

Indigenous Flood Coping Strategies towards Livelihoods: A Study in Haor Area of North-East Bangladesh

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in Social Welfare)

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Declaration

The material embodied in this thesis is original and has not been submitted in part or full for any other Diploma or Degree of this or any other university.

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This is to certify that the thesis entitled **Indigenous Flood Coping Strategies towards Livelihoods: A Study in Haor Area of North-East Bangladesh** done by Abu Zafar Mohammad Sadeque is an original research work. The views expressed in the thesis are original from field-based data and is entirely his contribution. The thesis has not been submitted anywhere else for any purposes e.g. degree or publications. This may be submitted to the examiners to evaluate for conferring the degree of Doctor of Philosophy in Social Welfare.

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Abstract

The study has been conducted in the famous Tanguar Haor region in north-eastern part of Bangladesh which represents one of the most vulnerable communities as there are frequent monsoon and flash floods. People of this remote area have developed some coping mechanisms to resist the adverse impacts of flood. The study has attempted to explore resilience of the households with regard to various aspects of livelihoods such as income opportunity, shelter, water and sanitation, health, food security, marketing system, communication, food intake behavior, etc. The purpose of the study was to explore coping and resilience of the *haor* resource-dependent community living in adjacent villages of Tanguar Haor region to minimize flood risks for maintaining their livelihoods. Four villages of *Uttar* (north) and *Dakshin* (south) Bongshikunda union of Dharmapasha upazila under Sunamgonj district have been selected for this study following some specific criteria. A total of 175 households were selected following purposive sampling. The demographic and socio-economic data were collected through questionnaire survey and qualitative data were collected through in-depth interview, key informants interviews, participant observation, case study, focus group discussions (FGDs) and PRA techniques and methods. A descriptive approach was used for data analysis.

Findings reveal that in the study villages, cycle of economic activities varies significantly with changes in the seasons. Farming (82.27%) and fishing (80.68%) are considered the major occupations of the households. Members of most of the households carry out multiple livelihood activities apart from their primary or main occupation. Households in the village are not affected by flood equally as they vary in source and amount of income, households composition. The findings show on average 16.84% of households has no homestead land and about 52.61% households has no agricultural land of their own. Female-headed households and elderly women are more likely to be indigent. Data shows that 90.29% households received loan during the previous 12 months preceding the day of enumeration. Local *mohajon* (moneylenders) popularly known as '*gerostho*' (householder) are the main providers (33%) of their loan. In case of early flash flood people are bound to borrow money from the available sources or sell property (e.g., cow, land). In the rainy season, the only transport is boat/trawler. The findings clearly reveal the remoteness of the villages indicating difficulty for development of physical infrastructure in the area. As a result, scopes relating to livelihood cannot be created at the expected level.

Before the commencement of flood season people usually raise the plinth of their houses, they repair mounds of homesteads by constructing bamboo fence with soil, *chaila* grass (one kind of tree), *dholkolmi* (one kind of tree, local term *ujauri*), water-hyacinth (local term *germoni*), etc. to withstand flood. In most cases house protection initiative is carried out by household members alone, but the issue of common interest e.g. constructing a barricade around the people's cluster-homestead area for its protection is often done by neighborhoods collectively. People have traditional knowledge regarding prediction of rain and flood. Perception of women and men regarding early warning of flood is quite distinct. During big flood the devastating situation compelled a large number of people to migrate to a safe place to take temporary refuge. Households adopt various types of mechanisms to save lives of their vulnerable family members. They adopt some good practices to protect children e.g. they construct fencing barriers across the door, around veranda and courtyard to prevent children from unintended access to flood risk areas. The results indicate that though aged persons are vulnerable, they have resources and capacities as well. Older women often play a key role in childcare, allowing young generations to invest time and energy in risk reduction or adaptive strategies. The community people take collective initiatives to rebuild or reconstruct the damaged community

assets like embankment, school, mosque, village roads, bamboo-bridge, tube wells, etc. They raise community fund and those who are unable to contribute financially, provide physical labor. The study shows commonly adapted coping strategy to face water crisis. The villagers mentioned installing tube-wells on high ground or raising the platform to deal with this catastrophe. As adaptation measure some households (16.57%) harvest rain water traditionally. The villagers raise the plinth of toilets by piling up earth considering the highest flood level. During flood people living in the *haor* villages keep valuable items like food, clothes, grain, etc. on elevated structure locally called '*machan*'. They use elevated *dhaner gola* (paddy container) to keep their grain safe from flood water. Households keep valuable documents like land records, certificates, books, etc. (wrapped with plastic sheets) on the ceiling, to the house post hanging, on elevated shelf or raised platform. Documents stored in this manner are protected from rain or flood. Small country boats under private ownership are used to meet emergency needs (e.g. evacuation). The villagers have transport repair capacity within community.

It is found that people in the study area regularly visit the *haor* in connection with the affairs of their livelihoods. Majority people go to *haor* for agriculture and fishing purposes. Findings show that over 87% households procure various plants and fruits from *haor* which are used for different purposes namely food, fuel, fodder, medicinal plants, materials for fencing/thatching, making boat/raft, protecting village mound from waves, and trap for fish. Prior to harvesting of *boro* rice opportunities for income become scarce, then indigent people go to the *haor* with a view to collecting wild fruits and plants. The study finds that the self-serving force dominated social power structure excludes the marginalized from sharing the scarce *haor* resources. Depletion of natural resources has direct negative impact on the livelihood of the families who rely on *haor* for their livelihood sources.

Households in the study area need at least two sources of income, because occupational engagements vary in the dry and flood seasons. The survey finds 82.27% of households engaged in farming (both cultivation of owned and leased land and also a day laborer), while 80.68% either as primary or secondary source dependent on fishing. Non-farm day labor provides additional income for 39.17% of the families, while small business activities are a source of income for 34.23% of the families in the villages surveyed.

To cope with the economic losses induced by flood, people take alternative source of income, which is not always guaranteed. In the months of *Ashwin* and *Kartik* (months of Bengali year) the poor households take land from the rich as *Aadi-bhaga* (sharecropping). This practice of '*aadi bhaga*' characterizes the economy of the study area. Crop damage due to flash flood is a big threat to the people, especially who work as sharecroppers. To cope with the adverse situation, some farmers in Bongshikunda followed some adaptive and innovative farming practices. They cultivate short duration rice variety such as BR-28 in their small plot of land for saving their only one crop from flash flood. Another method they usually apply is early seeding on seed bed, when flood water recedes early. According to farmers, early seeding followed by early transplanting method can save their *boro* rice from flash floods. It is found that though the floods cause a huge effect, people are still able to recover some harvest or income because of these innovative practices. To mitigate crop damage farmers reap pre-mature crops.

Households of the study area practice traditional methods of seed storage. In most cases women carry out seed preservation related activities. The traditional seed storage practices include: storage in *motka* (big sized clay pot), *Payela* (earthen pitcher), '*dula*' (special container made of bamboo, plastic bag and cane). They also build extra ceilings underneath the main ones to store seeds and crops to protect from inundation.

During the monsoon months agriculture laborers are engaged in fishing to cope with the vulnerable situation or to earn livelihoods. The results indicated that the total income from different sources declined after the post-flood period. The poor affected households are reported taking loans with high interest from '*gerostho*' to meet basic needs. The study explored livelihood diversification trend of the households. Diversification of livelihood contemplated through off-farm labor such as ferrying passengers by boat, goods transportation, paddy business by boat, earth work, renting boat, etc. The results explored that the families having more than one income earning member and involved in multiple income sources are more disaster resilient. Fishers are excluded from their rights to fishing due to illegal practices and negative role of local power structure. As a consequence, fishers opt for alternative livelihood. When farmers do not get a good harvest of rice, they will be heavily dependent on fish. It was observed that people use local knowledge to save their livestock as they are valuable assets. Many people especially the landless raise goats and cows on sharing basis. When the low-lying areas of villages are inundated by severe floods, livestock is usually shifted to the high land of the locality. Some poor families try to avoid risk and sell livestock in an attempt to keep some money at hand.

The findings illustrate the measures taken for overcoming food insecurity situation during the lean period (*Falgun-Choitra* months of Bengali year or February-March), immediately before harvesting *boro* paddy. One of the most common strategies found among the households is to compromise with the quantity and quality of meals. People often depend on unconventional food items i.e. wild plants collected from *haor*. Usually women and children make attempts to collect water fruits and plants. When there is a prolonged flood or early flash flood households switch over to austerity measures like increased dependence on credit, distress sell of productive assets, which ultimately weaken their future income potential. Prior to floods, households store dry food such as *chira* (flattened rice), *muri* (puffed rice), grinded rice, etc. In most cases the food preservation works performed by women. Almost 98% of households said they preserve fire wood/fuel in advance. Collection, preparation and preservation of firewood are basically women's job. About mechanism for cooking food during flood, 97% of the respondents stated arranging portable mud stove prior to any probable flood. Women carefully cook common food so as to save fuel and time.

It revealed that the total income from different sources declined during the post-flood period. Income opportunity reduces greatly, during the flash flood. The poor affected households reported taking loans with high interest from '*gerostho*' during the post-flood period to meet basic needs. Local people in Bongshikunda cannot easily transport their crops, vegetables, small fish, chicken, egg, milk etc. to the market and get good prices from sale. Ultimately, they endure the suppression of the middlemen. Almost 90% of the households reported taking loans during the year prior to the interview. Once the crops are lost or houses are damaged, households tend to take loans from *mohajans* (moneylender) or mortgage their land to *mohajans* for borrowing money. The researcher observed various conditions of money lending systems prevailing in the area. It is common that many poor households sell their valuable assets to repay the loans taken from moneylenders who are very rigid and realize amount of loaned money by any means.

The researcher observed that household members adopt a number of coping strategies to recover from disaster related losses. The strategies include use of social networks and relationships, livelihood diversification, reduction of expenses such as changing food habit, engaging women and children in work, advance labor, distress selling, working for extra hours, temporary or permanent migration etc. The findings reveal that household members are changing their mindsets regarding choice of occupations. They try to be involved in non-

traditional sectors e.g. some small farmers temporarily become rice traders. Fishers opt for fish related business like buying and selling fish. The flood affected people take some 'austerity measures' in regard to food intake and use of resources. As a negative coping strategy, some ultra-poor people sell their labour in advance at low rate. To recover from property damage (e.g. house), caused by the monsoon and post-monsoon flash flood, households sell their assets including cows, paddy, agricultural land. Some of them take future risk to meet present needs through selling household belongings and taking loan on high rate of interest. All these can be termed as 'Risk Transfer'. As a strategy to recover from loss and damage caused by flood, some household members work for an extended period of time and engage themselves in laborious and risky work. For the people of Bongshikunda union (around 40%) seasonal migration is a crucial way of maintaining livelihood as well as coping with natural disasters. Many households also become *de-facto* female headed households as a consequence of the absence of male members for a long time. The role played by women in the absence of male is not usually appreciated. Many households invested remittance in more diverse livelihoods such as running small shops, leasing in land, raising cattle and dealing in crops/commodities and thereby they reduce extensive disaster risk. It is found that household intends to invest in house construction so as to be safe at the time of any flood or catastrophe.

Households adopt a number of coping strategies to recover from disaster related losses. One of the major factors that help recover immediate loss is activation of social networks and relationships. Almost all the respondents claimed that support of neighbors, family, and kinship networks in their resilience efforts is crucial. The invaluable support provided by the community to them usually reflect in the forms of taking care of children, elderly people, PWDs, taking care of belongings and domestic animals as well as tangible support like money, food, transport, shelter, tools and equipment. People work together to repair crop protection embankment every year to save crop fields from flood. Neighboring families share their labor and resources to protect their homestead from 'afal' or strong wave. The researcher found that these collective actions often occur spontaneously and informally, with significant impact on people's livelihood. Many examples of social capital exist in the study area. In the villages sharing of resources (e.g. food, boat) is a common practice to face flood. It is found that the neighbors help the families of low income with repairing house and raising homestead land. Households collaborate with each other in respect of sowing seeds, planting seedlings in the land and harvesting crops. In a disaster situation, people help each other in whatever way e.g. they help carry paddy, rice, cow, goat, to the dry and high land. There are many evidences that the big land owners provide shelter for flood victims. Those who have boat help other people to evacuate safely. The destitute, who have no land receive material support like shelter, food, work opportunity from relatives and neighbors. It was observed that the households who could establish linkages and networks with individuals and institutions were better able to reduce the risks from disaster.

In the context of disaster prone villages in the *haor* area people have advantages including disaster experiences, which give them the ability to cope with, adapt to, and recover from disasters. For instance, households' knowledge of hazard history, nature and risk plays an important role in building their resilience. When the rainy season comes, they observe the danger level of water and can understand through the past experience which side of the village will be badly eroded. Examples of skills that can contribute to natural disaster preparedness include knowing how to swim, local practices for agriculture and fishing, knowledge related to carpentry (boat/raft making), bamboo weaving, making fishing crafts and gear, *shika* (hanging net made of jute) making, building flood resistant houses, building houses on plinth/platform, etc. It revealed from FGD with fishing community that local fishers possess certain ecological knowledge such as what environment a particular species of fish likes and does not like, fish migrations in the rivers and movements to the *haor*, breeding places of particular species in the

khal (canal) *beel* (fresh water lagoons), *haor* or in the river. The researcher observed the local fishermen use various fishing techniques. Local farmers follow some agricultural practices to protect their crops from flood hazards e.g. they harvest immature paddy during early flash flood and fast growing vegetables are planted after flood is over. The houses are typically built on mud platforms (or plinths) so that they remain above flood levels.

The inhabitants of the study area perceive disaster as part of their life. Despite hazard threats, people opt to live in their ancestral land with a hope that they will resume their normal life after the disaster. The risk associated with flood, lightning, thunderstorm, *afal* (strong wave) creates more or less anxiety among people, but their fear is minimized through some ritualistic behavior. At the time of storm, people make loud sound with a metal objects. Some people arrange special prayer before harvesting crops so that it is not damaged by flash flood. They believe storm will go away if they perform religious worship. Local knowledge is undergoing changes as a result of broader socio-economic and cultural changes. Traditionally, food and labor were shared throughout the village. Now labor sharing system has become almost extinct due to the dire economic condition of the poor.

As *haor* people live in remote isolated island like villages they have limited access to different organizations. According to local people, the government activities to manage flood are visible only in post-disaster response phases such as providing relief to the flood affected people. Union Parishad (lowest tier of local government institution) is the only government institution where the poor people have easy access to get service at first during flood. For lack of financial capacity, the local institution is required to work under the guidance of the upper level bodies (*upazila*/sub-district and district administration). As a result, it becomes difficult for the local institution to allocate funds according to the deserving people's needs and demands. This study takes the view that safety net program had a poor coverage because only 27.82% of households received some sort of help. By and large, NGOs programs aim to improving the overall living conditions of the *haor* people. However, their interventions are too small compared to the broader needs of the people. Often, there are problems in terms of necessary coordination.

It is evident that women build up resilience on the basis of their experience that they gain through their day-to-day hardship and struggles. They know they will have to face catastrophic floods every year but never give up. Women have certain capacities that help not only them but the whole family to cope better during flood. Women are involved in productive activities such as pre and post-harvest activities, poultry and livestock rearing, small shop keeping, duck rearing, *mateer kaj* (earth cutting), vegetable gardening, arranging traditional fishing gears such as *chai*, *bair*, net weaving, collecting and selling fuel wood. Women perform reproductive chores such as care and maintenance of household and members; ensuring food availability; make portable stove, fetching water; preserving fuel; preserve fodder and dry food, make *shika* (jute net), clean household premises after flood; repair houses, raise homesteads, make *machan* (elevated platform), bamboo fencing around homestead; etc. Many of them are involved in disseminating early warning messages; constructing temporary embankment to protect crops as community role. During the monsoon, regular income generating activities drop and men lose their earning. In this situation, men cannot perform their responsibility i.e. catering to their families and as a result, they tend to migrate. At that time women earn their livelihoods and fill up the vacuum by looking after the respective families through arrangement of food and other goods. The role of women in ensuring food security is vital to the household economy. Women's responsibility and workload increase manifold during severe flood. They need to perform immediately after flood water recedes. They clean flood-damaged home, polish house floor with mud, repair house fence, clean the dirt from yard, repair cattle shed.

The study investigates household responses to disaster risk from resilience perspectives. “The Resilience House”-- an analytical framework for household resilience has been used in this study to analyze the research issues. The framework as illustrated by the researcher considers household as part of a broader community or system. In defining the concept of resilience, the researcher has reviewed three components of resilience i.e. *absorptive*, *adaptive*, and *transformative* capacities. Some examples of absorptive capacity of the households include: households temporarily reduce their expenses following a drop in their income; they reduce the quantity of meals per day; they have developed community-based early warning system based on traditional knowledge; stock of emergency food, etc. Adaptive capacity, e.g. household in the study area diversify its crops in order to respond to floods; they adopt new agriculture methods (e.g. growing early variety crops, early seeding and transplantation), diversifying livelihood bases (engaging in off-farm labor); engaging in new social networks (membership of NGO *samity*/group, village-based *samity*, Tanguar Haor Samity); etc. Transformative capacity, for example, when a farmer or fisherman decides to stop farming and fishing and migrates to city to become day labor in Fish *Arot* (wholesale house), stone worker, farm labor, domestic helper, rickshaw/van driver, etc. From the past learning, households in the study area now make houses with stronger structures; they elevate their houses more than the water level of the past few years. Individuals have also transformed their behaviors, such as they are trying to do other jobs apart from their traditional occupation. Flood hazards have differentiated impacts on households, even in the same village of the study area. The findings illustrates that resilience of *haor* community constrained by some factors such as exclusion of local poor fishers from water bodies, the neediest people remain out of coverage of government scheme, absence of community based planning for risk reduction. The present research employs “Sustainable Livelihoods Framework” (adopted from Carney, 1998) as theoretical underpinning to search for broader meaning of findings.

The findings reveal that local people have developed their own coping strategies to cope with the adverse situation of flood. They are quite resilient to flood, facing it with courage. The flood devastates their livelihood, but affected people always bounce back. It was observed that adaptive capacity of the local communities has been severely curbed by social, economic, and political factors leading to marginalization and exclusion of the poor from local resources by powerful groups. The researcher firmly believes that efficient management of the flood risks will be truly effective and meaningful if consideration is attached to the local people’s enormous abilities as well as their invaluable indigenous knowledge. The study emphasizes that careful initiatives should be taken to establish the rights of the poor fishermen to natural resources of the *haor* and its surrounding areas. The concerned authority must foil any conspicuous attempt taken by the local powerful group(s) to exclude the poor from possessing natural resources. Government’s special attention is required to strengthen local institutions, giving full autonomy to local institutions so that they can mobilize and generate enough capabilities to cope with and respond to floods and improve their livelihoods of the people living in *haor* area.

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ABBREVEIATIONS

ADP	Annual Development Program
ASA	One of the top NGOs of Bangladesh
BA	Bachelor of Arts
BARCIK	Bangladesh Resource Centre for Indigenous Knowledge
BBS	Bangladesh Bureau of Statistics
BCAS	Bangladesh Centre for Advanced Studies
BDHS	Bangladesh Demographic and Health Survey
BDT	Bangladeshi Taka
BHWDB	Bangladesh Haor and Water Development Board
BRAC	Top NGO of Bangladesh
BRDB	Bangladesh Rural Development Board
BRII	Bangladesh Rice Research Institute
BWDB	Bangladesh Water Development Board
Caritas	An NGO
CBFM	Community Based Forest Management
CBO	Community-Based Organization
CBRMP	Community-Based Resource Management Project
CBSMTHP	Community Based Sustainable Management of Tanguar Haor Project
CDMP	Comprehensive Disaster Management Programme
CFSs	Child Friendly Spaces
CFW	Cash for Work
CI	Corrugated Iron
CNRS	Centre for Natural Resource Studies – A local partner NGO of Bangladesh
Concern	An NGO
CPC	Child Protection Cluster
CRC	United Nations Convention on the Rights of the Child (1989)
CWBMP	Coastal Wetland Biodiversity Management Project
DAE	Department of Agriculture Extension
DC	District Commissioner
DFID	Department for International Development
DMC	Disaster Management Committee
DoE	Department of Environment
DoF	Department of Fisheries
DRR	Disaster Risk Reduction
ECA	Ecologically Critical Area
ERA	Effort for Rural Advancement (an NGO)
EWS	Early warning system
FAO	Food and Agriculture Organization
FFW	Food for work
FGD	Focus Group Discussion
FIVDB	Friends in Village Development Bangladesh – An NGO
FRRAS	Flood Risk Reduction Activities in Sunamganj
GBM	Ganga Brahmaputra Meghna-Three big Rivers
GO	Government Organization
GoB	Government of Bangladesh
HFA	Hyogo Framework for Action
HH	House Hold

HIES	Household Income and Expenditure Survey
HSC	Higher Secondary Certificate
HWDB	Haor and Water Development Board
HYV	High Yielding Variety
IDS	Institute of Development Studies
IFRC	International Federation of Red Cross and Red Crescent Societies
IGA	Income Generating Activities
IK	Indigenous Knowledge
IPCC	Inter Governmental Panel on Climate Change
ITK	Indigenous Technological Knowledge
IUCN	International Union for Conservation of Nature
KII	Key Informant Interview
LGED	Local Government Engineering Department
MA	Master of Arts
MDG	Millennium Development Goal
MoEF	Ministry of Environment and Forest
MoL	Ministry of Land
NGO	Non-Government Organization
NIPORT	National Institute of Population, Research and Training
Oxfam	An international NGO
PDB	Power Development Board
PIC	Project Implementation Committee
PRA	Participatory Rural Appraisal
PRSP	Poverty Reduction Strategy Paper
PWDs	Persons with Disabilities
SDC	Swiss Agency for Development and Cooperation
SEMP	Sustainable Environment Management Program
SHOUHARDO	Strengthening Household Ability to Respond to Development Opportunities
SOD	Standing Order on Disaster
SSC	Secondary School Certificate
SSNP	Social Safety Net Program
STW	Shallow Tube Well
Sun Cred	A local NGO
TBA	Traditional Birth Attendant
TR	Test Relief
UDMC	Union Disaster Management Committee
UNDP	United Nations Development Program
UN-ISDR	United Nations International Strategy for Disaster Reduction
UP	Union Parishad-The lowest administrative unit of local government in Bangladesh
USAID	United States Agency for International Development
UzDMC	Upazila/sub-district Disaster Management Committee
VCC	Village Co-management Committee
VGD	Vulnerable Group Development
VGf	Vulnerable Group Feeding, a program launched by the government
WDB	Water Development Board

GLOSSARY OF LOCAL TERMS

Aaadi bhaga	Share cropping
Aati	Scattered small patches of raised land
Aay	Income
Afal	High waves generated due to wind in the haor
Agam Bonnya	Early Flood
Agla Bari	Isolated Homestead
Agrahayan	8th month of Bengali year
Aile	A demarcation line in the paddy field
Alga Chula	Portable Hearth
Aman	Local variety of rice
Ansar	A paramilitary auxiliary force responsible for the preservation of internal security and law enforcement in Bangladesh
Arjun	A tree usually found growing on river banks or near dry river beds in Bangladesh,
Arot	Wholesale house
Arotdar	Big wholesaler
Ashar	3 rd month of Bengali year
Ashwin	6 th month of Bengali year
Aus	Rice is cultivated in Bangladesh throughout the year as Aush, Aman or Boro. Aus in July-August cropping seasons.
Bair	A traditional fishing gear
Baor	Oxbow lake or wetland formed when a river changes its course and a section of it is cut off by siltation. A baor more stagnant than a beel and generally water year round.
Bari	A sub-unit within a village, literally (kin related) homestead organized around a courtyard, household.
Bata	A plant grown in swamp forest
Bathan	Pastures in haor region for duck rearing
Bazar	Local village market typically weekly market.
Beel	Beels are small saucer-like depressions of a marshy character. Many of the beels dry up in the winter but during the rains expand into broad and shallow sheets of water, which may be described as fresh water lagoons.
Beez Ghar	Grain House
Bepari	Rural assemblers who collect from growers or local markets and export to wholesale-cum-retail markets or distant urban wholesale markets
Bhadro	5 th month of Bengali month
Bhela	Raft
Bhushi	Rice husk
Bigha	Calculation of area of land in Bangladesh. Formula 1 Bigha = 33 Decimal 1 Decimal = 1 Shotangsho (Shotok) = 435.6 Sq Feet (approx).
Binna	(<i>Vetiveria zizanioides</i>) A type of grass grown in the open areas of swamp forest in haor.
BKash	The easiest and safest way to send or receive money, making payments, mobile balance recharge – nationwide.
Boishakh	1 st month of Bengali month
Bondh	Hamlets located in agriculture land
Bonnya	Flood

Borgadars	Lease Holder
Boro	Rice grown during the winter season, transplanted during January-mid-February and harvested during mid-May.
Borsha	Monsoon
Chailla ghash	(Phyllanthus reticulatus) one kind of trees which protects homesteads land erosion from wave
Chair	Traditional fishing gear
Chang	A triangular bamboo made upright structure which is used for the storage of household items
Char	Chars are areas of new land formed through the continual process of erosion and deposition in the major rivers and coastal areas
Chepa	Dried fish
Choitra	12 th month of Bengali year
Chula	Hearth
Dadondar	Moneylender
Daitta Borshi	Traditional fishing gear
Dapog seedbed	Dapog method of raising nursery consists of growing seedlings on a concrete floor or a raised soil bed covered with polythene sheets
Dhan	Paddy
Dhaner Gola	(Paddy store made of bamboo hay) bowl shaped basket to keep grains
Dharna	Ceiling of the house
Dheki	A dheki is an agricultural tool used for threshing, to separate rice grains from their outer husks, while leaving the bran layer, thus producing brown rice. In earlier times a dheki was an important part of village life in Bangladesh. It was generally operated by two or three women.
Dhekikal	Indigenous method of irrigation
Dholkolmi	(Ipomoea aquatic) One kind of tree which protects homesteads land erosion from wave
Duli	Paddy container made of cane and bamboo
Durga Puja	Durga Puja, also called Durgotsava, is an annual Hindu festival in the Indian subcontinent that reveres the goddess Durga.
Falgun	11 th month of Bengali year
Ferry Business	Petty trade at village level on foot or by boat
Gera Jal	Traditional fishing net
Gerosther Kaj	Household based wage labor in return of cash or kind
Gerostho	Colloquial 'gerostho' is the corruption of the formal 'grihostho', from the Sanskrit 'grihastha' = 'griha' meaning 'house', 'stha' meaning 'to inhabit' householder.
Gur	Molasses
Gura Icha	Small prawn
Haor	A haor is a wetland ecosystem in the north eastern part of Bangladesh which physically is a bowl or saucer shaped shallow depression, also known as a backswamp.
Hari Dhora	A system of collecting money from the community for emergency works
Hater Nouka	Small country boat
Hidal	Dried fish
Hijol	(Barringtonia acutangula) Type of water tolerant tree
Hira	A type of hybrid paddy
Ijaradar	Lessee or leaseholder
Ikar	A tree species grown in freshwater swamp forest
Irri	A rice genetic diversity of IRRI - International Rice Research Institute

Jal	Fish net
Jalmohal	Fishery-estate that lease out by government for revenue collection
Jermony	Water hyacinth
Jheel	A pond, marsh, lake or similar wetland area, usually with significant vegetation providing shelter and/or food to a variety of aquatic and semi-aquatic animal species.
Joishtha	2 nd month of Bengali year
Kachu	Arum
Kalboishakhi	A storm occasionally accompanied by thunder that takes place a few times every year during or slightly before the Bengali month of Baishakh (early April) in Bangladesh and West Bengal, following the hot and humid Choitra month ending an old year and symbolising the washing away of the grime of the old year.
Kanda	Highland on the haor, used for cattle grazing, cropping or rice threshing.
Kantha	Kantha is a type of embroidery. Old saris are stacked on each other and hand-stitched to make a thin piece of cushion. This is normally used as a bed cushion.
Kartik	7 th month of Bengali year
Katcha	Unsanitary
Khal	Canal
Khas	Refers to government property, and used with reference to land
Kherer Pala	Paddy straw piled up on elevated platform to build the structure
Khoar	Livestock and poultry shelter shed
Khoil	Oil-cake
Kobiraj	Traditional healer
Koi	Koi is a very resilient native fish variety of common carp
Kolshi	Pitcher
Koroch	(Ponogamia pinnata) Type of water tolerant tree
Krishi Bank	Agriculture Bank
Logi	A long pole made of wood for boat rowing
Machan	Elevated Platform made of bamboo and wood
Magh	10 th month of Bengali year
Matbar	Local Leader in rural area
Mateer Kaj	Earth work
Meni	A native fish
Mohajon	Person who lends money with high interest. The word 'Mahajan' is derived from two Sanskrit words: Maha and Jan. Maha means great, and Jan means respectful people or individuals. The word Mahajan has become a common generic job title used to describe people involved in money lending. Mohajoni system is the informal money lending system.
Motka	Big size earthen clay pot
Mouza	A mouza or mauza is a type of administrative district, corresponding to a specific land area within which there may be one or more settlements. Before the 20th century, the term referred to a revenue collection unit in a pargana or revenue district. Today it has become mostly synonymous with the gram or village.
Muitta	Firewood made of cow dung and rice husk
Nigari	The traders who offer 'dadon'-cash as loans to producers, in return for buying the produce at a pre-fixed price, which may be well below the market level.
Niruddesh	Untraceable

Nolkhagra	A tall grass namely Nal (Phragmites kakra), Khagra (Sccharum spontanium) grown in haor.
Nouka	Boat
Pacca	Sanitary
Paikar	Small scale wholesalers who collect products from small markets and send them to big markets, or sell to nearby arottdars (big wholesalers).
Para	Hamlet
Paschim Para	West Hamlet
Pathar Kuchi	Bryophyllum pinnatum, also known as the air plant, cathedral bells, life plant, miracle leaf
Payela	For carrying paddy and earth
Peer	Spiritual leader
Peerer Dorga	Temple of spiritual leader
Pikar	Traders who lend money to the growers or local producers in advance to buy products at low price
Pitha	Cake
Polo	One type of fishing gear
Popi	An NGO
Poush	9 th month of Bengali year
Purbo Para	East Hamlet
Rakhaine	Indigenous Community
Reeds	Tall, robust grass like vegetation of swamps.
Robi Season	Rabi crops are agricultural crops that are sown in winter and harvested in the spring in South Asia. It is sown around mid-November, preferably after the monsoon rains are over, and harvesting begins in April/May.
Sadar	Main town
Samity	Local organization
Sanai Borton Puja	Hindu festival
Shabolombi	An NGO
Shako	Small bridge
Shaluk	Water fruit
Shapla	Water Lily
Shika	Hanging net made of jute
Shikha Tori	Floating school on boat
Shinny	The practice of offering holy feast usually sweet dishes to the lord of temple
Shrabon	4 th month of Bengali year
Shutki	Dried fish
Singra	Water fruit
Surma	A major river in Bangladesh
Swamp forest	Forest that is seasonally flooded with freshwater
Tana Jaal	Traditional fishing gear
Thela Jal	Traditional fishing gear
Thelagari	Handcart
Tufan	Cyclone
Tulsi	Commonly known as holy basil, tulsi, is an aromatic perennial plant. It is native to the Indian subcontinent and widespread as a cultivated plant throughout the Southeast Asian tropics.
Uijja Fishing	Indigenous method of fishing during arrival of monsoon season when fish starts to move from shallow to deep water against the current.
Ujan area	Upstream Area

Ujauri	A plant usually use for firewood and fencing
Union Parishad	The lowest administrative unit of local government in Bangladesh
UNO	Chief Executive of <i>Upazila</i> administration appointed by the government
Upazila	Immediate senior level administration to Union Parishad

KEY TERMS

Hazards

Hazards are usually referred to by many people as disasters. A hazard, however, can only be called a disaster when it hits a community which is unable to cope with its effects. According to the Glossary of Terms of UN-ISDR, a hazard is “a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, loss of livelihoods and services, social and economic disruption or environmental degradation.”

Disasters

A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources (UN-ISDR 2009). A disaster is viewed as a “social construct” which means that it is a result of individual and community systems and structures.

Flash Floods

Flash flood is defined as the rapid occurrence with no early warning and time to prepare. Typically, they are caused by the heavy downstream of run-off of water within a limited place and short period of time.

Disaster risk

The potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time period.

Mitigation

The lessening or limitation of the adverse impacts of hazards and related disasters. It means structural and non-structural measures undertaken to limit the adverse impact of natural disasters, environmental degradation and technological disasters.

Adaptation

The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Response

The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected.

Recovery

The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors.

Preparedness

The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions.

CHAPTER ONE

INTRODUCTION

The present study examines the 'Indigenous flood coping strategies towards livelihoods' of the rural households in *haor* area of north-east Bangladesh. It inquires into the local knowledge, practices, adaptation means and resilience of *haor* community and the efforts made by them to reduce disaster risks. The study has been conducted in the Dharmapasha *upazila* under Sunamganj district, situated in the well-known Tanguar Haor region in the north-eastern part of Bangladesh. The area represents the dwelling place of one of the most vulnerable communities which fall victim to frequent monsoon floods and flash floods. In this introductory chapter, the context of the study is portrayed, then the proposition is posed followed by objectives, assumptions, rationale and methodology that stimulated the research.

1.1 Background

Owing to the factors like geographical positioning, deltaic formation history and low-lying coastal morphology– Bangladesh is perhaps the most disaster-prone region on earth. The country is frequently encountered with several natural hazards such as flood, riverbank erosion, cyclone, tidal surge, drought, water logging, salinity intrusion, tornado, landslide, earthquake, etc. The nature of such occurrences, the seasons and extent of effects of the hazards are not the same in all places. These extreme natural events are termed as disasters when they adversely affect the whole environment, including human beings, their shelters, or the resources essential for their livelihoods.

In Bangladesh, flood is almost a frequent phenomenon and often within endurable limits; though occasionally it becomes devastating. Each year about 26,000 sq km, 18 percent of the country is flooded (BBS, 2013). During severe floods, the affected area may exceed 55 percent of the total area of the country. People generally use two terminologies to explain the extent of flooding and its consequences on their socio-economic lives. The first one is *borsha*, a normal flood equating with the monsoon rains occurring between *Ashar* (June) and *Kartik* (October). The second one is *bonnya*, an abnormal flood, which occurs once every few years and is considered undesirable as it causes massive loss of life and property (Islam 1980; Alam 1990, cited in Paul and Rashid 1993). Generally, four main types of floods occur in Bangladesh: flash floods,

river floods, monsoon floods and tidal or storm-surge floods (cited in Mirza, 2002). Flash flooding is caused by overflowing of hilly rivers. It rises and falls rapidly, typically within a few hours or days, and most prevalent in the north-eastern and the south-eastern part of the country (National Plan for Disaster Management, 2010; Brammer, 1990). River floods generally rise and fall slowly over 10–20 days or more from the overflow of major rivers and their tributaries and distributaries (Mirza 2002). Monsoon floods, on the other hand, are the result of high intensity local rainfall of long duration in the monsoon season, and storm surge floods are generated by tropical cyclones and mainly occur in the coastal area of Bangladesh (ibid). Every year during the rainy season, poor households face the devastating impacts of flood in terms of loss of assets and shelter, loss of livelihood opportunity, health hazard and increasing food insecurity (Paul, 2009; Ahmed, 2005).

Since flood is a recurrent phenomenon in Bangladesh, people have learned to live with extreme flood and have adjusted their livelihood accordingly. The vulnerable people in order to cope with the adverse situation primarily depend on their own coping mechanisms before any external assistance reach their doors. They have traditionally developed different kinds of indigenous coping mechanisms to avoid as well as to reduce the damages of floods (Ahmed, 2005; Haque and Zaman, 1993; Paul and Routray, 2010). However, conventional disaster management approach has often led to overlooking the potential in local experiences and practices.

The enduring experience of living with disasters in *haor* region suggests that women (including women-headed households); children; elderly persons; persons with disabilities (PWD); constitute the most vulnerable segments of the community (Rashid 2000). Furthermore, different marginal groups and people in very low earning households fall prey to a disaster as they are usually the poorest of the poor and most vulnerable amongst the vulnerable. Several studies indicate that different social groups are impacted differently during a disaster. Each of them has therefore, problems, capacities, abilities and particular needs. For example, a woman who becomes a *de-jure* household head during the flood when her husband migrates to another district, her situation and needs is quite different than other social groups.

Disasters affect both women and men, but the burden of coping with disasters falls heavily on women's shoulders. Women's own initiatives become crucial for their family

survival. Though women are among the vulnerable groups, they also have capabilities which help their whole family to cope the difficulty during a disaster like flood. In such a situation woman in addition to their day-to-day routine activities, take a leading role in caring for sick, infirm and elderly people and they provide emotional support for family members.

The hazard exposure, vulnerability and coping practices vary from one geographical context to another. The present study mainly focuses on indigenous knowledge of flood affected people in *haor* area of north-east Bangladesh which has unique geographic features indeed.

The Haor area of north-east Bangladesh

A *haor* is a wetlands ecosystem in the north-eastern part of Bangladesh which physically is a bowl or saucer shaped shallow depression, also known as a backswamp. There are 423 small and large *haors* in Bangladesh comprising an area of about 8000 km dispersed in the districts of Sunamgonj, Sylhet, Moulvibazar, Hobigonj, Netrokona and Kishoreganj (Alam et al., 2010; BHWDB, 2011). In Sunamganj, there are at least 133 *haors* alone. The most prominent *haors* are Saneer Haor, Hail Haor, Hakaluki Haor, Dekar Haor, Maker Haor, Chayer Haor, Kawadighi Haor and Tanguar Haor (Master Plan of Haor, 2012). Adjacent to the foothills of Garo Hill range of the Indian state of Meghalaya, covering 9,727 hectares, Tanguar Haor is a unique wetland ecosystem of national and international importance. In 1999 the Government of Bangladesh, recognizing the ecological importance of the area and the over-exploitation of resources declared the Tanguar Haor an “Ecologically Critical Area” under the Environment Conservation Act 1995 (Chowdhury, 2003).

In 2000 the Tanguar Haor was listed as the country's second Ramsar Site – wetland of international importance.¹ Tanguar Haor consists of about 50 *beels*. These areas retain

¹ Ramsar Site: The Ramsar Convention (The Convention on Wetlands of International Importance, especially as Waterfowl Habitat) is an international treaty for the conservation and sustainable utilization of wetlands, i.e., to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. It is named after the town of Ramsar in Iran. The convention was developed and adopted by participating nations at a meeting in

water during the dry winter months. In between the *beels* lies higher ground, known locally as *kanda*.² During the monsoon, from April or May until October, the *beels* merge to form a single and large body of water, called a *haor*.

The inhabitants of the villages near the Tanguar Haor area are considered to be one of the most vulnerable communities, who experience frequent monsoon flood and flash floods. Due to deforestation in both *haor* basin and upstream of Meghalaya Hills in India flash flood hits this region. Siltation has raised *haor*, canals and riverbeds which results in reducing their capacity to hold the flowing water, and intensifying the severity of flood. The annual flood pattern has two distinct phases in the region. The early flood phase occurs during the pre-monsoon season. Due to climate variability and change, increased rainfall early in the season, making flashfloods more unpredictable and damaging. The hilly rivers coming down from the *Khasia* and *Jaintia* hills in Meghalaya carry huge water as they rise from some of the rainiest places in the world. During July to November due to flood these areas go under deep water and look like seas with erosive water surface. When heavy rainfall occurs in the Assam and Meghalaya hilly region of India, flood water quickly moves towards the *haor* area through the trans-boundary rivers and eventually enters into the *haor*. During monsoon the *haor* area turn into a vast waterbody and look like seas within which the villages appear as islands. The pre-monsoon flash flood is the biggest threat for agriculture and livelihood in the area. During the annual flood season, the phenomenon of *afal* – the high waves produced by winds also has a pronounced influence on livelihoods in the region.

Ramsar, Mazandaran, Iran on February 2, 1971, hosted by the Iranian Department of Environment, and came into force on December, 21 1975. The Ramsar List of Wetlands of International Importance now includes 1,950 sites (known as Ramsar Sites).

² Kanda land: This is a high and raised land that does not get submerged in flood water. This type of land previously used to be allotted to community/family by elder(s) which in time turns into a land for the community with the enlargement of the family. This piece of land is utilized by the family turned community (simply by the increase in numbers of the family members) in rearing livestock - their grazing, for small and irregular use for kitchen gardening, etc. It is not owned by a single person or a single family. It is essentially a community property. The government also does not have any control on this land.

With abundance of natural resources, the *haor* has been utilized age after age in support of livelihoods for a large number of downtrodden human beings of the area. More than two-thirds of the households in Tanguar Haor are either directly or indirectly dependent on the *haor* (IUCN 2008). Most economic activities carried out in the area including farming, fishing, fuel wood collection, grass and reeds harvesting and duck rearing are based on these resources. Farming and fishing are the principal occupations of people living in Tanguar Haor. Since fishing is a seasonal activity, even those for whom it is the primary occupation must turn to non-fishing jobs to make both ends meet throughout the year.

The effects of flood are manifold and immeasurable. Almost every year vulnerable households in the study area face devastating impact of floods with regard to village and homestead erosion, loss of assets, loss of livelihood opportunity, health hazard, food insecurity, etc. For six-seven months of the year, the agricultural land is completely inundated. Flash floods cause massive destruction to '*boro*' crop creating a huge impact on livelihood and food security in the area. Pre-monsoon flash flood locally called '*agam bonnya*' is the biggest threat for agriculture and livelihood in the area. The rural poor households have to depend upon fisheries and off-farm labor to supplement the meager farm income. The infrastructure development is limited in the area. Housing is confined to cramped villages on high grounds and mobility is restrained which in turn limits access to livelihood opportunities. The poor communication network limits access to markets, off-farm employment opportunities and existing social services such as health and education. The high seasonality of the *haor*-based economy forces local people to remain out of work for a considerable period of time, and as a result, they suffer from food insecurity. The *haors* are known as a region of severe poverty and limited livelihood options with many people seasonally migrating to find income opportunities (Talukder, et al. 2011).

Not only the economic condition, but different aspects of livelihoods are affected by flood. During severe flood, life is threatened in the villages under study. The people live in scattered small plots of raised lands which assume the form of islands during the rainy season. The rushing water erodes the land, and destroys homes and homesteads. Household items are washed away during big floods. Since most of the people's livelihood is related to agriculture, especially with the single crop '*boro*', each year the

people living around Tanguar Haor have a concern about its damage due to early flooding.

It is evident that floods in the *haor* villages have multifaceted effects on livelihood. The effect of flood is not the same to all the households of the same village. Even within the same household vulnerability and effect varies from person to person. Despite these manifold effects of flood, people in the *haor* area have traditionally developed different kinds of indigenous coping mechanisms to avoid or to reduce the damages of floods (Ahmed, 2005; Paul, 2005). Vulnerable communities collectively and its members individually living in close contact with nature develop their own ways to deal with exceptional circumstances caused by disasters within the range of their available resources and experiences. The present study has attempted to explore resilience of the *haor* households with regard to various livelihood aspects for the foreseeable disaster.

A number of studies have been carried out to date in the context of *haor* area in Bangladesh (Chowdhury, 2003; Huq, 2006; Hussain, 2008; Rahman, 2008; IUCN, 2010; Hannan, 2011) however; limited efforts have been made to understand the coping and resilience of *haor*-community specifically focusing on livelihood. Over the past decades, many authors have underscored the need to accommodate the concept of resilience in research, policy, and disaster risk reduction arenas (Nasreen 2012). Nasreen (2012) emphasized people's coping and resilience to floods is still very much in need of research. These indigenous coping practices are the main thrust of the present research.

Most approaches to disaster management tend to focus on people's vulnerabilities and on what people do not know. The focus on local knowledge and practices provides an entry point to try and reverse this tendency. Like other disaster-prone areas, people in the *haor* areas depend on their indigenous knowledge and coping practices to fight frequent flood disasters. There is a need to collect and collate good practices and promote them widely. An effort has been made through this research to identify solutions to some of the challenges based on recommendations from the vulnerable communities. The following section explains proposition of the study. It focuses on the possible outcomes this study can reveal.

1.2 Proposition of the Study

The communities of the *haor* area have developed their ecological knowledge, coping mechanisms, cultural heritage, local level resource management and value systems through a long interaction with their immediate environment. Even before the advent of modern technology based early warning systems, or standard operating procedures for response, local communities in the *haor* have prepared, operated, acted, and responded to natural disasters using indigenous methods passed on from one generation to the next. Despite having rich traditional knowledge, the *haor* community people have been given little attention by disaster planning mechanisms. Much of the knowledge embedded in these communities has been treated by outsiders as “backward, inferior and incompatible”. Paul Sillitoe (2000) explains faith in science and technology promote the view that ‘folk knowledge’ is inferior. During any disasters, the community is capable of assessing the situation, understanding the extent of local threats and reducing risks. There are many lessons to be learned from this community (Sillitoe 2000).

