al. 2002). Sanitation facilities was one of the most affected areas in this study areas, according to the responder's opinion.

All respondents from all households said that "they use the open place at flood water for their sanitation. Some said that they used boat to go far from the house and chose a small tree ground to manage their sanitation work".

Due to this process of sanitation, the flood water becomes contaminated by different types of bacteria and poison. As a result, this flood water creates different water born disease very easily.

Water and sanitation facilities are mostly affected sector. During any flood most of the tube well goes under the flood water, and for this region, safe water for drinking and other activities become unavailable. Due to damage of the sanitation facilities or infrastructures during flood, people are bound to complete their sanitation work under the open sky or unhygienic ways.

Figure 5.5: Safe water source was under flood water
Source: Google Image

5.5 Health sector

The research also revealed that out of the 23 sampled households, more than half indicated having at least one member of their household getting sick during the floods. The most significant diseases experienced among the sampled households were diarrhoea, malaria/fever and skin diseases.

Two-fourth of respondents of the study said that "the flood water stayed for 10-15 days and the road and transports were under water and as a result responder's family members bound to move to the flood water. For this reason they easily suffer from fever, diarrhea and scabies".

They also mention that “the economic cost was higher to treat their family members for flood water borne diseases”.

Furthermore, other sampled households indicated that they experienced other disease immediately after the flood period outbreak such as cough, scabies, sores and rash. The survey further established that more than half of households whose main source of drinking water was the river, had household members falling ill followed by a small group of households who indicated borehole (a big pond for reserve safe drinking water) as their main source of water. This means that households will continue to be vulnerable to increased disease outbreak as long as the river continues to be their main source of drinking water. This is as a result of increased contamination that occurs during flooding. Despite borehole being the safest water source for drinking, past vulnerability assessments undertaken within the district have shown that handling of the water by households due to distance to the source has led to increased disease burden such as diarrhoea. In terms of specific diseases experienced by households due to varying water sources for drinking during the floods, most of households talked about having diarrhoea. The study further finds out that half of households whose main source of drinking water was river suffered from different water born diseases and the expediter for this illness is high.

5.6 Educational sector

The educational sector was the seriously affected during any flood. In the study area flood water entered all educational institutes. Therefore, all educational institutes were closed down during flood period.

All respondents from all households said that “all types of educational institutes were closed during flood period. All types of exams and classes were stopped as well the maximum educational institutes used as a flood shelter”.

Some of the respondents said that “in recent years the sustainability of flood water is increased. Therefore, the flood waters some time damages school furniture which has huge economic losses”.

Some respondents of households said that “after flood period by the support of the school authority and the local community volunteer the educational institutes are cleaned up and this also repair the roads and transport facilities”.

Therefore, the flood water into the educational institutes has great negative impacts in educational sector in livelihood. During flood, the educational institutes are used as a flood shelter as a result all types of educational activities need to be closed. Just after the flood the class rooms get unusable because of sleeper floor and broken furniture's, therefore it also takes time to start the educational activities.

Sometime, the furniture of the class room is not able to use as those break. Therefore, huge amount of money is needed to recover the loss. In many cases, the infrastructures of the institutes are broken down. In a study it was found that, Infrastructure of any area is always considered important for the stability of the living people but because of flood the overall infrastructure was totally scattered in study area (Starkey et al. 2002).

Figure 5.6: Flood affected educational institute
Source: Google Image

CHAPTER 6
CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

As discussed under various sectors and across sectors, it is clear from the study that floods have adverse impact on the socio-economic status of livelihoods for people in Gopinathpur Community. To a large extent, the study has established that flood sustainability and depth have a vital role on livelihood patterns. It is also evident that there are varying underlying causes of people's vulnerability in flood and this poses a challenge for reducing or minimizing vulnerability Proximity to the flood prone area, residing in flood prone area and poverty are identified as being the main underlying causes of vulnerability for the Gopinathpur community. Besides that, some of the superstations about flood also play a vital role to increase the vulnerability of flood.