The research explores the indigenous flood coping strategies and livelihood dynamics of *haor* community and the cross-scale issues that impact their livelihoods. While indigenous coping strategies are widely practiced by rural household in the flood affected *haor* area, its recognition and visibility are less emphasized by the development planners. Indigenous coping strategies in disaster management arena are still insubstantial and unknown in the sense that there is an absence of adequate documented proof of its practice. Mahfuzul Haque (2000) explores the value of rich heritage of indigenous knowledge and practices, much of which has been lost due to their non-documentation. The present study is undertaken to fill this knowledge gap.

The issue of disaster and floods always put forward the scenario of subsequent relief activities provided for the vulnerable people. Government and NGO interventions also in most cases focus on immediate response programmes except very recent paradigm shift in disaster preparedness activities. With a few exceptions, national planners in Bangladesh have so far advocated large-scale engineering solutions as measures for coping with flood hazards, neglecting thereby the socio-economic aspects of flood adjustment process (Islam 1998). The ineffectiveness of flood management in many instances has been attributed to the focus on these large-scale technological solutions which tend to emphasize short-term, sectoral approaches. This research will identify

coping practices, adaptation options and resilience that may contribute to develop appropriate plans for the *haor* area considering the local knowledge, customs and practices. A growing literature has been promoting the importance of building upon local knowledge and local adaptive strategies for improved flood management in Bangladesh (Paul 1984; Rashid and Paul 1987; Haque 1988; Zaman 1991; Sillitoe 2000; Niaz 2004; Nasreen 2000; Carlo Ninno 2001). Indigenous knowledge is a precious resource that can facilitate the process of disaster prevention, preparedness and response in cost-effective, participatory and sustainable ways.

Conversely, the conventional development process itself does not essentially decrease the vulnerability from natural hazards. Instead, it can sometime inadvertently create new forms of vulnerability. Optimal solutions which seem to increase hazard resilience and promote sustainable development need to be explicitly sought. Such solutions can best be derived by integrating indigenous coping strategies within the overall disaster management framework, viewing participation of local people as an indispensable component of the process.

Niaz, et al (2000) found indigenous knowledge is typically originated, augmented and transmitted in relation to the local people's diverse and complex livelihood and survival strategies. Understanding local knowledge and practices can help identify what is needed and acceptable locally and how people's participation can be solicited to ensure their support for external action. Integration of indigenous knowledge in existing practices and policies encourages the participation of the affected community and empowers its members to take the leading role in all disaster risk reduction activities. From a social point of view, taking local knowledge and practices into account promotes mutual trust, acceptability, common understanding, and the community's sense of ownership and self-confidence. Information obtained about indigenous knowledge can help improve intervention strategies by providing effective guidelines for the local context. The non-formal means through which indigenous knowledge is disseminated provides a successful model for other education on disaster risk reduction. Understanding the process of knowledge creation and transformation is more important than focusing on the knowledge outcomes.

This research helps to realize that efficient management of the flood risks seems to be difficult without taking into consideration the invaluable Indigenous Technical

Knowledge (ITK) of the people. Hence a blend of approaches and methods from science and technology and from traditional knowledge opens avenues towards better disaster preparedness. Finally, to address the research problem one has to understand livelihood from the people's perspective, then one has to know the dynamics of rural livelihood systems and the strategies people deploy. Based on the considerations outlined above, the objectives of the research can be formulated as follows:

1.3 Objectives of the Study

The overall objective of the study is to explore coping and resilience of the *haor* resource-dependent community living in adjacent villages of Tanguar Haor region to minimize flood risks for maintaining their livelihoods. Specifically, the research looks at the following:

- i. To examine vulnerability and risk factors that affect livelihoods of the people in the flood prone *haor* area;
- ii. To assess resources of flood affected people to cope with the floods;
- iii. To explore existing local knowledge and practices of *haor* resource-dependent community to resist flood risks in order to maintain their livelihood;
- iv. To understand the environmental factors that affects the resilience of the people of *haor* area with regard to their livelihood;
- v. To assess institutional arrangement regarding flood management and the dynamics of peoples' participation in the process to incorporate their indigenous knowledge.

The following section states the purpose in the form of the assumptions that the research investigated.

1.4 Assumptions

- i. Natural disasters are primarily managed by local community in the remote *haor* region;
- ii. Development interventions always neither consider local knowledge, practices, customs and values nor harness or capitalise capacity of local people;
- iii. Women's knowledge, capacity and resilience are often unrecognized.

The following section presents a description of rationale of the study. It provides a clear statement of the rationale for research approach to the problem studied.

1.5 Rationale of the study

In the 1960s and 1970s, geographers studied the impacts of natural disasters on people mainly from a technical perspective. The dominant approach to natural hazards and disasters focused on hazards as physical events requiring scientific and technical solutions. Natural hazards were understood in the context of simplistic determinism (where physical processes determine human actions) and linear causal relationships from geophysical events to impacts to human responses. People were assumed to live in vulnerable conditions due to a lack of knowledge (Schilderman 2004, p 416). In the 1980s and 1990s, researchers in the field of natural hazards and disasters began to criticize the deterministic, ahistorical, and asocial concept of hazards and disasters and its dependence upon the use of choice and decision models (Gardner 2002). As Messer (2003, p 3) reports: "As recently as the late 1990s, scholars complained of the absence of much social science research on disasters in developing countries."

The hazard studies show that natural hazards are non-linear and complex events shaped by and resulting from the combination of not only geophysical and meteorological factors but also (and mainly) political, economic, socio-cultural, and psychological (or perceptual) phenomena and factors. The social dimension of risks and hazards is important because local communities see them through a cultural lens; and this is dependent upon their view of the universe and accumulated experience (Linkenbach-Fuchs 2002, p 7). The growing focus of research and development is the need to take the human dimensions of natural hazards into account (including local knowledge, practices, and perceptions) in disaster management (Anderson and Woodrow 1989). Overall local knowledge was absent from the early mainstream research into natural hazards and disasters. Then, the change from a focus on natural hazards to vulnerability and resilience was accompanied by a growing recognition of the importance of local knowledge and practices.

The case of flood management in Bangladesh can illustrate this shift in thinking. In many instances, the ineffectiveness of flood management in Bangladesh has been attributed to the focus on large-scale technological solutions which tend to emphasize short-term, sectoral approaches. Fazle Hasan Chowdhury (2000) states many failures of the

development policies have arisen precisely because these non-economic, cultural dimensions (quality as opposed to quantity) have been undermined. M. Khairul Alam (2000) pointed out that indigenous knowledge is dynamic, evolving to suit changing circumstances and remaining relevant to the groups' socio-cultural make up. A growing literature has been promoting the importance of building upon local knowledge and local adaptive strategies for improved flood management in Bangladesh (Paul 1984; Rashid and Paul 1987; Haque 1988; Zaman 1991).

Although many studies are available on disaster in general, but so far, the researcher knows very few of them have been conducted specifically focusing on socio-cultural aspects of indigenous coping strategies towards livelihoods. Socio-cultural and historical knowledge is often ignored by studies of natural disasters, despite its importance (Ellis and West 2000). Socio-cultural knowledge includes knowledge related to the socio-cultural environment in its broadest sense, viz., social, political, economic, and spiritual aspects of life (Langill 1999; Antweiler 1998). Against this backdrop, Mahbuba Nasreen's (1995) Ph.D dissertation was the pioneer one about women's experiences to disasters in Bangladesh.

The concept of resilience has received an increasing amount of attention in the area of risk management over the past several years. The growing influence of the concept of resilience is particularly prominent in disaster risk reduction, climate change adaptation, or even social protection. Not only do academics increasingly make reference to it, but practitioners and NGOs are now increasingly exploring the modalities of its implementation in the field. Until 2000, the research on disaster was mostly focused on vulnerability and coping strategies (Zahir Ahmed 2000; Carlo del Ninno et al. 2001; Rashid; Paul Sillitoe; Ahmed Fazle Hasan Chowdhury; Mohammad Nurul Amin; Mizan R. Khan; Mahfuzul Haque). In recent times some studies have been carried out focusing on resilience (Nasreen 2012; Mahed-UI-Islam 2015, Tulshi Kumar Das 2015, BARCIK 2010; CDMP 2009). Nasreen (2012) in her book "Women and Girls Vulnerable or Resilience", mentioned that people's coping and resilience to floods is still very much in need of research. The present study proposes a framework for household resilience based on resilience theory in order to fill the research gap.

Evidence suggests that women play a large role for household resilience. Their ability to contribute to this task, however, can be limited by socio-cultural, gender-based or

religious restrictions on their mobility, participation in decision-making (at both household and community levels), and access to productive assets, credit, markets and certain livelihood activities. Nasreen (2012) pointed out that women's gender specific responses to disaster risk should be promoted from resilience perspectives, not from vulnerability perspectives. The present study has taken these issues into account while measuring resilience at individual, household and community level.

Rahman (1988), in his study on riverbank erosion and floods argued that people's ability to adjust to hazards should be viewed as an extension of social and natural systems already existing in society. Hossain et al. (1987) examined, from behavioral approach, whether rural people adopted different survival strategy or not. Ahmed (1993) emphasizes the importance of kinship during disasters. Alam's (1991) study, discusses human behavioral factors in the context of existing social relations. He sees flood-prone people in relation to vulnerability and argues that people's behavior differs by gender, age, ethnic group and economic status. Dev (2009) discusses livelihood dynamics of fishermen community. Some researches mainly deal with flood coping strategies towards food security (Paul 2010, Rahman 2010, Carlo Ninno 2001, Haque 2010, Ahmed 2005). Mallick and Rahman (2009) studied the indigenous knowledge of flood risks management in Bangladesh. Their study is very much concentrated to the indigenous knowledge of flood risks management in *char* land areas of Bangladesh.

These studies are not inclusively focused on indigenous knowledge towards rural livelihoods. The combination of the subjects of flood hazards, indigenous knowledge, and rural livelihoods is still not much explored terrain. As the sector has received a little attention so far, it underscores the necessity of this research.

As *haor* is a unique area in Bangladesh and Tanguar Haor have some international values, there are many researches on Tanguar Haor. In maximum cases, the studies based on the biodiversity and fisheries development in *haor* area. Hossain (2007) has given an emphasis to consider environmental issues during water resource development in *haor* area. IUCN (2008) have some research on the bio diversity of Tanguar and Hakaluki Haor. Choudhury (2005) has given more emphasis on the use of indigenous knowledge of flood risks management in *haor* area. Hussain (2008) showed that community participation-oriented program is the only way in *haor* area to make flood

management program successful. Huq (2006) also put emphasis on the community participation-oriented flood management program in *haor* area.

In the previous studies, there is lack of information about cultural factors that include risk perception of the affected community. Those documents related to livelihood mainly focus on economic activity and income opportunity, while the present study particularly observes coping strategies and resilience of the *haor* people in socio-cultural aspects. Livelihood vulnerability has cross-scale connections. Paul and Routray (2010) presented a descriptive analysis on flood coping strategies on various aspects of livelihoods (i.e. saving human lives, saving household items, saving shelters, protecting crops, etc.). The present study attaches importance to socio-cultural variables in assessing human responses to flood. Attention has been given to most vulnerable groups such as women-headed households and marginalized ones. The present research also deals with people's behavior such as their perception, attitudes, beliefs, values, response and personalities. It reveals how people's risk perception is interlinked with their behavior. In fact, community people's belief systems shape their understanding, perceptions, and responses to natural hazards. Understanding local beliefs, perceptions, and values is crucial because it provides insight into why people do things the way they do.

Hence, in this research individual responses to disaster are viewed in a broad socio-cultural and historical context (Haque and Zaman 1989). In that sense, how people say things (and in which context they say things) may be more important than what they say (Berkes 1999) because the outcome can be interpreted in many ways unless someone understands the context. In order to understand how to identify and use local knowledge and the process of marginalization surrounding local knowledge, one has to contextualize local knowledge and practices on disaster preparedness within the wider context. Although it might even be obvious, often the content of local knowledge has been recorded leaving out the context in which it had developed (Antweiler 1998, p 35). In fact, understanding the context and processes surrounding local knowledge creation, transmission, and interpretation is more important than understanding the knowledge outcome per se.

This study is concerned with the multiple sets of vulnerabilities that synergistically impact the family well-being and livelihood resilience. Vulnerabilities rooted in both natural systems as well as socio-culturally induced have been explored. By examining the

experiences of the geographically and culturally different vulnerable communities of *haor* area, this research enhances understanding about their inherent 'social, cultural and geographical context' of indigenous knowledge. There is a general lack of information and understanding of the need to integrate or mainstream indigenous knowledge into disaster preparedness plan for sustainable development in the *haor*. It is hoped that the output of the study will be beneficial to all concerned with a bit contribution to the academia. The next section portrays profile of the study area.

1.6 Profile of the Study Area

This section provides a comprehensive account of the physical, social, ecological settings and flood context of the study area.

1.6.1 Socio-economic, physical features of the study area

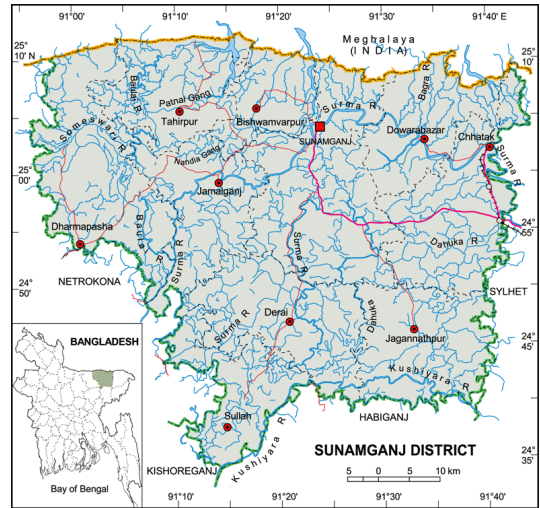
In terms of ecosystem, crop production practices, economic activities and overall livelihoods of the people, the *haor* areas are quite different from other parts of the country (Alam, et al., 2010). Local community's daily modes of living are profoundly influenced by their immediate ecosystem. It is difficult to understand the *haor* communities, their coping strategies and livelihoods without a thorough understanding of the socio-cultural setting they live in, the institutions they interact with, and the ecosystems they depend on for their livelihoods. The people of the *haor* area see the world differently through their behavioral lenses and socio-cultural factors.

1.6.1.1 Geographical location of the study area

The present study has been conducted in the well known Tanguar Haor region in Dharmapasha Upazila under Sunamganj district situated in the north-eastern part of Bangladesh.

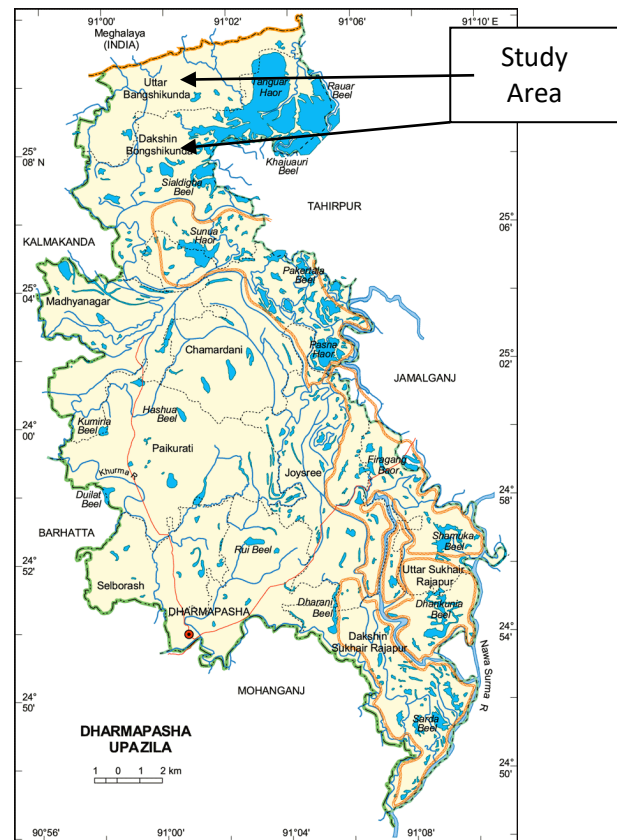
Sunamganj District situated in the north-eastern part of Bangladesh (Sylhet division) with an area of 3669.58 sq km is mainly low-lying floodplain possessing enormous area of wetland including *haors*, *beels* and rivers. In total, there are 132 *haors* and 1301 *beels* in the 10 *upazilas* of Sunamganj. Sunamganj is bounded by Meghalaya state of India on the north, Hobigonj and Kishoregonj districts on the south, Sylhet district on the east, Netrokona and greater Mymensingh districts on the west. Sunamganj stands on the bank of the river Shurma (Banglapedia, 2000).

Fig. 1.1 Map of Sunamganj district



Dharmapasha Upazila is surrounded by Meghalaya State (India) to the north, Mohanganj and Barhatta Upazilas on the south, Tahirpur and Jamalganj Upazila on the east, Kalmakanda upazila on the west. Dharmapasha upazila is 65 km. away from Sunamganj district town. The total area of Dharmapasha upazila is 496.03 sq. km where in there are 10 unions, 181 *mouzas* and 324 villages. The density of population here is rather low compared to other parts of the country, which can be considered to be a manifestation of the degree of difficulty for the poor people to eke out a living inside the *haor* basin. Livelihood vulnerability of the people living there perhaps is at the highest level in comparison with other parts of the country. All seven rivers namely the Shurma, Kongshow, Someshwar, Monai, Gunai, Khashia and Boulai which flow through Dharmapasha upazila play a vital role in the development of the area. Water ways are widely used to carry sand, stone and fish easily to the areas of deficit. But river erosion and siltation create a negative impact on the lives and livelihoods of the

Fig. 1.2 Map of Dharmapasha upazila



community people. Being filled with silt some rivers are losing navigability and harming arable land of the locality. As stated before, Dharmapasha *upazila* is in the *haor* region in which the largest haor of Bangladesh called Tanguar Haor is located here and its neighbouring *upazila* Tahirpur. This *haor* is one of the world heritage sites. Water ways are extensively utilized for transporting passengers, commodities and crops across the area. There are 94 *beels* in Dharmapasha *upazila*. Among them the size of 78 *beels* is over 20 acres, which are pretty big. Different types of fish abound there. Most importantly, the water of the *beels* is used for irrigation. Dharmapasha *upazila* is a very disaster-prone area. The main calamity is presumed to be flashflood. Furthermore, seasonal flood, river erosion, draught and '*kalbaishakhi jhar*' (monsoon storm) are fatal disasters that affect the people as well. Flash flood occurs in Dharmapasha due to heavy rainfall in Meghalaya. Its flood water very speedily enters the upstream of the Khashia River and affects *Uttar* (north) Bongshikunda union, one of the unions under this study. Flash flood causes widespread damage to agriculture, fishery, livestock, house-infrastructure disrupting education, health, communication etc. It harms the main crop boro paddy of the locality. Seasonal flood is a very common and familiar phenomenon of Dharmapasha *upazila*. In the rainy season, it takes place from *Ashar* to *Ashwin* on account of heavy shower and flashing water from Meghalayas. Disaster rips through every union of Dharmapasha *upazila* almost every year creating a negative impact on the toiling people's lives and livelihoods (Source: Bangladesh Bureau of Statistics; Cultural survey report of Dharmapasha *upazila* 2007, *Upazila* Office, Dharmapasha).

The villages under this study are situated in *Uttar* (north) Bonshikunda and *Dakshin* (south) Bonshikunda unions of Dharmapasha *upazila*. *Uttar* Bongshikunda union of Dharmapasha *upazila* has an area of 9143 acres. This union consists of 33 villages with 4492 households and a total population of 20,900 (male 10582, female 10318, sex ratio 103). The literacy rate is 27.4 % (male 29.5%, female 25.2%). This union has a history of natural disasters; it was affected by severe floods in 2004, 2007, 2010, 2014 and 2017. The primary schools and high schools of this union are often used as flood shelters. Due to its geographical location the people living in *Uttar* Bongshikunda union depend on the natural resources of the *haor* for their livelihoods. The present study therefore, has selected this area so that there is sufficient scope to understand the overall effect of flood hazards and the coping strategies with a special focus on the Tanguar Haor. *Dakshin* Bongshikunda union consists of 47 villages. Its total area is 18039 acres with a

total population of 28689 (male 14539, female 14150, sex ratio 103). The literacy rate is 23.6% (male 26.2% female 21.0%). The families are at risk with various hazards, including flash floods. This union has a similar history of natural disasters like *Uttar* Bongshikunda union. When necessity arises, all local schools are transformed into flood shelters. *Dakshin* Bongshikunda union is surrounded by the core *haor* area; therefore, the seasonal flood remains longer period in this union compared to *Uttar* Bongshikunda union. However, *Uttar* Bongshikunda has more proneness to flash flood, since it is located near the Indian border hills. During heavy rainfall in the monsoon the union office of *Dakshin* Bongshikunda and its surroundings including *bazaar* are inundated by flood water. Very little Infrastructural development is noticed in this union.

1.6.1.2 Socio-economic features of the study area

A comprehensive account of socio-economic, physical and flood related data of the households and the study area were collected through household survey and PRA tools. The results show that 46 percent of households is located in high risk areas keeping them exposed to hazards. It is revealed that 49.4 percent of the households under survey having family size of 4-6 persons. The literacy rate is higher in Rongchi (34.75%) than Antorpur (33.31%) Batta (33.84%) and Khidirpur (30.58%). The major occupations of the people of the study area are agriculture (82.27%) and fishing (80.68%). The occupational engagements vary in the dry and flood seasons. A large segment of the surveyed households (51.28%) have a monthly income of ranging between 8000-10000 taka. It was revealed that 52 percent of the surveyed households have only 1-7 decimal homestead land. The landless (0-.19 ha) and marginal landowners (0.2-0.9 ha) are around 89% of the total household.

1.6.1.3 Flood context of the study area

In the study area, pre-monsoon or early flash flood, monsoon and post monsoon flash flood and seasonal flood are the common phenomenon. In this study, the flood situation has been described based on major floods occurred in the study area such as flood of 2004, 2007, 2010, 2014 and 2017. Most of the respondents of the present study could recall the largest flood in their area in recent year of 2004. Almost 90 percent inhabitants of the study villages evacuated during the big flood event in 2004. People experience more frequent flash flood than the river flood. Flash flood and inundation of cultivated land are quite common in the study villages. During early flash flood (pre-

monsoon) water comes in just a few days before the harvesting time. To protect the crops from flood water *haor* people build submersible embankment beside the river. If floods accompanied by strong wave (*afal*) it causes homestead erosion.

Almost every year people in the study area face the same problem and lose their only crop *boro*. In March 2017 flash flood affected the study area at Dharmapasha *upazila*. Heavy rainfalls as well as onrush of water from the upstream Meghalaya hills in India have led to the inundation of a vast areas of croplands of *haors* and low-lying areas. Rising water overflow and breeched embankment in many places and inundated vast areas of croplands. The embankments in Dharmapasha namely *Ajarkhali*, *Shoytankhali*, *Marardair*, *Haldirbodh*, *Ulashkhali* and *Balrampur* were damaged. Floods in these *haor* areas caused huge damage to *boro* crop and overall food security of the region experienced negatively as a consequence.

1.6.2 The study villages

For this study, the researcher carried out surveys and qualitative research in four villages namely Antorpur from *Uttar* Bongshikunda union and Batta, Khidirpur and Rongchi from *Dakshin* Bongshikunda union of Dharmapasha *upazila*. All the villages are almost similar in terms of flood situation, socio-economic condition, ecology, etc. Every year flood occurs in the study villages and causes a great deal of human sufferings and damages to crops, livestock, fisheries and valuable resources and most of people are vulnerable to chronic flood damages.

1.6.2.1 The floodplain village 'Antorpur', under *Uttar* Bongshikunda union

The village Antorpur is located at the northern end of Dharmapasha *upazila* with a travel distance of two hours by engine boat or trawler from Dharmapasha *upazila* Headquarters and Kalmakanda *upazila*. During dry season rented motorbike is the convenient mode of transportation. This small village situated inside the Tanguar Haor comprised of three hamlets/*para* named '*Uttar Aati*', '*Dakshin Aati*', and '*Maizh Aati*'. In local terms '*Aati*' means scattered small patches of raised land. It has a total population of 516 (Male 266, Female 250, Sex Ratio 106:100). Altogether 106 families live in Antorpur village. On average, each household has 4.9 members. The total population of this village is Muslim. Heavy floods ripped through the area in 2002, 2004, 2007, 2010,

2012, 2014 and 2017. During this time, the villagers were badly affected on account of shortage of food and shelter. Normally homesteads are protected by planting trees and bamboo around. Almost every year after receding flood water each household spends around Tk. 5,000 – 10,000 in order to repair its infrastructure. This village has a population of diverse occupational groups, but most of the people make their living on crop cultivation on the Tanguar Haor. Other occupational groups include fishers, day laborers, and self-employed people. The growing season of paddy is from *Kartik* to *Falgun*. Most of the people in this village are either all season or part time fishermen. One key attribute that differentiates this village from others is that it is located near Indian border hills having coal and sand mines. Because of close proximity with these natural resources, many people of the area work as laborers. The average monthly income of the household is about Tk. 7000-8000 and for a day laborer it is about Tk. 150-200 per day. Almost 80% of the people in this village depend on loan from moneylenders or microcredit managed by NGOs and village level *samity*.

About 30% of the people find no work during the rainy seasons here and they migrate to other places namely Tangail, Comilla, Feni, Chittagong, Jaflong, Sunamgonj, Bholagonj, Dhaka, Bikrampur, Norshingdi, Sylhet mainly for alternative jobs in agriculture, construction, carrying soil, breaking brick, working in garments, pulling rickshaws, rendering labor in 'fish *Arot* (wholesale house)' etc.

The nearest market of the village is Gurgaon *Bazar* (two km away). Another big market 'Moheshkhola *Bazar*' is situated near the union headquarters which is five km away. There is no electricity in the village. Solar energy has been introduced recently as alternative power source. The community clinic is situated at Gurgaon *bazar*, two km away. The nearest hospitals located are 30 km away in Kalmakanda and Dharmapasha. There is no primary school in this village. The nearest primary school is in the adjacent village of Nawabpur, which is about one km away.

1.6.2.2 The floodplain village 'Batta ', under *Dakshin* Bongshikunda union

The village named Batta is located inside the *haor* with a travel distance of 30 minutes by country boat from Dakshin Bongshikunda union office. There are in total 115 households with a population of 559 (male 278, female 281) sex ratio 99:100. An

average a household has 4.86 members and the literacy rate is 33.84% (male 35.63%, female 32.05%). This village has a population of diverse occupational groups, but most of the people make their living on crop cultivation and fishing in the Tanguar Haor. Other occupational groups include day laborers, and self-employed people. One key characteristic of this village that distinguishes it from other villages is that 100 percent of the people are the followers of Hindu religion. They have surnames, such as Sarkar and Biswas. A new government primary school in Batta village was under construction during the period of data collection.

1.6.2.3 The floodplain village ' Rongchi ', under *Dakshin* Bonshikunda union

Rongchi village is situated in *Dakshin* Bonshikunda union of Dharmapasha *upazila*. It is located 20 km north of *upazila* headquarters. Its population is 1724 (male 862, female 862, sex ratio 100:100), comprised of Muslims (100%). The total number of households is 337 and most of the villagers are farmers, although considerable occupational diversity exists.

In Rongchi village there are 21 hamlets namely, *Abuj Miar Bari*, *Dakshin Bari* (south *para*), *Montolar Bari*, *Jumma bari*, *Puber bari* (east *para*), *Syian Bari*, *Morol bari*, *Puran Bari*, *Dokan Bari*, *Dilarer bari*, *Chapaiti Bari*, *Paschim Bari* (west *para*), *Uttar bari* (north *para*), *Noya Bari*, *Bondher bari* (in the middle of agriculture field), *Paschim Para* (west *para*), *Sorkarer Bari*, *Ijjat Alir Bari*, *Dewan Alir Bari*, *Agla Bari*, and *Arshader bari*. The hamlets were named after some persons; professions of some elite persons; location of mosque, shop; location of the hamlet; etc. The hamlet which is situated in agriculture land called '*bondher bari*'; '*agla bari*' means isolated from mainland of the village.

In this village, there is one primary school cum flood shelter. The people find no work during the rainy season here and they migrate to other places such as Dhaka, Sylhet, Chittagong and Jaflong mainly during the month of '*Ashar*', to work as day laborers. Monthly income of each household is approximately Tk. 7000. Male is the head of the family, but women also participate in the income generating activities. They help out in the agricultural fields and work in other people's homes as housemaids to contribute to their families financially. ASA, BRAC, Grameen Bank, CNRS are the main microcredit service providers in this village. Women are the main beneficiaries of loans and they

usually use the money to start small shops handicrafts, and poultry farms in their courtyards. To get to the nearest hospital, the villagers have to travel to Kalmakanda or Dharmapasha.

Heavy floods occurred in this area in 2004, 2010, 2012, 2014 and 2017. During this time the villagers were badly affected for lack of flood shelters. Every year flood damages most of the houses in this village. The homesteads are protected from wave erosion by planting various trees such as *hijal*, *koroch* and bamboo. Grass and wood are also used for the same purpose. During the monsoon, the houses and hamlets of this locality assume the shape of isolated islands. Traditional crafts such as stems of banana trees or rafts, and small wooden boats are the means of communication within and outside the villages. Among the four study villages only Rongchi is protected by a 'Protection Wall' (made of concrete) constructed surrounding this village in 2012 under SHOUHARDO Program II, funded by USAID and Bangladesh Govt. and implemented by Care Bangladesh and LGED. This has a huge impact on reducing house plinth damage.

1.6.2.4 The floodplain village 'Khidirpur ', under *Dakshin* Bonshikunda union

Khidirpur is a neglected part of the *Dakshin* Bongshikunda union. This village is located inside the *haor* with a travel distance of two hours by boat from *Dakshin* Bongshikunda Union office. In this village, there are three hamlets - *Purbo Para*, *Paschim Para* and *Bondher Bari*. In the local term '*Bondh*' means hamlets located in agriculture land. The total population of the village is 405 (male 201, female 204, sex ratio 99:100). There are 74 households each of which has on average 5.5 members. Their literacy rate is 30.58% (male 33.54%, female 27.62%). In this village, there is one primary school. In the rainy season, the village looks like a small isolated island, when it is surrounded by water. It takes 40 minutes to reach this place from *Natun bazar* by engine boat. The life and livelihood of the villagers are *haor*-centric. This village has a population of diverse occupational groups; however, most of the people living there are either fishermen or small farmers. Other occupational groups include day laborers and self-employed people. The villagers heavily rely on the Tanguar Haor for their livelihoods, but due to leasing system and changing pattern of social relationship, the poor and marginalized are often excluded from accessing the resources.

It is observed from the forgoing discussion that the study area is most prone to flood hazards. The researcher observed that vulnerability of local people not only stem from geo-physical setting but socio-cultural factors as well. The following section discusses in detail the methodology employed in the present research.

1.7 The Research Methodology

Keeping in view the research objective, this section describes and justifies the methods, procedures, and techniques used to explore and assess the vulnerability as well as the resilience of households and communities exposed to flood hazards.

1.7.1 Study Design

In the present research, in order to understand the flood situation, geographical perspective such as hazard characteristics of the *haor* area, perception of community people about flood, coping strategies to combat flood, socio-cultural factors affecting the people, the researcher like to follow the combination of both qualitative and quantitative methods (with more emphasis on the former), and each approach serves different but complementary roles.

Broadly, the researcher used a qualitative paradigm for conducting the research. Five strategies of inquiry within qualitative research paradigm are documented, namely ethnography, grounded theory, case study, phenomenological study, and narrative approach. The present research interest involves understanding the beliefs, languages, and behaviors of the households and community. It also aims to capture the detailed stories of life experience of households in *haor* area. Therefore, the researcher applied combination of both ethnographic and narrative research approach. A pragmatic approach was also applied to study the problem. Toward that end, data collection techniques through qualitative methods were supplemented by field survey in order to develop a better understanding of the issues.

1.7.2 Selection of the study villages

The study was undertaken in *Uttar* Bongshikunda and *Dakshin* Bongshikunda unions of Dharmapasha upazila under Sunamgonj district of Bangladesh. The *upazila* was primarily selected as a suitable area for the study because this is one of the most flood prone *upazila* of the region. Considering the highly flood vulnerability, *haor*-based

livelihood of the local people the unions have been selected as the study location following purposive sampling. The selection of the study areas was made by the suggestions of local members of Union Parishad, NGO workers and *upazila* level officials who used to deal with flood affected people. The villages namely Antorpur, Batta, Khidirpur and Rongchi were selected according to a pre-defined set of indicators: i) their degree of vulnerability to flash flood or seasonal flood hazards or both; ii) the connection of villages with the Tanguar Haor in terms of livelihoods (e.g., crop cultivation, fishing and for other natural resources); and iii) occupational diversity. Detail about the study villages has been discussed in section 1.6 of this chapter.

1.7.3 Population and sample of the study

The unit of the study is the individual female member of the household (either household head or spouse). An up to date list of all the households and population of the selected villages has been prepared with the help of concerned local government office/ward members. In the first stage, all the households of the study villages were classified into four categories such as landless (0-0.19 hectare), marginal (0.2-0.9 ha), medium (1-2.9 ha), and large farmers (3+ ha) on the basis of ownership of land. It was used as sampling frame. In the second stage from each of the homogenous stratum households primarily were selected following stratified random sampling. Finally, 175 women (one from each household) of the selected four villages were selected as respondents from among these sub-categories following purposive sampling. Almost 30% of the village people have been taken as the sample for household survey.

Table 1.1 provides research objectives with corresponding methods. It provides an analysis of specific tools used for gathering specific information.

Table 1.1: Methods for analysing research issues

Objectives	Research Issues	Methods	Sources of data
1. To examine vulnerability and risk factors that affect livelihoods of the people in the flood prone <i>haor</i> area	Demographic and socio-economic data	Survey	Household
	Hazard characteristics, Geographical features, historical data, Vulnerability of individual Vulnerability of household Vulnerability of community	SC, TL IDI, CS IDI, PO FGD, KII, TW, SC	Community people, elderly Women respondent Household members Community people, Key Informants Farmers, fishers,
2. To assess resources of flood affected people to cope with the floods	Livelihood: seasonal constraints and opportunities, effect of flood, Understanding farmer's problems with crop cultivation practices, Understanding fisher's problem due to marginalization,	SC, FGD, IDI	Farmers, Key informants Fishers, Key informants
	Household's dependence on natural resources	FGD, PRA, KII	Women respondent, farmers, fishers
3. To explore existing local knowledge and practices of <i>haor</i> resource-dependent community to resist flood risks in order to maintain their livelihood	Capital and resources of individual and household	IDI, PO	Women respondent
	Perception, belief, values, rituals	IDI, FGD, PO,	Women respondent, Community people
	Coping practices at household level	IDI, PO, CS	Women respondent
	Coping practices at community level	FGD, KII	Community people, Key Informants
	Indigenous agriculture practices	IDI, FGD	Women respondent, Farmers
4. To understand the environmental factors that affects the resilience of the people of <i>haor</i> area with regard to their livelihood	Indigenous fishing practices	IDI, FGD	Women respondent, Fishers
	Livelihood diversification,	SC, FGD, IDI	Women respondent, farmers, fishers
	Migration	KII	Household Head, Women Respondents
5. To assess institutional arrangement regarding flood management and the dynamics of peoples' participation in the process to incorporate their indigenous knowledge.	Local Power dynamics	FGD	Farmers, Fishers
	Policy implications	KII	Key Informants
	Exclusion and Marginalization process	FGD	
5. To assess institutional arrangement regarding flood management and the dynamics of peoples' participation in the process to incorporate their indigenous knowledge.	Depletion of resources	IDI, FGD	
	Role of Formal and Informal institutions to reduce flood risks	VD, KII	Govt, NGO, Local Administration (Union, Upazila)
	Scope of people's participation in the existing flood management program of formal and informal institutions		Community people, representatives of local institutions

Key: PO = Participant Observation, KII = Key Informant Interview, FGD = Focus Group Discussion, CS = Case Study, SC = Seasonal Calendar, IDI, In-depth Interview, VD = Venn Diagram, TW = Transect Walk, TL= Time Line

1.7.4 Research plan and process

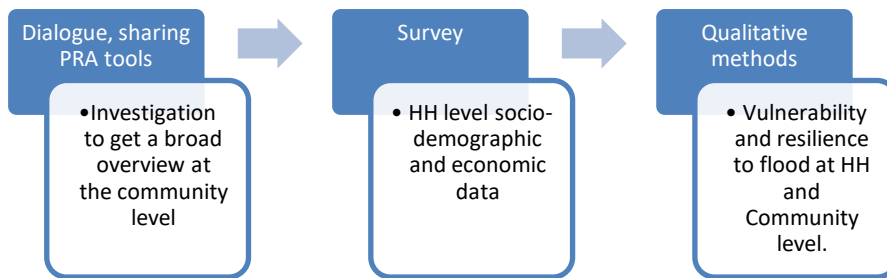


Figure 1.3: Flow chart of data collection

The research was conducted in three stages: 1) Dialogue, sharing and use of PRA tools 2) Household Survey 3) In-depth field work focusing on individual household through qualitative methods and Triangulation/verification.

At first, the investigation was carried out at the community level to get a broad overview of the concerned phenomena; the search has been made through dialogue, sharing and use of PRA tools. The researcher entered the household level in order to gain socio-demographic and economic data through survey after the community had been sensitized to the research. Along with survey other qualitative methods were administered with a view to obtaining information on people's vulnerability, resilience, adaptation options, perception, etc.

1.7.5 Collection of Data

Both primary and secondary data were collected to carry out the study. Primary data were collected through interview, interview with key informants, focus group discussions, participant observation, Participatory Rural Appraisal (PRA) techniques and case study. Secondary data were collected from different NGOs and Government offices including local government. A wide range of books, web articles, paper clippings, research documents, government and related agency documents, various disaster related projects documents and web sites, seminar papers, were reviewed to crosscheck, complement or illustrate the primary data, collected through the survey schedule.

1.7.6 Period of the Study

The fieldwork for primary data collection was carried out over a period of three phases- firstly, in the month of December 2015 - February 2016, secondly in July-September 2016 and finally in July-August 2017. For this study, the researcher himself stayed in the village and collected the data directly from the field in cooperation with the research assistants. For collecting the supplementary data, the researcher visited the area few more occasions.

1.7.7 Development of Tools

The primary data collection tools that have been prepared include: i) Interview Schedule; ii) FGD Checklist; and iv) Observation Checklist.

1.7.8 Pre-testing

After formulation of the detailed interview schedule the draft was pretested among ten percent households for checking the consistency and appropriateness of language, sequence of questions, and selecting pre-coded and open-ended questions. Necessary corrections and modifications were brought about in the interview schedule in light of pretesting.

1.7.9 Validity and Reliability

Face validity was used for reducing measurement errors. After constructing the schedule, the researcher reviewed each statement to assess the extent to which it is related to “flood coping strategies”. For that the researcher consulted a number of specialists. When there was agreement among the experts, the researcher proposed that the instrument has face validity and that consequently, it measures “flood coping strategies”. The measuring instrument was administered to the same group of persons at two different times, and the correlation between the two sets of observations (scores) were computed.

1.7.10 Survey

A sample was drawn from four villages involving 175 respondents. The survey was conducted to obtain the general socio-demographic and economic information about the households. Findings accrued from this survey have been useful for comparing and supplementing qualitative data.

1.7.11 Interview

With adequate focus on research objectives, in-depth interviews were conducted to complement the surveys and to deepen the research results. The researcher conducted sixty in-depth interviews at the household level along with household surveys. For each household, the female adults were preferably interviewed face to face who identified themselves as the 'heads' and/or spouse of the head of the family. The interviews, lasting about two hours, focused on their existing coping strategies against flood, coping ability and resilience of the households. The schedule consisted of 42 major questions. Interview schedules were printed in Bangla but an English version which is attached to the appendices of this thesis.

1.7.12 Interview of Key informants (KII)

To get in-depth and significant information about the localities, which cannot be explored by survey, the open-ended interview has been made with the aged, leader who have vast experience and practical knowledge about the area, resources, e.g., UP chairman, old fisherman, old farmer, teacher, fish traders etc. The interviewees were selected after discussion with local people. It explores issues such as community-based resource management, local power dynamics, threats, GO and NGO interventions for the flood affected people of *haor* areas.

1.7.13 Focus Group Discussions (FGDs)

Six FGDs were conducted with 10-12 participants in each session in four study villages. Participants were farmers, fishermen and women head of the households. It complemented and validated data from the survey and interviews. Issues discussed included: people's livelihoods, control of *haor* resources, food deficit, coping with livelihood insecurities, livelihood diversity, gender differences, social capital, rituals, norms, values, taboos, and social networks, etc. FGDs with farmers helped identify crop cultivation related problem they usually faced at the time of early flash flood hazards. Discussions with fishers were helpful in understanding their miseries which mainly resulted from marginalization and exclusion. Such interactions with different occupational groups revealed the fact about community collective efforts in disaster loss recovery.

1.7.14 Participant Observation

The researcher deeply observed households from four villages using the checklists on different activities like household chores, consumption patterns, resource allocation, management of assets, and division of labor as well as livelihood strategies. This approach enabled the researcher to develop a more comprehensive understanding of the context within which the village people live (Oakley & Mardsen, 1984). It also allowed him to learn about things the community members did not mention during interview or focus group discussion.

Activities like carrying out need-based complementary roles in the household activities, and attending numerous rituals in the *haor* villages helped the researcher immensely to become part of the real atmosphere of *haor* villagers. Night halt with the villagers in the *haor* area proved very useful for directly learning about their real life.

1.7.15 Participatory Rural Appraisal (PRA) techniques and methods

The researcher applied data collection techniques from participatory rural appraisal (PRA) tools, including transect walks, seasonal calendars, time lines and local histories, and venn diagrams (institutional analysis).

The researcher started with general observation of the area, approached by a transect walk. He followed systematic walk with some key informants of the village. Transect walks accompanied by direct observation were very helpful for the researcher to identify community people's problem with flash flood hazards. The physical observation enabled to analyze people's vulnerability contexts. While doing transect walk within the villages, the researcher identified the locations of the villages that are most vulnerable to flooding. He discovered various local practices, use of plants, variety of crops, etc.

Seasonal calendars were helpful to understand the cycle of events that occur in *haor* community life round the year. The yearly cycle with the information about rainfall, early flash floods and monsoon floods, production of crops, fishing, migration, food shortage, spread of diseases, etc. were the most important ingredients for preparation of this kind of document. For convenience, the researcher initially prepared these calendars in one village and then went to other three villages to get their inputs. After receiving the villagers' inputs, he finalized the calendar.

The time line was prepared through discussion with a small group of elders. The significant events in the history of the community were documented. In this study time line records included flood history, big flood events, changes in livelihood pattern, etc.

Venn diagramming was administered to find out who or what persons or organizations became important for the community. It was used to identify formal and informal institutions operating in the community and to show how they facilitate or hinder the resilience of local people.

1.7.16 Case Study

A total of seven case studies were conducted for further in-depth understanding. They were helpful for the researcher to know about household stories, vulnerabilities, coping strategies and daily struggles in lives. The case studies provided more insight into the realities of women's lives including their perceptions about changing roles as wives, mothers, and caregivers during the flood time.

1.7.17 Data Processing and Analysis

The researcher began the analysis of the qualitative data by going back to the objective of the study, to ensure that the process of data analysis is systematic and verifiable. A descriptive approach was used for data analysis. It is tried in this research to keep the original detail field notes. From the household level interview, the reported coping mechanisms were classified into different flood stages such as before, during and after flood. Secondly, the specific sets of coping mechanism/indigenous knowledge were classified into various factors that influence resilience include physical, natural, economic, social, human, cultural and institutional. The raw data were analyzed with computer by MS-Excel and MS-Word programs and then it is converted into table, chart, and graph/diagram for statistical analysis. The details of the analytical approach employed in this research are outlined below.

Analyzing Interviews - The researcher looked into the interview notes analyzing them question by question. While going through each question he noted down the similarities and dissimilarities. Then he perused each script again, looked for common themes and arranged them chronologically. Through reviewing the transcripts of the interviews and field notes he drew out some preliminary findings and endeavored to retain the language used by respondents concerning the different themes.

Analyzing Observation - It was used in conjunction with other methods. Adequate care was taken to analyze overall observation about the community life of *haor* area. Emphasis was laid on the contextual circumstances.

Analyzing FGD -To analyze focus group data the entire interview was transcribed. To supplement the transcript some additional observational data were obtained during the interview. Such data included notes of the systematic recording of specific events and behaviors. He scrutinized the transcript and identified those sections which were relevant to the research question(s). Based on this initial reading, a classification system for major topics and issues was developed.

After collecting and analyzing the data, through these above methods, the researcher had accomplished the task of drawing inferences from the collected facts in order to search for broader meaning of findings. He tried to explain the findings on the basis of some theory.

1.7.18 Limitation of the Study

Though the research objective was shared before the interview but, the respondents expected immediate benefits from the survey. Since, the researcher was not in a position to provide such benefits, he had a guilt feeling when he sought co-operation from the respondents. He tried to compensate by offering small food items for the children of the respondents. The interview schedule in all contained 28 pages. As a result, some of the respondents were unwilling to give adequate time to the interviewers. With regard to earnings, it was difficult to determine the value of service rendered by the family members, particularly those services rendered by the female and the children in kind. Such household members were not normally considered as earners by the respondent and therefore, their income was likely to have been under reported. Despite those constraints, sincere efforts were made to maintain the quality of the research.

The study was conducted focusing on one *haor* area (i.e., the Tanguar Haor). This area may not be representative of the entire wetland area of Bangladesh in terms of the attributes related to flash floods, resource dependency, and other socio-ecological characteristics like power structure and politics. This study is only limited to specific period of time and place. To understand coping and resilience of *haor* community to

flood hazards, a longitudinal study may offer a deeper insight to the problem, which was not possible for this study due to time and resource constraints.

1.8 Organization of the thesis

The thesis comprises five chapters that are organized to provide distinctive contributions in fulfilling the obligation of the research objectives.

Chapter One sets out a general overview of the thesis by explaining the research context and problem, objectives, assumptions, rationale, profile of the study area and methodology that stimulated the research.

Chapter Two analyses conceptual framework of the study.

Chapter Three after reviewing the existing body of literature, examines the indigenous knowledge to reduce flood risk reduction.

Chapter Four reveals the findings of the study. It explores vulnerability and resilience of the households and community and critically observes various aspects of livelihood. It also deals with discussion on findings in relation to conceptual framework in detail.

Chapter Five provides an overall synthesis of the findings of this research. It concludes the thesis and also provides recommendations for policy makers and practitioners.

In light of the above discussion and the background information, the present study has been undertaken with the major purpose, to determine the coping strategies of *haor* people to flood vulnerability. The research attempted to portray the general background and context of the study followed by description of the study area and its livelihood situation. It discussed in detail proposition and rationale of the study. Keeping in view the research objective, this chapter described and justified the methods, procedures, and techniques used to explore and assess the vulnerability as well as the resilience of households and communities exposed to flood hazards. The following chapter provides detailed explanation of conceptual framework of the study.

CHAPTER TWO

CONCEPTUAL FRAMEWORK

This chapter deals with the analytical foundation for the present research. The research examines the dynamic nature of livelihoods, coping strategies and resilience to flood hazards within the domains of vulnerable people in *haor* area of north-east Bangladesh. The theory of Resilience, Livelihood and Sustainable Livelihood has been used to analyze research issues. The concept and theory of resilience has been applied to explore capacity of flood affected people especially of women and explored the efforts being made by them to cope with floods depending on their capitals. The researcher has developed an analytical framework for household resilience which is termed as the 'Resilience House'. This framework has further improved based on empirical data from the field. The researcher has reviewed a substantial number of literatures on livelihood to define its various aspects. To assess livelihood sustainability of *haor* people one has to look at how they are maintaining their livelihoods and understand the dynamics of *haor* livelihood systems and people's strategies. Therefore, the present study employs the sustainable livelihood analysis. It assesses the vulnerability context; identify the livelihood assets or capitals people possess; prevailing social, institutional and organizational environment; livelihood strategies people deploy; and the outcomes they achieve. In doing so, the "Sustainable Livelihood Framework" provides over-arching analytical tool. Before proceeding to elaborate discussion on main conceptual underpinnings, some relevant key terms explained very briefly. Then the conceptual underpinnings are made critically in the following order: The concept of 'Resilience', 'Livelihood' and 'Sustainable Livelihood'.

2.1 Key Concepts Used in the Research

The key concepts used in the research have been briefly explained below:

Vulnerability

Vulnerability is defined as "a set of prevailing or consequential conditions, which adversely affect the community's ability to prevent, mitigate, prepare for or respond to hazard events" (Anderson and Woodrow, 1989). The International Strategy for Disaster Reduction (ISDR), which uses this definition, states that these conditions are determined

by physical, social, economic and environmental factors or process, which increase the susceptibility of a community to the impact of a hazard.

Anderson and Woodrow (1989) grouped vulnerabilities into three broad interrelated categories: physical/material, social/organizational and motivational/attitudinal. Below are some examples of vulnerabilities based on this grouping:

Table 2.1: Grouping of vulnerabilities

Categories	Example
Physical/material	Risky and insecure sources of livelihood Lack of access and control over means of production (land, farm inputs, animals, capital) Occurrence of acute or chronic food shortage Lack of basic services: education, health, safe drinking water, shelter, Sanitation, roads, electricity, communication High mortality rates, malnutrition, occurrence of diseases
Social/organizational	Weak family/kinship structures Lack of leadership, initiative, organizational structures to solve problems or conflicts Ineffective decision-making, people/groups are left out Unequal participation in community affairs Rumours, divisions, conflicts: ethnic, class, religion, caste, ideology
Motivational/attitudinal	Negative attitude towards change Passivity, fatalism, hopelessness, dependence Lack of unity, cooperation, solidarity Ignorance about hazards and consequences Dependence on external support

Vulnerability based on unsafe location refers to the “degree to which an area, people, physical structures or economic assets are exposed to loss, injury or damage caused by the impact of a hazard.” (*A Disaster Manager’s Handbook, Chapter 2. Disaster Mitigation in Asia and the Pacific, p 30-40*).

Vulnerability can be determined by the interplay between exposure and sensitivity to a range of interrelated social, economic, political, governance and environmental factors (Oxfam GB, 2010). There are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors. Examples may include poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited official recognition of risks and preparedness measures, and disregard for wise environmental management. Vulnerability varies significantly within a community and over time.

Capacity

Capacity refers to the combination of all the strengths, attributes and resources available within an individual, community, society or organization that can be used to achieve agreed goals (UN-ISDR, 2009). Capacity may include physical, social, institutional or economic means as well as skilled personal or collective attributes such as leadership and management. Similar definition of capacities are strengths and resources, which exist or are present in individuals, households and the community-enabling them to cope with, withstand, prepare for, prevent, mitigate, or quickly recover from a disaster.

Coping and Adapting

In simple terms, coping capacity refers to the “ability of people, organizations, and systems, using available skills and resources, to face and manage adverse conditions, emergencies, or disasters” (UN-ISDR, 2009b). It suggests that people can deal with some degree of destabilization, and acknowledges that at a certain point this capacity may be exceeded.

Adaptation means the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (UN-ISDR 2007). Adaptive capacity is considered to determine “the ability of an individual, family, community, or other social group to adjust to changes in the environment guaranteeing survival and sustainability”.

Coping aims to maintain the system and its functions in the face of adverse conditions; adaptation involves changes and requires reorganization process. Overall, coping focuses on the moment, constraint, and survival; adapting (in terms of human responses) focuses on the future, where learning and reinvention are key features and short-term survival is less in question (although it remains inclusive of changes inspired by already-modified environmental conditions).

Flood

In the context of Bangladesh, it is ironic that floods should be termed 'disasters' or 'hazards' for without riverine floods Bangladesh would not exist (Mahbuba 1995). The silt which the rivers bring down, a million tons a day by the Ganges alone is responsible for replenishing the fertility of the soil, which would otherwise have been exhausted by

continuous agricultural activities. This renewed fertility has allowed Bangladesh to become a country based on highly intensive agriculture.

Alam (1990b:5) have pointed out that in Bengali the English term 'flood' does not imply abnormality. Rather distinctions are made between 'normal' and 'abnormal' floods. Normal floods, or *borsha*, are an accepted and much anticipated event and are perceived by people for providing sustenance to farmers and agricultural laborers. Abnormal floods, or *bonnya*, on the contrary, are regarded as disasters and damaging phenomena. Abnormal floods cause widespread damage to standing crops and other property.

Four main types of natural floods occur in Bangladesh: flash floods, river floods, rainfall-induced floods, and coastal floods induced by storm surges (Ahmad et al. 2000). A flood, which is caused by heavy or excessive rainfall in a short period of time over a relatively small area, is referred as flash flood. In flash flood, water level rises and falls quite rapidly with little or no advance warning. Typically, flash floods occur in areas where the upstream basin topography is relatively steep and the concentration time of the basin is relatively short. In Bangladesh flash floods generally occurs in the north-east, south-east and Chittagong region. But devastating and extended flash flood is a recurrent phenomenon for the north-east region of Bangladesh. The extreme flashy character of the rivers and sudden excessive rainfall in the region causes frequent flash floods in the north-eastern *haor* areas. In the *haor* area, flash flood comes from the very steep uplands adjacent to the region in Asam and Meghalaya hills range in India causing immense damage to the standing boro crops, lives and properties every year (BWDB).

With the onset of monsoon all the major rivers start swelling to the brim and bring flood water from upstream. Since over 70 per cent of water annually generated in the combined GBM catchments flows during the few monsoon months along the rivers in Bangladesh, the rivers cannot smoothly drain all the waters and the water level begins to rise sharply during the peak flow periods. When rising water levels cross riverbanks, spillage occurs. Such events are common in every hydrological year. However, if certain conditions arise, riverine overbank spillages frequently trigger the most devastating floods in the country. High intensity riverine floods may continue for months, as it was observed during 1988 and 1998 (Rasheed, 2009).

Haor

A *haor* is a wetland ecosystem in the north-eastern part of Bangladesh which physically is a bowl or saucer shaped shallow depression, also known as a back swamp. The *haor* basin is an internationally important wetland ecosystem, which is situated in Sunamganj, Hobigonj and Moulvibazar districts and Sylhet *sadar upazila*, as well as Kishoregonj and Netrokona districts outside the core *haor* area. The total area of *haor* type wetland ecosystem in Bangladesh is eight million hectares. It includes about 47 major *haors* and 6300 *beels* of varying in size of which about 3500 are permanent and 2800 are seasonal (Hussain and Salam 2007:3).

In Bangladesh, which lies in the floodplain of three great rivers, Bengali language has several terms to differentiate between lakes, including *Baor*, *Haor*, *Jheel* and *Beel*. All four are types of similar freshwater wetlands. The word *haor* is corrupted form of the Bengali word *sagor* (meaning sea) in regional dialect. In parts of Bangladesh, people often pronounce the Bengali alphabet, m (sa) as n (ha), and sometimes — M (ga) as n (ha). In the pronunciation mix up *sagor* has become *haor* (Source: Wikipedia).

The core *haor* area, alternatively referred to as the *haor* basin, is estimated to spread over an area between 4,450 square km and 25,000 square kilometers by experts. The *haor* basin is bounded by the hill ranges of India – Meghalaya on the north, Tripura and Mizoram on the south, and Assam and Manipur on the east. The basin extends north to the foot of the Garo and Khasia Hills, and east along the upper Surma Valley to the Indian border.

The *haor* basin is a remote and difficult area that is flooded every year during monsoon. The hilly rivers coming down from the Khasi and Jaintia hills in Meghalaya carry particularly high volumes of water as they come from some of the rainiest places in the world. During July to November due to flood these areas go under deep water and look like seas with erosive water surface. The fight against natural calamity of the local people, mostly day laborers, relies on traditional and indigenous methods. Many villages have already been washed away, and many more are on the verge of extinction, forcing people to migrate to other districts.

Indigenous Knowledge

Knowledge is defined by the Oxford English Dictionary (Trumble, 2007) as 'information and skills acquired through education or experience' or an 'awareness or familiarity gained by experience of a fact or situation'. This can then be divided further into 'scientific knowledge' and 'indigenous knowledge'. While the former is generally understood to involve western technology or techniques, there exists no concise definition of the latter. Indigenous knowledge (IK) is the local knowledge – knowledge that is unique to a given culture or society. Indigenous knowledge contrasts with the international knowledge system generated by universities, research institutions and private firms. Constantly changing, being produced as well as reproduced, discovered as well as lost; though it is often perceived by external observers as being somewhat static. Indigenous knowledge is not the reverse of scientific knowledge. Rather there are scientific basis of local wisdom that has evolved over the years and that has been effective for communities. Indigenous knowledge differs from other types of knowledge as it originates within the community, is transferred through informal means of dissemination, is collectively owned, developed over several generations and subject to adaptation, and is embedded in a community's way of life as a means of survival and well-being. Indigenous knowledge is the local knowledge that is unique to a culture or society. This knowledge is passed from generation to generation, usually by word of mouth and cultural rituals, and has been the basis for agriculture, food preparation, health care, education, conservation and the wide range of other activities that sustain societies in many parts of the world.

Sillitoe (2000) defines Indigenous knowledge as a body of knowledge existing within or acquired by local people over a period of time through accumulation of experiences, society–nature relationships, community practices and institutions and passed down through generations. Warren (1991) defines it as the basis for local-level decision making in agriculture, health care, food preparation, education, natural-resource management, and a host of other activities in rural communities. Flavier et al., (1995) states scientific knowledge is global in nature whereas indigenous knowledge is considered local. However, as with scientific knowledge, indigenous knowledge is dynamic in nature, continually influenced both by internal creativity and experimentation, and by contact with external systems. Niaz Ahmed Khan (2000) argues indigenous

knowledge's main strength lies in the fact that it is deeply anchored on the socio-economic fabric, and therefore, enjoys wide social acceptability. Second, indigenous practices have generally problem-solving (down to earth) focus. These are often low cost, time efficient, flexible and adaptive.

Indigenous knowledge mostly remains undocumented, embedded among people in various forms-cultural practices, customs, traditions, religious and spiritual beliefs, rituals, ceremonies, folk stories, folk songs, legends and proverbs.

Indigenous knowledge generally refers to knowledge systems embedded in the cultural traditions of local communities. Traditional knowledge includes types of knowledge about traditional technologies of subsistence (e.g. tools and techniques for hunting or agriculture), ecological knowledge, etc. These kinds of knowledge are crucial for the subsistence and survival and are generally based on accumulations of empirical observation and interaction with the environment. In many cases, traditional knowledge has been orally passed for generations from person to person. In many societies with oral traditions, past events, including hazard events, are embedded in individual and collective memory through stories, songs, poems, proverbs, worship, ceremonies, and rituals. Songs and proverbs become the repository as much as the relay of past hazard events and can help stimulate people's learning, memory, and creativity. Indigenous knowledge is wide-ranging. It includes technical expertise in seed selection and house-building, knowing where to find certain wild foods, economic knowledge of where to buy or sell essential items or find paid work, and knowledge of whom to call upon for assistance.

Indigenous knowledge is scattered and it is dispersed institutionally: it is located at the individual and household level as well as collectively through community stewards and other key social actors (e.g., shamans, elders, local religious and political leaders, and healing artists). As such, one can distinguish between common (or everyday or public) knowledge (i.e., held by the whole community) and specialist knowledge (i.e., retained by a few local experts, e.g., healers with specific medical expertise and knowledge of local curative plants; knowledge of local plants known only by women; or knowledge of crops known only by men (Berkes 1999).

For example, as it was revealed by the present study that certain disaster preparedness practices were found only at the household level while others were found only at the community or village level. Practices may differ from one social group to another according to factors such as age, gender, profession, caste, or ethnicity. Some practices may help people to deal with natural hazards in the short term; while others may help them to be prepared and to adapt in the long term. Similarly, some effective short-term human adjustments might actually increase the long-run vulnerability (White et al. 2001).

The present research employs the concept of indigenous knowledge as the methods and practices developed by the *haor* community through their living experiences in hazard prone areas for decades. The *haor* people have, inevitably, devised their own methods for protecting themselves and their livelihoods. These methods are based on their own skills and resources, as well as their experiences. Their knowledge systems, skills and technologies are usually referred to under the heading of 'indigenous knowledge'. This knowledge contains several important characteristics which distinguish it from other types of knowledge. These include originating within the community, maintaining a non-formal means of dissemination, collectively owned, developed over several generations, subject to adaptation, and embedded in a community's way of life as a means of survival.

Indigenous Coping Strategies

Coping strategies refer to the specific efforts, both behavioral and psychological, that people employ to master, tolerate, reduce or minimize stressful events. Coping skills are those skills that someone uses to offset disadvantages in day to day life. Coping skills can be seen as a sort of adaptation. Coping skills can be positive or negative. Positive coping skills help us get through situations at nearly the same level as those who do not have the disadvantage. Negative coping skills, however, may provide short-term relief or distraction, but ultimately worsen people's disadvantage.

The application of indigenous knowledge in the face of hazards and other threats is referred to as a 'coping mechanism' or 'coping strategy' (also sometimes known as a 'survival' strategy). The choice of skills and resources to be applied varies according to the nature of the hazard threat, the capacities available to deal with it, and to a variety of community and individual priorities that can change during the course of a disaster. The present research considers the coping strategies of the *haor* community in a

comprehensive manner, comprising economic, technological, social and cultural elements. It explores different forms of coping strategies adopted by *haor* people and factors that affect this traditional knowledge.

Forms of coping

Coping strategies can be divided into four broad categories: i) Economic/material (e.g. having more than one source of income); ii) Technological (such as house materials and construction methods); iii) Social/organizational (e.g. labor and food sharing during crises); and iv) Cultural (e.g. risk perception, local beliefs and related practices). Most coping strategies involve elements of all of these.

Vulnerable community in the disaster prone *haor* area has traditionally been depended on indigenous knowledge to cope with the extreme natural hazards such as floods. Until external assistances reach to this disaster affected remote area, people find out their own ways, survive on their own mechanisms. But their indigenous knowledge and coping strategies are often overlooked and undervalued by development actors. The present research has considered the coping strategies of the *haor* community in a comprehensive manner, comprising economic, technological, social and cultural elements. The researcher looks objectively at all forms of local knowledge to identify and recommend the most suitable approaches to redress vulnerable situation and developing the capacity of *haor* community. Indigenous knowledge of this remote geographic region is affected by changes in the economy and society at large and often undermined by these changes (BARCIK 2010). The present study explores different forms of coping strategies adopted by *haor* people and factors that affect this traditional knowledge considering the issues mentioned above. So far, some relevant key terms briefly explained in this section. The following section provides details for the conceptual underpinnings of the research.

2.2 CONCEPTUAL UNDERPINNINGS

The conceptual underpinnings of the present study are explained below:

2.2.1 The Concept of Resilience

The present study investigates household and community responses to disaster risk from resilience perspectives. While defining resilience at individual, household as well as at community level the present study used theories of resilience to analyze - what a resilient households and/or communities look like? What are their characteristics in a given context? One of the most useful characteristics of resilience is its ability to help frame the issues under consideration within a 'system approach', which is particularly relevant in the specific context of this study mainly for the following reasons: i) applying a resilience framework helps thinking holistically (i.e. about the system), ii) a systematic approach is relevant because flood hazards simultaneously affecting groups of households or even entire communities, iii) adopting a systematic approach recognizes the dynamics that it affect people and/or their environments across scales i.e. from local to global (Adger 2005), iv) in the context of rural livelihoods, resilience and its emphasis on system do also find some resonance in relation to natural resources. Poor households in the *haor* area are recognized to dependent more heavily on natural resources. In that sense, the resilience of a household is inextricably linked to the condition of the environment and the treatment of its resources.

The conceptual framework of this research is based on the most recent lessons derived from the literature on resilience. Cutter *et al.* in their analysis of community resilience to disasters explain that resilience within hazards research is generally focused on social systems, and includes pre-event measures to prevent hazard-related damage and losses (preparedness) and post-event strategies to help cope with and minimise disaster impacts (Cutter et al. 2008:600). In the recent 'Special report on managing the risks of extreme events and disasters', the IPCC defines resilience as the 'ability of a system and its components parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner' (IPCC 2012:5). UN-ISDR defined resilience as "the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions" (UN-ISDR, 2009, p. 24). The concept of disaster resilience has

gained a wide interest and has become more popular especially after the adoption of the Hyogo Framework for Action 2005-2015: Building the resilience of nations and communities to disasters. Since the adoption of the Hyogo Framework, the main goal of hazard planning and disaster risk reduction has slightly shifted to focusing more on building community resilience rather than only reducing vulnerability. Increasing number of scholars conceptualise resilience as an ability (Brown and Kulig 1996/97, Norris Stevens 2008). To be more precise, it is the ability to deal with adverse changes and shocks. It is the 'ability to resist, recover from, or adapt to the effects of a shock or a change' (Mitchell and Harris 2012:2). This dynamic nature (things are not static, but change, adapt or evolve) is in itself a progression with respect to previous conceptions of equilibrium and immobility. Resilience exists at multiple levels or scales: individual, household, community, system, society, etc. (Berkes and Folke 1998).

Kulig (1999) defined community resilience as the ability of a community to not only deal with adversity but in doing so reach a high level of functioning. Manyena (2006) conceptualized Resilience as Process. This understanding underlines the importance of viewing resilience as a 'process' rather than only an outcome. Mayunga (2007) stresses on five capitals. This understanding of community resilience to disasters springs from the sustainable livelihoods approach where social, economic, human, physical and natural capital are seen as the determinants of resilience. Adger (2000) defined resilience as the ability of communities to withstand shocks to their social infrastructure. Twigg (2007) in his guidance note on 'Characteristics of a Disaster-resilient Community' provided some characteristics of resilience.

As noted above, most theorists refer to resilience in the context of a 'system' but no part of the reviewed literature provides a substantial explanation of how this entity and its boundaries are defined. The use of 'system' in the context of resilience stems largely from ecological theory where theorists such as Holling (1973) discussed the resilience of 'ecosystems'. However, this brief review highlights how theorists have taken many of the original ideas developed in the context of ecosystems research and applied them to understanding socio-ecological systems. It is clear that there is major gap in understanding how 'resilience' should be measured. Some theorists propose tentative indicators and formulas (for example, Twigg 2007), there is little guidance on how indicators should be developed and tailored for specific situations or direction on the kind of data that needs to be collected. The vast majority of the available literature on the

resilience concept still tends to be largely conceptual and, while some empirical examples are discussed, there remains a lack of robust studies and research that prove or test the theories put forward.

The definitions of resilience are diverse, reflecting the complex nature of the concept. McEntire et al. (2002) argue that one of the major challenges that limit the agreement on a common definition is due to the fact that individuals, groups, and communities may each possess different degrees of resilience which vary significantly over time. Hence, finding consensus or common ground on the definition of resilience concept is difficult.

In this research, 'Resilience' is seen as a broader concept than 'capacity' because it goes beyond the specific behavior, strategies and measures for risk reduction that are normally understood as capacities. However, it is difficult to separate the concepts clearly. In everyday usage, 'capacity' and 'coping capacity' often mean the same as 'resilience'. A focus on resilience means putting greater emphasis on what communities can do for themselves and how to strengthen their capacities, rather than concentrating on their vulnerability to disaster or environmental shocks and stresses.

Resilient individuals and households are the foundation for resilient communities. It is critical to note that resilience at one level does not automatically result in resilience at higher levels, i.e., resilient households do not necessarily result in resilient communities. Individuals, households and communities do not exist or operate in isolation from each other. Rather, they form an interrelated hierarchy of dependencies. Evidence suggests that women play a large role for household resilience. Their ability to contribute, however, can be limited by socio-cultural, gender-based or religious restrictions on their mobility, participation in decision-making (at both household and community levels), and access to productive assets, credit, markets and certain livelihood activities, Nasreen (2012) pointed out that women's gender specific responses to disaster risk should be promoted from resilience perspectives, not from vulnerability perspectives. The present study has taken these issues into account while measuring resilience at individual, household as well as at community level.

To the researcher a resilient household and community is one in which people can manage risk and recover from shocks such as floods. It also means people have the ability to adapt to longer term changes without undermining their well being. The factors that influence resilience include natural, physical, economic, human, environmental,

social, cultural, political and institutional. In defining the concept of resilience, the researcher has reviewed the following framework:

The 3-D Resilience Framework

As mentioned earlier, resilience can be defined as the ability to deal with the impacts of adverse changes and shocks. This ability includes 'returning to pre-shock situation' or 'bouncing back', 'shock absorbing', 'evolving and adapting' or even 'transforming' (Berkes et al.2003). This multiplicity of terms reflects the broadening of the concept from its initial relatively narrow focus (the ability of a system to bounce back or return to equilibrium following disturbance- what Holling (1973) referred to as resilience) into a more elaborated concept which embraces the ability not simply to bounce back but also to adapt and to transform. The 3-D framework proposes to use three components of resilience: *absorptive*, *adaptive*, and *transformative* capacity as the three structuring elements aimed at understanding what resilience means. The framework is presented in Figure 2.1.

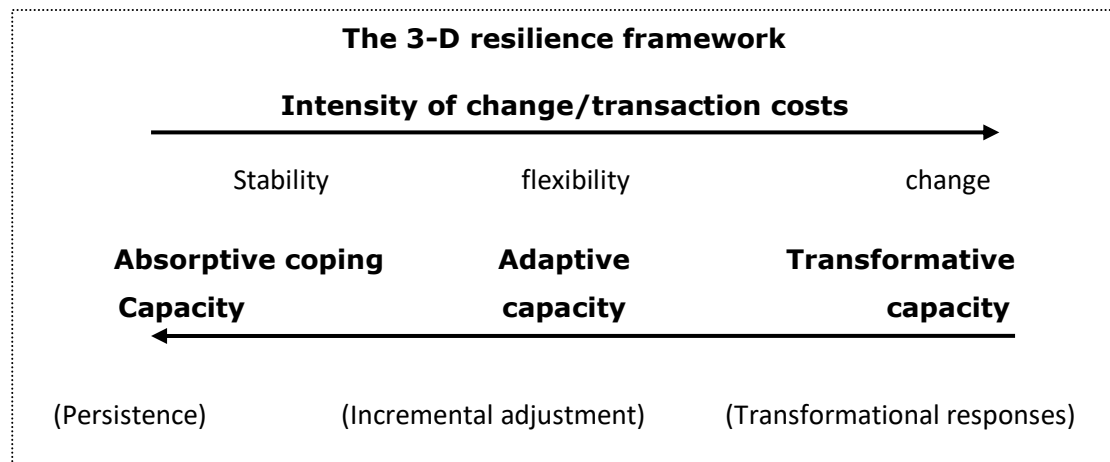


Fig. 2.1. The 3-D resilience framework

The salient point of the framework is the fact that resilience emerges as the result not of one but all of these three capacities: *absorptive*, *adaptive*, and *transformative* capacities, each of them leading to different outcomes: persistence, incremental adjustment, or transformational responses. Absorptive capacity, that is, the ability to cope with, and absorb the effects of shocks and stresses; Adaptive capacity, that is, the ability of individuals or communities to adjust and adapt to shocks and stresses, but keep the overall system functioning; and Transformative capacity, that is, the ability to change the

behavior, practices and system fundamentally when the way it works is no longer viable. These three capacities comprise a 3-D resilience framework (Fig. 2.1).

When the absorptive capacity is exceeded, the individual will then exercise their adaptive resilience (Cutter et al. 2008). Eventually, if the change required is so large that it overwhelms the adaptive capacity of the household, community or system, transformation will have to happen. It can be a deliberate process, initiated by the people involved, or it can be forced on them by changing environmental or socio-economic conditions. The present study uses the 3-D resilience framework to formulate its own analytical framework.

The analytical framework for the present research: The Resilience House

Following the argumentation of the IDS, resilience emerges as the result of three capacities that form the dimensions of resilience: *Absorptive*, *Adaptive* and *Transformative* capacity. A combination of these capacities will contribute to the household's or community's resilience. Community resilience "is not just about the ability to maintain or return to a previous state; it is about adapting and learning to live with changes and uncertainty" (IDS 2013). These dimensions need to be connected, adapted to the respective context.

Considering the conceptual underpinnings, the present research proposes a framework for analyzing household resilience (adopted from Swiss NGO DRR Platform). The "Resilience House" framework as illustrated by the researcher is shown in Figure 2.2. The present research considers household as part of a broader community or system.

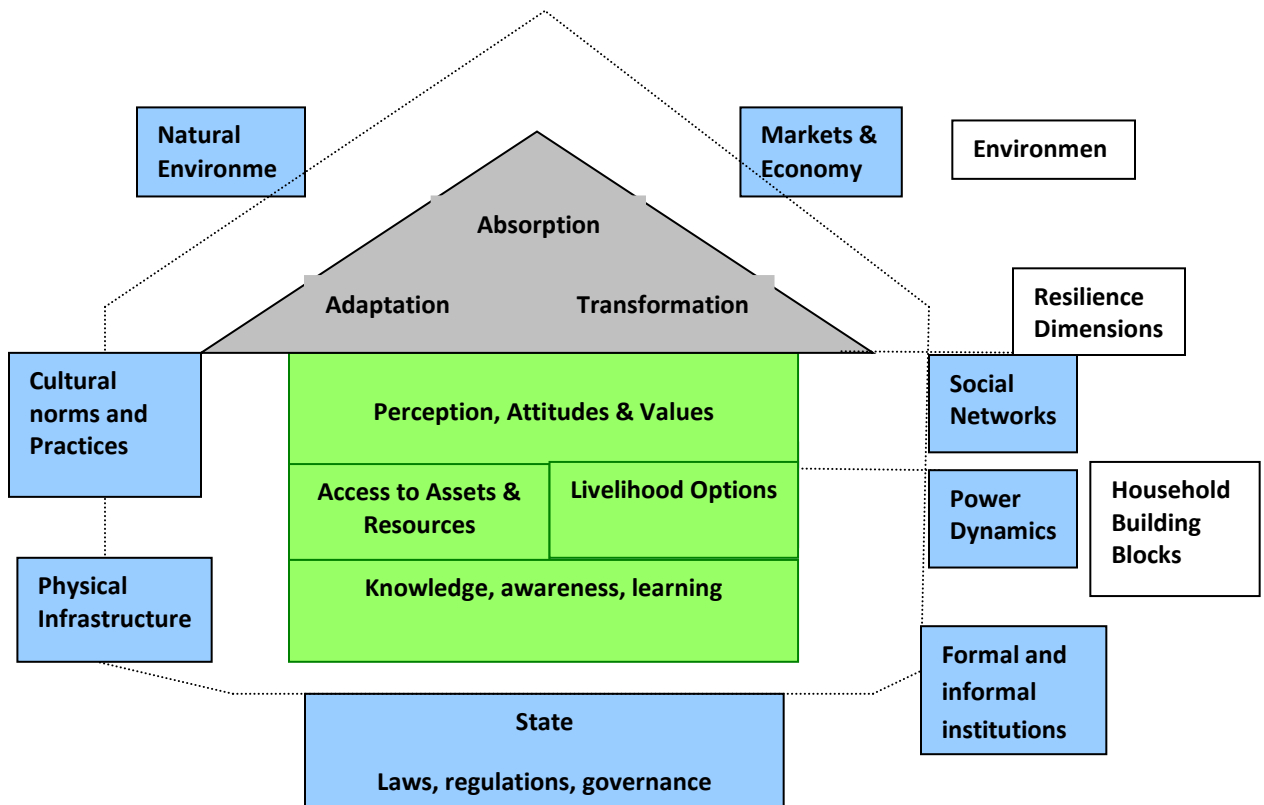


Fig. 2.2 The resilience house - an analytical framework for household resilience

Explanation of the House:

The “resilience house” depicts a disaster resilience household. Resilience entails three capacities: *absorption*, *adaptation*, *transformation*. These three dimensions constitute the roof of the resilience house. The way in which this triangle (“the roof of the house”) is adjusted to the context and the household’s needs will be a key determinant for its resilience.

Building Blocks

Households in general are characterized by a certain combination of what the researcher would like to call “building blocks”. These include: perception, attitudes and values - which attitudes and risk perceptions prevail in the household and community? Which values and attitudes guide the family and community members? This building block is overarching and directly influences how the other building blocks are perceived and weighed. Access to assets and resources- which assets and resources are at disposal of the household and its members? How can they be mobilized and how are

they distributed? Knowledge and Learning- how knowledge is generated, stored and passed on in the community? Who are the key carriers of knowledge? Livelihood options- what livelihood options are available? What are the alternatives?

Acknowledging that a household does not function in a vacuum, the context in which it is embedded is crucial for resilience building, and is subsumed under “the environment”. To measure the resilience of household the environment has been assessed. The natural environment can offer resources but also present threats to hazards (e.g. *haor* is a resource and also poses serious threat to life and livelihoods). As part of broader system or community household level values are shaped by cultural norms and practices. The state presents an important environment, with its rule of law, governance structures and the provision of crucial services to the community. Which critical infrastructure is in place and how does it protect the household or put it at risk? What is the institutional landscape in a community, which organizations shape decision-making, how are processes managed? Local power dynamics play an important role in resilience building process of people. It can facilitate or hinder the process. A good connection with neighbors, relatives, local and even national institutions facilitates access to resources, support and security. If these linkages do not exist or the institutional functions are not provided, these create serious challenges for building resilience. Markets and economy shape the capacities of the household in manifold ways. Economic trends such as price fluctuations for local produce can seriously undermine coping capacities with shifts and shocks. On the other hand, reliability on access to markets can create new opportunities in the communities enhancing absorptive and adaptive capacities.

The researcher has employed the “Resilience House” as analytical framework for explaining household resilience. With this framework, the researcher intended to develop and implement assessments of resilience at the household and community level in the study area. The characteristics of a resilient household or community were thoroughly investigated during the field study. The different corners of the ‘house’ i.e. roof, building blocks, the environment was analyzed with respect to the particular disaster context in *haor* area. The interlinkages of different corners of the house were also investigated.

As has been found in many literatures, the measurement of resilience at individual, household and community level entails considerable challenges. The researcher investigated with household members and community people to define what a disaster-

resilient household and community actually looks like. In defining household resilience, the researcher adapted to the particular study context i.e. *haor* area. In doing so, he followed J. Twigg's (2009) Characteristics of a Disaster Resilient Community.

Some of the key characteristics include :- risk awareness of household members, early warning systems based on community knowledge, households take long-term perspective; trust within community; informed, realistic attitudes towards risk and risk management; life protecting saving measures and possession of appropriate skills; access to community-managed common property resources; reserve stocks of grain and other staple foods managed by households; livelihood diversification including on-farm and off-farm activities; adoption of hazard-resistant agricultural practices for food security; access to basic social services (safety net services); security of land ownership/tenancy rights; adoption of physical measures to protect items of domestic property (e.g. raised internal platforms and storage as flood mitigation measure, portable stoves) and productive assets (e.g. livestock shelters); infrastructure and public facilities to support emergency management needs (e.g. shelters, secure evacuation and emergency supply routes); available transport sufficient for emergency needs, etc.

The characteristics as mentioned above (and few more) were used as a resource, not a checklist. These were adapted to the context in which it is being used and the needs of the present research. The researcher believed that new indicators might evolve through the field study and based on empirical data. In that sense, the indicators were not blueprint; rather it followed customized approach based on the research context.

2.2.2 Livelihood

The word 'livelihood' in local term '*Aay income*' signifies diverse meanings to the villagers in *haor* area. The word 'livelihood' originates from the word 'live'. The simple dictionary definition of livelihood is a "means of living". The concept of livelihood is relatively new but is now widely used in poverty and rural development literature.

Livelihood thinking dates back to the work of Robert Chambers in the mid-1980s. Chambers developed the idea of "Sustainable Livelihoods" with the intention to enhance the efficiency of development cooperation. According to Chambers and Conway (1992: 6), livelihood "comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living". To Ellis (2000: 10), livelihood "comprises

the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household". A livelihood comprises people, their capabilities and their means of living, including food, income and assets (tangible and intangible). Tangible assets are resources and stores, and intangible assets are claims and access (DFID, 1999). Huq (2000: 177) argues that "livelihoods encompass income, both cash and kind, as well as social institutions relating to kinship, family, neighborhood and village, women's groups and property rights required to support and to sustain a given standard of living. Livelihoods involve social and kinship networks for facilitating and sustaining diverse income possibilities". The UNDP (2005) described that livelihoods, are the means, activities and entitlements by which people make a living. A livelihood system is a dynamic realm that integrates both the opportunities and assets available to a group of people for achieving their goals and aspirations as well as interactions with and exposure to a range of beneficial or harmful ecological, social, economic and political perturbations that may help or hinder group' capacities to make a living. In social sciences, the concept of livelihood extends to include social and cultural means, i.e. "the command an individual, family, or other social group has over an income and/or bundles of resources that can be used or exchanged to satisfy its needs. This may involve information, cultural knowledge, social networks and legal rights as well as tools, land and other physical resources."The concept of livelihood as described by Long (1997) expresses the idea of individuals and groups striving to make a living, attempting to meet their various consumption and economic necessities, coping with uncertainties, responding to new opportunities, and choosing between different value positions.

The present study focuses on indigenous flood coping strategies of *haor* people towards livelihoods. Therefore, features of some important definitions are very crucial for conceptualizing this study. With that view, the researcher has reviewed a substantial number of literatures on livelihood. For instance, it is found very useful in the definition of Chambers and Conway (1992: 6) when they define livelihood as "comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living". The coping strategies of *haor* people also require in-depth study on capabilities and assets. The idea of different assets which comprises livelihood such as natural, physical, human, financial and social capital, have direct linkage to the capacity of local people. Access to these resources mediated by institutions and social relations

together determine the living gained by the individual or household in the present study area as well. The researcher also gains idea from two types of assets i.e. tangible and intangible mentioned by (DFID, 1999). As articulated by Huq (2000: 177), livelihood encompass social institutions relating to kinship, family, neighborhood and village, social and kinship networks give opportunity to explore social capital of the *haor* communities. As clearly defined by UNDP, also the livelihood system in *haor* area is a dynamic realm that integrates both the opportunities and assets available to a group of people. Livelihood also depends on interactions with and exposure to a range of beneficial or harmful ecological, social, economic and political perturbations that may help or hinder. There is no exception that sustainable livelihood of vulnerable communities in *haor* area depends on their capacity to cope with, recover from and adapt to stresses and shocks. The idea of social science resembles with the understanding that livelihood extends to include social and cultural means, information, cultural knowledge, social networks, etc. The present study has reviewed these literatures to define various aspects of livelihood.

In this research understanding livelihoods not just mean looking at people's main sources of employment or income. It means looking at all the different activities and choices within the household and community which provide food, health, income, shelter and other benefits. The livelihood options available to individuals and households depend on the diversity of resources, skills and technologies they are able to access. Livelihood resilience means the diversity and security of people's livelihoods so that people have more options available to them. Considering the above issues, the present study focuses on how households sustain their livelihoods and build resilience against critical situations i.e. lean periods of the year and risks i.e. floods by using indigenous knowledge.

2.2.3 Sustainable Livelihood

In a classic 1992 paper, Sustainable Rural Livelihoods: Practical Concepts for the 21st Century, Robert Chambers and Gordon Conway proposed the following composite definition of a sustainable rural livelihood, which is applied most commonly at the household level:

A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term.

The Sustainable Livelihoods literature (Sen 1981, Chambers 1983, 1987; Chambers and Conway 1992, Scoones 1998, Ellis 2000) induced the present researcher conceptualize issues revolving around livelihood dynamics through the 'lens of the poor' for an enhanced resource productivity, and secure ownership of and access to assets.

The important works of Amartya Sen (1984; 1987) form the basis for the inclusion of 'capabilities' within sustainable livelihoods thinking. The contextually dependent concept of capabilities refers to "being able to perform certain basic functioning, to what a person is capable of doing and being" (Chambers and Conway, 1992, p. 4). The ability to feed oneself, one's access to commodities, and the length of one's life, for example, all contribute to one's capability to function (Sen, 1984). Capabilities can also be seen as the 'freedom' of individuals or households to choose pathways to participate in activities that increase their quality of life (Sen, 1984; Chambers and Conway, 1992). The notions of 'well-being' (cf. Chambers 1995; 1997) and 'capability' (Sen 1984; 1987) provide a wider definitional scope for the livelihoods concept. Sen sees capabilities as 'what people can do or be with their entitlements', a concept which encompasses far more than the material concerns of food intake or income. Such ideas represent more than the human capital which allows people to do things, but also the intrinsically valued elements of 'capability' or 'well-being'.

Ellis (1998, 2000) examines the topic of livelihoods through the lens of diversification, which he sees as a rural livelihood survival strategy. For example, there was a shared labor system in the past, but this system is no longer in place so households are forced

to be idle when there is no work in the field. Ellis suggests that diversification is a positive strategy for decreasing vulnerability, supporting asset building and decreasing poverty, while maintaining local natural resources. These benefits accrue because diversification decreases pressure on local resources, enhances people's options, builds individual human capital, increases cash flows to and within rural areas, and promotes 'spatially diverse transactions'. Ellis' focus is on the importance of changing macro-level development policy for supporting livelihood diversification.

To assess livelihood sustainability of *haor* people one has to look at how they are maintaining their livelihoods and understand the dynamics of *haor* livelihood systems and people's strategies. Households of *haor* area manage their livelihood strategies according to the household situations, using different types of strategies in different situations and at different phases in the life course of the household. Furthermore, people develop their livelihood strategies according to the situation they face on the basis of their past experiences (Pennartz and Niehof, 1999). Households use their assets, livestock or savings, or they use social capital to handle or overcome situations or stress.

A sustainable and vibrant livelihood system enables people to pursue robust livelihood strategies that provide, in effect, 'layers of resilience' to overcome 'waves of adversity', consequently enabling people to deal with and adapt to changes, and even transform multiple adversities into opportunities. The sustainable livelihood analysis, as the present study employs, goes far beyond the constricted economic ideas of employment and income, and attempts to bring multi-dimensional issues and complexities centering on the ways of living to the focus of attention.

2.2.4 The Sustainable Livelihoods Analytical Framework

The researcher employed the Sustainable Livelihoods Framework (adopted from Carney, 1998) to analyze the research issues. The framework for analyzing sustainable livelihoods is shown in Figure 2.3

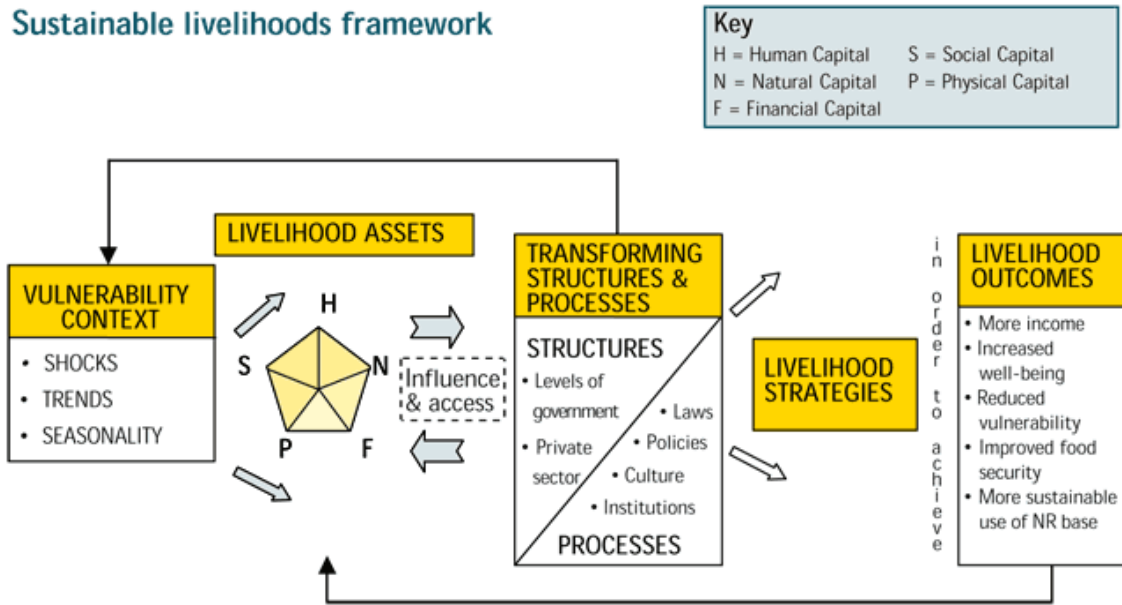


Fig. 2.3 DFID's Sustainable Livelihoods Framework (adopted from Carney, 1998)

The Sustainable Livelihoods Framework presents a number of factors that impact on livelihood strategies and outcomes and also emphasizes the many relationships between these factors. Central to the framework is a pentagon of interchangeable livelihood assets or capitals (i.e., natural, social, physical, financial, and human capitals) that can be utilized for achieving self-determined outcomes of livelihood strategies in order to reduce the vulnerability of households and communities to shocks, trends, and seasonality. Access to the capitals is mediated by transforming structures (i.e., levels of government, private sector, civil society) and processes (i.e., laws, policies, culture, institutions, power relations), which are also perceived to be contributing factors to the vulnerability of livelihoods.