The study has further demonstrated that effects of floods in one sector can affect other sectors of society. Under the health section, the outbreak of different diseases such (malaria, diarrhoea and coughing) was attributed to the impact of floods on water sources and sanitation facilities. The issue of water contamination of the river at the pick of floods and the handling of water from the borehole increase the health risk. Furthermore, although health facility was damaged due to damage of the road and transport due to floods, accessibility to health services was a problem due to infrastructure (roads and bridges) damage as discussed under the housing section.
In addition, school attendance was disrupted due to impassable roads as discussed under the education section. From the study, it was clear that households cope differently when affected by floods. The communities should be encouraged to build houses using durable materials and away from the flood prone area as a way of coping with the floods. Furthermore, the Ministry of Agriculture and Cooperatives should through the Extension Services, encourage the communities to increase the area cultivated on the upland to enhance the food security at household level. Input support programme for the vulnerable but viable farmers should be considered. Clearly, there is need to develop better and appropriate measures to prepare and mitigate the effects of the floods. Above all, the aim must be to involve all the stakeholders to enhance communities' resilience to floods.

6.2 Recommendations

Therefore we can approach to some ways or solutions in this chapter to highlight some policy considerations, practical orientations and as well as awareness building which, if implemented, could play an important role in flood risk management. The following considerations are recommended from this study:

- Government and key stakeholders should engage communities in order to move permanently to higher grounds as they have expressed a willingness to relocate. Consideration should also be made to introduce alternative livelihood strategies in the new area of settlement.
- There should be a deliberate policy to compel communities, especially in rural areas, to build house using durable materials and away from the flood prone areas as well as the height from the flood level must be considered.
- The Ministry of Agriculture and Cooperatives should, through Extension Services encourage Communities to increase cultivation and tree plantation on the upland in order to enhance food security and household level.
- The relevant authorities should delineate both with the non-flood areas and flood areas. The non-flood areas can serve as a temporary flood shelter for the settlements during floods.
- Construction of dams should be considered to trap the excess water. This could be used for irrigation.
- Tree plantation need to be encouraged among the village people outside the community areas that should protect or minimize the flood impacts.
- Government and key Stakeholders should engage the communities and local authorities in making them aware of the flood risk in view of the climate variability.
- Community initiated mitigation measures should be promoted to build community resilience. In the long term, community based floods early warning system for flood should be developed.
- Multi-sartorial approach to flood mitigation as opposed to single sector should be promoted and should be link it to the impacts of flood on various aspects of society.

6.3 Consideration for further research

- There is clearly a need for more research into the human adjustment to the flood hazard, particularly in terms of the perception and behavioral responses to floods.
- The aspect of early warning and how the information is utilized (what action is taken by the community when the warning is issued) should be investigated.
- There is need for further investigation (environmental impact assessment) on the proposal to construct canals in the flood affected area especially where flood is a natural phenomenon.
- In future research, the issues of flood shelter and utility have to be identified.
- River erosion is one of the biggest causes of social migration and evacuation of this study area. Future research should need to explore the nature of river erosion and river migration.

6.4 Limitation of the study

The findings of this study are just a snap shot of the impacts of flood on lives and livelihoods of one small village in Bangladesh, which is naturally considered a big limitation for generalize the research results. The research questionnaire and impact assessment were not culturally validated, so the trustworthiness of the data cannot be ensured fully. This study has only investigated the lives and livelihoods impacts of the respondents. Other personal factors and psychosocial factors (frequency of feeling stressed, adaptive strategy, and work satisfaction, work pressure, conflicts with other family members etc) were not considered. Lastly, respondents who had no experiences about flood situation as well as who were already being migrated from their land space by the river erosion were excluded from this study and during survey no participant reported about having such conditions but that does not mean that respondents did not have any possibilities to have any types of exclusion condition. This may be due to inaccessibility of data collection become of some cultural barriers in rural Bangladesh for participating in the data collection. Some rural people do not put much emphasis on the disastrous impacts of flood and along with them; some social and community leaders also become careless about these impacts.