In its simplest form, the Sustainable Livelihood Framework depicts stakeholders as operating in a context of vulnerability, within which they have access to certain assets. These gain their meaning and value through the prevailing social, institutional and organizational environment. This context decisively influences the livelihood strategies

that are open to people in pursuit of their self-defined beneficial livelihood outcomes (Fig. 2.3). The present research employs “Sustainable Livelihoods Framework” as theoretical underpinning to search for broader meaning of findings. This framework is useful to assess the vulnerability context of *haor* area; identify the livelihood assets or capitals *haor* people possess; prevailing social, institutional and organizational environment; livelihood strategies *haor* people deploy; and the outcomes they achieve.

As indicated above the sustainable livelihood analytical framework has some inherent notions: 1. people have resources (capitals) which they use to make a livelihood, 2. the resources are not homogenously distributed across members of the society and hence, there are intrinsic competitions over access to and control over those resources; 3. one's capability to transform multiple resources for livelihood goods and services determine one's livelihood resilience and status in the society; 4. people are subject to a process of interaction among different social actors, and there are obvious influences of policies and multi-layer institutions in determining one's property rights and well-being; and 5. households are subject to multiple sources of man-made and natural negative externalities that impact upon well-being and ill-being (Chambers and Conway 1992, DFID 2000).

As illustrated above the sustainable livelihood framework focuses more on people's strengths, abilities and capabilities than on their weaknesses. This idea resonates with the concept of resilience which also focuses on capability rather than vulnerability. The livelihood framework that the present researcher proposes for vulnerable household emphasizes their access to and control over the natural resources, and their inherent abilities, knowledge, and creativity to construct and shape the world around them.

The concept and theory of resilience, livelihood, and sustainable livelihood have been used in order to formulate a conceptual base for this study. The researcher observed that if the concept of resilience is transformed into a livelihood system, then it can be viewed as the capacity of individuals to tolerate shocks and stresses without compromising livelihood status, and devising strategies for adaptive management and retaining memory through learning-by-doing (Berkes 2007). He further explored that conceptually, sustainable Livelihood, livelihood well-being and livelihood resilience are interconnected and complementary concepts to the understanding of livelihoods.

In this research, household livelihood strategies imply various activities performed by the households to gain and maintain their livelihoods. The nature of these activities depends on the availability of assets, resources, labor, skills, education, social capital and gender. Within a household, members perform different activities in accordance with their culturally defined gender roles and age. Household strategies vary according to historical time, season, and situation. The households determine and design strategies, reviewing the previous strategies and incorporating lessons learned from past experience, sometimes changing their strategies to face a new situation. The present research has attempted to analyse household livelihood strategies considering these issues.

In the present study focus is given on how households sustain their livelihoods and build resilience against critical situations (lean periods of the year) and risks (floods) by using indigenous coping strategies. Based on the theoretical insights from the literature review, a concept of resilience was developed to guide the research and to answer the research questions. It shows how different environmental factors together with risk factors influence the household livelihood strategies and decision-making processes through time, taking the role of gender explicitly into account. At the center of the concept are the household, where strategies are developed and decisions taken to develop and maintain livelihood. This chapter explained relevant concept and theory in order to formulate a conceptual base for the present research. The following chapter deals with the review of literature relevant to the thematic organization of the research.

CHAPTER THREE

REVIEW OF LITERATURE

This chapter deals with the review of literature to identify the research gaps to be filled by the present study. It is found that there have been quite a number of studies conducted in recent years in Bangladesh on various aspects of disaster such as impact of flood as well as other disasters, indigenous coping mechanisms, climate change and adaptation strategies, people's resilience to hazard and so on. But specific studies on household and community resilience to flood hazards using indigenous knowledge with special focus on livelihoods are not very common. Against this backdrop, the main purpose of the present study is to explore resilience of the rural household towards livelihoods in the *haor* area of Bangladesh. Available literature that have been reviewed are mainly focused on Disaster Resilience; Indigenous Knowledge and Coping Strategies; Livelihood and Food Security; Gender issues and Disaster; *Haor* area; and Climate Change Adaptation Practices. In the present chapter, relevant studies, books and articles have been reviewed which are presented below:

3.1 Literatures related to Disaster Resilience

Mahbuba Nasreen (2012) in her book *Women and Girls Vulnerable or Resilient* focused on how rural women and girls in Bangladesh, cope and response to a common most disaster, flood. She addressed several related questions in her longitudinal study: How do women perceive and experience floods? Are they merely vulnerable to floods or do they play an active role in protecting their households? In responding to these questions, a sociological perspective was adopted. The author mentioned disaster related problems affect women more severely than men because of the wider range of responsibilities that they have for their households. Explanation of these phenomena is sought in the economic, cultural and political structure of the country. Factors stressed in this study are the male-dominated structures of a predominantly conservative society and the position of women within the socio-economic context of their households. She observed that although disaster affects all segments of population, there are gender variations to vulnerability and resilience during disasters. The study was the pioneer one about women's experiences to disaster in Bangladesh. While conducting the field study in 1992, there was no theory on how people in flood affected areas respond to or cope with floods. The author did not find any relevant theory due to lack of sociological or

other research related to disaster response in Bangladesh. A grounded theory about women's experiences to live with floods has emerged. The theory indicates that women's gender specific responses to disaster risk reduction should be promoted from capability and resilience perspectives, not from vulnerability perspectives. Nasreen explores how women and girls adopt many strategies during flood which are related to their gender identity and the socio-economic position of their households. It is women's strategies, developed over the years, those are vital in enabling rural people to become forces of resilience to cope with disasters. The researcher applied grounded theory about women's experiences to live with floods in the plain land. However, the present study investigates household's (more specifically women's) responses to disaster risk in *haor* area from resilience perspective. It helps frame the issues under consideration within a system approach. The system approach not only considers intra household but the environmental factors that have influence on household resilience.

A guidance notes by John Twigg (2009) ***Characteristics of a Disaster Resilient Community*** shows what a 'disaster-resilient community' might consist of, by setting out the many different elements of resilience. It provides some ideas about how to progress towards resilience. The characteristics are organized under five thematic headings based on a framework developed by the UN-ISDR. When discussing how to monitor the success of the implementation of the HFA, it became apparent that there was no framework for understanding the impact at the grassroots. To support the promotion of the HFA, particularly at local level and to identify basic characteristics of community resilience the framework was developed. The guidance note emphasized that the 'disaster-resilient community' presented in this note is an ideal, though in reality no community can be free of risk. The five thematic areas are governance, risk assessment, knowledge and education, risk management and vulnerability reduction, disaster preparedness and response. The thematic areas are very broad. Each is therefore divided into components. For each component of resilience, a set of characteristics of disaster-resilient community is provided. These are much more detailed and specific, and they bring users close to reality on the ground. These characteristics help design analytical framework of the present research. The characteristics set out in this guidance note are general ones for all contexts, whereas every location and community is unique. In order to formulate analytical framework of the present research some characteristics have been adapted to the study context.

Mahed-UI-Islam Choudhury (2015) in his thesis ***Wetland-community resilience to flash flood hazards (Bonnya) in Sunamganj district, Bangladesh*** intended to understand the recovery and resilience of wetland-community to flash flood disasters and its associated risks in the north-eastern part of Bangladesh. This study was conducted using a case study approach following an interdisciplinary research paradigm. The researcher found that wetland-community is extremely vulnerable to flash flood hazards - both in biophysical and social terms. However, they possess certain coping thresholds, and are resilient to disaster losses. The research identified adaptive capacity of the local communities has been severely curbed by a number of socio-ecological, economic, and political factors, leading to natural resource degradation, marginalization and exclusion of the poor from common pool resources by powerful groups. The researcher concluded that for building resilience of the community, effective management and access of the poor to natural resources and enhancing autonomy of local institutions are required. This study focuses on role of human agency to recovery from flash flood hazards. The study was conducted focusing on one *haor* (i.e., the *Karcharia haor*). This wetland area may not be representative of the entire wetland area of Bangladesh in terms of the attributes related to flash floods, resource dependency, and other socio-ecological characteristics like power and politics.

Md. Rajibul Alam (2011) in his thesis ***Flood Risks Management in the Haor Region: A study of Local knowledge and Institutional Interventions*** made an attempt to comprehensive study of local knowledge of *haor* people, who apply it to survive with flood risks management along with the arrangement of institutions in *haor* area providing services regarding flood management. The research also tried to prepare a list of suggestions for the effective institutional arrangement in *haor* area so that poor *haor* people can get services regarding flood effectively and timely. The researcher applied questionnaire survey, focused group discussion and key informant interview methods. The study finds out that the *haor* people rely on some unique indigenous knowledge to cope with flood risks. The research scrutinized institutional limitations and prevailing opportunities of flood management system in *haor* area with respect to indigenous knowledge of flood management. Some suggestions have been put out to achieve an effective institutional arrangement so that flood resilient communities are built up in *haor* area.

A paper entitled ***Understanding and Applying the Concept of Community Disaster Resilience: A capital-based approach*** by Mayunga (2007) questions the theoretical understanding of the concept of disaster resilience and looks to raise critical challenges in assessing resilience. The author finds that there are four overlying principles found throughout the definitions of disaster resilience. The definitions examined here are accompanied by some common characteristics- the ability/capacity of a population, the amount of time taken post disaster to reach normalcy, the ability for adaptation in both social and physical forms and sustainability in the sense of long-term survival without decreased quality of life. This paper looks to review the current frameworks for analysing community disaster resilience i.e. “community capital approach.” Cited factors that can reduce vulnerability include economic resources, assets and skills, information and knowledge, support and supportive network, as well as access to services and shared community values. The author discusses that a more holistic framework for determining disaster resilience needs to be taken. Instead of taking the “community capital approach” he suggests taking a “capital-based approach” that looks beyond the community and includes five different forms of capital. This capital-based approach looks at social, economic, human, physical and natural capital. The present study takes into consideration the five capitals to assess capacity of the people in *haor* area.

Understanding community resilience and program factors that strengthen them (2012) is a comprehensive research by International Federation of Red Cross and Red Crescent Societies tsunami operation. Six characteristics of a safe and resilient community emerged from this research. The research that led to these findings is unique in that it is grounded in the community’s own identification of characteristics. The six characteristics of resilient communities identified in this research include- a safe and resilient community is -- knowledgeable and healthy; is organized; is connected; has infrastructure and services; has economic opportunities; can manage its natural assets. It is mentioned in the study resilience is achieved within a system (economic, infrastructure, ecological, social) that includes multiple activities, interactions and relationships. The study also identified five key themes critical to strengthening community resilience. Meeting basic needs (food, water, shelter, health) is a prerequisite to building resilient communities. Building assets (physical, natural, financial, social, political and human) are seen as critical 'buffers' to withstand shocks and stresses. However, the study emphasizes assets and resources alone are insufficient. It is the

qualities of those assets which determines the safety and resilience of a community. The study turns to discussing assets need to be robust, diverse, well located, and equitably distributed. For example, a community may have houses, but they need to be strong enough to withstand flood or cyclone. The study concludes that the capacity of the community to adapt to change, self-organize, act and learn from experience, factors which ultimately enable communities to mobilise their assets and resources. The present study explores household and community resilience within a system approach of resilient communities.

Zubyda Siddika (2008) in her study on ***Women's Livelihood Resilience and Adaptive Options for Climate Change*** begin by exploring the perception of women regarding their livelihood option and capacity to cope with climate change, and prioritize the adaptation options to reduce vulnerability. Flood prone Saturaia upazila in Manikganj district was selected as the study area, and agriculture and livestock sectors have been considered. Participatory rural appraisal approaches were used for data collection. The study explores that direct and indirect impacts of flooding have imposed negative effects on vulnerability. The community's resilience to cope is through changing food habit, diversion of income options, and depending on credit loans from NGOs or local money lenders. However, the study did not thoroughly explore various capitals of vulnerable community.

3.2 Literatures related to Indigenous Knowledge and Coping Strategies

The article published in Grassroots Voice by BARCIK (2010) on ***Cyclones and the Rakhain: Indigenous Perception, Prediction and Survival Strategies*** by Mohammad Tareq Hasan, draws on indigenous knowledge-based perception, predictions and survival strategies of the Rakhain community in the coast belt area during natural disasters. The author described that Rakhain Community use their indigenous knowledge to predict natural disasters as well as to mitigate losses during disaster. Rakhains rely upon their cumulative experiences of the earlier generations, which is evident in the structural adjustments and specific form of housing, prediction of cyclones using different indicators and also in their ability to sustain before the arrival of any outside help. An attempt has been made to reveal their indigenous perception, prediction and survival strategies at pre, during and post cyclone phases. The study observed that Rakhains have accumulated knowledge to perceive, predict and to survive cyclones.

The indicators they use for early warning include: wind direction; heat/warmth of the wind; roar from the sea; behavior of certain fishes in the sea; behavior of insects. Ecofriendly house of the Rakhains provides structural protection and helps them to sustain against major damages during cyclones. The study discussed that the Rakhains' indigenous knowledge guides their adaptation with the cyclone, which have been proved by their survival experiences. Ecological aspects and quality of this knowledge vary among the community members depending on gender, age, location of residence and occupation. The author concludes socio-economic changes are slowly eroding vast knowledge capital of Rakhains, which for so long has maintained their resilience against cyclones. Like the Rakhains, the community who has a strong sense of solidarity and harmony possess more knowledge on disaster mitigation. Though all the people in *haor* area are not from ethnic community but they have lived in this region for generations. So, they also have accumulated experience of traditional knowledge.

The research by M. Hammadur Rahman (2010) on ***Ultra Poor Households' Flood Coping Strategies towards Food Security*** in Two Flood Prone Regions was undertaken to have an understanding of ultra poor people's flood coping strategies towards food security. The research identified commonly practiced flood coping strategies towards food security followed by the ultra poor such as relying on casual labor for food, discontinuing children's education for saving money or alternative employment, selling cattle and/or livestock, spending money from deposit, borrowing money or food from neighbors/relatives, relying on help from relatives and neighbors, selling advance labor, involving family members in income earning activities, and selling land and other assets. The study mainly focused on flood coping strategies towards food security. However, it did not explore in detail coping strategies for other aspects of livelihood. The present study focuses on overall livelihood aspects.

Niaz Ahmed Khan (2000) in his thesis ***"Popular Wisdom, Popular Lives"*** provided an overview that interests in common people's day to day wisdom and resource use technologies have moved centre stage in the recent years. These localized and socio-culturally bound knowledge and technologies often represent examples of cost-effective and sustainable survival strategies for poverty alleviation and rural development. Niaz proposes local cases and examples of popular wisdom or Indigenous Knowledge, therefore, need to be documented and disseminated for designing appropriate development policies and actions on a broader scale. This study focuses on some

issues of conceptualizing and documenting IK in Bangladesh, together with the particular wisdom and practices relating to biodiversity, health, agriculture, water, watershed, housing and disaster management. The author suggests knowledge and practices of local communities may offer valuable lessons for policy discourses, and therefore, deserve to be integrated into the mainstream development agenda. Niaz argues IK's main strength lies in the fact that it is deeply anchored on the socioeconomic fabric, and therefore, enjoys wide social acceptability. Second, indigenous practices have generally problem-solving (down to earth) focus. These are often low cost, time efficient, flexible and adaptive. In the face of the gradual disillusionment with the mainstream development and planning models (e.g. modernization, transfer of technology, blue print planning), a more humane, democratic and participatory mode of development has become increasingly popular. Traditionally, popular wisdom has most effectively been used in mitigating the problems and difficulties which surround popular lives, i.e. the life and living of disadvantaged local (rural) communities in the developing societies.

Selina Hakim (2012) in her study ***Reduction of Flood Risk by Indigenous Knowledge*** tries to identify the livelihood practices of the *Char* dwellers. For this dissertation the researcher selected Alekdiar Char at Shibalay upazila in Manikganj district. The author found the *Char* dwellers face flood and river bank erosion almost every year. The main aim of this study was to explore the use of indigenous knowledge and practices in *Char* People to reduce the impact of flood disasters. The research showed that the community people have knowledge regarding the changing climate and are putting their own efforts in order to cope up. They have their own ways of forecasting and early warning systems. The author observed, the indigenous practices which proved to be useful in the past years were not enough to cope with the rapid change in climatic patterns. The researcher proposes investigation of natural hazards from a people-centered perspective: that is what the residents know about natural hazard risks and what they believe and do about them in a given situation. This study documented preparedness strategies undertaken as preventive measures from traditional knowledge mostly involves protecting household and assets, securing shelter, protecting livestock, protecting harvest, storing food, fuel and preparing portable stove, preparing emergency communication and transportation. The author describes nature of floods as experience by *Char* people is changing in terms of their frequency, intensity, time of occurrence (relation to cropping season) and predictability. She argues this changing nature has an

impact on people's ability to cope. Social capital e.g. reciprocal support among the neighbors, support from immediate family members, greater kinship network are the vital safety net for the *Char* people in coping with recurrent flooding. However, people are increasingly dependent on the formal institutions, particularly in the context of changing nature of flood. The author concludes that the focus on local knowledge and practices (especially adaptation strategies) provides an entry point for reversing this tendency. It enables internal and external organizations to explore what people's strengths are and what they actually do know, that is to build upon community resilience. The study recommends build upon community resilience based on people's strength. Similar exploration has been made for the *haor* area.

Monzu Morshed (2007), for his study on ***Indigenous Coping Mechanism in Combating Flood*** collected primary information from the flood affected people of Sirajganj and Gaibandha. The study evaluates the knowledge that the risk exposed people mentally possess concerning flood, their indigenous perception and prediction capacity, and their ability to understand the recovery needs and future risks from it. According to the author, most households employ a few common coping strategies in response to a shock or abnormal event. Regarding flood responses, the author states: many poor families tend to stay back in their marooned dwellings, often in raised platforms inside the dwelling or on rooftops to avoid moving out and risk the theft of valuables. Living within the marooned homestead or opting to relocate to a neighbor's or a kin's house during a flood is a family level response while opting for relocating temporarily in a flood shelter is largely a community response. With regard to recovery and rehabilitation the research explores that flood affected people are keen to get back to normal life. Sometimes, neighbors help one another towards getting back to 'normal life'. Interpersonal relationship and kinship also play vital roles in helping some flood affected people to find their feet again. Community effort can be useful in repairing partially damaged houses, often by means of collective free labor supporting one another. Well-to-do people sometimes employ poor neighbors in restoration activities, thereby offering temporary employment. Through this study, the researcher turns to explore the wisdom of community in combating flood in their local context. The study clearly explains the social capital of the flood affected people in two districts. However, the cultural factors and values embodied in local level flood coping strategies were not explained adequately.

Zahir Ahmed (2000) in his article ***“The conceptualization of indigenous knowledge”*** explores the analysis of indigenous knowledge system that is of growing interest within anthropology and development studies. The paper reviews development has relied exclusively on one knowledge system, the modern Western one which has marginalized and disqualified non-Western knowledge systems. By critically examining knowledge in the development domain in anthropology, this paper raises some conceptual and practical questions regarding the nature of ‘local knowledge’. Ahmed asserts that indigenous knowledge systems include people’s values, norms, perceptions, world views and so forth. He reminds like Western science; indigenous knowledge is the result of experimentation of over centuries. Hence, indigenous knowledge is not static but ‘dynamic’. This means indigenous knowledge is inevitably shared, borrowed and adopted from different forms of knowledge including Western knowledge. There can be no clearcut distinction between Indigenous and Western knowledge. The question in understanding indigenous knowledge” in the development situation is the central to Ahmed’s (1999) work.

The article published in Grassroots Voice by BARCIK (2010) on ***“Sacred Trees and Plants in the Wetlands of Bangladesh: Looking from an Anthropological perspective”*** by Farhana Yeasmin is a humble attempt to prepare an inventory of the sacred trees and plants in wetlands of Bangladesh and examine the values attached to them. In doing so, data have been collected from a selected site of the country’s wetlands zone and have been analyzed from anthropological perspective. The author observed that there are botanical studies or studies from economic and other dimensions but no comprehensive study has been made to uncover different values that people attached to the flora. The paper attempted to show the types of values the people attach to trees and plants which include religious, medicinal, commercial or economic and ancestral or emotional. The researcher noticed that the religious value is more prominent among the Hindu population while the commercial value is dominant among the Muslims. Again, the medicinal value of certain plants and trees are found among both the Hindus and the Muslims as the emotional value is common to both. Often high emotional value is attached to selected trees. Emotions are mainly manifested through special care and appreciation of fruits of those trees. Usually, the trees planted by father or grand father are a matter of pride to the owners and children are always reminded about the planters and asked to show due respect. The present study has been

conducted among the *haor* people to know their own way of assessing natural resources, particularly the plants and trees.

The paper entitled, ***Endowed Wisdom: Knowledge of Nature and Coping with Disasters in Bangladesh*** by Hasan Shafie et al. under the auspices of CDMP-I (2004) mentioned that local communities have accumulated over the centuries enormous indigenous knowledge on how to sustainably utilize their natural resources engaging a variety of innovations to deal with natural disaster. Community people's experience, knowledge base and response practices regarding disasters provide the subject matter of the book under review. The book aims at exploring the indigenous knowledge and coping strategies found in the regions prone to flood, flash flood, water logging, salinity intrusion, cyclone and drought. Good community coping responses related to flood and river bank erosion were collected from different locales of seven flood plain districts and a coastal district. Indigenous knowledge bases of different study areas have been proven to help contribute to the community's ability to mitigate the impact of regular flood and river bank erosion crisis. Significant ethnographic information on the episodes of good community coping responses related to flash flood is described in this document. The hazard pattern, season, vulnerabilities and different coping are sketched here. This document provides examples such as the indigenous knowledge of housing pattern reduces the vulnerability of flash flood. They plant different grass and plants in the homesteads and river banks for protection of their individual and community properties. People grow many food grains in different fallow and pocket lands and plants of different vegetables around homesteads for reducing the vulnerability. This document reveals good community coping responses related to flood and river bank erosion from different locales. However, it did not focus on women's role in maintaining household livelihoods.

Carlo del Ninno et al. (2001), in their research report on ***The 1998 Floods in Bangladesh, Disaster Impacts, Household Coping Strategies, and Response*** explains that natural disasters such as prolonged droughts, floods, and cyclones threaten food security in many developing countries, directly reducing agricultural production and food supply. Moreover, these disasters can disrupt local economies and reduce households' access to food by destroying infrastructure and private productive assets, reducing employment opportunities, and lessening the profitability of private enterprises. This report combines a careful analysis of government policy and private food grain markets with a detailed survey of 757 households in rural Bangladesh in

1998. The impact of the floods on household assets, employment, consumption, and nutritional outcomes has been analyzed using the micro-level survey data. This report also examines in detail how the floods affected food security in Bangladesh at the national and household levels and draws lessons for the management of future natural disasters in developing countries. At the heart of this analysis is the food security triad of availability, access, and utilization. Thus, the report not only examine food production, imports, government interventions, and prices, which determine availability, but place a major focus on households' access to food (which was seriously threatened by loss of assets and income-earning opportunities) and utilization of food (including intra household food distribution). The authors show household access to food, however, requires not only well-functioning markets or effective government distribution programs, but also sufficient resources to acquire food (obtained through current incomes, transfers, savings, or borrowing). Intra-household distribution and the health environment ultimately determine individual consumption and nutritional outcomes, as well. Though the study focusses on household's access to food, utilization of food, resources to acquire food but, it did not shed sufficient light on household coping strategies or knowledge during food crisis.

The paper ***Indigenous Knowledge on Disaster Mitigation: Towards Creating Complimentarity between Communities' and Scientists' Knowledge***, by Man B. Thapa, et al. Published by UN-ISDR (2008) focuses on landslide mitigating techniques that exists and are practiced in Nepal. The study pointed out that local communities possess a range of traditional measures to mitigate landslides. For example, in agro-forestry sector instead of heavy trees, communities in the hills prefer to grow shrubs, bushes and grasses in and around the villages. Farmers perceive that small trees, shrubs and grasses in bounds and steep areas protect their farms from soil erosion and landslides. Farmers in the hills as well as in Terai increase crop intensity through mixed and inter-cropping in order to increase and diversify harvest. In addition to these various mitigation techniques, the communities also have the ability to recognize warning signs for impending landslides. For instance, if new faults appear in the earth's surface, it can be an indication of landslides in the immediate future. Furthermore, a change in the posture of the tree in any vertical or horizontal angle may be an indication of landslides in or around the area. After almost a year of observation and interaction with the local people in the eight villages, it becomes apparent to the researchers that not all

communities hold an equivalent range of knowledge on disaster mitigation, as can be expected. Such knowledge has been found to be stronger in homogenous and tribal communities than in migrant communities. Communities that have a strong sense of solidarity and harmony possess more knowledge on disaster mitigation. The more self-reliant and relatively endogenous a community is, the higher the chance that it possesses a rich stock of indigenous knowledge. This paper mainly discussed about tangible precautionary measures for landslide and flood risk reduction. However, it did not emphasize social, cultural and values related information.

Rashid (2000) in his article ***The Urban Poor in Dhaka City: Their Struggles and Coping Strategies during the floods of 1998*** 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. They 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 author explained women and children are the most vulnerable during the disasters. During these particular floods almost, all of the wells were covered by the flood waters. A number of women managed to cope by purchasing water from individuals who owned deep wells. The study explored the difficulties women faced during 1998 flood. The current study explores not only difficulties but resilience of women.

Vulnerability and Coping Strategies of Women in Disaster: A Study on Coastal Areas of Bangladesh by Md. Rabiul Islam (2010) was conducted to know the vulnerability of women and their coping strategies during disasters. The researcher tried to find out the range of women's vulnerability in coastal areas during and after disasters and tried to know their coping strategies. The study explored though disasters do not discriminate, the socially constructed role of women makes them the vulnerable group during disaster. As revealed by the study the differentiated impact of disasters on men and women is primarily caused by the existing gender inequalities. This study brought the concept despite the limited resources in coastal areas women play a significant role in food preservation to combat the adverse situation. The author explains that women preserve dry food, fuel, candle, matches, ropes and medicine at home and prepare portable mud stoves for future use. They often collect firewood to store in dry places, store fodder for domestic animals and engaged in drying fish. Women on coastal lands are engaged through the entire process of crop production. In post disaster period,

women are also engaged in homestead gardening. The author observed that disaster has its devastating impact on all areas of life- physical, psychological, social and emotional and all these reactions are interlinked. The present study also explores in detail these intertwined aspects of women's life.

Md. Saiful Hossain (2009) in his study on ***Design and Dissemination of Community Oriented Flood Warning Message*** argues that Flood Forecasting and Warning Center of Bangladesh Water Development Board disseminate flood warning as a national source. But the message is not fully satisfying the needs of the vulnerable communities and disaster managers as the contents are not well understood or reach the community at the right time. The study proposes community oriented early warning dissemination system as an adaptive measure to mitigate the declining situation within a tolerable limit. It suggests that warnings should be in Bangla and contain data of expected rise or fall of existing water level with probable peak flood level and should be communicated in feet and inches in addition to meters and centimeters. Though the study proposes community friendly early warning system but, it does not clearly demonstrate traditional knowledge and practices of the community people with regard to early warning.

Mahbuba Nasreen (2000) in her article ***“Indigenous Coping Mechanisms The role of Rural Women During Non-Flood and Flood Periods”*** discusses indigenous coping mechanism of rural women. She describes coping mechanisms of rural women such as water collection, food consumption, food allocation and health care techniques during flood and non-flood period. The assets, resources and social network of rural women are also discussed for both flood and non-flood period. It is found that these indigenous coping techniques of rural women are important means of survival for the rural households. The author argues that although poor rural women have very few options open to them to overcome their problems, their roles in disasters are obviously not simple: they relate to a complete range of socio-economic activities. She observed that it is women's strategies, experience and indigenous knowledge developed over the last few years, are vital in enabling the people to cope with floods. The study found that during floods women adopted many coping strategies which were related to their gender identity and the socio-economic position of their households. The strong division of labor in the society forced women to do certain tasks, for example, collect water, aquatic plants and medicinal herbs for their households' survival which led them to compromise their *purda*. Poorer women drew upon stores or savings, sold their very own assets,

adjusted cooking and consumption patterns, sacrificed their own meals for their husbands and children and drew upon their social networks. The author concluded these indigenous coping strategies were vital for the survival of the poor households and only adopted by women.

Abdul Momen Miah (2004) in his study ***Indigenous Technical Knowledge: Unexplored Potential for Sustainable Development*** explains efforts to achieve sustainable development in agriculture should take into account indigenous knowledge and technologies to reduce reliance on scientific technical knowledge. The author assumes that most of the indigenous technical knowledge and practices of farmers are fundamentally sustainable. The outside knowledge is incorporated into the store of indigenous knowledge only if it is compatible and considered relevant by the traditional practitioners. Innovations based on scientific technical knowledge have been widely adopted by resource-rich farmers but this has not been possible for resource-poor farmers, a larger segment of the rural population, who are dependent mostly on indigenous technical knowledge. Some indigenous knowledge and practices mentioned in this study include: the use of bamboo sticks or tree branches for insect control; the use of neem leaves with its active insecticide when storing seeds to deter insect attack; the laddering of standing wheat crop and pulling of ropes across rice/wheat fields early in the morning to moisten the soil with falling dew drops; the intercropping of garlic with potato; the use of ash in vegetable cultivation, which contains all essential minerals (in varying proportions) and adds to the water-holding capacity of the soil; and the application of poultry excreta to vegetable gardens to provide nitrates. The author reminds we should encourage the identification, collection and documentation of indigenous technical knowledge before much of it is lost; research should be conducted to determine the performance potential of indigenous technical knowledge. He concludes that necessary modifications and improvements to indigenous technical knowledge should be made according to scientific findings and verified in different locations.

M. Millat-e-Mustafa (2004) in the chapter ***“Towards an Understanding of Indigenous Knowledge”*** provides a background to indigenous knowledge. It looks at various definitions and discusses how indigenous knowledge contrasts with scientific knowledge. The paper turns to discussing indigenous knowledge is especially relevant to sustainable development planning. It is locally appropriate, having been tried and tested through

time to meet the demands of local conditions, and it is fully integrated into a region's social institutions. The study explores researching indigenous knowledge from the perspective of the demands of formal science throws up a number of challenging issues. Firstly, indigenous knowledge is difficult to categorize since it is holistic in nature, not disciplinary like conventional science. Secondly, indigenous knowledge systems have been most studied by social anthropologists who have immersed themselves in cultures other than their own in order to comprehend the knowledge and values of those societies. Thirdly, there is the danger that local knowledge may be interpreted in terms of formal scientific concepts, of agriculture and economic. This is grossly distorting and what anthropologists call 'ethnocentrism'. Some researchers portraying local practices in terms of their own external perspective of technical expertise without having a sympathetic understanding of the cultural conditions that have informed their evolution.

Fourthly, informants may find it hard to give formal accounts of their knowledge and how they use it. People transfer much knowledge between generations by tradition learnt and communicated through practical experience and are not familiar with trying to express everything they know in words. Fifthly, problems of communication are central to indigenous knowledge research. The familiarity and skill with which words are used to express concepts will affect the status and quality of knowledge elicited through interview. The author reminds it is important for development workers and researchers to recognize that indigenous knowledge can vary greatly within a group. Gender affects the knowledge held by an individual, particularly where there is a sexual division of labour. The author showed quite explicitly indigenous knowledge is now recognized as an under-utilized resource in rural development. Understanding indigenous knowledge can help to determine whether or not external scientific alternatives are appropriate, and if so how they may be adapted, and how best to introduce them. It will be by comparing and integrating scientific and indigenous knowledge that the most appropriate solutions will be found for many development problems.

Paul Sillitoe (2000) in his article ***Some Comments on Science, Indigenous Knowledge and The Poorest of the Poor in Bangladesh*** observed that the need for indigenous knowledge research is emerging with the participatory movement. Paul explains faith in science and technology promote the view that 'folk' knowledge is inferior, and in need of change. He argues it is indisputable that local people will be well qualified to define problems, and will be experts on their soils, crops, pests and so on.

We have something to learn from them. Furthermore, scientific knowledge may not be relevant for some problems, and may even worsen them by overlooking local issues. This study revealed that far from being stagnant and closed-minded, indigenous knowledge is flexible, adaptive and innovative. Paul discusses we should beware interpreting and testing local experience and knowledge according to our canons alone, reproducing our dominant world view, which may be misleading, even inimicable to the interests of the poor. The author showed indigenous knowledge research should concern itself with the entire socio-cultural milieu in an attempt to pinpoint ways that scientific and technical research can benefit the poorest without the wealthy hijacking it. This brings us to a central issue in participatory development: empowerment of the poor. Paul concludes the campaign to mainstream indigenous knowledge in development has only just started, and he stressed on addressing both the scientific-technological and socio-political dimensions.

Niaz Ahmed Khan, Sukanta Sen and M. Millat-e-Mustafa (2000) in the short exercise ***A Primer on the Documentation of Indigenous Knowledge in Bangladesh: The BARCIK's Experience*** intend to raise some preliminary issues concerning the documentation of IK in the country. They begin with a working definition of IK, and subsequently move on to examine the current state of literature in IK, followed by an analysis of the problems associated with its documentation. IK essentially connotes a holistic system of knowledge, comprising of values, concepts, beliefs and perceptions, which is naturally located amongst people living in a local (often rural) environment. The authors found IK is typically originated, augmented and transmitted in relation to the local people's diverse and complex livelihood and survival strategies. It entails a wide range and variety of elements including forestry, medicine, linguistics, botany, zoology, agriculture, handicraft, pastoral studies, ethnology, and environment. The authors examined some major problems and constraints on the process of IK documentation in Bangladesh: IK is mostly found in rural areas in unwritten form and in informal conventions. There is serious gap in communication and contact among the (limited) persons and institutions working in the fields of IK exploration and documentation in Bangladesh. The general level of awareness about IK among majority of the academics and development activists is still low in the country.

The paper entitled ***Indigenous Knowledge System: A Development Paradigm in Anthropology*** by Ahmed Fazle Hasan Chowdhury (2000) emerges from a concern

about boundaries between anthropology and other social sciences dealing with development issues and proposes an alternative paradigm which is distinctively anthropological. This study reviews over the last three decades, research on underdevelopment has been dominated by three major schools of thought, namely: i) 'Growth Model' or 'Stage Theory'; ii) 'Modernization Theories'; and iii) 'Dependency Model' or 'World System Perspective'. He argues while economic growth is an essential component of development, it is not the only component involved. Many failures of the development policies have arisen precisely because these non-economic, cultural dimensions (quality as opposed to quantity) have been undermined. The author argues experience has proved that when poor nations are pushed into the adoption of western production methods and consumption standards, traditional economies suffer irrecoverable setbacks. It destroys the possibilities of self-reliance and self-development. This paper forwarded the poor of the world cannot be helped by mass production but only by production by masses. The technology of mass production is inherently violent, ecologically damaging and self-defeating in terms of non-renewable resources, while the technology of production by masses is conducive to decentralization, compatible with the laws of ecology and designed to serve the human beings...small is beautiful, free, efficient, creative, enjoyable and enduring.

According to the author today many anthropologists recognize that anthropology can make a substantive contribution to development planning using an indigenous knowledge systems approach. We seek to reverse the patterns of development. The thrust of our argument is that 'development from below' is a more productive approach than that from above, and an essential ingredient is indigenous knowledge. The point of development anthropology today centers around the basic issue that each culture has its own internal dynamics that can be developed from within in accordance with its indigenous tradition and values. The paper reviews for a community to choose progress it must not be introduced from outside. The choice must be made from within. Unlike other social sciences, anthropology goes beyond the realm of material development; it incorporates enrichment of culture too. The building of a participatory society requires freedom as an essential condition to develop the capacity to organize itself. Local autonomy, self-reliance and socially effective participation at the village level are inalienable parts of that freedom. The indigenous knowledge system approach, as an appropriate tool, can be applied for solving development problems.

Mohammad Nurul Amin (2000) in the paper "***Potential Use of Indigenous Knowledge in Sustainable Conservation of Plant Diversity in Bangladesh***" examines the community information on present state of plant diversity and vulnerability of the species with medicinal importance in tribal communities of the Barind region. A preliminary survey on biodiversity status of medicinal plants was conducted among the ethnic communities (Santals and Mahalies) inhabiting in four *paras* under, Godagari Thana, Rajshahi District. The survey results obtained through the use of community experience indicate that vulnerability of the ethno-botanically important plants increases in a linear mode. Habitat loss due to agricultural expansion and over exploitation are the main causes of the present state of species vulnerability. The author provides us with complete overview that the ethnic communities not only know about various uses of the plant diversity but they also aware about biological aspects of plants e.g. growth, flowering time, seed formation, propagation method, useful parts and varietal/genotypic differences in indigenous uses. The author shows the ethno-botanic Indigenous Knowledge is, therefore, very effective for planning and implementing conservation programmes. The ethnic community's livelihoods are dependent on using local biodiversity resources. Therefore, their indigenous knowledge is of immense value for identifying rare and endangered species and their lost habitats. In depth discussion is provided that Indigenous Knowledge has two components, the system (knowledge) and the material (plants/crops/foods/medicines) or event (floods/droughts/tornadoes/disease outbreaks) on which the system (knowledge) is based, they are collectively called the indigenous knowledge system. Both the components of the indigenous knowledge system are independent, if the material (e.g. plant with ethno-botanical uses) is lost there will be practice of the particular system which based on that material or event, i.e. the knowledge will be eroded/extinct from the community life. In other words, if an indigenous culture/knowledge dies, any plant taxon dependent upon that culture for survival somehow goes extinct and there has been an implied relationship between indigenous knowledge and plant taxon in local community life. In conclusion, the author stress as ethnic perception of a particular plant taxon is very important for opting conservation strategy, therefore, indigenous knowledge of rural/tribal communities can play a pivotal role in conserving plant diversity in general and ethno-botanically recognized species in particular.

In a recent study, titled ***Flood proneness and coping strategies: experiences of two villages in Bangladesh***, Paul and Routray (2010) presented a descriptive analysis on flood coping strategies followed by the people of two flood affected areas (Gopalganj and Sirajganj districts) after 2005 floods. Although the study focused strategies on all aspects of livelihoods (i.e. saving human lives, saving household items, saving shelters, protecting crops, protecting poultry and livestock, protecting fisheries, food security and water, health and treatment, eating behavior, and other areas), majority of the coping strategies considered in the present study were also identified. But no ranking or quantitative analysis was done to have understanding on severity of these strategies. Brief descriptions of the strategies towards food security have been made in this study.

The article ***Indigenous Knowledge Research on the Floodplains of Bangladesh: The Search for a Methodology*** published in Grassroots Voice, BARCIK by Paul Sillitoe, Peter Dixon and Julian Barr (2006) states that farmers have an intricate and detailed knowledge of the environments from which they gain their livelihoods, that they both experiment and innovate, and that such indigenous knowledge can be a positive resource for Natural Resource development. Since the 1980's there has been a growing recognition that indigenous people have their own effective 'science' and resource use practices, that is their own Indigenous Technological Knowledge (ITK), developed over many generations. This article brought the concept to understand indigenous knowledge and management practices and to grasp the rationale behind these practices with a view to determining natural resource development constraints within their socio-cultural context. The authors show one functional justification for Indigenous Knowledge (IK) research in development contexts is that appropriateness and uptake of technical interventions based on scientific understanding of the world is likely to be enhanced if Indigenous Knowledge is taken into account. Another justification is that, together with participatory practice, appropriate and sustainable technical interventions can be developed that empower local populations, giving them a high degree of 'ownership' of the technologies. The authors indicate that research aimed only at technological solutions is unlikely to lead to the development of sustainable livelihood systems. Research into Indigenous Knowledge issues can assist in integrating technical research into the wider socio-cultural and agro-ecological environment. It is necessary to integrate social science into the research of bio-physical scientists to access the farmer knowledge side of this equation. The authors conclude there are domains where

Indigenous Knowledge has an important functional role to play in informing and correcting externally-derived technical interventions (i.e a role for Indigenous Knowledge in adaptive technology transfer), significant domains where Indigenous Knowledge is deficient and where science can take the lead (i.e. a role for science), and others where a shared input from both would seem appropriate (i.e. a synergistic partnership). Likewise, the article tried to grasp rationale behind indigenous practices of the farmers, the present study attempts to grasp rationale behind similar practices of *haor* communities.

A report on ***Good Practice, Community-Based Disaster Risk Reduction*** by Mercy Corps (2009) has identified ten areas of good practice based on their learning and continual community feedback. Mercy Corps began working in the field of community-based disaster risk reduction in 2007, focusing on flood-prone areas and introducing capacity building, early warning systems, small-scale mitigation measures and school safety through peer education. This report identifies ten risk reduction practices which were successfully implemented in the pilot communities and are replicable elsewhere. Its objective is to encourage knowledge and experience sharing among communities, organizations and other Disaster Risk Reduction (DRR) stakeholders for the benefits of all those vulnerable to natural disasters, especially floods. The ten practices described are street drama as a social empowerment and awareness tool; bottom-up DRR planning; the establishment of emergency and maintenance funds; the innovative development of information, education and communication (IEC) material; search and rescue; local resource-based bio-engineering interventions, cross-cutting issues (gender and social inclusion), capacity building, school safety and young rescuer clubs, and community-based Early Warning Systems (EWS). The good practices mentioned in this report mainly based on project piloting experiences. It tells about the approach of community-based DRR but did not demonstrate any specific example of indigenous knowledge.

Omar Farook (2006) in his study ***Coping Mechanisms at Char Communities with Reference to the Persons with Disabilities: Case study of Sirajganj*** identified the *Char* lands of Sirajganj are the most vulnerable in this flood prone district. The researcher documented the coping mechanisms of the *Char* people during flood, focusing especially on those with disabilities. It also researches the implication of flood occurring trends, indigenous knowledge in coping, and the perception of the community

about the government's safety net, especially on risk reduction fund program. The findings are identified through the different terms of physical, psychological, value and dignity, behavioral and organizational patterns. Activities concerning housing, agriculture, food consumption, water and sanitation, access to finance, livestock, social status etc. are found to vary according to gender, people with disabilities and normal community people. The study mainly focuses on Persons with Disabilities (PwDs). It explores vulnerabilities of PwDs however; their capacities are not adequately identified.

M. Khairul Alam (2000) in his article ***Indigenous Knowledge at Local Level Environment Management*** discusses different issues related to indigenous knowledge which place an emphasis on the perceptions about plants for different uses by some hill tribes from Bangladesh. According to the author, the forest people perceive themselves as part of the ecosystem and their survival is linked with it. He identified some indigenous practices e.g. water conservation, storage and harvesting in the dry season, local flora and food plants, tree felling and management by hill people, choice of fuel wood by hill people, site identification by soil texture, gully control by bamboos, etc. He pointed out that indigenous knowledge is dynamic, evolving to suit changing circumstances and remaining relevant to the groups' socio-cultural make up. It may help the process of adoption of technology to local needs with modification, and at the same time preserve the value and local knowledge. The author concludes studies of indigenous knowledge may provide important insights into appropriate technology for sustainable environmental development.

Mizan R. Khan (2000) in his view point ***Convention on Biological Diversity (CBD), Traditional Knowledge and Bangladesh*** asserts that over the last several years, biodiversity has emerged as an issue of global concern because of its rapid reduction and extinction worldwide. He explores that the loss is attributed to the prevailing socio-economic factors that encourage exploitative development, while discouraging conservative resource use. The author pointed out that to promote the cause of conservation, among other instruments, is the use of traditional/indigenous knowledge of the local indigenous communities. As revealed by the paper, local communities have lived in perfect harmony with nature and have substantially contributed to the conservation of the richness of their biological surroundings for centuries. Life on the planet has been sustained by the contribution of these knowledge systems in the development of agriculture and medicine. This has been treated as part of the

intellectual common goods for the welfare of the humanity. Poor rural communities depended on the surrounding ecosystems for their livelihood.

Mahfuzul Haque (2000) in the study *Indigenous Knowledge and Practices in Disaster Management in Bangladesh* explores the value of rich heritage of indigenous knowledge and practices, much of which has been lost due to their non-documentation. He examined people in disaster-prone areas still nurture such knowledge in their myths, beliefs and traditions. Haque explores how the people of rural Bangladesh have developed through a process of innovation and adaptation a variety of coping-strategies and techniques that are fine-tuned to the local environment, economy and socio-cultural system. This article examines the coping strategies of people in disaster-hit areas should be documented for their potential utilization in other parts of the country. Haque argues it is evident that disasters like cyclones, tornadoes and tidal surges cannot be controlled. They can, however, be better managed and casualties can be reduced. Haque reminds improved management strategies include: better management of pre-disaster, during and post-disaster situation; improvement of early warning systems; faulty warning systems must be corrected and made user-friendly; precautionary measures are to be improved (e.g. safe refuges, cyclone shelters, motivation and awareness raising); food emergency plan considered in advance; more emphasis on awareness-raising than on infrastructure development.

In addition to the above measures, Haque further explains that it is crucial that indigenous knowledge and practices are promoted. This would include dissemination of local people's knowledge in managing disasters, replication of local roof designs in coastal area, and the plantation of local varieties of plants and trees, etc. In this regard, the author mentioned that in Sandwip Island people plant *hurma* trees, which are very strong and can withstand many tidal waves. Many people's lives were saved in cyclones and tidal surges with the help of mangrove trees, like *Koyra* and *Sundari*. The author asserts that coastal people are able to predict the approach of cyclones from the movements of ants and rats. Boatmen can predict the advent of a *tufan* (cyclone) from the temperature of the wind. People in the erosion hit areas of *haor/baors* (a depression where water accumulates) in Sunamganj district plant *Chaila* grass in and around their homesteads in order to halt the wave action that continuously erodes their homes. The author shows the survival patterns of people inhabiting a *haor* are unique in the sense that they have learned from nature how to live in a hostile situation. The author stressed

indigenous knowledge and practices are to be promoted in flood management. Emphasis needs to be placed on social capital. The author concludes there is a need to consult local people and investigate what coping strategies, they are utilizing in the face of natural disasters.

Paul Sillitoe (2004) in his paper entitled ***Cultivating Indigenous Knowledge on Bangladeshi Soil: An Essay in Definition*** describes Indigenous knowledge may refer to any understanding held collectively by a population, informing interpretation of the world, currently in development particularly that pertaining to natural resource management. He further explains that it is conditioned by socio-cultural tradition, being culturally relative understanding inculcated into individuals from birth, informing how they interface with their environments. The author emphasizes the definition of indigenous knowledge is no straightforward endeavor in rapidly changing contemporary societies subject to the forces of globalization. No ecological system is static. Any indigenous knowledge has of necessity to accommodate to changes as they occur. The study is concerned with the fact that indigenous knowledge is eclectic and hybrid, dynamic and continually evolving, presents us with methodological challenges, of how to document it without petrifying and so distorting it.

H. Zaman (2004) in the research ***Indigenous Knowledge and Sustainability: On the Brink of Disaster or Revolution*** examines Bangladesh has developed over millennia a knowledge base and agricultural technologies suitable for its subtropical climate. Subsistence focused farming developed with a mixed crop/livestock/fishery culture more or less minimized risk in a land where natural calamities are common. This research shows that the penetration of alien and modern high technology into agriculture and local industry has, in many cases, displaced traditional or indigenous technologies. Some of these modern technologies are high-input and expensive and as such are not well suited to the needs of poor local people. They have undermined the sustainability of local agricultural technologies.

4.3 Literatures related to Livelihood and Food Security

The Ph.D thesis '***Voices of the Fishantry': Learning on the Livelihood Dynamics from Bangladesh***, by Deb Apurba Krishna (2009) critically examines the livelihood dynamics of the artisanal fishers of Bangladesh. For examining fishers' conditions, production relations and livelihoods, this study introduces an innovative conceptual lens 'Fishantry' for artisanal fishers (as is peasantry for peasants). This research has examined the vast and esoteric traditional ecological knowledge of the fishers. The researcher views that poverty and vulnerabilities in fishing village have cross-scale connections to multiple roots (institutional, political, geographical, religious, cultural) that affect fishers singly or synergistically. The author observed that small scale fishers are trapped in a vicious cycle of absolute poverty in all considerations and bear the consequences of livelihood ill-beings. They evolved sets of coping strategies to shield themselves from a host of adversities. Fishing entitlement is an important determinant of fishers' livelihoods and overall well-being or ill-being, especially in the floodplain wetlands. The study examines the aspects of the livelihood war of small-scale fishers on Bangladesh. It inquires into their capitals and differential entitlements, the shocks and stresses they face in their lives, their efforts in diversifying livelihood strategies, and the ways they handle livelihood insecurities. The researcher asserts that for the resource-dependent communities like artisanal subsistence fishers, the entitlement for accessing the natural resource is the most important determinant of livelihood strategies and outcomes. He further states generally, fishers possessing multiple numbers of capitals are more powerful and better able to gain access to the institutions of the state and market. In both the study villages, livelihoods are strongly influenced by the access to and health of the natural resource base. Natural capital is an example of overexploited capital among all the capitals. With regard to human capital, the researcher asserts that these small-scale/artisanal fishers represent the most important and diverse source of indigenous ecological knowledge than any other forms that the fisheries hold. This study introduces Fishers' livelihood centre on subsistence income. Fishers' livelihood is highly determined by their fishing entitlement. This has resemblance with *haor* fishing community. However, fishermen in *haor* area has unique livelihood diversification strategy.

Ali Ahmed (2005), in his Ph.D thesis on *Livelihood and food security in rural Bangladesh* raises and tries to answer questions about household livelihood, food security and vulnerability in a rural area in Bangladesh. In finding the answers to these questions, special attention is given to the role social capital plays in these processes. The aim of this research is to investigate the pattern of livelihood, food security and vulnerability and the use of social capital in these processes using a temporal perspective. This research discusses the issue of livelihood security and vulnerability in the context of time, gender and social capital. It looks at how rural households in the research area are coping with adversity. It shows how households avert vulnerability and sustain their livelihood with their assets or resources and use of social capital. The relationship between the life course of households, their livelihood portfolios and their economic status has been discussed in this study. This is set against the background of the changes in agriculture, food production, socio-political conditions and gender relations, and the impact of the 1998 floods on livelihood. People's perception about food security and the role of social capital and gender in implementing the strategies to attain food security is also discussed. It looks at how livelihood status affects food security at the household level, and how household food security translates into individual food and nutrition adequacy. It also looks into how food beliefs and taboos, and gender affect nutrition adequacy.

The study further shows networking and good relations with relatives and neighbors and having friends are crucial in achieving support at the time of need and in daily life. The study found women or girls are not food secure even if a household is food secure. In this way, gender ideologies, customs, and food beliefs make women and girls nutritionally vulnerable. With regard to household coping strategy for the risks and shocks like flood the study shows households try to smooth their consumption through saving, borrowing and altering feeding practices. Referring to Ellis the author states that livelihood diversification is one of the ways to achieve, maintain or enhance livelihood security (Ellis, 2000). According to the author it is difficult for a household to cope in a disaster situation when assets and social capital are depleted. At the same time, household and individual food securities are at risk due to diminished income opportunities. In such situations, households rely mainly on borrowing money and selling labor. The study shows that whenever there is a crisis such as a food shortage, households try to maintain their calorie intake at an optimum level. First, households

avoid expensive foods such as non-staple items then they switch to cheap staple foods like sweet potatoes, potatoes, wheat or corn. If the household spends all its money on food, then any shock will cause the household to become more vulnerable because no investments have been made. This points to the difference between livelihood and food security; livelihood security ensures food security, but not the other way around. The author argued that people's own perception of food security is crucial to attaining food security. This research reveals that people's perception of food security leads households to prioritize less profitable rice cultivation and compels to return to farm-based production.

The author noticed that at times of natural disaster, when the whole community is at risk, social capital is also depleted. After the flood, poor households lost both material assets and social capital and their chances of getting credit diminished. Poor people who do not own land also have difficulties in accessing social capital. Landholding and income function as collateral informally or implicitly. This research aimed at gaining insight into the role of social capital of households and individuals in generating livelihood, achieving food security and averting livelihood and food vulnerability. It is evident that households both develop longer-term livelihood strategies and use short-term coping strategies. The study explores the relationship between the role of social capital and food security. But it did not focus on how the households and individual cope with food insecurity resulting from hazard. It is mentioned in this study that social capital has linkage with other capitals like economic capital. But knowledge, skill, experience, values, perception all these have profound influence on people's livelihood in reducing disaster risk, which, the study did not focus.

Mohammad Mizanul Haque, Md. Zakir Hossain, Charles C Villinueva and Tulshi Kumar Das (2010) conducted a study on ***Food Security Strategies of The People Living in Haor Areas: Status and Prospects***. The study was designed to assess the status of food security of the *haor* people based on the background features of their life and livelihood. The household poverty condition was measured by using both Cost of Basic Needs (CBN) and Direct Calorie Intake (DCI) methods. The output of the research project is mainly discussed in terms of households' socio-demographic and economic profile, food intake behavior and poverty level, food insecurity status and coping strategies. The profile of household members and household heads indicates that the *haor* people were mostly illiterate, engaged in farm activities and unemployed about six

months in a year. The vulnerability of physical and social infrastructures of the *haor* areas was also evident in the findings of the remoteness of selected clusters. The analysis of crop production system in *haor* regions clearly dictates the mono-crop cultivation pattern of the region and production of *boro* paddy was the topmost source of income generation, followed by labor selling. Both the content of and the expenditure on rice in the food bundle was found higher for the *haor* people indicating their imbalanced food intake behavior. An adverse seasonal effect on food intake in terms of quantity and quality of meals was observed in the survey households and dropping the lunch in the lean season was very common indicating acute seasonal effects. The calorie and protein intake of the households was positively associated with landholdings and education and negatively associated with family size. The incidence of poverty at household level varied significantly according to some selected characteristics such as landholdings, occupation and education of the household head and family size. Mainly four reasons are explored for food insecurity in *haor* areas – landlessness, mono-crop cultivation, seasonal unemployment and natural calamities. This study discovers that the major coping strategies the *haor* people adopt are borrowing money and food, reducing familial expenses and internal out-migration both in short run and long run. This study draws conclusion and recommends policy interventions focusing on combating household-level food insecurity problem of *haor* people. Food security is the main focus of this study. Therefore, other dimensions of livelihood were not critically examined.

Nasreen et al. (2008) conducted a study on ***Climate Change and Livelihood in Bangladesh: Experiences of people living in coastal regions***. The objective of the study was to explore the impacts of climate change on livelihoods of people living in coastal areas in Bangladesh. The research questions that were followed include i. to what extent climate change affects the coastal people's livelihoods? iii. what are the coping and or adaptation options in maintaining sustainable livelihood? The study followed a triangulation method i.e., a combination of quantitative and qualitative research methods. For quantitative method, sample survey was conducted with selected respondents. On the other hand, for qualitative data, Case Study, Key Informants' Interview, Focus Group Discussion and Observation (participation and non-participation) methods were applied. It is evident from the study that all women in coastal areas are trying to become more resilient to adopt with climate change. The impacts of climate change vary based on the socio-economic conditions amongst vulnerable groups, poor,

ultra poor and rich categories. Climate change induced disasters destroy livelihood options and increase peoples' vulnerabilities. Like unemployment, food scarcity, health problem, water crises have been identified as major challenges in the coastal belt of Bangladesh. It is evident from the study that in order to cope and/or adapt with the unexpected conditions contributed by climate change local communities are taking multiple alternative livelihood strategies based on their indigenous knowledge and coping mechanisms. The study draws an attention to the institutional and economic factors and opportunities that facilitate people's well beings to cope with climate variability and climate induced disasters.

In a paper, ***Livelihood Diversification and Natural Resource Access*** a thorough examination of the relationship between livelihood diversification and natural resource access is provided by Frank Ellis and Edward Allison (2004). Ellis and Allison begin by exploring the benefits of the diversification of livelihoods, including decreasing vulnerability, supporting asset building and decreasing poverty, and maintaining local natural resources. These benefits accrue because diversification decreases pressure on local resources, enhances people's options, builds individual human capital, increases cash flows to and within rural areas, and promotes spatially diverse transactions. The authors propose mobility, flexibility, adaptability, and ease of participating in 'spatially diverse transactions' are required to benefit from diversification. Local policy and governance often create barriers to these attributes. The paper turns to discussing the essentialness of natural resources (assets) in rural livelihoods and explores how natural resource management regimes often hamper livelihood diversification. The authors show that there are often gender imbalances in access to natural resources. This paper provides clear idea about the benefits of livelihood diversification.

Rijve, Kaiser (2006) in his study titled ***Changes of Livelihood Pattern of Inhabitants in Water Logged Areas in South-West Region in Bangladesh*** examined that the life and livelihood in the coastal zones in south-west of Bangladesh is shaped by different natural and anthropogenic reasons. The region is subjected to different environmental imbalance for the intervention of different development projects which influence the status and quality of life. The study searches the impact of the different development projects in the livelihoods that are at odds with the environmental characteristic and ecological balance of the region. It shows that isolated mechanisms and technological approaches from the foreign experts that do not integrate the locals in decision making

have negatively affected the locals who have to endure this situation. The study identifies impact of human induced development projects on livelihood. It has explored changes in livelihood but, did not analyze the coping practices.

The discussion paper on ***Sustainable rural livelihoods: practical concepts for the 21st century*** by Robert Chambers and Gordon Conway (1992) set the stage for the increased popularity and usage of the sustainable livelihoods concept in development practice. According to the authors, livelihoods is an integrating concept that is a response to 1) increasing change and uncertainty, particularly for the rapidly increasing population of rural poor and the natural resources on which they depend, and 2) the defects of previous narrow conceptual modes of development thinking that focused on production, employment, and poverty. The paper reviews three practical and normative concepts of capabilities, equity, and sustainability (both social and environmental) upon which the sustainable livelihoods concept is based. This paper forwarded the most often cited definition for sustainable livelihoods, which suggested that a) livelihoods are made up of people's capabilities, their available tangible assets (stores and resources) and intangible assets (claims and accesses), and activities which contribute to their overall means of living, and b) the sustainability of livelihoods refers to their resilience and ability to recover from stresses and shocks, the maintenance and enhancement of capabilities and assets, provision of opportunities for future generations, and long and short term global and local benefit. Livelihoods are seen as being central to overall quality of life. This paper provides a critical grounding in the theoretical and practical considerations that underlie the livelihoods concept. The concepts i.e. sustainable livelihoods, capabilities, tangible and intangible assets enrich understanding of present researcher to theoretical perspectives of his research.

In a report, ***Livelihoods research: Some conceptual and methodological issues. Chronic Poverty Research*** Colin Murray (2001) of the Department of Sociology at the University of Manchester, explores issues associated with livelihoods concepts and methods through examining the strengths and weaknesses of the methodologies of six different livelihoods projects. Murray suggests that livelihoods research should focus on the household or community level (micro), take into account the structural, historical, and institutional context (macro), analyze the impact of social relations and power inequalities on poverty, and reflect on the macro context of policy creation. Several conceptual issues identified by Murray include the lack of importance attached to the

vulnerability context, the tension between 'participatory' methodologies and development 'interventions', the presumption that people's assets can be expanded, and a lack of specific criteria for sustainability. Furthermore, Murray sees the equation of assets with capital to be particularly problematic. Murray argues that livelihoods need to be examined circumspectively (at a moment in time), retrospectively (change over time from past), and prospectively (for future policy and action) and that trajectories need to be done for the various social classes. He concludes that a combination of methods will be most useful in practice and suggests that small sample surveys, participatory methods, and deep life histories all have advantages and disadvantages. Murray's idea of considering macro and micro level context for household and community level livelihood research is very relevant to the present study. At the macro level structural, historical and institutional context is also very important.

3.4 Literatures related to Gender issues and Disaster

Farzana Nasrin (2012) in her article *Women, Environment and Environmental Advocacy: Challenges for Bangladesh*, seeks to provide basic information related to women and environment and advocacy for environment and women in Bangladesh. The study reveals that women are the worst victims of environmental degradation. Since the lives of women in Bangladesh are totally dependent on nature, they have to carry their family through managing and using natural resources. This paper attempts to explain the linkages between environment and women and focuses on environmental advocacy for women to come out from this suffering. The author reminds women are efficient resource managers and have a central role in the conservation of natural resources. They are considered as the primary users of natural resources (i.e. land, forest and water). They are responsible for gathering food, fuel and fodder. Their involvements in pre-seasonal and post-harvest operations are considered very critical, as also their work in weeding and pest management, seed selection, treatment and storage of harvested crop. They have profound knowledge of the plants, animals, ecological processes around them since they are traditionally involved in homestead forestry through nursery work and tree plantation. Preservation of seeds is the heart of agriculture and traditionally used to be handled by the women (Akash, 1998). The study mentioned throughout history, men have considered natural resources as income generating sources, while women have looked on them as their basic needs. Women have different relationship with environment including different needs, responsibilities and knowledge

about natural resources. The present culture, environment and systems are against women and do not include women's concerns. For this reason, eco-feminists start their work in small groups. Eco-feminism is a new word in environmental movement which is connected with women and environment. This paper attempted to cover issues related to women, environment and advocacy. The author argues exploration in terms of vulnerability of poor women and linkages between gender and climate change are required. The present study has also similar objective to find out the relationship of women with nature. How the resource degradation in *haor* area impact women's livelihood has been explored in this study.

In her paper ***Gender Issues in Natural Disasters: Talking Points and Research Needs*** Elaine Enarson (2000) explores gender has been integrated into disaster research and practice as a demographic variable or personality trait and not as the basis for a complex and dynamic set of social relations. Gender is also seen as an aspect of women's lives more than men's and as derivative of social class, i.e. women are disaster victims because they are poor. Gender powerfully shapes human responses to disaster, both directly and indirectly. Women are especially hard-hit by the social impact of environmental disasters. The paper provides while natural disaster often impacts human communities very broadly, residents are not equally at risk of loss and harm nor equally able to recover. Poor households are well-known to be especially vulnerable but gender-specific effects are also suggested. A wide range of gender differences have been documented in this paper regarding emergency communication; household disaster decisions about preparedness, evacuation, mitigation, and use of relief assets; voluntary relief and recovery work (e.g. search and rescue, emotional and material care of survivors); access to evacuation shelter and relief goods; employment in disaster planning, relief and recovery programmes; and other areas relevant to disaster practitioners. The article examines gender inequality is a root cause of women's disaster vulnerability. This paper presents gender inequality is a significant contributing factor in the social construction of risk. Most disaster studies focus on vulnerability of women however; capacity of women was not mentioned.

In a guidebook titled ***Practicing Gender and Social Inclusion in Disaster Risk Reduction*** by AKM Mamunur Rashid; Hasan Ali Shafie (2009) presented thorough outlines for analyzing and managing the risk situations of the most vulnerable groups in Bangladesh through capturing their own voices. It is explained in this book that the

enduring experience of living with disasters in Bangladesh suggests that the women, children, PwDs and socially excluded groups constitute the most vulnerable segments of the society and are disproportionately affected by the negative impacts of any disaster. They have some additional vulnerability against different hazards and often remain 'invisible' in disaster reduction or emergency response programs. The book explores additionally, different marginal groups and people in very low earning households are rather prone to be in disaster as they are usually poorest amongst the poor; and more vulnerable amongst the vulnerable. This guidebook recognizes that all these aforesaid groups entail certain degrees of alienation in the disaster reduction or emergency response programs. These groups are, in various ways, kept away from full participation in the wider economic, political, cultural, and social life. Regarding the exclusion of women and children it is mentioned in this book that disasters in Bangladesh have always impacted the women and children more adversely because of built-in societal norms. The authors give explanation that social groups experience disasters differently, have differential access to resources, endowed with discrepancies in capacities to face disaster and have differences in resilience to combat respective susceptibilities caused by hazards. The authors suggest that the stakeholders, who are responsible for the formulation of plan, need more specific understanding about gender and social exclusion in respect to the background of the areas, classification of the socially excluded people as well as the situation of the excluded people in disaster. The book explains the situation of most vulnerable sections of the community. It also exhibits the suffering of vulnerable people from disaster and their limited capacity to resist and recover from losses sustained from hazard. But the coping strategies of these vulnerable people are not precisely mentioned in this book.

In a study entitled ***Effects of Storm Surge Flooding on Women and Adaptation Process***, Md. Shahe Alam (2009) speculated that climate related disasters like storm surge flooding imposes a lot of pressure on women and the international debate on climate change still lacks a gender sensitive perspective. The study examines the impacts of storm surge flooding on the women of Padma village of Pathorghata upazila, Barguna district as a case study. Site survey and interview are used for collecting data. It proposes an analysis of the perceptions of coastal flood hazards by the women and the threats of extreme poverty as a consequence of income loss and crop damage. It points at the different adaptations processes like change in food habit, diversion of income

option and credit loans. The study mainly focuses on response capacity of the community to disaster but, not so much attention given to preparedness measures.

Oxfam GB's handbook (2011) on ***Women Leadership in Disaster Management*** shows the extent to which women gain many indigenous knowledge and skill as well as strategies to cope with disaster. They gain these knowledge and skill by using their own perspective and attitude which is different from men. Assuming the fact that during disaster women's workload and responsibilities increase, women's risk increases; the handbook stresses mainstream disaster risk reduction system can use women's knowledge, skill and strategies by facilitating women at leadership position. Though the handbook proposes women's leadership position but not clearly mention how to overcome social and political barriers which hinder women to take such role.

3.5 Literatures related to Haor area

A Ph.D thesis on ***Participatory Wetland Resource Governanance in Bangladesh: An Analysis of Community Based Experiments in Hakaluki Haor*** by Khan SM Munjurul Hannan (2011) states that in Bangladesh access to and control over wetland resource are determined by the existing top down, bureaucratic management regimes. Present policy practice undermines the inclusion of local resource users as legitimate stakeholders in the decision-making process. Local communities, which largely depend on wetland resources, are persistently excluded from access to and control over such resources. The purpose of this research was to investigate options (such as community-based, co-management and partnership approaches) for institutionalizing participation of stakeholders in wetland (*haor*) resource management as alternatives to state-governed management approach.

Considering the objectives of the study, the following major questions were addressed: i. what are the various societal institutional arrangements that administer the access, use and control over wetland resources? ii. how and why community-based resource management approach is more effective in resource planning and management than the traditional approaches? This research selected three development initiatives, namely, Sustainable Environment Management Programme (SEMP), Community Based Fishery Management -2 (CBFM-2) and Coastal and Wetland Biodiversity Management Programme (CWBMP), for assessment. A set of PRA methods, which included baseline surveys, FGD, semi-structured interviews, participant observation, *addah* (informal

chatting) was used at different stages of the research to attain the objective of the study. The findings show that the cumulative effects of policy changes in *jalmohals* management have resulted in the total exclusion of local fishers and other poor communities from wetland resource use, which have severely impacted their livelihoods. The findings have confirmed that lack of institutional capacity augments the marginalization of local poor and vulnerable groups by depriving them of their entitlement rights. Often, the legitimate rights of local resource users are taken away by manipulation and malpractice by politically and financially powerful individuals and groups. It was observed that relevant formal institutions failed to play an effective role in protecting the interests of local resource users. Common property becomes private property within the rent-based leasing system of *jalmohals*. The rent-based leasing system influenced the lessee to put their maximum efforts for ensuring higher profit margin from *jalmohals*; the aspects of sustainability of natural resources are usually ignored by the lessee. The study revealed that changes in the wetland management policy not necessarily ensure or protect the interests of local poor fishers in terms of access and rights on *jalmohals* rather these processes aggravate the exploitation and deprivation of targeted stakeholders. In many instances such changes enabled outsider, non-fishermen to capture benefits from new policies. The study found CBRM as an alternative to the traditional Economic Efficiency Focused Approach, has created opportunity for adopting new strategies and options to address conflicts amongst stakeholders. The evidence from the CBOs' performance suggests that planning at the local level is more realistic and effective for engaging local resource users in the implementation of development programmes for sustainable resource management.

This research found out that multi-stakeholder governance approach engenders a mechanism by which the sustainability of community-based or co-management can be ensured, at least in Hakaluki Haor *jalmohal* management, in which the initiative from the formal institutions remains the fundamental triggering force. The study not only provide an analysis of what has been happening with wetland resource management under the conventional Economic Efficiency Focused (EEF) approach, but they also extrapolate many issues related to the complexities and inter-linkages of economic, social, political and ecological facets of resource governance. The research outcomes also offer insights about the critical roles of local institutions, participation, deliberations and partnership as vehicles for approaching good governance in resource management. This study was

conducted in Hakaluki Haor focusing on community participation in wetland resource management. The present research explores what the societal arrangements that administer the access, use and control over wetland resources in Tanguar Haor area.

IUCN Bangladesh (2010) conducted a study on Disaster Risk Reduction (DRR) on Tanguar Haor. This study was carried out to capture people's vulnerabilities induced by climate change manifestations. The objectives of the study were to: identify the vulnerabilities, induced by climate change manifestations, document the current coping strategies adopted by the communities and prioritize and recommend DRR measures for the communities. In total, nine villages were covered from four unions, namely *Uttar* (North) Sripur, *Dakshin* (South) Sripur, *Uttar* Bangshikunda and *Dakshin* Bangshikunda. A total of 23 FGDs were performed, where various stakeholders were consulted. In order to supplement the FGD findings, seasonal calendar of crops, disasters and ranking and scoring of options were also done. The findings of this study were presented according to the various dimensions conceptualized in the framework of the study model. The vulnerabilities and coping strategies of the people of Tanguar Haor area as revealed by the study can be categorized as: Income - there are large seasonal variations in income; most of the households have little or no income during the rainy season. Health and nutrition - food intake is not sufficient for the impoverished people in the *haor*. They suffer from malnutrition and deficiencies, which often makes them weaker and more vulnerable. Women are worse off than men in this case. Agriculture - the farmers have no access to agricultural activities during monsoon. Fishing - according to the people consulted, fish abundance and species composition has changed due to illegal fishing by government enforced guards (*Ansars*) and locals. Housing - due to poor construction materials houses need to be repaired almost every year, following a flood. Migration - it is common for the people of Tanguar Haor area. There is no job available during the rainy season in the *haor* area. For almost six months of the year, they have nothing to do. Transport - boats are the most common mode of transport in the *haor*. It is evident that the study identified vulnerabilities of the people of Tanguar Haor area. However, it did not explain in detail the coping strategies of the people in all these respects.

Anwar Hossain Chowdhury (2003) in his paper ***The State of Community Based Sustainable Management of Tanguar Haor, What measures are to be taken*** states that wetland resources are of particular importance in the context of livelihood strategies of the poorest segments of society. The author states the *haor* has been supporting and

being the only natural resource in support of livelihoods of a large downtrodden human population of fishers and other poor people of the area. The author observed fishing and farming are the principal occupations of people living in Tanguar Haor. During leasing time, hired fisherman of the lease catch the fishes and local fisherman has few or almost no access for catching fishes. This paper presents the most important cause of insecurity and conflict in Tanguar Haor revolves around use of *haor* resources. The document pointed out the leasing system in place until 2001 (de facto until 2003) legally vested only limited powers in the leaseholder, but on the ground the leaseholder severely restricted the rights of local communities to access and use the same resources. The author stresses the objective of the poverty reduction is closely linked with natural resource conservation, because poor people in developing countries like Bangladesh depend on natural resources for their livelihoods. The author suggests it is therefore important to ensure sustainable management of these resources. It stresses on sustainable management of natural resources but no explanation given on livelihood diversification.

A study report on ***Essential Services of Haor Areas and Way Forward*** was prepared by Siddiquir Rahman *et al.* (2008) based on the participatory research findings. The participatory research took place in two *haor upazila* (Nikli and Mithmoin) under Kishoregonj district. The broader objectives were to understand the state of essential services in *haor* areas. With regards to providing the basic services, the activities of concerned departments of the governments and the activities of NGOs were studied. Besides, different stakeholders in the villages were also interviewed. The study adopted a participatory approach to collect the primary data. These include participant observation, in-depth interview, Focus Group Discussion and case studies. The findings of the study reveals problems in *haor* area with regard to education, health, communication, water and sanitation, agriculture, employment, migration, livestock and fisheries. The findings of the report portray a shocking picture of essential services in *haor* areas in Bangladesh. The people in the *haor* areas have no or little access to the basic services in compare to that of the people in the mainland. The study report portrays the problem in Tanguar Haor area with regard to essential services. The status of these essential services has correlation with vulnerability and capacity of people living in *haor* area.

3.6 Literatures related to Climate Change Adaptation Practices

The article ***Building Resilient Future: Bangladesh, Reducing Disaster Risks in Changing Climate*** published by CDMP (2009) focuses on climate change and disaster challenges in Bangladesh. It describes climate change will have negative impact on all aspect of human development including livelihoods, food security, safe water and sanitation, health care, shelter etc. The article indicates poor communities in the coastal areas of Bangladesh are the most vulnerable to the impacts of climate change and extreme climatic events with environmental degradation. Data shows that hundreds of thousands of the coastal impoverished communities have already been displaced and pushed into extreme poverty without any livelihood opportunity and shelter. This article examines Bangladesh also has demonstrated its ability to withstand disaster and climate risk by combining indigenous knowledge and practices with the spirit of endurance and perseverance of the affected population. This article brought the concept upholding the spirit and vision for disaster risk reduction and climate change adaptation, Bangladesh has embraced a holistic process to integrate disaster and climate risks into development planning and processes. Strategies such as adjustments to the cropping calendar, flood tolerant paddy cultivation, plus alternative crops, technologies, fisheries and livestock that are resilient to climate change are being promoted. The article provides some examples of climate resilient habitat such as solar panel, bio gas, developing ground water level, rain water harvesting, tree plantation, community-based early warning mechanism, drought tolerant crop, ensuring safe drinking water for coastal community, pond sand filters, desalination panel. The present research has attempted to find out the household level endurance of affected people in *haor* area to withstand disaster and climate risk by combining indigenous knowledge and practices.

A research on ***Climate Change, Gender and Vulnerable Groups in Bangladesh*** published by CDMP (2009) attempted to build an information source on specific aspects of vulnerability of women and disadvantaged groups to climate change. The overarching goal of the research is to identify specific aspects of vulnerability of women to climate change and to analyze how this specific vulnerability can be addressed with planned adaptation measures, given the sustainable development framework in the country. Participatory Vulnerability Analysis techniques, facilitated by tools such as FGD and Key Informants' Interview (KII), have been used for the study. An attempt is made to analyze vulnerability in the eyes of the vulnerable people. The study indicates women try to

'cope' with the altered hydro-geophysical condition the most. It explores women's utmost attempt to survive through the bad times takes a lot of personal sacrifice and compassion as well as accepting psycho-physical burden. This study has been the pioneering one to reveal gender specific vulnerability to climate change in Bangladesh. A few observed coping practices in relation to specific climate induced vulnerability such as cyclone and storm surge, salinity, droughts, riverrine flood have been discussed in this study. The study investigates women's coping efforts are severely challenged by gender relationships and handicapped by power structure both within the household as well as within the community. The findings show that women's resilience building demands women's empowerment in all aspects of life: physical and mental, social, economical, political and cultural. The intra household and community power structure as pointed out in this study provides food for thought for the present study.

Bangladesh Resource Center for Indigenous Knowledge (BARCIK) conducted a study (2011) on ***"Documentation of Effective Climate Change Adaptation Practices by Rice Growing Communities in Bangladesh"***. The aim of this study was to assess the level of vulnerability and adaptive capacities of rice-growing communities by documenting the impacts of climate change on the communities and their adaptation practices. To understand the climate-related challenges in agriculture, changes in farming practices and ecosystems, farmer's perception of climate change, and how farmers are adapting through indigenous knowledge and technology, some case studies were conducted in three flood prone villages in three different districts where a large part of agricultural lands are used for Aman cultivation. It was reported farmers can cope with water scarcity by cultivating local varieties of Aman rice. They are able to change their cultivation technology and cropping patterns in response to changes in temperature, rainfall, dense fog, cold and heat waves, as well as climate induced flooding. The findings show the preservation of local varieties by farmers is critical in dealing with the effects of climate change. The case study conducted in Basudevpur village of Gopalganj revealed that the area remains submerged for long periods in the monsoon season. Crop patterns, cultivation technology, and crop diversity represent a distinctive farming system developed long ago based on farmer's eco-specific knowledge and experience. The author emphasized the importance of conducting participatory research on locally available/adapted rice varieties in different vulnerable climatic conditions, including saline, flood and drought prone areas. The study suggests dependence on externally

improved hybrid or even high yielding varieties of rice will not bring positive responses to climate change and will create food insecurity among small farming families. The study observed that people-led agricultural research can be the alternative to ensure food security. Farmer-to-farmer and farmer-to-scientist exchanges need to be strengthened; systematic documentation of people's indigenous knowledge related to rice production systems should be initiated. This study dealt with adaptive capacity of rice-growing communities in Aman cultivation area. The *haor* area is famous for mono-crop (*boro*) cultivation due to inundation almost for six months. The adaptation techniques employed by the community in *haor* area have been explored in the present study.

The Climate Change Adaptation Research (2009) published by Climate Change Cell, DoE, MoEF pointed out that in the context of climate change, a 'gender analysis' promotes an understanding of the ways that men and women are differently impacted by climate-related hazards and by adopting adaptation and mitigation strategies. The overarching goal of the research is to build an information source on specific aspects of vulnerability of women to climate change. Study sites from all over Bangladesh were carefully chosen to meet the criteria of representing diverse geo-physical realities and their interactions with the climate system anticipated for the future. Participatory vulnerability analysis technique, facilitated by tools such as Focus Group Discussions and Key Informants' interview (KII), has been used for the study. Through this technique an attempt is made to analyze vulnerability in the eyes of the vulnerable people. The research shows that in a traditional society like Bangladesh women are even more vulnerable to the impacts of climate variability and change because they are often not allowed to participate in the public sphere, and are therefore less likely to receive critical information for emergency preparedness. They are also less mobile due to strict gender codes of social behavior, and have lesser chances to escape from affected areas. The study reviews most climate change issues, policies and programs are not gender neutral.

In view of the above, several areas deserve attention, specifically: gender specific resource-use patterns; gender-specific effects of climate change; gender related pattern of vulnerability; women's capacity to cope with climate change; gender and decision-making on climate change; and gender aspects of adaptation and mitigation. The study suggests as women are differently vulnerable than men under climate variability, they also have developed their own 'survival coping' mechanisms. The study explores issues

like women living in poverty bear a disproportionate burden of consequences of climate change. Because of women's marginalized status and dependence on local natural resources, their domestic burdens are increased, including additional work to fetch water, or to collect fuel and fodder. Poor women's lack of access to and control over natural resources, technologies and credit mean that they have fewer resources to cope with natural disasters.

The paper turns to discussing climate change, which reduces crop yields and food production affects women's livelihood strategies and food security, and therefore their right to food. Traditional food sources may become more unpredictable and scarce as the climate changes. Droughts and flooding can be detrimental to women who keep livestock as a source of income and for security. Women's knowledge and experience of maintaining bio-diversity through the conservation and domestication of wild edible plant seeds and food crop breeding is the key to adapting to climate change more effectively. The author observed that women's coping efforts are severely challenged by gender relationships and handicapped by power structure both within the household as well as within the community. The study indicated women's resilience building demands women's empowerment in all aspects of life: physical and mental, social, economical, political, and cultural. This study has been the pioneering one to reveal gender specific vulnerability to climate change in Bangladesh.

Suvit Yodmani (2000) in a paper ***Disaster Risk Management and Vulnerability Reduction: Protecting the Poor*** shows linkages between poverty and vulnerability. It is stated while it is clear that the poor are often the most affected in a disaster, it is too simplistic to assume that there is a direct and absolute correlation between poverty and vulnerability. The paper explained poverty, as an indicator of lack of access to resources and income opportunities, is only one of the several dimensions of vulnerability. Vulnerability is a relative and specific term, always implying a vulnerability to a particular hazard. In addition to the economic dimension, the author explains there are also other aspects of social positioning such as class, ethnicity, community structure, community decision making processes and political issues that determine poor people's vulnerability. According to the author, it is becoming clear that the nature of vulnerability of the poor is complex and varied. Hence there is no straightforward solution for risk reduction for the poor. The author indicated that it will require multi-dimensional approaches and innovative institutional arrangements to achieve the goal of risk

reduction for the poor. Frequently disasters adversely affect the livelihoods of poor people by damaging their means of earning (destruction of the factory, loss of land due to erosion in flooding, destruction of the shop) and/or tools (loss of animals, plowing tools, etc.). Families, who lose their means of livelihood during a disaster, find their recovery from adverse effects become more unlikely and their vulnerability to future disasters more increased. It is also assumed that if people will have better sources of livelihoods and higher incomes, they will spend more on disaster risk management in order to save their property, because due to higher incomes they have savings to spend for their purpose. But if they do not have any savings then spending on disaster management, becomes the least priority in comparison to the chronic issues of survival. The author emphasizes diversity in the sources of livelihoods is very important for increasing people's capacity to cope and recover. The authors idea of various aspects other than economic dimension such as class, ethnicity, community structure, decision making, political issues that determine poor people's vulnerability helps to define vulnerability context of the present research.

The report entitled ***Drowning Sand and the Holy Banana Tree*** by Khurshid Alam *et al.* (2007) is the story of people with disability and their communities, living in two of the most vulnerable Chars of Bangladesh - *Mollar Char* in Gaibandha and *Sonaton Char* in Sirajganj district. The report is an analysis of how and whether people with disabilities are included when communities define and apply various strategies to deal with flood. This report offers knowledge to fill the missing link between strategy for disaster risk reduction in Bangladesh and beyond and advancing rights of the people with disabilities in disasters. The study investigated how *Char* people as communities, where many people with disability live, understand the probability of occurrence of a flood, its scale and potential impact. How the local science and arts, developed and practiced over hundreds of years, maintained its relevance in the life of *char* people when flooding itself is changing its pattern due to climate change and other developmental processes. The study also designed to explore core issues in people's coping mechanism when they sense an imminent flood, manage their livelihood during a flood and recover from the losses after the disaster. Among the many coping strategies, discussed in this study, in contrast to the drowning sand and the curse it brings with itself, the banana tree emerges as the holy savior of the *char* people. It has many uses for *char* people both during their normal and flooding life. The entire life of *char* people is centered around the

drowning sand and the holy banana tree. The study has documented a diverse array of indigenous knowledge that is being used at present to predict flood. The author argued beside large differences in believing and practicing IK, determined by household characteristics, women in general tend to have greater faith on IK than men, in both the *char* areas. However, men lead the practices that are ritualistic in nature. Women are closer to and having observation to the symptoms around their daily life. In the agro-based families, men practice IK that are related to agriculture. The authors show there is a stereotype mindset among the community that people with disabilities may not be able to contribute and participate in collective approaches. The study concludes many people with disabilities have the knowledge and capacity to contribute towards the ability of their families and community to cope with floods. This study has documented indigenous knowledge to predict flood. However, little explanation was given on preparedness activities.

The study on ***Survival Strategies of the Char Land Women from Climate Change Hazards in Bangladesh*** by Nirapad (2010) explained the problems and challenges of the *Char* land women and explored the best practices of survival strategies with involvement of local knowledge during hazards. The author examined although they are disproportionately impacted by disasters and swift environmental changes, women have also contributed to curbing the impacts of climate change. Women's knowledge and responsibilities related to natural resource management have proven to be critical to community survival. This study identified the *Char* land women's perception of climate change-induced hazards. The life of the *Char* people is closely related to variations in the dynamics of river and *Char* formation as well as the associated erosion and flood hazards. The author explained vulnerabilities do not always affect women and men in similar ways. The study identified some pre-disaster activities of the Charland women. The repair work of their house is very essential to save their houses from any disaster. They fasten their roofs and pillars to make them resilient for flood and cyclone. Diversification of crop agriculture is a key approach in addressing climate change in Charland. Household and community assets are reinforced through alternative livelihood options such as homestead gardening, horticulture, floating gardens and handicraft production. Increasing assets and diversifying livelihood options are key components in ensuring that communities are able to adapt to meet the challenges that climate change brings. The study suggests strategies such as floating gardens, fish cultivation cages,

adjustments to the cropping calendar, flood tolerant paddy cultivation, plus alternative crops and livestock that are resilient to climate change should all be promoted. It concludes that though women are considered as one of the most vulnerable group to disaster, but they possess unique localized knowledge and practices which developed through a cumulative experience that constitute survival strategies in the face of natural disasters. This study focused on dynamics of *Char* people's life related to erosion and flood. Charland women's knowledge and perception may differ from the *haor* area but it provides some similar insights and knowledge for the present study.

A report by **Concern Universal Bangladesh (2010)** identifies the indigenous disaster mitigation measures (structural and non-structural) in use in the community based DRR project areas, and which have been adopted or applied by the community as a whole or by individual households in order to decrease the negative impacts of cyclones and tidal surges. The practices included in this report were collected at grassroots level as it was found during the research that community elites were unaware or did not recognize this indigenous knowledge. It provides a detailed description of all the indigenous mitigation practices that are perceived by community members as “good” practices against the risk of cyclones and tidal surges in the project areas. Perceptions of community members on the effectiveness of the measures come from a combination of objective parameters, namely scale, cost, availability of material at local level, and an empirical test. This report deals with particular hazards like cyclone and tidal surges. It is known that the nature of vulnerability and coping practices vary from one hazard to another. This report is based on the experience of project intervention which included both structural and non-structural measures. However, the indigenous knowledge of the community, which is mostly non-structural or software nature were not discussed thoroughly.

The foregoing discussions revealed that there have been ample studies on disaster resilience, indigenous knowledge and coping strategies, livelihood and food security, and climate change adaptation, but till today there is a lack of extensive empirical work on the socio-cultural aspects of flood affected people. Paul Sillitoe (2004) describes that taking knowledge out of cultural context threatens both to misinterpret and devalue it. The assumption that there exist definable bodies of knowledge independent of socio-cultural context is unacceptable from an anthropological perspective. Niaz (2000) argues IK's main strength lies in the fact that it is deeply anchored on the socio-economic fabric, and therefore, enjoys wide social acceptability.

The key issues that have been discussed in the studies mentioned above include the following:

Studies on disaster resilience such as Nasreen (2012) focused on how rural women and girls cope and response to a common most disaster, flood. She mentioned women's gender specific response to disaster should be promoted from capability and resilience perspectives, not from vulnerability. Nasreen (2012) observed although disaster affects all segments of population, there are gender variations to vulnerability and resilience during disasters. Six characteristics of a safe and resilient community emerged from the comprehensive research by IFRC (2012). John Twigg (2009) in his guidance note shows what a 'disaster-resilient community' might consist of, by setting out the many different elements of resilience.

In the indigenous knowledge related article by BARCIK (2010) it is described that Rakhain Community uses their indigenous knowledge to predict natural disasters as well as to mitigate losses during disaster. M. Hammadur Rahman (2010) identified commonly practiced flood coping strategies towards food security followed by the ultra poor. Selina Hakim (2012) explored the use of indigenous knowledge and practices in *Char* People to reduce the impact of flood disasters. Farhana Yeasmin (2010) in her article attempted to show the types of values the people attach to trees and plants which include religious, medicinal, commercial or economic and ancestral or emotional. Niaz (2000) argues indigenous practices have generally problem-solving (down to earth) focus. These are often low cost, time efficient, flexible and adaptive. Paul Sillitoe (2000) discusses we should beware interpreting and testing local experience and knowledge according to our canons alone, reproducing our dominant world view, which may be misleading, even inimicable to the interests of the poor. The author showed indigenous knowledge research should concern itself with the entire socio-cultural milieu. Monzu Morshed (2007) evaluates the knowledge that the risk exposed people mentally pose concerning flood, their indigenous perception and prediction capacity, and their ability to understand the recovery needs and future risks from it. Julie Dekens (2007) asserts it is essential to understand local perceptions of natural hazards which influence how people perceive and respond to natural hazards, risks and disasters.

In the literature related to livelihood and food security, Deb Apurba Krishna (2009) critically examines the livelihood dynamics of the artisanal fishers of Bangladesh. Ali

Ahmed (2005), shows how households avert vulnerability and sustain their livelihood with their assets or resources and use of social capital. Mohammad Mizanul Haque et al. (2010) mainly discussed in terms of households' socio-demographic and economic profile, food intake behavior and poverty level, food insecurity status and coping strategies. Nasreen et al. (2008) draws an attention to the institutional and economic factors and opportunities that facilitate people's well beings to cope with climate variability and climate induced disasters. Frank Ellis (1998) provides clear idea about the benefits of livelihood diversification.

Gender issues related literature such as Farzana Nasrin (2012) attempts to explain the linkages between environment and women and focuses on environmental advocacy for women to come out from this suffering. Nasreen (2000) argues that although poor rural women have very few options open to them to overcome their problems, their roles in disasters are obviously not simple: they relate to a complete range of socio-economic activities. She found that during floods women adopted many coping strategies which were related to their gender identity and the socio-economic position of their households. Elaine Enarson (2000) examines gender inequality is a root cause of women's disaster vulnerability. Gender inequality is a significant contributing factor in the social construction of risk. AKM Mamunur Rashid et al. (2009) give explanation that social groups experience disasters differently, have differential access to resources, endowed with discrepancies in capacities to face disaster and have differences in resilience to combat respective susceptibilities caused by hazards.

Studies on *haor* area such as Anwar Hossain Chowdhury (2003) states that *haor* has been supporting and being the only natural resource in support of livelihoods of a large downtrodden human population of fishers and other poor people of the area. Khan SM Munjurul Hannan (2011) show that the cumulative effects of policy changes in *jalmohals* management have resulted in the total exclusion of local fishers and other poor communities from wetland resource use, which have severely impacted their livelihoods.