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Appendix- 01

Data collection questioner

Research title: Impacts of flood on the lives & livelihoods of people in Bangladesh:

A case study of a village in Manikganj district

Holding number:
Respondent Name:
Questionnaire ID:
Date of Interview:

1. Household Demography

Sex of Household Head	M / F	Age		Marital Status		Household size	

1.1 Types of house

_____

1.2 Description of the household

_____

1.3 Area of land ownership

_____

1.4 Main income generating activities of the household_____

1.5 Total number of children of the household _____

1.6 Total number of school going children of household _____

1.7 Educational qualification of the household head _____

2. Livelihood Patterns

2.1. What is the major livelihood strategy of household? (Rank 5 of them)

	RANK
1. Crop Production	
2. Trading	
3. Livestock production	
4. Fishing	
5. Horticultural production	
6. Manufacturing	
7. Wage labor	
8. Shop keeping	
8. Other; specify	

3. Flood Impact

3.1. Housing

3.1.1. Please briefly explain what types of damage happened to your house

_____

_____

1.2. What types of assets in your house most commonly affected, please explain in brief

_____

_____

3.1.3. Maintain cost/ labour needed to get recovery from this flood affected house, detail explanation

_____

_____

3.2. Livestock

3.2.1. How much cash crop are damaged/affected for this flood, explain in detail

_____

_____

3.2.2. Cost of total loss in cash crop damage in the flood

_____

_____

3.2.3. In case of livestock, what type of damage or problem are you suffered during the flood and also level of loss in this sector in your household

_____

_____

3.3. Agriculture/ Shop keeping

3.3.1. List three main staple crops that you grow:
3.3.1.1._____
3.3.1.2. _____
3.3.1.3._____
3.3.2. What types of damage happened during
flood_____

_____

3.3.3. Total cost in agriculture sector in your household did you experienced during this flood

_____

_____

3.3.4. In your shop, what types of damage or loss happened during the flood

_____

_____

3.3.5. Approximately how much loss was happened for the flood and during the recovery period the cost you need, after the flood

_____

_____

3.4. Education

An overview of the education sector in your area

_____

_____

3.4.1. Explain in briefly what types of damage was occurred in educational institute during flood

_____

_____

3.4.2. Maintenance cost for recovery of the educational institute after the flood affect

_____

_____

3.4.3. What types of disruption (e.g. exam, class attendance) occurred for school going children in your household experience due to the floods?

_____

_____

3.4.4. Are the educational institute were closed for the flood; please provide detail information about it

_____

_____

3.5. Health

3.5.1. What types of health service existing in your area

_____

_____

3.5.2. What types of damage/trouble happened during the flood in your area

_____

_____

3.5.3. Cost of recovery of the health facilities infrastructure in your area

_____

_____

3.5.4. Which of the following diseases were experienced by the household members who got sick?

3.5.5.1. Diarrhoea ⌴

3.5.5.2. Cough/ ARI ⌴

3.5.5.3. Malaria/ Fever ⌴

3.5.5.4. Measles ⌴

3.5.5.5. Others

Specify_____

3.5.5. In your household, total cost for recovery from health related problems for this flood

_____

_____

3.6. Water and Sanitation

3.6.1. How much damage or affected in the area of water and sanitation in your household during the flood

_____

_____

3.6.2. What types of problems is your family face during the flood in case of water supply and sanitation

_____

_____

3.6.3. Cost for recovery from the flood damage, in case of water and sanitation sector

_____

_____

Appendix 02

Consent form

Research title: Impacts of flood on the lives and livelihoods of people in Bangladesh: a case study of a village in Manikganj district

I am a participant of this study, name _____, are totally known about the aim and procedure of this study. I also know about my benefits and problems of this study. I have right to refuse or withdraw own self from the study at any time, for this reason I am not bounded to any person about explain my causes of withdraw. Confidentially will be maintained and also all the records should be kept in security. Only researcher can use my information in his study purpose. During publish the study researcher not use any types of name identification indicator. No identity will be published without my permission.

I read all the information and willingly participate in this study.

Signature:

_____ _____

Sign of the researcher Sign/Finger print of the participant