Climate change adaptation related studies such as an article by CDMP (2009) describes climate change will have negative impact on all aspect of human development including livelihoods, food security, safe water and sanitation, health care, shelter etc. The study by BARCIK (2011) observed that people-led agricultural research can be the alternative to ensure food security.

Reviewing the above-mentioned literature on disaster, indigenous coping strategy, livelihood and other issues, the following knowledge gaps have clearly been identified: a few literatures were found (Paul and Routray, 2011; Haque and Zaman, 1994) basically emphasized on the current coping mechanisms that those different communities have developed over the years for such recurring events rather than concentrating the criteria that influence their coping capacities in the long run. The above-mentioned studies have not adequately addressed the sources of vulnerability, resilience perspective of the flood affected people, women's role to maintain the livelihood of their households, strength and weakness of the coping strategies and to ascertain the needed changes in the current strategy in a sustainable livelihood perspective. The present study endeavors to fill these gaps. While the present research attempts to identify knowledge gap, it also aims to generate new knowledge. Therefore, the present research explores to what extent the households are resilient; the characteristics of a resilient household and community; how natural hazards affect men and women in different ways due to gendered patterns of access, entitlements and division of labor; women's role in household flood risk reduction, food security, livelihood diversification; what is the belief systems that shape people's understanding, perceptions, and responses to natural hazards; how the flood affected people in *haor* area adapt to climate change, how the external factors influence households' coping mechanism; how far indigenous knowledge of this remote area is affected by changes in the economy and society at large? The present research has attempted to respond to these queries, thereby filling the research gap and generating new knowledge.

Besides, none of the studies mentioned above used theory of resilience and sustainable livelihood in explaining household and community resilience. This study has introduced a resilience house framework. The framework tends to see household and community resilience from a holistic system perspective. In this respect, the present study will be different in the field of disaster management.

Though the number of studies on flood hazards in Bangladesh is plenty, there is scarcity of study found conducted in *haor* areas focusing on indigenous coping strategies towards livelihoods. But *haor* areas are recognized as one of the most vulnerable areas where livelihoods need to be protected. This study made an effort to undertake a research on the situation of livelihood strategies of the people living in *haor* areas so that the entire livelihood management existing in the areas could be better

understood, the livelihood insecurity coping strategies including their determinants could be properly identified and concrete recommendations for ensuring livelihood security in these areas could be made on the basis of the findings of the research. In the following chapter, the findings of the study are presented.

CHAPTER FOUR

FINDINGS OF THE STUDY

The Chapter Four deals with the findings of the present study based on empirical data, both quantitative and qualitative, gathered mainly from the field. It explains the situation of flood victims as well as their resilience. The study presents an exploration of the resilience process that the people in *haor* area go through and the process of facing the challenges of flood adversity with courage.

The main disaster of the area is flash flood. According to local people, flash flood took place much earlier in the recent years. It usually causes widespread damage to agriculture, fishery, livestock, house, educational institute, road communication, etc. Though the people have adapted their agricultural patterns and lives to cope with the regular annual flooding, early flash flood often may have devastating impacts on the livelihood situation of *haor* households. Apart from flash floods, monsoon flood also a very common and familiar phenomenon of Dharmapasha *upazila* under Sunamganj district. It occurs from *Ashar* to *Ashwin* (June-September) in this area due to heavy rainfall and flashing water from Meghalayas, India. Local people believe flood occurs in the month of *Ashwin* (the 2nd part of September - the 1st part of October) due to *Durga Puja*, and in *Shrabon* (the last part of July - the 1st part of August) due to *Sanai Borton Puja*. They also think flood is inevitable during this Holy Puja festival. Boat rowing competition is arranged at this time. Based on the field observations, most of the respondents of this research could recall the largest flood in their area in recent years of 2004, 2007, 2010, 2012, 2014 and most recently in 2017. However, most of the respondents have been experiencing the flood every year in the area with the magnitude getting higher and higher. According to the local people, the worst natural disaster (in terms of extent of damage/loss of life/property etc.) was the flood of 2004 when most of the *haor* area was fully inundated. This terrible disaster seriously affected the lives and livelihoods resulted in demolishing homesteads, agriculture, fisheries, livestock and led to the outbreak of water borne diseases in the areas.

When flood hits the *haor* area, livelihood of the people is enormously affected; they have to relentlessly struggle in adjusting with the disrupted environmental condition. The researcher observed that communities in the *haor* region use many strategies to cope or

adapt to the flood situation which include - precautionary strategies taken before a flood to avoid the likely impact; managing strategy taken in response to the circumstances during a flood and recovery strategies taken after a flood to recover from the damage caused by a flood. The researcher observed that strategies people usually employed were also in the form of behavioral change in terms of agricultural practices, food habits, sanitation habits, practice of seasonal migration and so on.

The first section of this chapter presents demographic and socio-economic data which were collected through survey. The following section presents study findings focusing on vulnerability and resilience of the households and *haor* community in terms of physical, natural, economic, social, human, cultural and institutional context. The findings relate to the first, second and third objectives of the study i.e. i) vulnerability and risk factors that affect livelihoods of the people in the flood prone *haor* area; ii) resources of flood affected people to cope with the floods; iii) local knowledge and practices of *haor* resource-dependent community to resist flood risks in order to maintain their livelihood.

4.1 DEMOGRAPHIC AND SOCIO-ECONOMIC PROFILE OF THE HOUSEHOLDS

Demographic and socio-economic condition of the households is vital in understanding the living standard of the study area. This section provides the characteristics of household members revealing their overall socio-economic behavior. These aspects are analyzed covering household composition, age, sex, marital status, education, occupation, income, landholding, location of the house, housing condition, household assets, water and sanitation, borrowing and saving patterns, consumption and investment expenditure, etc. This section presents a brief demographic and socio-economic profile of the sample households of four study villages collected through survey.

4.1.1 Villages under the Study

Considering the high proneness to flood, socio-economic characteristics, and keeping the objectives of the study in view, four villages (Antorpur, Batta, Khidirpur and Rongchi), one from *Uttar* (north) Bongshikunda union and three from *Dakshin* (south) Bongshikunda union of Dharmapasha *upazila* have been selected. As mentioned earlier, the selection of study villages followed some specific criteria: i) their degree of vulnerability to flash flood or seasonal flood hazards or both; ii) the connection of villages

with the Tanguar Haor in terms of livelihoods (e.g., crop cultivation, fishing and for other natural resources); and iii) occupational diversity. The profile of the villages under this study is explained in detail in the first chapter.

4.1.2 Population, Demography and Ethnicity

During the study the total number of populations of 632 households belonging to four villages was counted. Population of each village is mentioned in the following Table.

Table 4.1: Population of the Villages

District	Upazila	Union	Village	Total Household	Total Population
Sunamgonj	Dharmapasha	Uttar Bongshikunda	Antorpur	106	519
		Dakshin Bongshikunda	Batta	115	564
			Khidirpur	74	407
			Rongchi	337	1719
			Total=	632	3209

Source: Field survey data

In 632 households of four *haor* villages the total number of population was 3209. The size of the family was different from one another. The average number of members of the household was 4.9 in Antorpur, 4.9 in Batta, 5.5 in Khidirpur and 5.1 in Rongchi. Average household size stands at 5.1.

4.1.3 Household Composition

Regarding the distribution of family members of the household, this study finds on average nearly 22.08% of the households consisting of 1-3 members and 49.4% 4-6 members. It is to be noted that about 28.0% households consisting of 7-8 members (Figure 5.1). The average family size is estimated at 5.1. It is slightly higher than that of rural Bangladesh (4.53) as reported by the HIES survey 2010 (BBS 2011).

Table 4.2: Percentage of Households Composition

Household Composition	Antorpur		Batta		Khidirpur		Rongchi	
	No. of hh n=30	%	No. of hh n=32	%	No. of hh n=20	%	No. of hh n=93	%
1-3	8	26.7	7	21.9	4	20.0	21	22.6
4-6	17	56.7	19	59.4	9	45.0	46	49.4
7-8	5	16.6	6	18.7	7	35.0	26	28.0
Average Size of Household	4.9	100	4.9	100	5.5	100	5.1	100

Source: Source: Field survey data

A decreasing trend has been observed in the household size which may be attributed to the reduction in fertility rate in the recent years and to the transformation of large families into nuclear ones. The following Figure 4.1 shows composition of households in the study area.

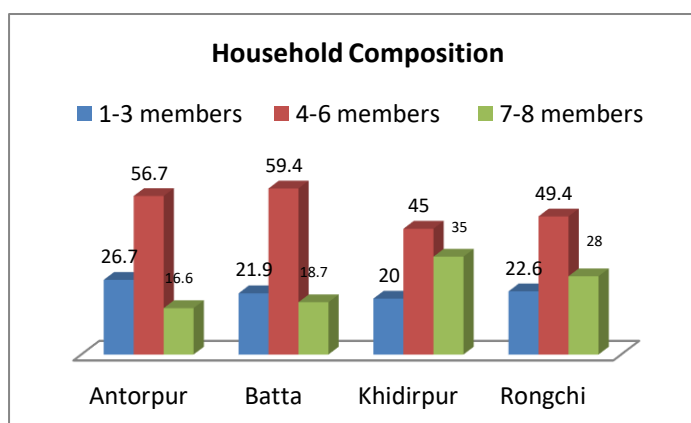


Fig. 4.1 Composition of Households in the Study Area

4.1.4 Age and Sex

The age distribution of the household members is presented below.

As shown in the Table 4.3 on average about 43.17% of the population is below 15 years of age, 23.78% of them is between 15-29 age groups, about 20.81% is between 30-49 age groups, about 8.42% is between 50-64 age groups, and 3.83% is of 65 years or above. Analyzing the collected information and data, it is found that a significant portion of the household members belongs to a group of average ages of 15-49 years. The average dependence ratio of the studied population is estimated at 88.86, which is

significantly higher than that of (78.1 for rural Bangladesh) reported by HIES survey 2010 (BBS, 2011). The higher dependence ratio of the *haor* people indicates that they are more vulnerable than their counterparts living in other parts of the country.³

Table 4.3: Age Distribution of the Household Members

Age Group	Percentage distribution of the household members by age group								
	Antorpur		Batta		Khidirpur		Rongchi		Average
	Populati on	Percent age	Populati on	Percent age	Populati on	Perce ntage	Popula tion	Perce ntage	
0-14 yrs	61	41.5	63	40.13	51	46.36	212	44.7	43.17
15-29 yrs	35	23.81	39	24.84	27	24.55	104	21.9	23.78
30-49 yrs	34	23.13	33	21.02	20	18.18	99	20.9	20.81
50-64 yrs	11	7.48	14	8.92	9	8.18	43	9.1	8.42
65+years	6	4.1	8	5.1	3	2.73	16	3.4	3.83
Total Population	147	100	157	100	110	100	474	100	
Dependency Ratio	83.75		82.56		96.43		92.68		88.86

Source: Source: Field survey data

Sex of household members in the study villages presented below.

Table 4.4: Sex of Household Members in the Study Villages

Particulars	Number of HH members								
	Antorpur n=147		Batta n=157		Khidirpur n=110		Rongchi n=474		Average %
	No	%	No	%	No	%	No	%	
Male	77	52.38	78	49.68	54	49.09	237	50	50.29
Female	70	47.62	79	50.32	56	50.91	237	50	49.71
Total	147	100	157	100	110	100	474	100	100

Source: Field survey data

The distribution of household population according to sex indicates that on average 50.29% is male and 49.71% is female. The sex ratio is found 101 men per 100 women which is higher than the national figure (98.2 for rural) as reported by HIES survey 2010 (BBS, 2011). Age distribution of the female respondents presented below.

³Age dependence ratio denotes dependent people younger than 15 or older than 64 years on the working-age people of 15-64 years. Data are shown as the proportion of dependence per 100 working-age population.

Formula

$$\text{Dependence ratio} = \frac{(\text{number of people aged 0-14 and those aged 65 and over})}{\text{Number of people aged 15-64}} \times 100$$

Table 4.5: Age Distribution of the Female Respondents

Age distribution	Number n=175	Percentage
<20	24	13.71
21-40	121	69.14
41-60	30	17.14
Total	175	100

Source: Field survey data

The age distribution of the female respondents indicates that about 14% are of ages 20 or below, 70% of them are of ages between 21 and 40 years. Over 17% are of ages 41-60 years.

4.1.5 Marital status

Table 4.6 presents information concerning the marital status of the respondents. The results show the majority of the respondents are married (living with husbands) in Antorpur (83.33%), Batta (81.25%), Khidirpur (80%) and Rongchi (81.72%) villages. On an average, most of the respondents (81.58%) are married. A significant number of respondents are found as widows, divorced or separated (18.42 %).

Table 4.6: Marital Status of the Respondents

Marital Status	Antorpur n= 30		Batta n= 32		Khidirpur n=20		Rongchi n=93	
	No	%	No	%	No	%	No	%
Married (living with husbands)	25	83.33	26	81.25	16	80	76	81.72
Widowed	3	10	4	12.5	2	10	9	9.68
Divorced/Separated	2	6.67	2	6.25	2	10	8	8.60
Total	30	100	32	100	20	100	93	100

Source: Field survey data

As pointed out above a significant number of female respondents are found as widows/ divorced or separated. It is worth-mentioning here that 100 percent of people of Hindu community inhabit Batta village. According to Hindu religion divorce is prohibited. However, the researcher came across some women-headed households who were abandoned by their husbands who migrated to other districts and got married there. In such a case a husband does not formally divorce his wife but stays away from the family. In local term, it is called '*Niruddesh*' (untraceable). This phenomenon is also common in Muslim pre-dominant villages.

In the study villages, the number (18.42%) of female headed households is higher than the national figure (13.2%) in the rural communities as reported by BDHS 2007 (NIPORT et al., 2009). Migration and family breakdown force women to shoulder responsibilities of the family (Hossain, 2000).

4.1.6 Education

The level of education of the household members is categorized into the following groups i.e. illiterate (no schooling), primary level (1-5 years schooling), secondary level (6-10 years schooling), SSC, HSC and graduate level. The educational attainment of the household population is given in Table 4.7.

Household-members of the under-mentioned villages completed the following levels: Class V- Antorpur (22.22 %), Batta, (21.25 %), Khidirpur (20.0 %) and Rongchi (20.59 %); Class X- Antorpur (5.13 %), Batta (5.51 %), Khidirpur (4.7%) and Rongchi (7.75%). The household members educated up to SSC were found higher in Rongchi (3.74%) than that of Antorpur (2.56%), Batta (3.15%) and Khidirpur (2.35%) villages. HSC Antorpur (1.7%), Batta (2.36%), Khidirpur (2.35%) and Rongchi (1.87%). However, only 7 persons have completed graduation/post-graduation. This is only 1.31% of the total population.

The overall literacy rate in the villages under study is calculated as 33.12% (7+ years), in contrast to the corresponding national figure 53.37% (male 56.67% and female 50.21%) in the rural area, reported by (HIES, 2010). On average about 66.88% of the study population aged 7 years or older is illiterate. This finding clearly reveals the poor education profile of the *haor* people.

Table 4.7: Educational Status of the Household Members

Educational Level	Antorpur n= 117		Batta n= 127		Khidirpur n= 85		Rongchi n= 374	
	Number	%	Number	%	Number	%	Number	%
Illiterate	79	66.69	84	66.16	59	69.42	244	65.25
Up to class-V	26	22.22	27	21.25	17	20.0	77	20.59
Up to class-X	6	5.13	7	5.51	4	4.7	29	7.75
SSC	3	2.56	4	3.15	2	2.35	14	3.74
HSC	2	1.7	3	2.36	2	2.35	7	1.87
Graduate	1	1.7	2	1.57	1	1.18	3	.80
Total literacy rate	38	33.31	43	33.84	26	30.58	130	34.75

Source: Field survey data

In each village under the study only one/two persons completed higher level of studies (BA, MA). Many people under the age of 35 completed primary school and read for sometime in high school but those of the age group 50-60 are identified as illiterate. So, most illiterate people belong to the aged generations.

There also exist sex differentials in educational attainment at various levels. The differences in educational attainment by sex show the female attendance rate at primary and secondary levels higher than their male counterparts. On the other hand, the proportion of attainment of education from higher secondary to graduate levels are found remarkably higher for men than women, partly due to gender discrimination against girl children. Parents favor boys' education than girls with the expectation that the former would support them in the future. The practice of early marriage of girls, another consequence of discrimination, also contributes to high female illiteracy.

As revealed by the study, children are engaged in income generation or family cost saving activities. Instead of going to school they work for the family to supplement income. Usually, children get involved in varieties of income related activities such as fishing; grass, fire wood, *singra* (water fruit) collection; domestic chores and other families' cattle rearing. In the study villages, a child can earn about 12-15 maunds (450-560 kg) of paddy for such type of work in six months. Parents from poor families find it helpful and beneficial to engage their children in work rather than sending them to school. This is especially the case where after the death of father, children become the main breadwinners for a family or woman-headed household. Consequently, dropout rate increases.

4.1.7 Occupation

The cycle of economic activities in the *haor* region varies significantly with changes in the seasons. Members of most of the households carry out multiple livelihood activities apart from their primary or main occupation. Their occupational engagements vary in dry and flood seasons. Farming (growing crops through cultivation of land) and fishing are usually considered the major occupations of the heads of households. During the monsoon months, the area of the land goes under water and then fishing is the principal economic activity. So, they cannot remain in single occupation throughout the year. Household-members become engaged in fishing when the *haor/beels* are full of water and in the dry season do farming, or wage laboring. Thus, it is often difficult for them to

specify which their main occupation is. There is interrelation between fishing and agricultural/non-agricultural labor. Normally people who work as fishermen in the rainy season work as agricultural wage laborers in harvesting period and they may also work as non-agricultural laborers in *Ashar* to *Ashwin* (mid May to mid October).

The occupations of the households under this study are broadly categorized into eight groups namely; i. agriculture based, ii. fisheries based, iii. trade related, iv. wage labor, v. self employed, vi. transport related, vii. aquatic resource based and viii. technical. A significant number of household members are involved in dry season occupations such as cultivation (own and leased land), agro-based work/day labor, harvesting paddy on contract basis, vegetable gardening, fish cultivating, earth and sand filling work, carrying passengers/crops/commodities by horse cart, buffalo cart, motor cycle renting, collecting fire wood, fodder, etc. During the monsoon season people's occupations are catching fish, rendering labor to fishing, weaving fishing net, making *chai*, *bair* (fishing gears), drying and dealing in fish, guarding *beel*, rearing duck in *bathan*, husking paddy (on engine boat), running makeshift shop on boat, procuring stone, rowing boat, assisting/driving engine boat/trawler, as a porter to loading and unloading goods from cargo boat, constructing bamboo bridge for crossing canal/river and collecting *deb*, *shaluk*, *singra*, *shapla* (aquatic fruits and herbs). Local people perform these activities to earn their livelihoods as the dry and flood season occupations round the year. People also take up some occupations such as rearing livestock/poultry, carrying out small trade, domestic chores in '*gerostho*' (affluent cultivator) houses, mechanical/technical jobs and non-agricultural day labor, sewing, stitching *kantha* (homemade quilt), hawking locally called ferry business, producing bamboo craft, (paddy container, basket) and carpenter (boat/house).

Table 4.8 shows the details of the occupational distribution of the household of the study villages.

Table 4.8: Village-wise Occupations of Household Members

Occupation	Antorpur n=30		Batta n=32		Khidirpur n=20		Rongchi n=93		Average
	N	%	N	%	N	%	N	%	
Agriculture based									
Cultivation (owned and leased land)	7	23.33	7	21.88	5	25.0	24	25.81	24.0
Agri-worker also a day labourer	19	63.33	20	62.05	11	55.0	49	52.69	58.28
Vegetable gardening	11	36.67	11	34.38	7	35.0	41	44.09	37.54
Harvesting paddy on sharing contract	3	10.00	4	12.5	1	05.00	6	06.45	8.49
Livestock rearing	5	16.67	5	15.63	4	20.00	22	23.66	18.99
In house poultry	17	56.67	19	59.38	11	55.00	56	60.22	57.82
Duck rearing in <i>Bathan</i>	2	06.67	2	6.25	1	05.00	5	05.38	5.83
Fisheries based									
Fisherman	24	80.00	25	78.13	17	85.00	74	79.57	80.68
Fishing labor in <i>arot</i>	0	0	1	3.13	0	0	3	03.26	1.6
Fish drying and trading	5	16.67	7	21.88	3	15.00	17	18.28	17.96
Fishing gears (net weaving, making <i>chai, bair</i>)	6	20.00	6	18.75	3	15.00	15	16.13	17.47
Fish cultivation	2	06.67	0	0	0	0	2	02.15	2.21
Trade related									
Small shop	6	20.00	6	18.87	3	15.00	14	15.05	17.23
Hawking-Ferry Business (selling goods on foot)	6	20.00	7	21.88	2	10.00	15	16.13	17.0
Wage labor,									
Off farm day labourer	10	33.33	12	37.5	9	45.00	38	40.86	39.17
Stone-related work	3	10.00	1	3.13	1	05.00	4	04.30	5.61
Coal-related work	4	13.33	1	3.13	0	0	6	06.46	5.73
Sand-related work	2	06.67	1	3.13	1	05.00	4	04.30	4.78
Domestic worker in <i>gerostho</i> house (affluent cultivator)	4	13.33	6	18.87	2	10.00	17	18.28	15.12
Earth work (Soil digging)	6	20.00	6	18.87	3	15.00	11	11.83	16.43
<i>Beel</i> guarding	2	06.67	0	0	0	0	3	03.26	2.48
Self employed									
Tailoring	1	03.33	1	3.13	0	0	2	02.15	2.15
<i>Kantha</i> (homemade quilt) stitching	2	06.67	2	6.25	1	05.00	4	04.30	5.56
Paddy husking business (on engine boat)	0	0	0	0	2	10.00	4	04.30	3.58
Selling goods on boat	0	0	0	0	1	05.00	7	07.53	3.13
Bamboo craft, (paddy container, basket)	5	16.67	5	15.63	2	10.00	9	09.68	13.0
Transport									
Boating	4	13.33	5	15.63	4	20.00	8	08.60	14.39
Engine Boat/Trawler driver/laborer (goods carrying)	2	06.67	1	3.13	1	05.00	4	04.30	4.78
Constructing bamboo bridges for crossing canal, river	2	06.67	0	0	0	0	0	0	1.68
<i>Thelagari</i> Driver	2	06.67	2	6.25	1	05.00	5	05.38	5.83
Horse Cart	1	03.33	0	0	0	0	0	0	0.83
Buffalo Cart (carrying paddy)	1	03.33	0	0	0	0	0	0	0.83
Motor cycle rent	4	13.33	1	3.13	1	05.00	3	03.26	6.18
Aquatic resource based									
Fuel wood collection and sell	2	06.67	4	12.5	2	10.00	6	06.45	8.91
Fodder collection	4	13.33	3	9.38	2	10.00	9	09.68	10.6
Technical									
Mechanic/Technician	1	03.33	1	3.13	0	0	2	02.15	2.15
Carpenter (boat, house)	1	03.33	1	3.13	1	05.00	2	02.15	3.4

Source: Field survey data

Table 4.8 presents data describing the type of occupations held by the members of the households. The *haor* people are a resource dependent community, as there are mainly two scopes for earning such as agriculture and fishing. Agricultural activities involve farming in one's own/rented/mortgaged land or in other people's land as share croppers. Agricultural labor means working as day/contract laborers. The survey conducted in four villages of Tanguar Haor area to measure people's livelihood options found that 82.27% of heads of households are engaged in farming to some extent (both cultivation of owned and leased land and agri-worker also a day laborer), while 80.68% are dependent exclusively on fishing.

Off-farm day laboring is also an important form of livelihood for a good number of households in the area, as data shows that nearly 40% are involved in this occupation. Data also shows that a significant number of households are engaged in small trading (17.23%). Ferry Business (selling goods on boat or on foot) forms a good source of livelihood for many people in the area (17%). In house poultry is also very common in the *haor*. As seen, about (57.82%) of the households are engaged in in house poultry rearing. Livestock rearing is also an important economic activity; about 18.99% of the people are involved in it. Vegetable gardening as household-based occupation was mentioned by a good number of households (37.54%). About 17.47 percent of the households are engaged in making fishing gears (net weaving, making *chai, bair*). Fish drying and trading, is also an important economic activity. About 17.96% of the people are involved in it. A significant number of households (8.49%) were involved in harvesting paddy on sharing contract, 15.12% were engaged in domestic work in *gerostho* house, 16.43% women were engaged as earth work, about 13.0% were in bamboo craft, (paddy container, basket), 14.39% were in boating, 5.83% *thelagari* driver and 10.6% fodder collection.

Just under half of the population is engaged in other activities, many of them *haor*-based, including, duck rearing in *bathan*, engine boat laborer, paddy husking business on engine boat, shops on boat, fuel wood collection. Others involved in sand-stone-coal related work, *kantha* stitching, tailoring, motor cycle rent; constructing bamboo bridges for crossing canal, river and fishing labor.

As the nature of the demand for labor is highly seasonal, employment opportunities drop tremendously in the monsoon period. Many individuals become involved in casual

manual labor, then migrate to nearby districts where they stay for several months of the year. There they find some jobs like agricultural labor; potato harvesting; day labor; stone, coal, sand extracting; fish labor; rickshaw/van peddling; cart pushing; garments and house chore related activities, etc.

There are some activities which play important role in the livelihood of the households. Among them collecting water plants, fruits, herbs and fodder are very important especially for the poor people. Usually for women, fuel wood collection is a good practice in the study area.

4.1.8 Income

Income means material return in cash or kind received in exchange of goods and services in a particular period. So, household income in a particular period can be defined as the sum of the earnings of all the members of the household in cash or kind in the same period of time.

The Table 4.9 below contains the result of the monthly Income of the households. The analysis by income reveals wide variation (income ranges from Tk. 6000 to Tk. 20000) depending on the nature of occupation. The results suggest that the majority households (51.28%) have the income up to Tk. 8000-10000. A significant number of households (30.40%) are found having income Tk. 10000-15000 per month on average. On the other hand, 6.66% are found having income as low as Tk. 6000-8000 per month or less. This indicates prevalence of extreme poverty among the population especially in the monsoon season. However, a few numbers of households earn more than Tk. 15,000-20,000 per month.

The number of such amount of money earners per household is found to be 1.34 in the *haor* area. The average monthly income is estimated per household as TK. 8,560 which seems to be consistent with some other national surveys of Bangladesh (e.g. by HIES Tk. 8795 in 2010).

Table 4.9: Distribution of Monthly Income of the Households

	Antorpur n=30		Batta n=32		Khidirpur n=20		Rongchi n=93	
	No of HHs	%	No of HHs	%	No of HHs	%	No of HHs	%
6001-8000	3	10.00	2	06.25	1	05.00	5	05.38
8001-10000	14	46.67	16	50.00	9	45.0	59	63.44
10001-15000	9	30.00	11	34.38	8	40.0	16	17.20
15000-20000	4	13.33	3	9.38	1	05.00	13	13.98
Total	30		32		20		93	

Source: Field survey data

As pointed out above, there are large variations in seasonal income; most of the households have a little or no income during the rainy season. Income during the winter season is higher, because of additional source of *boro* (winter paddy) cultivation. However, their income becomes low during the monsoon, when land is submerged and unsuitable for growing crops. According to the respondents, most of the families' significant portion of income is exhausted because of loan repayment.

The study made an attempt to identify that within the study villages households of flood-prone area are not affected equally as they vary in source and amount of income, household composition, and apply various coping strategies. The primary group of floods affected people consists of those who have to depend on agricultural labor since their only or major source of income is either on the fields of others or on their own small plots of land. The farmers, who own medium quantity of lands, also face the problems of flood, as they get their main income during the harvest. The large farmers usually do not suffer much because they have enough financial support.

4.1.9 Land-ownership Pattern of the Households

Land-ownership of a household plays an important role in determining its socio-economic conditions as the rural inhabitants depend on land for their livelihoods. It has been estimated by taking into account all types of land (homestead, agricultural, fallow and pond) possessed by a household. The distribution of households according to land-ownership size along with the types of land is presented in Table 4.10. Considering the context of the study area the present study pays particular attention to four categories of land-ownership. These are: i) landless (own 0-0.19 hectare), ii) marginal (0.2-0.9 ha), iii) medium (1-2.9 ha), and iv) large (3+ ha). The Table 5.10 below gives statistical information about household-ownership of specific categories of land.

Table 4.10: Land-ownership Pattern of the Studied Households

Land-ownership categories	Antorpur n=106		Batta n=115		Khidirpur n=74		Rongchi n=337	
	No of HHs	%	No of HHs	%	No of HHs	%	No of HHs	%
Landless (0-0.19 hectare)	55	51.88	61	53.04	39	52.7	178	52.82
Marginal (0.2-0.9 ha)	40	37.74	43	37.39	26	35.13	126	37.39
Medium (1-2.9 ha)	8	7.55	7	6.07	7	9.46	24	7.12
Large (3+ ha)	3	2.83	4	3.48	2	2.7	9	2.67

Source: Field survey data

Table-4.10 shows landless households are in Antorpur (51.88%), Batta (53.04%), Khidirpur (52.7%) and Rongchi (52.82%); marginal farmers in Antorpur (37.74%), Batta (37.39%), Khidirpur (35.13%) and Rongchi (37.39%); medium farmers in Antorpur (7.55%), Batta (6.07%), Khidirpur (9.46%) and Rongchi (7.12%); and large farmers in Antorpur (2.83%), Batta (3.48%), Khidirpur (2.7%) and Rongchi (2.67%).

A typical size (1-7 decimals) of land per household in the study area is found. The landless (0-.19 ha) and marginal landowners (0.2-0.9 ha) are around 89% of the total household. It is clear that the medium and large landowners, which are 10% of the total households, are holding more than half of the total land of the study area. In the study villages the proportion of landless households is found higher than the national figure, about 60.5% functionally landless households (0.01-0.49 acre of land) reported by the HIES 2010.

The findings indicate that most of the households (89%) of the study area were landless as they had too little sized cultivable land (0.02 ha), mainly taken as *aadi bhaga* (share cropping) from others (wealthy landowners). The majority of landless people especially in *Uttar* Bongshikunda have been occupying *khas* land over many years. In fact, the big owners of land with sufficient income dominate others, particularly the ones having small plots and the landless. There is a connection between the socio-economic power structure and the ownership of land which makes a difference. Female-headed households and elderly women are more likely to be indigent. Some of them take shelter in their relatives' or neighbours' land. In this case social capital plays an important role for their livelihood security.

4.1.10 Housing Condition

Housing materials are concrete indicators to reflect a household's economic status. Detailed information about the housing condition is furnished in Table 4.11. About 98.29% of the respondents live in the houses with earthen floors and 73.14% in the houses having roofs with corrugated iron (CI) sheet. The supporting pole (locally called '*dharna*') of the house is made of bamboo or wood. In every village under the study only three/four houses are *pacca* (brick-built). About 76% of the households have one sleeping room, 20% has two rooms and 4% has more than two rooms. It is estimated that on average five persons live in a room indicating a high congestion. In the *haor* area 82.29% of the households do not have a separate room as kitchen for cooking.

Table 4.11: Pattern of Houses

Pattern	Construction Materials	Household n =175	Percentage
Floor	Earthen	172	98.29
	Brick/cement	4	02.29
Wall	Earth/mud	--	--
	Straw/thatch	39	22.29
	Wood	28	16.00
	Bamboo (polished with clay)	119	68.00
Roof	Straw/thatch	47	26.86
	Tin	128	73.14
Number of Rooms	1	133	76.00
	2	35	20.00
	3	7	04.00
Separate Kitchen in the household	Yes	32	18.29
	No (most of them have attached to the house)	144	82.29

Source: Field survey data

The most common housing materials are locally available *ujauri*, *ikar*, *bajail*, *bata*, *denga* (leaves and plants), straw/thatch, jute stick, mat, bamboo (polished with clay), wood, corrugated iron sheet. Most of the materials for making houses in the study villages come from the *haor* itself. However, over the time these sources have become scarce. So, people have to buy housing materials such as *Ikar*, *bajail*, *bata*, jute stick, mat, bamboo, wood, etc. from the local market. Some of them plant *Ikar* tree.

4.1.11 Household Assets

The households of the study area usually possess the following assets:

Table 4.12: Category of Household Assets

Category	Assets
Agricultural items	<i>Langal</i> (plow), <i>kodal</i> (spade), <i>khonta</i> (crowbar), <i>dheki</i> (husking pedal), <i>duli</i> (hollow basket for keeping grain), <i>kaste</i> (sickle), <i>cheni</i> (chisel), <i>kural</i> (axe), <i>da</i> (chopper), <i>niren</i> (hoe), <i>katchi</i> , <i>moi</i> , <i>joal</i> (tilling devices), husking machine, power tiller, <i>marai</i> machine (threshing device), water pump, 'kara' made of jute/plastic used for plowing. 'Shechkul' made of wood used as alternative to power tiller for cultivation.
Fishing gears	Trap such as polo, <i>chai</i> , flash light; Hook such as <i>daitta borshi</i> ; Nets such as push net, lift net, current jal, triangular net locally called <i>jali</i> .
Poultry and livestock	Chicken, duck, cow, buffalo, sheep, goat.
Domestic durable items	<i>Cot/khat</i> , <i>chang</i> /bamboo platform, bamboo shelf beneath the roof, almirah, trunk, table, chair, utensils, big paddy boiling cooker, crookeries, clothes, mattress, bed sheet, pillow, <i>kantha</i> (home made quilt).
Transportation	Bicycle, boat, engine boat, motorcycle
Domestic valuables	Solar panel, television, mobile, sewing machine

Source: Field survey data

It should be noted here that not every household possess more or less all the items mentioned above. Ownership of household assets (necessary for earning their livelihoods and leading lives) is given in Table 4.13.

Table 4.13: Distribution of Households according to Asset Ownership

Assets	Households n= 175					
	No asset		Poor assets		Countable assets	
	No of HHs	%	No of HHs	%	No of HHs	%
Agricultural items	19	10.86	90	51.43	66	37.71
Fishing Gears	12	6.86	65	37.14	98	56.00
Poultry and livestock	17	9.71	80	45.71	78	44.57
Domestic durable items	12	6.86	116	66.29	47	26.86
Transportation	14	8.0	99	56.57	62	35.43
Domestic valuables	20	11.43	125	71.43	30	17.14
Average		8.95		54.76		36.29

Source: Field survey data

The households are classified as of no asset, poor assets, few assets, and countable assets. It is further explored that on average only 36.29% households possess some sort of countable assets like agricultural items, fishing equipment, poultry/livestock, transportation, domestic valuables; 54.76% poor (nominal) assets i.e. most of them

own either a cot or a *machan* (elevated platform). It is to be noted that 8.95% have hardly any mentionable assets.

The possession of durable assets is related to land ownership of the households. The housing conditions and possession of durable goods of the surveyed households indicate that the economic condition in the study areas is worse than that in other rural areas of Bangladesh.

4.1.12 Water and Sanitation Facilities

In the study area, almost in every hamlet of the village there is one tube well. In some villages, there is more than one. These tubewells were installed by the local government. The researcher noticed forming bubbles from some tubewells in *haor* area since a vast area under Sunamganj district is filled with natural gas. According to the villagers' statement sometimes an accident happens when at night someone carrying a blazing lamp comes into contact with any tubewell having gas linkage. Asma, a 32 years poverty stricken old woman, living in Khidirpur village of Dakshin Bongshikunda says "*Before having a tube well in our hamlet, we used to collect water from a long distance. Most of the time children drank haor water and suffered from several diseases*".

During the dry season 84.57% of households depend on tubewell and 37.14% on open water body (OWB) i.e. *haor*, pond, river, canal, etc., at the time of flood 74.86% on OWB and 26.29% on tubewell for drinking water and other purposes. About 16.57% used harvested rain water.

Table 4.14: Access to Water

Source	Normal Time		Flood Time	
	Number n=175	Percentage	Number n=175	Percentage
Tube well	148	84.57	46	26.29
Rainwater			29	16.57
Haor/pond- canal-river	65	37.14	131	74.86

Source: Field survey data

Despite the fact that Tanguar is a 'Ramsar site' and a large wetland, people in this region do not have access to safe drinking water as much as others living in other parts of Bangladesh. 'Nationally on average 94.97% of households gets tubewell water whereas in the study area the figure is 84.57%. In the rural areas 94.97% use tubewell

and 1.27% other sources for drinking water (HIES 2010). Scarcity of water is a major crisis for these people round the year.

The sanitation facilities in the study villages are very poor. As per the survey data and field observation, a significant number of households in the area does not have latrines at all. The inhabitants were queried about the type of latrine used in different seasons. The respondents' report reveals during the dry season only 10.86% of the households have the ability to use *pacca* (water sealed) and 12.0% semi *pacca* (not water sealed) latrines. Bamboo fenced *Katcha* (unsanitary) latrines made of jute and plastic bag are used by the majority 58.86%. The rest 18.28% (men, women and children) defecate in the bush, field, backyard, *haor*, local River and canal (Table 5.15). At the time of flood only about 10.86 % can use water sealed sanitary latrines. The household members including women defecate at open places in the field or in bushes. During flood, they go far away from their house by boat/banana raft to defecate.

Table 4.15: Type of Latrine used by the Household Members

Category	Normal Time		Flood Time	
	Number n=175	Percentage	Number n=175	Percentage
Sanitary/ <i>Pacca</i> (water sealed)	19	10.86	19	10.86
<i>Pacca</i> (not sealed)	21	12.00	11	6.29
<i>Katcha</i> (unsanitary)	103	58.86	9	5.14
Open defecation	32	18.28	136	77.71
Total	175	100	175	100

Source: Field survey data

The use as well as ownership of toilets is low in the study areas as compared to other rural areas of Bangladesh. About 13.90% households have access to sanitary and 12.99% *pacca* (water sealed) latrines. Around 73% have no toilet facility at all (HIES 2010). The findings indicate that a considerable proportion of the households of the *haor* regions are deprived of some basic provisions required maintaining a healthy and hygienic life. Every year most of the areas remain under water for about 4-6 months and it wipes out all existing sanitation system. Lack of proper awareness coupled with financial constraints is the main reason for poor sanitation coverage in the *haor* areas.

4.1.13 Borrowing and Savings Pattern

This section discusses the borrowing and savings pattern of the households in the year prior to the survey.

Borrowing Situation

In the study areas, borrowing of money is a common coping measure. More than 90% of the respondents meet household financial needs from borrowing in crisis period. The borrowing details of the households are shown in Table 4.16 which shows that 90.29% households received loan during the previous 12 months preceding the day of enumeration. Indebtedness ranges from Tk. 1,000/- to 50,000/-. The majority of the respondents owe up to Tk. 20,000. The average amount of loan taken per household was Tk. 24,500 in the *haor* area.

Table 4.16: Indebtedness of the Households

Indebtedness	Number n=175	Percentage
No Loan	17	9.71
Up to Tk 10,000	38	21.71
Up to Tk 20,000	53	30.29
Up to Tk 30,000	27	15.43
Up to Tk 40,000	18	10.29
Up to Tk 50,000	22	12.57
Total	175	100

Source: Field survey data

Sources and purpose of loan

In the study area, different sources are available for borrowing. Information about the main providers of loan is shown in Figure 4.2. The respondents mentioned that local moneylenders popularly known as *mohajon/gerostho* (33%), NGOs (40%) are the main providers of their loan (Figure 5.2). Other sources of loan are relatives/neighbors (18%), *pikar/nigari* (8%), village based *Samity* (7%). It is worth-mentioning that the formal banking sector is reported to be the less common provider of loan in the *haor* areas.

The respondents were asked to indicate what type loan are most available. They spontaneously expressed that loans from *mohajon* are available at any time and any amount, and also said that it is easy to take. Moreover, they can return the money any

time at their convenience. But, the interest rate of such borrowing was very high. Many respondents (34%) borrowed from microfinance organizations. But none of the respondents borrowed from GOs, although interest rate of such borrowing was very low.

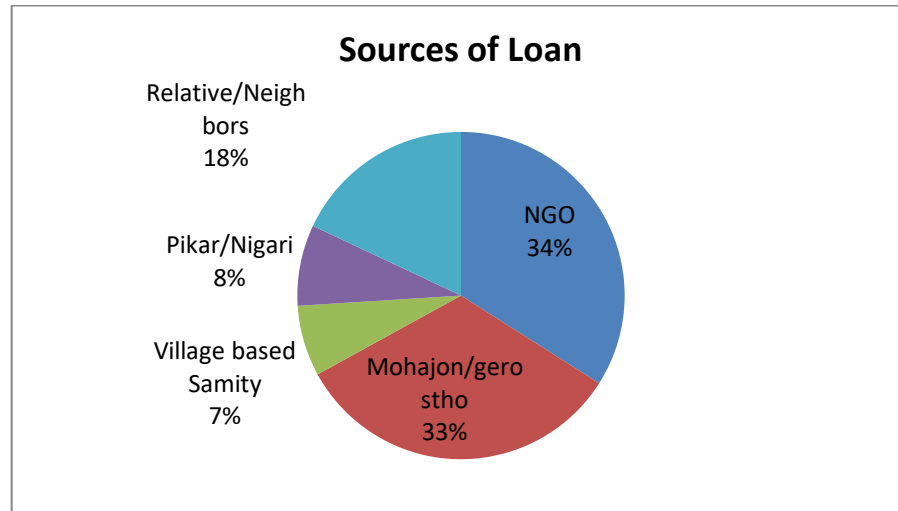


Fig. 4.2 Main Provider of Loan

As revealed by the study people primarily depend on the affluent neighbours for loan. A short-term interest free loan from relatives and neighbors is preferable. But taking loan from *gerostho* or *mohajan* always involves multifarious high interest rates. For loan of Tk. 1000, a borrower has to pay Tk. 500 as interest in six months. In local term, it is called '*dera*' which means half. In accordance with another system 80% interest must be paid for a year. A considerable number of woman-respondents are the members of NGO samity.

The purposes of loan are shown in Table 4.17. Loan utilization related activities include the following: for domestic purposes (27.43%), post disaster period family member's food consumption needs (43.43%), investment in land-lease (13.14%), agricultural inputs (17.71%), medical treatment (14.86%), investment in small business (9.14%), rebuilding houses (17.71) and repayment of loan (32.57%) taken from other sources. Some people used loan to meet dowry/marriage expenditure, buy boat, fishing equipment and raise poultry and livestock. Sometimes they borrow money from *mohajan* to grow crops. If they lose harvest due to early flash flood, they become compelled to sell property (e.g., cows, land property or other assets) to pay the loan. The proportion of households having loan was remarkably higher in the study households than the national figure (37.4%) in the rural areas as reported by Poverty Monitoring Survey 2004

(BBS, 2009). In case of early flash flood people are bound to borrow money from the available sources. Some households reported taking loan for other purposes like fish business (1.71%), education (4.0%) etc.

Table 4.17: Purpose of Loan

Purpose	Number n= 158	Percentage
Domestic purposes	48	27.43
Food consumption needs of family members just after disasters	76	43.43
Investing in land (land lease/purchase)	23	13.14
Agricultural/purchasing equipment	31	17.71
Meeting treatment expenditure	26	14.86
Meeting dowry/marriage expenditure	27	15.43
Fishing equipment purchase	11	6.29
Boat purchase	9	5.14
Poultry and livestock purchase	6	3.43
To rebuild their houses	31	17.71
To repay loan taken from other sources	57	32.57
Fish business	3	1.71
Investment in business	16	9.14
Education	7	4.0

Source: Field survey data

The findings indicate that the borrowers mainly took loan for essential consumption purposes to save their lives. In many instances, needy people take loan from NGOs to repay the installments of the previous loan received from *mohajon* or vice versa. As one woman stated “*I go to the NGO samity to repay the Mohajan loan.*” Some fishermen had to repay the loan and interest through sale of fish at the price fixed by the *dadondar* (money lenders). Others paid up the loan from the income generated from wage labor.

Savings practices

The savings status of the surveyed households is shown in Table 5.18. About 23.43% of the respondents saved money amounting to different figures in the year prior to the interview. About 16.57% saved Tk. 5000 or less, 4.57% up to Tk.10000 and 2.29% up to Tk. 20000. There are mainly two types of dependable depository organizations. NGOs received savings from 16.57% of households and village-based-*Samity* received from 6.86% of households.

Table 4.18: Status of Savings

Status	Number n=175	Percentage
<i>Amount of Saved Money</i>		
No savings	134	76.57
Up to Tk. 5,000	29	16.57
Up to Tk. 10,000	8	4.57
Up to Tk. 20,000	4	2.29
<i>Savings Depository Organization</i>		
NGO	29	16.57
Village-based-samity	12	6.86

Source: Field survey data

Note: The savings is cumulative. It is not monthly or yearly basis.

As members of NGO samity women deposit their savings on a weekly basis. Village-based-samity receives deposit money every month. This money is used as revolving fund. Most of the household members are day laborers who cannot save money owing to low wages. One of them from Rongchi village spoke with the researcher:

"We live from hand to mouth; we don't have money to save because whatever we earn is spent on food and other essentials, how can we save money?"

4.1.14 Distance of Service Stations/Institutions from the Villages

To measure the remoteness of the selected villages from the major service providers (institutions/stations), the data on distances were collected through administering Venn diagram. The results, as shown in Table 4.19 present that the mean distance of Upazila Head Quarters from the study villages is about 35.25 kilometers. *Upazila* Office is located from Rongchi (20 km), Khidirpur (27 km), Batta (47 km) and Antorpur (47 km) away. The mean distance of Union Parishad, Information Service Center, NGO office, and community clinic is about 2.75 kilometers. Rongchi (1 km), Khidirpur (1.5 km), Batta (5 km) and Antorpur (3.5 km) are away from these offices.

There is no primary school in one of the villages named Antorpur. Therefore, children from there go to the primary school located in one km distant neighboring village known as Nababpur. High school is located in union headquarters having 1.5-2 km of distance from the interior villages. There is a college in Bongshikunda. Other service stations like market place, health centre, *pacca* (metalled) road facility on average is 6.5 km away from the villages.

Table 4.19: Distance of Service Stations

Distance (in km)	Service stations/institutions										
	Upazila Head Quarter	UP Office	Information Service Centre	NGO Office	Community Clinic	Primary School	High School	Pacca Road	Upazila Govt. Offices	Religious Place	Market
<2		K,R	K,R	K,R	K,R	A,B,K, R	A,B,K, R			A,B,K,R	A,
2-5		A,B	A,B	A,B	A,B			A			B, K,R
5-10								B,K, R			
11-20	R										
21-30	K										
31-40											
41-50	A,B										

Legend: A-Antorpur, B-Batta, K-Khidirpur, R-Rongchi
Source: Field survey data

The villages are far away from the *pacca* road. In *Uttar* Bongshikunda, Moheshkhola is 3 km away and in *Dakshin* Bongshikunda and Madhyanagar is 5-6 km away. In every village, there is a shrine (mosque or temple). In Batta there are two temples-- one is situated quarter km north of the village. There are *Kalimandir* (named after Hindu goddess 'Kali'), *Durgamandir* (goddess 'Durga') and a mosque at Bongshikunda Bazar in *Uttar* (north) Bongshikunda. Gurgaon bazar is 1.5 km north of Antorpur village. From Batta, Khidirpur and Rongchi villages Bongshikunda Bazar is 2-5 km distant (20-40 minutes' boat journey). The big markets in *Uttar* Bongshikunda are located in Moheshkhola *Bazar* (3 km), and in *Dakshin* Bongshikunda these are located in Bongshikunda *Bazar* (1.5 km), Natunbazar (1.5 km), Madhyanagar (6 km), and Kalmakanda (7 km). In the rainy season, the only transport is boat/trawler, but during the dry (winter and summer) season the main transport is motorcycle as it is not possible to go everywhere by boat. Many people also go to *upazila sadar* (headquarter) on foot.

The findings clearly reveal the remoteness of the villages indicating difficulty for development of physical infrastructure in the *haor* areas. As a result, scopes relating to livelihood cannot be created at the expected level.

4.1.15 Household Expenditure

The average expenditure of the household is given in Table 4.20. The expenditure can be classified as consumption and investment calculated on monthly and annual basis. Food and clothing constitute the major heads of expenditure for consumption. On the other hand, expenditure on agriculture, education, health care, house construction/repair, plinth raising, boat purchase/repair, fishing gear, investment in business, land purchase/lease/rent, loan repayment, social programme, etc. are considered to be the major heads of investment related expenditure. Some investment costs are borne by the households on yearly basis (e.g. plinth raising). Poor and vulnerable households spend a substantial part of their income on food.

Table 4.20: Average Monthly Expenditure per Household

Head	Number of Households n=175	Average Expenditure (Taka)	% of total expenditure	
			Consumption	Investment
Consumption				
Food	175	5200	60.47	
Clothe	175	300	3.49	
Fuel	175	200	2.33	
Transport	175	200	2.33	
Investment				
Education	157	300		3.49
Medical treatment	175	500		5.81
Fishing gears	162	200		2.33
Investment in business	86	850		9.88
House construction/repair/ plinth raising	158	550		6.40
Boat purchase/repair	84	300		3.49
Total monthly expenditure=		Tk. 8,600	68.62%	31.41%

Source: Field survey data

* % of total expenditure = (item-wise total expenditure/total expenditure) x 100

Some items of consumption and investment are common to all households. However, a few items of investment are not similar e.g. all households in spite of having plans could not afford to purchase land during the reporting period. In this case average expenditure was computed by dividing the actual number of households. Statistical data show households' average expenditure is Tk. 8600 monthly which is lower than that (Tk. 9612) in the rural areas (HIES 2010). The average household consumption is Tk. 5900 monthly. The expenditure on food items accounts for 60.47% of the total expenditure. The proportion of food expenditure is higher than the national figure (57.67% for the rural

areas as reported by HIES 2010) indicating poor economic condition of the surveyed households.

The significant items in the household budget are medical treatment, house construction/repair, plinth raising, investment in business, land lease/rent, loan repayment, etc. A poor household needs to spend Tk. 4000 for a season in one *bigha* or 32 decimals of land. Land Lease/rent (one *care*/30 decimal) Tk. 10000. House repair costs Tk. 7000 per annum. Boat repair Tk. 3000 and a small boat making cost Tk. 7000. Fishing gear such as 100 *bair* (fishing gear) costs Tk. 3000. To open a small shop, it requires up to Tk. 15000 investment. Some costs such as medical treatment, meeting dowry/marraige expenditure exceed the ability of the poor day laborers. As a result, they often take austerity measures like selling property, borrowing loan at high interest, etc.

During the interviews, the respondents opined that most of the households of the *haor* areas had to purchase rice for about six months a year. Among other food items that are commonly consumed in Bangladesh, different kinds of fish are found to be consumed by all surveyed households. The *haor* areas are famous for fish and most of the people of *haor* areas catch fish in open water during the rainy season.

Conclusion

This section has discussed the demographic and socio-economic profile of the households which is vital in understanding the living standard of the people in study area. It provides the characteristics of household members revealing their overall socio-economic behavior. Some major findings as revealed by the survey include the following: Farming (82.27%) and fishing (80.68%) are considered the major occupations of the households. Members of most of the households carry out multiple livelihood activities apart from their primary or main occupation. It is found that households of the study villages are not affected equally as they vary in source and amount of income, household composition, and apply various coping strategies. The primary group of flood affected people consists of those who have to depend on agricultural labor since their only or major source of income is either on the fields of others or on their own small plots of land. A typical size of homestead land per household in the study area ranges from 1-7 decimals. Female-headed households and elderly women are more likely to be indigent. Some of them take shelter in their relatives or neighbour's land. Most of the

materials for making houses in the study villages come from the *haor*. Despite the fact that Tanguar is a large wetland, people in this region do not have access to safe drinking water. Data shows that 90.29% households received loan during the previous 12 months preceding the day of enumeration. Local *mohajon* (moneylenders) popularly known as '*gerostho*' (33%) are the main providers of their loan. In the study area system for interest rate were found multifarious. In case of early flash flood people are bound to borrow money from the available sources or sell property (e.g., cow, land) to pay the loans. Households' average expenditure is Tk. 8,600 monthly which is lower than national figure (Tk. 9,612 HIES 2010). Some investment costs borne by the households on yearly basis (e.g. house plinth raising). Some costs such as medical treatment, meeting dowry/marraige expenditure exceed the ability of the poor day laborers. As a result, they often take austerity measures like selling property, borrowing loan at high interest, etc. In the rainy season, the only transport is boat/trawler. The findings clearly reveal the remoteness of the villages indicating difficulty for development of physical infrastructure in the *haor* areas. As a result, scopes relating to livelihood cannot be created at the expected level.

The following section provides detailed explanation of resilience of the households and *haor* community in terms of physical, natural, economic, social, human, cultural and institutional aspects.

4.2 VUNNERABILITY AND RESILIENCE OF HAOR HOUSEHOLDS

This section relates to the first, second and third objectives of the study i.e. i. vulnerability and risk factors that affect livelihoods of the people in the flood prone haor area; ii. resources of flood affected people to cope with the floods and existing local knowledge and iii. practices of *haor* resource-dependent community to resist flood risks in order to maintain their livelihood. To address these objectives, the researcher focuses on vulnerability as well as resilience of the people in study area in terms of physical, natural, economic, social, human, cultural and institutional aspects.

Vulnerability means the characteristics and circumstances of a household, community, system, or asset that make it susceptible to the damaging effects of a hazard. Vulnerability is defined as "a set of prevailing or consequential conditions, which adversely affect the community's ability to prevent, mitigate, prepare for or respond to hazard events" (Anderson and Woodrow, 1989). Vulnerability varies significantly within a

community and over time. Capacity means the combination of all the strengths, attributes and resources available within a community, society or organization that can be used to achieve agreed goals (UNISDR, 2009). Capacity may include infrastructure and physical means, institutions, societal coping abilities, as well as human knowledge, skills and collective attributes such as social relationships, leadership and management.

The present research is concerned with the multiple sets of vulnerabilities that synergistically impact the family well-being and livelihood resilience of *haor* households. Vulnerabilities of the individuals, households and the communities are determined by physical environment, geographical location, infrastructure, socio-economic condition, knowledge, awareness and skill.

In line with the research objective the present researcher primarily focuses on the household level coping strategies. The concept of coping strategies has also connections to livelihood resilience; households with a higher level of livelihood resilience is expected to enjoy livelihood well-being and sustainability (Chambers and Conway 2002). Using a local perspective, the following sections examine various capitals the *haor* households employ for livelihood functions. It is also important to examine how *haor* people combine different capitals to produce synergistic benefits for livelihoods and building livelihood resilience for coping with adverse situations. Contemporary models on livelihoods put the emphasis on social, natural, financial, physical, political, cultural and human capitals.

This study documented three broad types of coping mechanisms in the study villages in *haor*: i) precautionary strategies taken before a flood to avoid the likely impact. Risk reduction activities taken under this stage are termed as mitigation and preparedness activities. Some examples of mitigation: assessment of early warning by observing environmental sign and animal behavior, elevation of homesteads land, repairing the embankment, flood water resistant crops cultivation, raising the plinth level of the houses, storing basic food items, protection of homesteads land from erosion during monsoon season by locally available plants. Some examples of preparedness: repairing embankment and constant vigilance by the villagers of the flow of water, emergency planning (searching temporary places at relative's or neighbor houses and searching safer places for cattle, preparing for communication and transport well in advance); ii) managing strategy taken in response to the circumstances during a flood; activities

taken during a disaster (time of occurrence) to ensure that suffering is minimized are called emergency response activities. Some examples of responses: collecting inundated crops by flood water from agricultural land, protecting erosion of the homesteads land from the wave of the *haor* water, using *machan* (elevated platform) made of bamboo and couch one after another to live when more flood water comes into the village, elevation of cattle shed to protect animals from flood water, evacuating the family, especially children and elderly to the safer place, evacuating the important things to safer places (relative's house), using elevated *dhaner gola* to store rice, guarding the house to ensure safety belongings, taken loan from neighbor/NGOs and iii) recovery strategies taken after a flood to recover from the damage caused by a flood. Measures taken after a disaster (post-disaster) to get rid of the calamity related effects are regarded as response and recovery activities. Some examples of recovery: roads repairing by villagers voluntarily, removing debris from the road, rebuild houses, clean the dirt from yard, make the land cultivable, utilize preserved seeds. Some examples of rehabilitation: collecting and drying inundated crops as much as possible, repairing and restoring the soil of the homesteads land, repairing important damage to the house and community structures, cleaning the house and surroundings and fixing things, helping other community members in doing recovery activities, searching job in another place.

Based on empirical data the following section presents the strategies the *haor* households employ for livelihood related endeavors using knowledge, skills and various assets. Flood coping ability and resilience of the poor household and *haor* community are determined by physical, natural, economic, social, human, cultural and institutional factors or process, which increase the susceptibility of a community to the impact of a hazard.

4.2.1 PHYSICAL CONTEXT

This section presents vulnerability and resilience of the people in study area in terms of physical context. The size of the villages in the study area varies considerably. Some are very small, whereas others are large villages. The geographical characteristic keeps the study area surrounded by water for six months a year. During this long period, people live in island-like villages virtually cut-off from all sorts of social and administrative cooperation and services. The most visible physical vulnerability of the study community means that they are exposed to hazard prone locations. Other examples of physical

vulnerability include risky and insecure sources of livelihood; lack of access and control over means of production (land, agricultural inputs, capital); acute food shortage; lack of basic services such as education, health, safe drinking water, shelter, sanitation, roads, electricity, communication, break out of diseases. Physical capital such as shelter, road, communication, market, water supply, health and sanitary facilities make the people able to pursue their livelihood strategies.

People living in the villages do not have access many of the basic amenities of life. Earning of the extremely marginalized people depends on the physical labor in agriculture field and fisheries. The water bodies such as *beel* outside the main *haor* are leased by the local administration to the powerful non-fishermen groups resulting in exclusion of real fishermen who have right to natural resources. Early flash flood often washes away '*boro*' crop and people loses their harvest. Therefore, they usually become unable to come out of vicious poverty cycle.

The villages belonging to Tanguar Haor region are situated in the remote places of Bangladesh. So, the physical infrastructure of most of the households has a look of poverty. The people's mobility is limited on account of poor facilities for communication and they cannot easily move from one area to other distant locations such as district, divisional headquarters and commercial centres having opportunities for economic activities. Consequently, living in this region is also very strenuous. Some respondents shared their grief about the transport and communication system which is in a very poor condition. The villagers remarked during discussion:

"We are deprived of good facilities like communication, education, health, trade, etc." - lamented, a male respondent of Batta, *Dakshin* Bongshikunda.

"It is very difficult to carry ailing people to hospital or medical centre. Last week one female patient died for want of proper diagnosis of the disease she suffered from. We are aware of the fact that life is in the hands of Allah, but doctors' treatment need to make us content." - said a male respondent of *Purbo Para*, Rongchi village

In this section various dimensions of physical context of the study area are elaborated which include location of houses and homesteads, early warning system, life protection measures, infrastructure, water and sanitation, household assets, valuable documents, communication and transport, etc.

4.2.1 Location of the house

The houses in the *haor* area are highly concentrated in clusters; multiple households live in the same yard in small areas. The following figure (4.3) illustrates the location of the house in the study covered villages in terms of exposure to hazards.

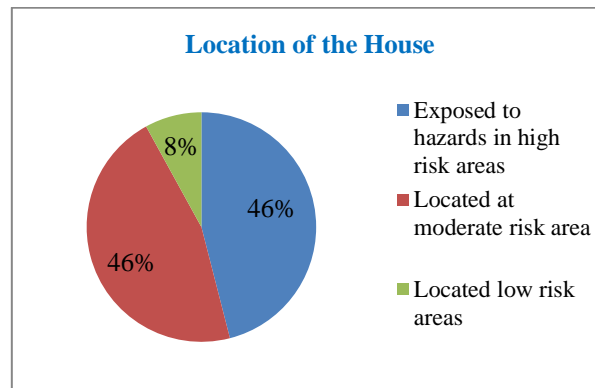


Fig. 4.3 Location of the House

The extent of suffering of vulnerable households of four villages has been calculated on average. The results explored that 46% of households is located in high risk areas keeping them exposed to hazards. About 46% are in moderate and 8% in low risk areas.

The characteristics of the most vulnerable houses are: i) surrounded by water, ii) at least one side affected by soil erosion due to '*afal*' (high wave) and iii) called '*Agla Bari*' (situated in agricultural land isolated from the main village). People try to avoid flood-prone locations when constructing a house, and keep away from hazardous places at certain times of year. However, absolutely landless and marginal households have no other option but to settle in unsafe location and they become the most vulnerable to flood hazards.

4.2.2 Local Practices for Flood Prediction or Early Warning System (EWS)

Early warning practices were defined as those actions that people in the community take to minimize loss of life and assets in anticipation of disaster. Early warning refers to avoiding loss of life and assets by predicting and responding to shocks and stresses.

The UN-ISDR defines EWS as the set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss (UN-ISDR, 2009).

Early Flood Warning System is recognized by the government as the National Water Policy states,

...through its responsible agencies, the Government will develop early warning and flood proofing systems to manage natural disasters like flood and drought...

However, the existing flood warning model in the country is not capable of disseminating a reliable early warning system of flash flood with a considerable leading time for *haor* region. The system relies heavily on the information of flood water coming from the upstream countries. About 93 per cent of the catchment areas of the major rivers – the Ganges, the Brahmaputra and the Meghna lie outside the country. Unfortunately, these river data are not available. The department of meteorology or Flood Forecasting Warning System does not have any special warning system for flash flood. Md. Saiful Hossain (2009) argues that Flood Forecasting and Warning Center of Bangladesh Water Development Board disseminate flood warning as a national source. But the message is not fully satisfying the needs of the vulnerable communities. Standing Orders on Disaster (SOD) issued by GoB clearly defines the roles and responsibilities of Union Disaster Management Committee (UDMC). UDMC bears the overall responsibilities of disseminating warning and security messages at grass root level. In reality the UDMCs of the study area are not functional due to various reasons such as lack of awareness, lack of resources, etc. Furthermore, the villages under this study are so scattered that warning messages cannot be disseminated in a short time.

Given this context people of the study villages have no option but to rely on their traditional knowledge. People's prediction about the advent of flood depends on close observation of their local surroundings, gained experience and capacity of adjustment to

the aftermath. For generations through accumulated understanding about the changeable nature of flood in the locality they have known its history (UN-ISDR 2008, Selina Hakim 2012). They have learned to interpret their landscape and the physical indicators of the past floods. It is also possible for them to describe and explain how their own vulnerability to floods has changed over time. The experienced elderly people almost accurately predict when and how flood may affect the area. So, the local knowledge of disaster preparedness helps a lot to determine strategies for coping with the situation where their survival as well as protection of the environment is ensured.

There is no medium of early warning system for flash flood, hence it is often unpredictable. People only notice flash flood when its affects are already felt, like water level rises and crops are damaged. News and warning of disasters are mostly conveyed through oral communication. The respondents share a variety of predictions for weather forecasting. Some excerpts of the respondents may clarify this point:

“If the weather condition is bad, we predict flood. During that time high tide in the river arrives. Heavy flooding occurs if rainfall is excessive. If we see new tides or tidal streams rise at Madhyanagar Bazar point, we assume flood is coming. Then we prepare to reap paddy. We even harvest immature boro paddy from the submerged land.” - narrated a farmer of Rongchi village

“When we see clouds cover the sky, no appearance of sun and incessant 3-4 day long rainfall, we predict flood.” - commented one female respondent of Antorpur village

Since flood is a regular annual phenomenon in the villages of *haor* area, people have rich amount of knowledge regarding prediction of rain and flood. People have developed their system of prediction, preparation, coping mechanism and recovery. Local people from their experience and observation of environmental signs apprehend the impending danger of flood. There are mainly twofold typologies of the early warning system which are presently practiced in the study area: i). weather predictions on the basis of environment and ii) weather predictions depending on the behavioral change in animals.

Environmental signal

Early warning in the *haor* area is purely based on the keen observations of the local people related to the environmental signals. Some experienced respondents of Bongshikunda shared that if it rains continuously in the higher region and the mountain

appears to be white, then certainly there will be flood. Black clouds and frequent thunder-clap, continuous heavy rainfall along with storm during the monsoon season also indicate possibility of flood. Strong wind blows from north to south western side as well as cold breeze flows from the mountains - any one of these three symptoms will persuade some people to predict swelling of *haor* water up to the danger level. When local people see the canal near the Bongshikunda *bazar* carries much more water than usual, they predict flood may happen. River water becomes cold and muddy before flash flood. Strong waves are created in the *haor*, water in the *haor* reaches the danger level, unusual sound in the river, floating trees in the river all these are important signs of flood.

Animal behavior

Given the proximity and interaction local villagers in *haor* area have with wild species, most of the indicators relating to flood come from the observed behaviour of these species. Some people claim they themselves can predict flood because they get a signal from unusual animal behavior e.g. insects start flying in the sky or in the crop fields before flood, croaking of frogs, desperate movement of snakes and rats around the house and climbing of ants and insects along dry places, more insects in hurricane lamp. When some kinds of new species of birds are seen or different known types move away from the village, people presume there is downpour in the high mountainous places and flood will appear soon. The croaking of frog in a certain unusual manner- frogs start to croak continuously before the flood and croaking stops only when the level of water rises. It revealed from the statements of respondents that the croaking of frogs sounds like 'Megh Ha' 'Megh Ha' as local people perceive it in Bengali phrase like $\hat{\text{O}}\ddot{\text{g}}\text{N } \hat{\text{O}}\ddot{\text{g}}\text{N } \hat{\text{O}}\ddot{\text{g}}\text{N } \hat{\text{O}}\ddot{\text{g}}\text{N}$. These types of information provide a framework that local people use to explain relationships between particular events and changes in the environment. Villagers combine different predictors and indicators to make critical decisions for livelihood and adaptive measures. Perception of women and men regarding EWS is quite distinct. Men perceive early warning or signal in relation to their daily livelihood activities whereas women visualize it through their close bond with the nature.

Various types of dissemination methods have traditionally been used within *haor* communities to warn the villagers about impending disasters. In the study villages in Bongshikunda, responsible youths make loud noise to make the inhabitants alert. Warnings are conveyed by beating metal objects such as tin, brass-plate,

announcement through mosque mike, house-to-house dissemination of warnings, personal interaction, etc. Community groups often monitor the level of water during heavy rains. In case of danger, people residing in vulnerable houses are informed by others by means of shouting and knocking on their doors. When warning of flood become visible, men discuss it in public places especially in the local *bazar*, at the tea stall and mosque; women interact with their neighbors while doing household chores or casual courtyard meeting. In such a way, local people disseminate flood-alert and warnings using indigenous communication channels and resort to the tested mechanisms for safety or survival when flood appears at their door-steps. Thus, by observing and interpreting environmental warning signal, local people manage to prepare themselves for the impending flood. It is important to note that in case of flash flood they have very short lead time of few hours only.

When local people predict imminent flood, they take some preparedness related measures such as house repairing, plinth raising, boat repairing, food preservation, building small bamboo bridges for smooth communication. Some respondents of Rongchi village reported that they also collect money from the community to implement these activities. "*Hari Dhora*" is a local term used to mean collecting money from the community to do some community work.

In the study area in Dharmapasha there are some submersible embankments namely *Ajarkhali*, *Shoytankhali*, *Marardair*, *Haldirbodh*, *Ulashkhali* and *Balrampur* embankments which are damaged during flash floods. When there is warning for early flash flood, people's main concern is to protect these submersible embankments so that flash flood does not enter into the agricultural land. When flash flood occurs, village people also warn people by shouting and whistling. Local volunteers make an announcement through the mike of mosque that flood is rushing to Tanguar Haor. Villagers with their available tools go to embankment to protect it so that it is not broken or overflow by flood water. The embankment is repaired with locally available materials to reverse the wave. Everybody contributes in cash or kind to the venture. Funds are collected from the landowners as per their ownership of land area. This community-attempt may not always be successful. Sometimes the collapse of the embankment results in crop damage. In that case people need to take rapid action to reap immature paddy.

4.2.3 Local Practices for Protecting Lives

The following excerpts of local people illustrates how local people confronting challenges with disasters.

“When the flood water had surrounded our house from every possible side during the downpour, I along with my children was hanging on the machan.” –said a woman of Khidirpur village

“Once a storm caused our boat to capsize in the Tangor Haor. One of our fellow passengers drowned. I hardly managed to survive for over two hours by floating on the upside-down boat. Later another boat rescued us” – a male respondent of Antorpur village

“During the flood the fence of our house collapsed, but we didn’t leave the house in which there was a machan (elevated platform). All members of the family stayed together on it. Our belongings were stored in the fishing boat which was taken inside the house. Since our kitchen went under water, my husband and I built raft from banana trees, placed an earthen hearth on its surface and cooked food” – narrated a woman of Rongchi village who was a victim of flood.

Every two- or three-years’ interval, flood devastates the *haor* area. In recent years the devastating flood occurred in 2004, 2007, 2010, 2012, 2014 and 2017. In such disastrous situation, the most vulnerable groups include women, children, the elderly, and people with disabilities. Drowning in the flood water is a common phenomenon in the *haor* area. There is a danger of traveling by small boat during high tide in the *haor*. The vulnerable people mentioned that they encountered problems like toilet use, health care facilities, mental fear of drowning, snake-bite and insect-sting while sleeping on the floor. They have always a risk of getting injured while walking in slippery path. This sort of calamity challenges psycho-social resilience of the household members.

The families of the study area adopt various types of mechanisms to save their lives. Some fishermen of Antorpur village shared how they save lives when the boat capsizes in the *haor* during storm. They come back faster to the village by following short cut way, or leave the boat upside down and start swimming to the shore, sometimes they hold the small trunks and branches of trees and swim to dry land to save themselves. They carry big cooking pot and tube with them. When the boat sinks in the *beel*/river, people catch hold of the ‘*logi*’ (15-20 feet long bamboo pole) which is firmly anchored to the shallow

river bed to save life. According to the villagers, they hold the boat steadily if it is floating. They put body weight on the upside-down boat and save their lives. These are some of the techniques local people apply to save their life as reported by the local villagers (source: FGD).

During *Boishakh* to *Joishtha* local fishermen of the *haor* area keep close watch over wave size, wave direction and wind speed while traveling or fishing in the *beel* near the *haor*. If they notice wind blowing from the south speedily and waves growing larger, they apprehend a severe storm. Then they stop fishing and get back home. Villagers across the *haor* have been practicing this tactic inherited from their ancestors for years.

The flood of 2004 was the most devastating. About 90% of the inhabitants of the study villages evacuated their houses during this big calamity. The rest stayed at home and suffered terribly (source: KII). The devastating situation compelled a large number of people to migrate to a safe place to take temporary refuge. The reasons for migration were manifold. They could not lead a normal life because their houses were inundated; communication facilities squeezed and opportunities for arrangement of food disappeared. Though many people had to leave the villages, a small section preferred to stay in their flooded houses to take care of domestic animals, crops and household items. Some thought temporarily abandoned houses and properties might be demolished by strong wave (*afal*); so, they did not leave home. Others decided to stay at homestead instead of taking refuge on high land since the latter had already been occupied.

One of the female respondents of Batta village narrated who was a victim of flood:

“How can we leave home without our valuables? A lot of people already gathered in the shelter. It can't accommodate all refugees in the village. During the flood, the fence of our house collapsed, but we didn't leave the house in which there was a machan (elevated platform). All members of the family stayed together on it. Our belongings were stored in the fishing boat which was taken inside the house. Since our kitchen went under water, my husband and I built a raft from banana trees, placed an earthen hearth on its surface and cooked food.”

For all the life-threatening reasons mentioned earlier many families had to shift to higher place. Affected people also move their valuables and family to a relative house or nearby

lower risky areas peoples' house, sometimes in the road, embankments or elevated areas (Rahman, 2010).

In *Uttar* Bongshikunda people mainly went to high land near the Indian border belt to take shelter. Flood affected people of Antorpur village took shelter in nearby 'Ichamari Primary School'. For shelter, some families decided to move to their relatives' dwelling places situated on high land before or during flood. Some sent only a few members to other places. Many of them took shelter on the hill. Some people took shelter on the high road at Moheshkhola *bazar* in *Uttar* Bongshikunda. The poorest and most vulnerable people who live in a fragile low land area mainly migrated to other places during the big flood. On the other hand, people whose houses are located on the high land did not migrate.

During the big flood, people in *Dakshin* Bongshikunda union who remained in the village, made a *machan* (elevated platform usually made of bamboo and tree branch) inside the house and stayed on it. People along with their household assets tried to take shelter on this *machan* when their house was flooded. Some of them also stayed on cot. As the water level rose, they increased the level of the platform. Many of the flood victims had taken shelter in nearby primary and high schools at Bongshikunda bazar. It is mention-worthy here that some parts of the village land are high, but near the *beel* it is low. For example if '*Agla Bari*' or the isolated land was inundated people would shift to the main land of the village which is comparatively high. Women, children and elderly were mainly evacuated and some young people of the household remained in the village to look after house and protect their assets. Some households having livestock did not leave. Others with their cattle had to escape to the mountainous areas. Several affluent families provided shelter for their vulnerable counterparts at the time of disaster. One such example was noticed in Batta village where 40 households had taken shelter at Thakurchan Sarker's house in the neighboring village of 'Basaura' during the big flood. Thakurchan Sarker who is a rich man granted shelter to these people in his sitting room local term '*bangla ghar*', and in the veranda of a big house.

Why did people stay at home or evacuate during the last big flood? In response to this question, 10% said that they stayed at home during the big flood because flood appeared very swiftly; it was impossible to move. They further mentioned the following:

there was no other suitable place to go; they decided to face the calamity with fortitude, it was necessary to watch or look after the house, taking care of livestock, grain and household items was a serious issue, fear of losing houses and property through the attack of *afal* (strong wave), high land was already occupied by the most affected people. Those who evacuated explained the reasons given such as houses were completely inundated; it was necessary to save lives, there was hardly any dry place to stay in, their houses were completely inundated, there was no source of income; it was extremely difficult to arrange food, communication facilities became disrupted; mobility was difficult, problem of staying in the house and taking food, it was impossible to cook food three times a day, menace was created by insects and venomous snakes.

The most vulnerable groups

In any disastrous situation, the most vulnerable groups in the *haor* area include women, children, the elderly, and people with disabilities (9.07% HIES 2010). Children in such circumstances are extremely vulnerable. There is always a fear that very small children may drown in the water. Drowning in the flood water is a common phenomenon in the *haor* area. There is a danger of traveling by small boat during high tide in the deep *haor*. To understand the good practices of child protection in the context of the risky area the study inquired about the household level measures to protect children through conducting FGDs with women. Table 5.21 reports the measures taken by households to protect children from flood.

Table 4.21: Measures Taken by Households to Protect Children from Flood

Coping strategies to protect children's life	Households n= 175	Percentage
Constructing fencing barriers across the door and around veranda and courtyard	125	71.43
Locking children's legs with chain/rope	28	16.0
Keeping children locked inside the house	21	12.0
Encircling the house with a kind of <i>jal</i> (net)	17	9.71
Looking after siblings by elder brothers /sisters	141	80.57
Making children wear <i>Jhumjhum</i> (jinkling anklet) to get indication about their movement	95	54.29
Looking after children by neighbors	87	49.71
Childless parents	19	10.86

Source: Field survey data

FGD findings indicate in all the villages families adopt some good practices to protect their children: e.g. constructing fencing barriers across the door, around veranda and

courtyard to prevent children from unintended access to flood risk areas (71.43%); they dissuade small children from moving around by locking their legs with chain/rope (16.0%); locking the door when mother is working outside the house (12.0%); encircling the house with a kind of *jaal* (9.71%); looking after siblings by elder brothers/sisters (80.57%); making children wear *Jhumjhum* (jingling device) to track their movement (54.29%) and looking after children by neighbors (49.71%). Taking part in the discussion the respondents indicated that family members keep a close eye on small kids. They reduce some chores to be able to spend more time with their children. One of the female respondents mentioned, *"We keep a close eye on our kids, make fence across the door and veranda."* A young girl stated, *"I take care of my younger brother after my school is over"*. As indicated by the respondents, children in the *haor* area have natural instinct to learn swimming at their early ages (6-8 years). Most of them including children know how to swim. When they are 6-7 years old, their families guide them to gain technique of swimming. Some children go to school by banana raft, but parents do not allow them to move by small boat in the deep *haor*.

Elderly people's fate

In the villages under the study it was found that elderly people were very susceptible to vulnerability during flood. At the time of discussion, they and their caregivers explained what they experienced. Flood poses substantial social and mental stress to the elderly people that may continue over extended periods of time. This sort of calamity challenges their psychosocial resilience and breaks down morale. Many of them suffer from trauma since they are left unattended. Many of them are ignored by their near and dear ones. Aged people encounter problems like toilet use, health care facilities, fear of drowning, snake-bite and insect-sting while sleeping on the floor. They have always a risk of getting injured while walking. An elderly man (80) of Rongchi village having faint eye sight and curved spines, opined, *"I use walking stick. My daughter-in-law looked after and fed me. During the big flood, my son helped me evacuate the house. I was taken to a safe place by boat"*. Many elderly people have to suffer from starvation all the day during lean period. Sometimes they are given least priority while households plan for evacuation or prepare to move to higher ground. Infirm aged people cannot get prepared by themselves to evacuate before water level rises.

'What measures were taken by households to protect elderly people from flood?' In response to this question most of the female respondents (86%) replied that they stayed on "machan" inside the house. For many elderly people, leading a normal life is possible only with the help from the family, especially women caregivers who provide meals, health care for them and assist to get daily necessities.

A female respondent of Batta village stated:

"We help our old household members to stay on "Machan" inside the house during flood. We have to make them climb up and get down. They need to be taken to the toilet. Sometimes they have to go to doctor. Once our grandfather was trapped in the flood affected house; then he was shifted to another house situated in the high land."

Capacity of elderly people

The results of this study indicate that though aged persons are vulnerable, they have resources and capacities as well. These senior citizens have long experience in respect of living with the catastrophe of flood. Older people's knowledge of the community history can be an asset of any community. Some older men and women have a greater knowledge of indigenous coping practices and risk-reducing practices. To have a better understanding of their strengths, some excerpts from the respondents are quoted below:

"I collect nolkhagra (reeds) from haor and make mats and fences. These plants grow in ujan (upstream) area in high land." – a female respondent of Antorpur

"I used portable stove to cook. I often collected firewood to store in the dry places to be used later." – a female respondent of Khidirpur

"I help make puffed and fry rice which is preserved to meet food deficiency during any calamity particularly flood." - a female respondent of Batta

"I look after my grandchildren." --a female respondent of Rongchi

A very old person (aged nearly 100) of Rongchi village shared his story and expressed his views in the following way:

"To get outside is difficult during monsoon storm. I cannot get into boat without taking help from others. I move with a walking stick. If I become sick, my sons and grandchildren take care of me. They assist me to move to other places by boat. In 2004

during the big flood I had to stay on a big fish tank (like a big box). Then I used to tighten the wires in the house fence so that it could not be damaged by flood”.

In response to a question, ‘what would he do if big flood like 2004 happens again?’ He replied *“I rely on Allah; we have to accept whatever He wishes”.*

The study reveals some older men and women have a greater knowledge of indigenous coping practices and risk-reducing practices. Older women often play a key role in childcare, allowing productive generations to invest time and energy in new risk reduction or adaptive strategies. The researcher came across one veteran woman (aged 60) of Khidirpur village who always takes care of her grandson who was born with mental deficiencies. She says *“I keep a close eye on my grandson so that he does not drown in the water”.*

People with disabilities

A person with disability from Khidirpur village shared his miserable experience of the flood in 2004 in such a way, *“When the water was rising, somehow I climbed to the roof and saved my life.”*

A woman with a disability from Antorpur village, said

“With the help of my sister I managed to reach the high secure area. Going to the toilet was the most awkward problem I had to face”.

The study explores the vulnerability of people with disability. The researcher identified PWDs through information provided by key informants and home visits. At least nine percent people in the study villages have a severe disability and require daily assistance from family members especially women for care. Interviews with individuals having disabilities and their caregivers were conducted by the researcher. From close interaction with them the following data were found.

The caregivers reported that their dependent PWDs faced difficulties with regard to mobility during floods. Heavy rain makes the village paths and homestead area muddy and slippery, and consequently movement is extremely difficult especially for mobility and visually impaired persons. Ensuring constant access to safe drinking water and sanitation during floods is a major challenge faced by them. Most people with disabilities depend on family members when they need to use latrines. A physically challenged

woman interviewed from Antorpur village explained, *'We feel our dignity is undermined each day when we need to depend on others at the time of using toilet; oh! would that we could use latrine and water source by ourselves.'* Throughout the flood, most of the communities' usable tube-wells and latrines were submerged under water. This made life extremely difficult for people in particular, those with disabilities to have continuous access to safe water and sanitation facilities. PWDs are even dependent on others for supply of drinking, washing and bathing water during this time. As a result, many people are forced to use contaminated water which leads to increased incidences of water-borne diseases. In some cases, PWDs prefer to stay in their submerged homes on raised platforms rather than going to alternative shelter. Sometimes one of the family members stay behind with them, but in some cases PWDs remain in the flood area alone. In another instance, the automatic choice of the family members with disabilities is to stay behind and guard household's belongings.

The researcher came across two severely disabled children in Majihpara hamlet of Khidirpur village. Shifat and Juanid age 8 and 7 respectively. These children are not able to take care of themselves. Somebody has to provide full time daily care to them. In both cases their parents take care of them.

A capable PWD of Batta village

Swadesh (his pseudo name) is a physically challenged young man of Batta village in Dakshin Bangshikunda union. But he is capable of doing many things by himself. In spite of being unable to use his feet, he can move very fast depending on his hands. He can sail a country boat. Swadesh usually goes to long distances in the haor area by boat to obtain firewood. He knows hand gathering and trapping techniques for catching fish. His wife is a dwarf. A local NGO provided her a sewing machine which she utilizes at home to get additional income for her family.

4.2.4 Local Practices for Protection of Houses and Homesteads

The most visible physical vulnerability of the study community means that they are exposed to hazard prone locations. People stay in mounds locally called 'Ati' which are formed with dumping soils and are situated in middle or the periphery of haors. It is found 46% of households is located in high risk areas keeping them exposed to hazards. Absolutely landless and marginal households have no other option but to settle in unsafe location and they become the most vulnerable to flood hazards. The vulnerable houses

and the surrounding areas have a little protection against strong wave or 'afal', erosion and high wind. Consequently, a considerable number of the dwelling places are damaged by flood almost every year. So, the recurring cost of house repairing creates economic pressure upon the affected households. One of the female respondents of Batta village stated, "*We are poor therefore we cannot afford to buy concrete post when our house is built; we alternatively use bamboo which does not last long*".

Indigenous adaptive housing technology

Different kinds of indigenous practices are found for house construction in the *haor* area. Locally available materials like leaves and plants (*ujauri, ikar, bajail, bata, denga*), straw/thatch, jute stick, mat, bamboo (polished with clay), wood, CI sheet (tin) are widely used for house construction. Housing patterns in the study area shows indigenous construction practices and locally available materials. These materials are coming from the *haor*. Every year during the flood season, there is some degree of damage to homestead or village mounds. When the rainy season comes, people observe the trend of wave, danger level of water and through acquired experience they understand which side of their locality is going to be eroded. The paper published by CDMP-I (2004) provides examples such as the indigenous knowledge of housing pattern reduces the vulnerability of flash flood. A study published by UN-ISDR (2008) pointed out that local communities possess a range of traditional measures to mitigate hazards, they prefer to grow shrubs, bushes and grasses in and around the villages.

The respondents were asked how they take precaution to protect houses and homesteads against flood and what they do when the village is moderately or severely inundated. The following Table 5.23 illustrates indigenous adaptive housing technology based on their response.

Table 4.22: Indigenous Adaptive Housing Technology

Indigenous adaptive housing technology	Number of Household n= 175	Percentage
Raising house-plinth	157	89.71
Planting trees around homestead (<i>koroch, hijol, dholkolmi</i>)	170	97.14
Repairing homestead-mounds with <i>ujauri</i> , water hyacinth, soil, <i>chaila</i> grass and bamboo	116	66.29
Constructing bamboo fence around house prior to the rainy season	59	33.71
Using plastic soil-bags around homestead	38	21.71
Increasing height of homestead areas	24	13.71
Using make-shift floor (wood etc.)	33	18.86
Using boulders to protect homestead from erosion	19	10.86

Source: Field survey data

Table-4.22 indicates the indigenous adaptive housing technology. Before the commencement of flood season people in the study area usually raise the plinth of their houses (89.71%). People raise the plinth of their homes which substantially reduce their vulnerabilities during and after floods. Often the family members plant trees like *hijol*, *koroch* and *dholkolmi/ujauri* tree around the homestead to increase its stability to face erosion caused by strong wave or *afal*. People usually repair their homestead mounds before the flood season with *dholkolmi* (locally called *ujauri*), water hyacinth (locally called *germoni*), soil, *chaila* grass and bamboo to withstand flood and reduce wave driven erosion (Mahfuzul Haque 2000). A locally available *Ikar* tree is used to fence the house from all sides. They construct frame around the house to protect it from erosion during floods using plants, water hyacinth, which is reinforced with bamboo and earth. Plastic soil-bags are effectively utilized to prevent floodwater from damaging house plinth and floor. It can act as a barrier to divert moving water. The use of soilbags is an effective method of preventing house plinth and floor from damage. A very common strategy in the study area to protect the homestead includes elevating and reinforcing the homestead. Some affluent people fix their homestead-mounds with boulders that last for longer period than grass and bamboo barricade. According to the data, 33.71% households construct boundary walls around homesteads. At the onset of the monsoon a family spends on average Tk 5000-10000 to protect its house against the upcoming flood.

Flood with high intensity, if accompanied by strong wave or '*afal*', earthen plinth tends to get completely washed away and the house posts become damaged. From the household level case study, it comes to light that when the most flood-damaged houses require replacement of bamboo posts, the owners (family-chiefs) in association with the neighboring people repair those attaching priority to ones located near the water. Through taking these steps the people of the *haor* area try desperately to face the calamity of flood and remain safe.

In most cases house protection initiative is carried out by individual household members, but the issue of common interest e.g. constructing a barricade around the people's cluster-homestead area for its protection is often done by them collectively. Such an example was observed in Antorpur and Batta villages. Here the people of neighborhood worked together to protect their homestead.

Securing shelter

The FGD participants mentioned they arrange for ropes, bamboo, wood etc. to face the adverse situation before flood appears. These materials are needed to build a traditional structure that works as an elevated shelter called a *macha*. People with their belongings take shelter on this *macha* when their house is flooded. Poor people, who cannot afford to buy these materials, usually try to borrow them from other people of the community. For shelter, some families decide to move to relatives' dwelling places before or during flood. Some send only a few members to other areas. There is a grave concern about the security of female members who are usually put in safe custody of close relatives for a short period of time. So, few families prefer to keep them away for an emergency period. If a house is badly inundated, sending pregnant women and children to relatives' or neighbors' houses becomes indispensable.

4.2.5 Local Practices to Have Access to Water and Sanitation

The respondents of the study villages explained the practices for ensuring water in the following way:

“While the flood affected our locality, we would fetch safe drinking water from a long distance. Sometimes we even used flood water to meet our needs.”

-- A woman of Rongchi

‘During flood pure drinking water becomes scarce and we have to travel far away by boat to bring tube-well water located on a raised land in another hamlet of our village’. - Rezia (30) Khidirpur village.

“We live in Agla Bari where there is no tube-well. So, we have to use haor water for bathing and washing. We collect drinking water from the sources like beel and rivers. For drinking purpose, we purify water by boiling, mixing salt or alum. We use pitcher or cooking pot to collect rainwater. We cover the mouth of pitcher with thin cloth. After the dust has been stabilized at the bottom of pitcher, we use it for drinking”. – A woman of Batta

Despite the fact that Tanguar Haor is a large wetland, people do not have access to safe drinking water. So, its scarcity is a major crisis for them in all the seasons. In this area around 77.6% households use water from *haor*, ponds, canals and rivers (IUCN Survey 2008).

The FGD participants from the study village shared their experience about water scarcity during flood. It is extremely difficult for all households to collect drinking water from very limited sources. Usually most of the tube-wells of the study villages go under flood water during flood. Most of the flood victims suffer for acute shortages of pure drinking water as the flood water starts to recede. Most of the time children drink unsafe water and suffer from multiple diseases. There is no tube-well in *Purbo Para* (East Hamlet) of Khidirpur and the inhabitants collect water from *haor*. Even during the previous rainy season, while the villages were surrounded by water, there was an acute shortage of safe drinking water. The situation faced by these villagers was not uncommon for the families located in other parts of the *haor* area. The respondents from Rongchi and Batta villages narrated their distressful stories in respect of obtaining safe water by boat from other hamlets especially in the rainy season. The hamlets are very scattered and all the

households do not have boats of their own. Sometimes the owners of tube-wells are reluctant to let other families take water assuming the idea that on account of excessive utilization, the devices may get damaged. In the circumstances, people are compelled to drink contaminated water from *haor* and become sick.

Water using scenario

It is mentioned in the first section of this chapter that most widely used drinking water sources are tube-wells (84.57%). For washing and other domestic purposes, all of them depend on the surrounding open water sources like *beel*, river, canal and *haor*.

In response to a question related to households' solution to water crisis, the respondents mentioned some coping strategies. The Table 4.23 shows commonly adapted coping strategy to face water crisis:

Table 4.23: Households' Coping Strategy to Face Water Crisis

Coping Strategies	Number n=175	Percentage
Community level		
Setting tube-well on high ground or raising its platform	-	-
Adding additional pipe(s)	-	-
Household level		
Fetching tube-well water from another hamlet or village	59	33.71
Purifying water by boiling or using alum	163	93.14
Using three pitchers (coal, sand and stone)	39	22.29
Fetching water by boat and banana raft from distant <i>haor</i> area	175	100
Harvesting rainwater	29	16.57
Applying disinfection method through solar energy	16	9.14

Source: Field survey data

As shown in the Table 4.23 the villagers mentioned installing tube-wells on high ground or raising the platform to deal with this catastrophe. To keep the hand pump of a tube-well above the probable highest level of water people add additional pipe(s) under community initiatives. Those who do not have tube-wells in their courtyards fetch water from the same source belonging to other families (33.71%). Many of them (93.14%) use boiled water or purify with alum. It is found some households harvest rain water traditionally (16.57%). During the monsoon months, they construct a structure on the edge of each house-roof with banana stems/bamboo/tin/plastic sheets to catch rainwater. Those who have thatch-roofs collect rainwater from the tin-roof facilities

possessed by others. When it rains, mouth covered containers (pitchers or buckets) with clean cotton cloths to keep them dirt/dust free (this method is widely used to ensure filtration) are placed underneath the roofs to collect drinking water. This type of filtration is the most widely used treatment method for drinking and cooking water. The people of Antorpur village have been using this process as a means of harvesting rainwater for a long time. Some respondents mentioned they put small amount of raw turmeric in rain water storage container. If there is no rain, villagers use boat or a banana raft to fetch water from the *haor*. The villagers (22.29%) have created a water purification device to solve water problem in the locality. It is a simple three-pitcher (locally known as 'three-kolshi) filtration device made with readily available local materials such as coal, sand and stone. This technique was observed in Rongchi village. Solar disinfection method introduced by an NGO has easily been adapted by the people (9.14%). This is an effective way to disinfect water with only sunlight and a bottle. A plastic or glass bottle filled with water is placed horizontally on the roof of a house to have full sun-shine for at least six hours. Then water in the pot becomes purified. All these methods are some examples of adaptation practices of the people in the study area. In some localities (*Uttar Aati* of Antorpur) of *Uttar* Bongshikunda people use purified pond water for drinking.

'Abuj Miar Para' is a small area of Rongchi village, where only twenty-two families live. A water treatment plant has been established here with the help of an NGO. The house/chamber of the plant is filled with tube-well water. The filtered water is collected from other three outlets. Prior to installation of this new water treatment plant, there was only one tube-well in this locality.

Sources of Water

From the above discussion, it is evident that *haor* water is extensively used for cooking, drinking, bathing and washing. During the dry season tube-well is the only source. Sometimes in the villages tube-wells stop working. In some hamlets, there is more than one tube-well whereas in other places there is none. A respondent of Batta village said:

During the rainy season, we collect tube-well water from far away villages or another hamlet by boat. We purify river or beel water with alum. Some people in our village cannot do it; so, they boil water. By means of applying this method dirt/dust can be removed and we feel mentally secure. During the dry season, most of the people bathe in the haor water.

It was found that rain water harvesting, *three-kolshi* method, solar disinfection method are some good examples of adaptation practices of the people in the study area.

Defecation type

Most flood-affected households lack for sanitation facilities. There were only few sanitary latrine owners in the whole village. The common defecation takes place in hanging toilets and open spaces (bush, field, backyard, *haor*). Bamboo, plastic bags, jute bags, etc. are used for constructing hanging toilets. Some toilets are installed without the ring. In the rainy season both male and female use open latrines. Some use *katcha* latrines in their backyard constructed by digging holes in the ground and placing banana stem over the hole. High proportion of the respondents reported use of boat/banana raft for defecation in the *haor*. Men go by raft or boat to a distant place in the *haor*, whereas women wait till dusk or early morning and go to the backyard for the purpose of defecation. Poor sanitation affects badly during and after flood. Women, aged people and adolescent girls suffer as sanitation systems are destroyed. Many women reported that they refrain from using the toilet during the day and consequently suffer from urinary infections.

The villagers have some good practices for sanitation facilities. During flood, some of the respondents made temporary toilet with bamboo, wood and gunny bags or polythene sheet. They raise the ground with earth a little higher than flood level and then install low cost sanitary toilets on there. People make temporary toilet with bamboo, wood and gunny bags or polythene sheet. They raise the plinth of toilets by piling up earth considering the highest flood level. Among the inhabitants there is neighborly cooperation in regard to installation of latrines in their houses. However, all the respondents do not have the same coping ability. Coping ability of the respondents varies from one to another due to their personal and socio-economic condition.

4.2.6 Local Practices for Protecting Household Assets

The following is a comprehensive list of assets that generally can be found in the households under this study. It is worth-mentioning here that not every single household necessarily own all these assets as listed below:

Household furnitures include cot, *machan*, table, chair, *alna*, and trunk; cooker items like plate, glass, utensil, spoon, mug, bucket, etc. bronze and aluminium dish, plate, bowl, *khancha*, *singair* (for Puja); agricultural equipment like *langal* (plow), *joal*, *moi*, *kaste* (sickle), shallow machine (irrigation pump), paddy husking machine, power tiller, *payela* (for carrying paddy and earth), spade, *shabal* (pickaxe), *khonta* (a digging instrument), *da* (chopper), *kural* (axe), *haturi* (handy hammer), *batali* (chisel), *karat* (saw); valuable items like TV, mobile, watch, fan, solar panel, sewing machine; transports like boat, trawler, van, cycle, motorcycle; fishing gears such as net, hook, trap; food grains; poultry and livestock.

Table 4.24 below shows the coping strategies of the households to protect some of the fragile assets such as bedding, clothes, utensils, food grains, domestic animals, etc.

Majority of the respondents (67%) build elevated structures one corner of the room made of bamboo locally called '*machan*' to protect household items, store foods, fuel and goods from flood (Paul, 2010). During flood people living in the *haor* villages keep valuable items like food, clothes, grain, etc. on this '*machan*'; they hang pillow, bedding (wrapped with polythene) against the ceiling (locally called '*dharna*') of the house; keep utensils in *Shika* (hanging jute net); keep removable assets on ceiling or high places of the house. Some of them leave their belongings on raft/any floating objects and they take shelter in relatives' houses. They keep food grains wrapping with polythene in *Shika*. Some of them keep animals on raised platforms during flood as a flood mitigation measure. The respondent use elevated *dhaner gola* (paddy container) to keep their grain safe from flood water.

Table 4.24: Coping Strategies to Protect Household Assets

Assets	Coping Strategies
Bedding, clothes, pillow, <i>kantha</i> , quilt	keeping these items on ' <i>machan</i> ' hanging pillow, bedding against the ceiling of the house wrapping it with polythene keeping it in trunk
Crookeries	keeping utensils in <i>Shika</i> or jute string bag keeping it in triangular shaped <i>chang</i> Keeping utensils/food items in a bag tied to a pillar keeping utensils on raised platforms
Food grains	keeping food grains wrapping with polythene in <i>Shika</i> keeping food on raised platforms keeping vegetable seeds in colored glass bottle keeping pumpkins in hanging nets keeping seeds in earthenware pots
Domestic animals	keeping domestic animals on raised platforms during flood

Source: Field survey data

4.2.7 Local Practices for Protecting Documents

Valuable documents including land records, certificates, books, etc. are most susceptible to flood. Vulnerable households have barely any secure places to store these materials which are often damaged, floated away or dampened by rainwater. To protect valuable documents people adapt practices based on local knowledge. The Table 4.25 shows the households' coping strategies in respect of protecting their valuable documents:

Table 4.25: Indigenous Methods for Protecting Valuable Documents

Protecting measures	Households n= 175	Percentage
Keeping valuable documents (wrapped with plastic sheets) on the ceiling and to the house post hanging	77	44.0
Keeping documents inside the bamboo stem with its mouth wrapped with a plastic sheet or cloth	31	17.71
Keeping important documents (wrapped with polythene) on elevated shelf or raised platform	43	24.57
Keeping documents in trunk	24	13.71

Source: Field survey data

People keep valuable documents (wrapped with plastic sheets) on the ceiling and to the house post hanging. Other methods include keeping them inside the bamboo stem (its

mouth is wrapped with a plastic sheet or cloth); keeping important documents (wrapping with polythene) on elevated shelf or raised platform; some of them keep documents in trunk. Documents stored in this manner are protected from rain or flood. These practices have been going on for ages in the villages of Bongshikunda union. The local people have learned them from their ancestors.

4.2.8 Local Practices for Communication and Transport

It is evident that the conditions of transport and road connection in Bongshikunda are really deplorable. In the study area of Bongshikunda union, the means of transportation is a small country boat locally called '*hater nauka*' or hand boat, engine boat/trawler, *tom tom Gari* (horse cart), motorcycle. Villagers often walk a long distance when the land is dry. During the monsoon, small boats and floating crafts made of banana stems are the only sources of communication in the villages. People use engine boat to go far away places but to move within the village they use raft made of banana stem, '*hater nouka*' or country boat. In some cases, they swim or use large cooking pots or pitcher to reach neighboring places.

Many families cannot afford to bear the fare of boat or any other transport to go from one place to another or send their children to school at the time of flood. Families possessing no boat often depend on other people's boat or sometimes they borrow it from them for the purpose of traveling. During heavy rainfall people who can afford travel by engine boat. In such a situation transportation may be fully disrupted. Although in the rainy season it is easy and comfortable to move or go on journey by boat, there is a risk of mishap if the weather becomes bad. Every year, there are incidents of boat capsizing and drowning. In bad weather people cannot go out to catch fish; so, they fail to earn their livelihood. Then insecurity about income threatens poor households.

A man of Rongchi village shared

"We don't go out during fierce storm when small boat even trawler may capsize in the haor. In such an incident, some people and cattle drowned. Once a number of people went to the haor to collect ujauri/dholkolmi (water palnt) and catch fish, suddenly a storm broke. There was no way to come back. Whenever we see any boat capsized in the storm, we do our best to rescue it.

Usually people from Antorpur, Khidirpur and Rongchi village go to Natunbazar and Moheshkhola *bazar* by a small country boat. School remains closed while heavy flood continues. Most people remain at home in the *haor* area during flood.

Cultivation of banana and bamboos for food, shelter and rafts for mobility to be able to cope up during flood and to cope with the consequences of floods are generally used by the communities (Morshed, 2007). People in the study area plant banana trees which are used for making rafts. These serve both as transport and shelter. For communication purpose, people also build locally developed bridge called '*shako*'. Those who are financially solvent buy boats beforehand or start repairing old ones. Small country boats under private ownership are used to meet emergency needs (e.g. evacuation). In the village, there are carpenters who make boats. They have transport repair capacity within community. Rafts made of banana plants are extensively used during flood. The majority people of the locality have the skills to make banana rafts.

4.2.9 Local Practices for Protecting Infrastructure

It is observed that there is a high incidence of vulnerable situation with regard to infrastructures. Flash flood and seasonal flood cause damage to different types of infrastructures like embankment, education and religious institutions, unpaved village roads, bamboo-bridge, tube wells, etc. Community people take collective initiatives to protect these infrastructures from the menace of flood waves. In the study area a number of submersible embankments have been constructed by Bangladesh Water Development Board (BWDB) to give protection against pre-monsoon flashflood. The earthen submersible embankments, which are submersed every year in monsoon, damaged by floodwater and wave, require regular repair and maintenance. Embankments are cut at different locations for drain out water by farmers and fishermen, which also need to re-build every year before the next pre-monsoon flash flood. BWDB is shouldering the responsibility of regular operation and maintenance of the submersible embankments and controlling structures. There are allegations against some unscrupulous BWDB officials that they are involved in corruption where they helped the contractors build embankments using poor construction materials, which couldnot prevent flow of water and preserve the boro crops (source KII).

It revealed from field data that protection of the embankment is the primary concern of the community to save the crop from flash flood. The villagers of *Dakshin* Bongshikunda union mentioned a good example of community initiative that made a significant impact on their livelihoods. In 2014, when the embankment (*Ajarkhali* embankment) was breached due to flash flood the announcement made through microphone of the local mosque. As the news spread, hundreds of villagers gathered along the river bank to protect the embankment. They used earth, bamboo, mat, jute/plastic bags for repairing it. Their concerted effort played a key role in limiting the extent of flood damages. Thousands of villagers including landless day laborers, sharecroppers, small and big farmers, youths and elderly people carrying spades, bamboo baskets, jute/plastic bags, etc. gathered at the venue even at night to do the job. Community people paid in cash (Tk. 100-3000 each as per their ability) or kind to save the crop. Some people even donated their house fences to make the embankments stronger. A number of people brought bamboo from their house while others purchased it from the local market. Those who are unable to contribute financially provide physical labor. It was an excellent way to gain community support and make a significant impact on their livelihoods. A sharecropper, *Dakshin Bari*, of Rongchi village said *“If we had not constructed the embankment, we would have faced famine in Boishakh. There would be no other option except begging.”*

According to local villagers, when there is early flash flood, they use mike of mosque or beating metal objects for dissemination of information and urgent actions in emergency situations. Sometimes crops are harvested early due to early flood or flash flood when embankments are not sufficient to save the crops from flash flood.

In all the four villages under this study, almost all of the roads are *katcha* roads. The villagers had to build temporary bamboo bridges on their own initiative to facilitate their mobility within the boundary. At the beginning of the dry season most of the temporary bridges are dismantled. However, all hamlets of the villages are not connected by such a network of bamboo bridges. Indeed, bridges are built to connect hamlets especially with mosques and schools. Union Parishad cooperates with the community people for repair of roads and *shako*. In some cases, people construct bamboo bridges by collecting money and materials from the community people who contribute to the initiatives as per their abilities.

The recent flood damaged a local bridge over the small canal, hampering the movement of villagers. The village of Rongchi in Dakshin Bongshikunda union took initiative to rebuild the local bridge using their own resources. The length of the bridge is about 40 ft. The villagers used local resources (e.g. wood, bamboo, rope, iron crew etc.) and their own labor for the reconstruction. This was completed within 20 days with the involvement of 30 villagers who highlighted it as a great example of community efforts towards reducing the adverse impact of flood.

The only remarkable infrastructure in the village is government primary school cum flood shelter. During a heavy flood people take shelter there. If the school floor and wall are damaged due to inundation, local people provide labor and raw materials to repair it. All the *katcha* roads go under water in the village during seasonal flood. In a typical village only two/four households have semi *pacca* house. Among four villages only Rongchi is protected by 'Village Protection Wall'. This village is surrounded by concrete wall which was constructed in 2012. This has reduced house plinth damage creating a very positive impact.

One villager mentioned:

"After the flood was over, trace of the village path could not be found anywhere. All roads were submerged. Flood water marred our houses, how could the inundated roads be saved?"

In the area, 50% households have their own boats which are used for fishing, going to *bazar*, family members' movement in the hamlets and children's transportation to nearby schools. As mentioned earlier in every village there are artisans known as boat builders or carpenters. The researcher interviewed one of them who also build houses. Though there is no big rescue boat available in the village, yet young people help elderly people, children and women to move to safe places by small country boat when a disaster appears.

Connection of solar panel to rural houses is a new innovative addition in the rural power system. Over some years different NGOs and private companies have been operating commercially in the *haor* villages to bring the households under solar power connection. It has enabled the inhabitants to use solar energy for light, fan, TV, charge of mobile phone, flash light and operation of other devices. Almost 50% of households is connected to the solar power system in the study villages.

Conclusion

The findings reveal that indigenous knowledge played a significant role in reducing the impact of floods in *haor* area. However, the extent to which indigenous knowledge enhanced resilience to floods was greatly influenced by geophysical locations, exposure to flooding and socio-economic abilities. Communities in an area with high intensity of flooding coupled with a weak socio-economic base such as education and income are less likely to cope with flood impacts. The study shows how indigenous knowledge is an indispensable component of disaster resilience building in *haor* area of north-east region of Bangladesh which has unique geographic features. This section has discussed about resilience of the households and *haor* community in terms of physical aspect. The following section presents a description of natural aspect.

4.2 RESILIENCE OF HAOR HOUSEHOLDS WITH RESPECT TO NATURAL CONTEXT

Natural resources are the main sources of livelihood for *haor*-communities. Most economic activities carried out in the area include fishing, farming, grazing and fuel wood collection are based on these resources. More than two-thirds of households in Tanguar Haor is either directly or indirectly dependent on the *haor*. Mizan (2000) states poor rural communities depended on the surrounding ecosystems for their livelihood. While conducting a survey the present researcher asked the household members whether they go to *haor* to collect resources. It is found that people in the study area regularly visit the *haor* in connection with the affairs of their livelihoods. The figure 5.4 shows distribution of households by reasons for going to the *haor*.

Figure 4.4: Reason based distribution (%) of households for going to the *haor* area (all villages combined)

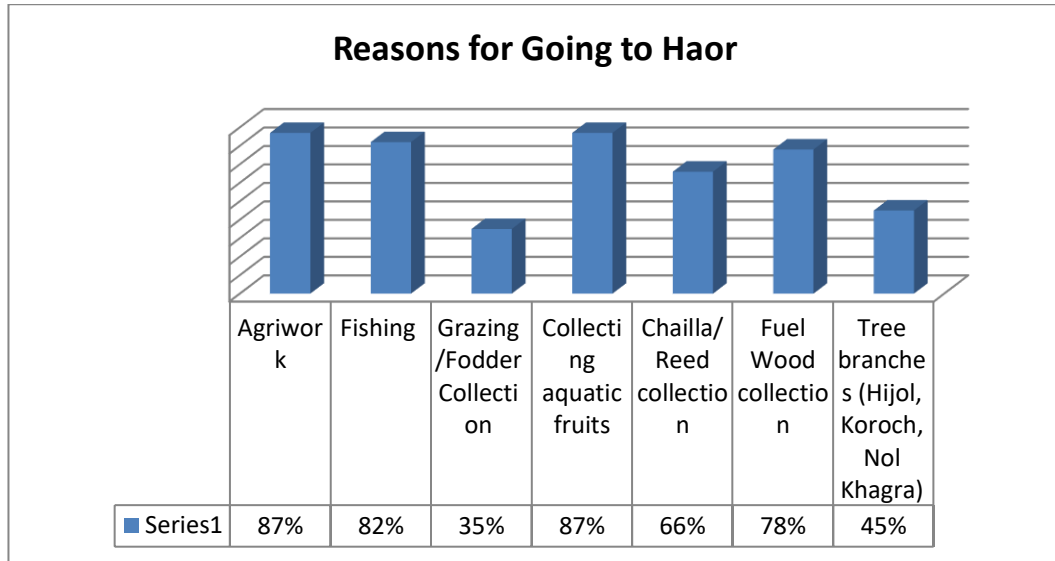


Fig. 4.4 Reason Based Distribution of Households for Going to Haor.

Being a rich fishery resource base, majority of people from the study area goes to *haor* for fishing purposes. Data show 80.86% people of the study area go to the *haor* to catch fish (Figure 4.4). Another main reason for which people go to *haor* is connected with agriculture. Figure 4.4 shows that 82.27% of people go to *haor* to cultivate lands and produce crops. Among them there are also agricultural laborers.

Apart from fishing and agricultural purposes, there are other important jobs which attract the local people to *haor*. Various plants and fruits locally known as *chaila*, *reed*, *ujauri*, *singra*, *deb*, *shapla*, *shaluk* that grow in *haor* are of good use to the local communities. In *Falgun-Chaitra* prior to harvesting of *boro* rice opportunities for income become scarce. Then indigent households go to the *haor* with a view to collecting wild fruits and plants. Sometimes these become the main ingredients for a meal. Poor people also sell water fruits and plants to enhance their income. *Dholkolmi* (locally called *ujauri*) is another resource that people collect from the *haor*. This plant is extensively used as fuel and for fencing. *Chaila*, a kind of tall grass extensively used for protecting homesteads against erosions caused by flood waves. Reed is used for house roofing, thatching and fencing, fuel and other purposes. The poor households have high reliance on these resources for their livelihoods. Data show over 87% households procure plants and fruits from there (Figure 4.4).

During the dry season, a considerable number of people go to the *haor* to graze their cattle (19%) and to keep the duck *bathan*/flock (5.83%). Collection of fodder grass from the *haor* is also an important livelihood related activity for the people in the area. Over 35% of the households collect fodder grass from the *haor*. The poor also sell part of the grass collected to supplement their family income.

One woman FGD participant of Khidirpur village, *Dakshin* Bongshikunda said:

“During the month of Chaitra, we had only two meals a day--- one meal with rice, salt and chilli and the other meal with singra that we collected from the haor. We just boiled this fruit and added salt to it.”

Table 4.26 provides a comprehensive account of the importance of the wetland plants for livelihoods of the poor.

Table 4.26 shows that there are some wetland plants grown in the *haor* area are used as food, fuel, fodder, medicinal plants, materials for fencing/thatching, making boat/raft, protecting village mound from waves, and trap for fish. These common property resources are of considerable importance to the poor. In the *haor* area, people grow banana plants that survive in floodwater aiming at getting fruit/vegetable and making raft with its stem. The Figure 4.5 shows *haor* resources.

Table 4.26: Commonly used plants in the *haor* for different purposes

Uses	Plants
Food	<i>Singra, deb, shaluk, paddy, shapla</i>
Fuel	<i>Ujauri, leave, branches</i>
Fodder	<i>Chailla, durba grass</i>
Food/family income	<i>Singra, ujauri</i>
Medicinal plants/herbs	<i>Arjun, neem, tulsi,</i>
House construction (fencing/thatching)	<i>Hizol-koroch, nolkhagra, chailla grass</i>
Protecting village mound from flood waves	<i>Hizol-koroch,</i>
Trap for fish	Water hyacinth

Source: Field survey data

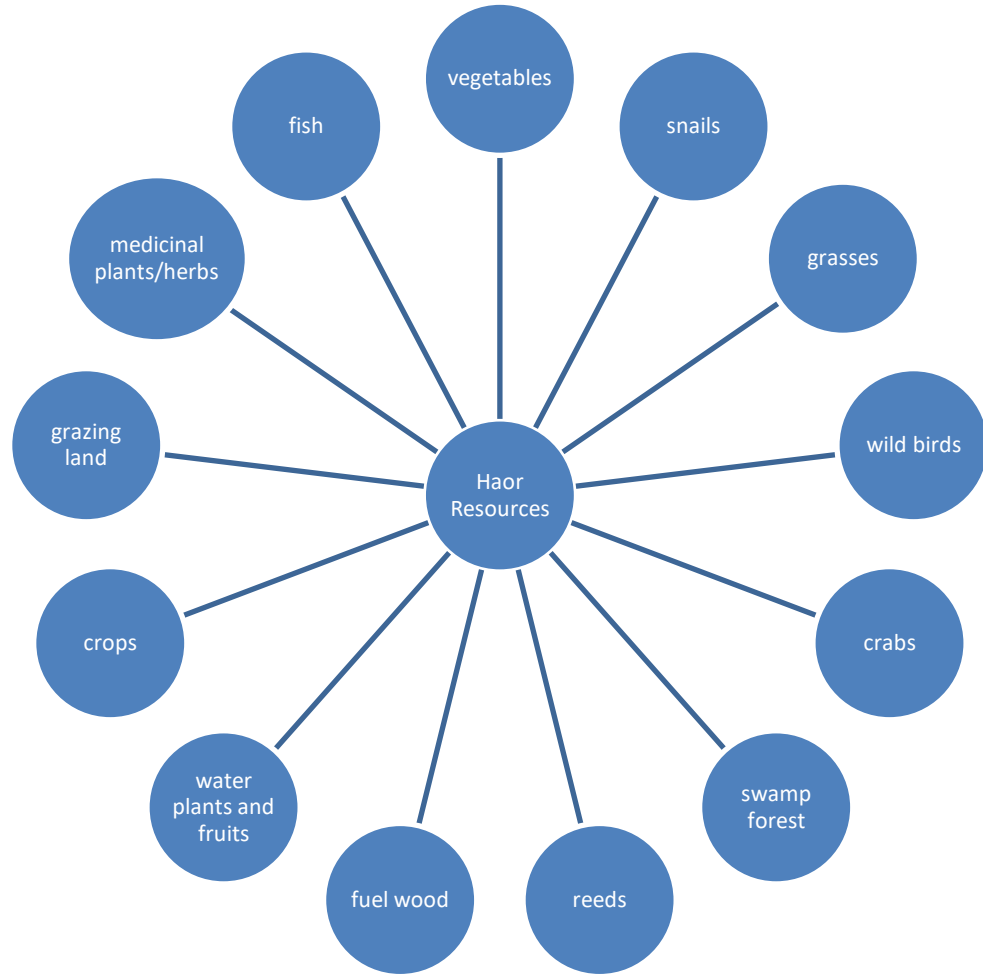


Fig. 4.5. Haor Resources

Depletion of natural resources

The study revealed the situation of natural resource depletion in the *haor* area. There is a growing conflict over procurement of resources between the community people and the local influentials. The researcher has noticed that the self-serving force dominated social power structure excludes the marginalized from sharing the scarce resources. Local people’s perception on endangered *haor* resources appears very clearly from the following excerpts:

“We used to catch fish near our homestead but now the quantity of fish has been reduced.” – a fisherman of Rongchi village.

“If we stop fishing, the production will increase. Though we are going to be losers for the time being, we will get fish in plenty within a short period of time. We will

abandon this profession if we are offered alternative work opportunities. We earn on average Tk 100 daily from fishing, but if we can earn Tk.300 by means of day-labor, we would stop catching fish indiscriminately.” – a fisherman of Maizher Aati, Antorpur

As to the opinion of the people interviewed overall fish population and species biodiversity have decreased. During FGD fishers from local villages mentioned that, they do not have sufficient access to large water bodies because of the threat posed by the influential and mighty people having connection with political high-ups. So, they are bound to catch fish of all types and sizes in the periphery/*beel* for their subsistence. They further narrate that now it takes relatively much long period of time to catch the same amount of fish they could do in the past. According to their testimony, currently some species of fish are rarely found, while these were available abundantly several years ago.

Some key informants opined that catching mother fishes during the dry season led to depletion of fish stock in the *haor*. According to them harmful fishing practices along with the use of some fishing gears (such as current *jaal*) restrict the growth of fish population. It revealed from local people's comments that the practice of catching fish by the commercial leaseholders through the process of dewatering the *beels* in the dry season led to depletion of its stock. Leaseholders use a water pump to dry out the water bodies to catch fish.

As per the study findings the *beels* outside the main *haor* are supposed to be leased out to the local fishermen. But in practice, the local influential persons in collaboration with their own group members actually control the system. Consequently, local fishermen cannot establish their rights over the water bodies. So, when they move to the *haor* to collect natural resources, they face obstacles. The leaseholders use *beels* for commercial fish production. The sustainable management of *beels* is vehemently ignored by the commercial leaseholders. Local people perceive that depletion of fish resources can only be attributed to the commercial fishing practices by the leaseholders. However, they think it has not resulted from their own subsistence fishing practices. Some key informants opined that crop loss due to early flash flood is directly related to fish depletion. If people do not get a good harvest of rice, they will sharply dependent on

fish. With the enhancement of the crop growers' capacity pressure on catching fish will become less.

The researcher noticed there is a destructive fishing practice in the *haor* area (locally called '*uijja* fishing') as elsewhere in other wetland areas in Bangladesh. During *Boishakh-Joishtha* when water recedes, different species of fish tend to move to the new water stream. Then women and children of the village easily catch brood-fish by hand. The duration of *uijja* fishing is 2-4 days. One of the female respondents of Antorpur village stated:

"During uijja fishing we can catch a lot of fish even a pitcher full. Women and children all love to go fishing for fun."

This method of catching brood-fish abates stock seriously. A fisherman of Antorpur village mentioned,

"We face many restrictions while collecting foods from the haor. However, we have to go there to catch fish and meet our daily needs. Police, Ansars and magistrates control the haor area. The magistrate arrests us if we go to haor for fishing. Other organization has taken lease of this beel therefore; the magistrate does not allow us to fish."

In the focus group discussions, the respondents narrated that some years ago the forest which covered substantial area of the *haor* has now become very small. Some villagers however, testified that the authority concerned now takes care of the forest. So, the number of species viz. *hijol* and *koroch* has increased. According to some key informants' observations, the *haor* natural resources such as plants, trees, fish stocks have diminished due to unsustainable harvesting practices.

Conclusion

The study identifies lack of employment opportunities for the people of *haor* area alongside excessive exploitation by leaseholders and marginalized poor, as a major cause of resource depletion. For the *haor* communities, recovery from flood disasters highly depends on equitable access to natural resources which are the main sources of their livelihoods. Therefore, natural resources are very essential for the community people both in terms of sources of income and means of recovery from flood related loss. The poor households of the study area fall prey to deprivation, exclusion due to

unequal social power structure and resource depletion caused by man-made and environmental degradation. Therefore, access of the poverty-stricken community people to the natural resources determines their ability to respond to any disasters particularly flood. The following section presents a description of economic condition of the respondents.

4.3 RESILIENCE OF HAOR HOUSEHOLDS WITH RESPECT TO ECONOMIC CONDITION

The *haor* area is a highly productive natural source of livelihoods that supports many poor people in the study area, who are highly dependent on its natural resources for their daily necessities. Nearly 90% households directly and indirectly depend on *haor's* natural resources. For these people *haor* is a source of income, employment as well as their livelihood. *Haor* is major source of livelihoods particularly for fishing, cultivating crops, vegetables, and pasture lands (BCAS, 2005). It provides rice and fish to them – the major two sources of income earning for the households. With these two major economic activities, as mentioned above, there are many other subsidiary and also minor income earning sources for them.

The major occupations of the people of the study area are engaged in agriculture and fishing. The poorer sections of the community, who do not have land, subsist largely on catching fish in the *haor*. To cope with the economic losses, people take alternative source of income in the informal economy, which is not always guaranteed. Flood causes widespread damage in the sector of agriculture; therefore, livelihoods become difficult. This section examines livelihood portfolio of the households, their economic vulnerability and strategies to overcome economic crisis.

4.4.1 Livelihood Portfolio of the Households in the Haor area

Households in the study area need at least two sources of income, because occupational engagements vary in the dry and flood seasons. A study by IUCN Bangladesh (2010) confirms that there are large seasonal variations in income; most of the households have little or no income during the rainy season. During the dry season, the majority of the people are assumed to be involved in occupations like cultivation (owned and leased land), agri-work/day labor, harvesting paddy on contract basis, vegetable gardening, fish cultivation, earth work, sand-related work,

thelagarip pushing/pulling, horse and buffelo cart (to carry passengers/paddy), motor cycle ridding with passengers, fire wood and fodder collection, etc. A significant number of people are involved in the monsoon occupations such as catching fish, fishing labor, making *chai, bair* (gears) and net weaving, fish drying and trading, guarding *beel*, rearing ducks in *bathan*/flock, paddy husking (on engine boat), selling goods on boat, stone-coal-related work, engine boat/trawler driving/labor, constructing bamboo *machan* (bridges) for crossing canal/river, collecting *deb, shaluk, singra, shapla* (water fruits and herbs). People in the study area perform these activities as dry and flood season occupations over the year to earn their livelihoods. Some occupations can be termed as all seasonal e.g. livestock rearing, raising in-house poultry, domestic work in *gerostho* (agri-based) house, bamboo craft (paddy container, basket), tailoring, *kantha* (home-made quilt) stitching, carpentry (constructing boat, house), holding mechanical/technical jobs, small business, ferry business, non-agricultural day labour, etc.

Households perform various activities to earn their livelihoods. The survey conducted in four villages of Tanguar Haor area to measure people's livelihood options finds 82.27% of households engaged in farming (both cultivation of owned and leased land and also a day laborer), while 80.68% either as primary or secondary source dependent on fishing. Non-farm day labor provides additional income for 39.17% of the families, while small business activities are a source of income for 34.23% of the families in the villages surveyed. Other families are engaged in vegetable cultivation (37.54%), livestock (18.99%), in house poultry (57.82%), duck rearing flock/*bathan* based (7%) ferry business (selling goods by boat or on foot, 17.0%), fish drying and trading (17.96%), earth work (16.43%), fishing gears making (17.47%). A significant number of household (8.49%) were involved in harvesting paddy on sharing contract, 15.12% were engaged in domestic work in *gerostho* house, about 13.0% were in bamboo craft (paddy container, basket), 14.39% were engaged in rowing passenger boats during the monsoon, and 10.6% fodder collection.

It was observed that during the monsoon some people visit the village by boat equipped with a rice husking machine which is utilized to deliver home service. Operating floating shops or boat shops is a unique livelihood activity in the study area during the monsoon. Vendors, in most cases women and children sell vegetables, home-made or locally available food and other household items by boat to the neighbouring villagers. Home-

based shop keeping is familiar in the study villages. Traditionally the people run small and petty trade locally called 'ferry business'. Carrying passengers on motor cycle on hire basis is a dry season occupation of a significant number of young people. Women's traditional skills enable them to take up firewood making locally called '*muitta*' in the areas where raw materials for the product are easily available. A good number of commercial boats emerged and some households took it as livelihood option. *Haor* resource-based communities are found who collect some plants that are used as food, medicine, firewood, and fodder from the *haor* and sell those in the market.

The respondents reported that when the people become unemployed due to less demand of labor in the agricultural field, the laborers are engaged in fishing alternatively to maintain their families. Some of the fishermen are involved in making fishing gears and bamboo traps to earn their bread. All these multifarious activities are important to the *haor* people for a reliable income throughout the year. Coping practices of some major occupational groups are explained below.

Farmers coping practices

In terms of ecosystem, crop production practices and overall livelihood of the farmers of *haor* areas are quite different from those living in other parts of the country (Alam, *et al.*, 2010). The people living in the area know well it is not fully possible for them to be free from the catastrophe of seasonal flood; so, they continue to develop ways and means to keep their suffering at low level. Over the years, they have gained proper experience about the crops that withstand the adverse condition of the nature. Abdul Momen Miah (2004) in his study assumes that most of the indigenous technical knowledge and practices of farmers are fundamentally sustainable. CDMP (2009) focuses on strategies such as adjustments to the cropping calendar, flood tolerant paddy cultivation, plus alternative crops are resilient to climate change.

In the study villages there is no single landowner who abstains from cultivating his own land. The findings show a considerable number of households of the villages have cultivable land (on average 32-64 decimals) and they are involved in crop production. Those who possess no land or nominal area of land work as day-laborers, when required by others. In most cases, landless or people having a very small plot of land, earn their livelihoods by cultivating others' land. This practice of sharecropping locally

called '*aadi bhaga*' characterises the economy of the study area. The land owner is always very strict about his/her share of the production. A sharecropper may lose contract if he fails to protect crop from flood owing to inadequate care and vigilance. If flood occurs early in the rain season, crops may be harmed extensively.

The study reports on crop pattern in flood-prone *haor* areas. Rice is the main produce in the area followed by pulses, mustard and vegetables. Boro paddy grows abundantly in *Dakshin* Bongshikunda union. Usually both *boro* and *aman* paddy grow near the hilly areas of *Uttar* Bongshikunda union. However, in the flood prone Antorpur village only *boro* is grown. The farmers have traditional preference over rice to other crops. During the winter, the seedlings of *boro* paddy are sown. According to local farmers they grow local varieties of rice such as *jagli boro*, *mongol*, *gochi*, *tepi*, *shail*, *baygun bichi*, *birun*, *agnishail*, *hira*, *agam*, *lakhai*, *rata* and *bashful*. The common high yielding varieties (HYV) of rice crops grown in this area are BR-28, BR-29, and BR-45. Traditionally, farmers use long duration and local rice variety, which are vulnerable to flashflood and hailstorm (CNRS 2009). BR-28 is normally grown on the high land under irrigation facilities.

Almost every household grows vegetables in its homestead for family consumption. However, 38% of household sells vegetables to increase their earning. Winter vegetables are grown during *Kartik–Chaitra*. Major vegetables grown in the area include lady's finger, eggplant, potato, cauliflower, cabbage, radish, pumpkin, ash gourd, bottle gourd, winter melon, broad beans, tomato, carrot, spinach, ceylon spinach, basella leaf, red amaranth, stem amaranth, water spinach, arum, brinjal, etc. Most of households attempt to grow radish, pumpkin and bitter gourd in *Kanda* (fallow and a bit high land) to meet their needs for vegetables. Principal spice crops are mustard, chili, onion, garlic, turmeric, flax seeds, coriander, sesame seed, and star anise. Fruits like papaya, banana, pineapple and guava are cultivated. It was observed that spices and vegetables have a great opportunity for this area.

In the study area, only crop *boro* always face the risk of early flash flood damage, sometimes which comes early, just before the rice harvesting and farmers do not get time to harvest their crops. To cope with this adverse situation local farmers though in small scale follow some adaptive and innovative farming practices. Some of these good

practices are based on farmer's traditional knowledge and some are new technology based transmitted from concerned authorities to the farmers (discussion with *Upazila* Agriculture Officer, Agriculture Extension Officer). During FGD session, local farmers indicated they adapt various methods.

Some medium category farmers mentioned they cultivate short duration rice variety in their small plot of land for saving their only one crop from flash flood. Another method they usually apply is early seeding on seed bed, when flood water recedes early. According to local farmers, early seeding followed by early transplanting method can save their boro rice from flash floods. However, they mentioned it was not possible to predict '*agam bonya*' or early flash flood. Therefore, farmers were not able to save their rice crop when early flood occurred.

Some farmers of the study area cultivate an early maturing high yielding rice. The seeding and transplanting time of rice could escape the early flash floods. The farmers prepare seed-bed by first week of November and transplant seedling by last week of December at an early time. Early seeding in seed bed and early transplanting of seedlings in the main field could save the boro rice from early flash floods in *haor* areas. Thus, farmers were able to harvest the rice crop. However, the researcher came to know that farmers were not able to save their rice crop since early flood occurred at the end of March 2017. It is not possible to predict when early flash flood will occur. Another option adopted by some farmers to save the crop from early flash flood is by direct seeding of boro rice (wet seeding of germinated seeds - rather than traditional seedling transplanting) in the main field. Direct seeded crop become mature 10-12 days earlier than traditional transplanted crop. As soon flood water recedes from the soil of *haor* areas - the land remains soft - thus, direct seeding of boro rice in zero tillage field (no ploughing, only weeding and labelling of lands) has advantage to establish the crop in an early time and thus to escape the early flash floods in *haor* areas. Some farmers were able to harvest BRRRI *dhan 28* by the end of March by direct seeding during first week of November. Few farmers grow a tall local boro rice variety named *Bitla* in study area. This variety also has advantage to survive in flash flood water and farmers could harvest paddy from tall plants under flood water.

According to the local farmers, during *Ashwin-Kartik* (mid September-mid November) the big landowners cannot manage to do all the cultivation work by themselves. In that period, poor households take land from the rich as '*Aadi-bhaga*' (share cropping). In this system, the owner and tenant share expenses and crop-yield equally. Crop damage due to flash flood is a big threat to the people, especially who work as sharecroppers and landless laborers. Another common practice in the *haor* villages is leasing out or mortgaging land for money. If someone is in trouble s/he gives land for money. The leaseholder enjoys right to cultivate the mortgaged land for minimum one harvesting season or until the cash amount is returned. In '*aadi*' (sharecropping) system two rules are followed: i) expenses and yield are equally divided between the landlord and the sharecropper; ii) If the owner does not bear any expenses, the produced crop is divided into three shares. The sharecropper gets two-thirds and the land owner gets one-third. A respondent of Antorpur village stated,

"I took one care land on 'aadi-bhaga' basis. Around 10 maunds of paddy were produced in one care of land spending Tk. 3000 on cultivation. As a sharecropper, I got five maunds of paddy which met our five-member family's need of food for three months. Recently, hailstorm damaged most of our paddy. From the field my husband and I managed to collect the remaining low-quality grain which was only 15 days' food for the family members. Had the calamity not affected the field, the whole family would have got food for three months."

The farmers interviewed shared some instances of inconvenience related to agricultural activities. They face difficulties in getting agricultural inputs as per need and cannot arrange for timely irrigation. It affects livelihood options, particularly for the poor. Flash flood washes away crops including main livelihood option the *boro* crops. Such a precarious situation compels them to choose different hazardous jobs to live at subsistence level.

In the study area supply of labor is inadequate during *Boishakh* and *Joishtha*. The landowners often cannot sow the seedlings of rice and harvest crop in time due to shortage of laborers. The hired laborers take a lot of pains to carry the harvest crossing muddy fields and roads to an owner's house. So, they demand high wages for the laborious work.

Sometimes early flood poses threat to paddy harvest. At the sudden advent of this disaster crop may be washed away. In such a situation, the land owners become bound to pay higher wages to agricultural laborers for urgently reaping even semi-mature paddy. The low-lying agricultural land is more susceptible to flash flood. Therefore, as a risk reduction strategy the landowners attempt to harvest crops so hastily. Then wage rate per day for a worker may stand at Tk. 300. Thus, during Boishakh-Joishtha paddy harvesting gets momentum. (FGD with farmers)

For cultivation of HYV Boro on the high land a shallow machine is used for irrigation. This irrigated land is called 'Scheme Land' – a term frequently used by local people of the study area to denote the relatively upper land in the *haor*. The land falls under this category is cultivated through irrigation by rented shallow pump. For irrigation in 30 decimals land under the scheme the machine owner takes two maunds of paddy as rent.

Local Practices for Protecting Crops and Seeds

Two major factors help people develop their adaptive capacities in agriculture-- crop intensification and diversification. Crop intensification is the growing of crop with intensive care and management to maximize production in a unit of land with the accommodation of a greater number of crops per year, while crop diversification is the growing of different species of crops in a farm or area either in succession or simultaneously or both together in the course of the year. A study by Nirapad (2010) explained diversification of crop agriculture is a key approach in addressing climate change.

It was observed that in *Dakshin* Bongshikunda farmers practiced mixed cropping of oil seeds (mustard) with paddy. They harvested mustard first by mid February. They grow spice crops in mixture such as onion+garlic+chilli; vegetables like cauliflower+potato+tomato; *sheem* (broad beans) +gourd+longbean+snakegourd; potato+raddish. It is found that though the floods cause a severe effect, people are still able to recover some harvest or income because of crop intensification.

There are some adaptive and innovative farming practices observed in the study area. As pointed out earlier, there is only one cropping season in the *haor*. As a crop diversification strategy, with single rice they accommodate other crops, vegetables, pulses, oil-seeds in the same land. Short duration vegetables, viz. red amaranth, stem

amaranth, spinach, radish, potato, etc; oil crop namely mustard and pulse crops are grown by some farmers before the cultivation of *boro* rice in the land.

To cope with the changed environment, farmers adapt short duration rice variety (BR-45) for saving their only one crop from flash flood. This variety requires minimum time to cultivate and found suitable for *haor* areas. In contrary BR-29 needs about 165 days from growing to harvesting which is usually treated as long duration variety and eventually damaged by the flash floods. To avoid long time process some farmers cultivate short duration-maturity paddy named '*jagli boro*' a traditional variety. They cultivate vegetables, spices, pulses during *Rabi* season and harvested much earlier than *boro* rice to avoid flash flood. Floating vegetable garden is found potential to increase the livelihood opportunity for farmers in *haor* areas. To have maximum benefit the farmers sow in the low-lying lands local varieties of seeds and some HYV in slightly high lands so that harvest can take place early. To mitigate crop damage (after flood) they reap pre-mature crops. Some farmers give possession of land to *borgadars* (shareholders) (source: FGD with farmers and KII).

The above-mentioned adaptation practices not only help reduce the negative impact of flood, but also considerably secure people's livelihoods. The adoption of any of these practices is generally need-based. Such practices either evolve spontaneously (independently by farmers) or with the support of external institutions such as Agriculture Office. A practice may be the outcome of the synergy between farmers' indigenous knowledge and technological know-how. A study by BARCIK (2011) observed that people-led agricultural research can be the alternative to ensure food security.

To protect crops the local farmers take actions collectively. In *Dakshin* Bongshikunda union people try to construct embankments in front of water streams to stop the water flow. The respondents of Rongchi village narrated:

"The last week of Chaitra is crucial. During this period if the level of flowing water seems a bit high, we predict flood is imminent. Then we prepare for protection of the embankment. It takes about 4-5 days to reconstruct the embankment utilizing hundreds of people's labor from 8 a.m. to 4 p.m." – a farmer of Rongchi

"If we had not constructed the embankment, we would have faced famine in Boishakh. There would be no other option except begging." –A respondent, *Dakshin Bari*, Rongchi

Another example was illustrated by the people of Rongchi village in FGD session:

The crop protection embankment at Rongchi village of Dakshin Bongshikunda union collapsed under the pressure of flood stream. A concerted effort has been made by the villagers to repair the embankment to protect their single boro crop. There was an announcement through the microphone of the mosque that the embankment was being broken apart; without delay the farmers were required to rush to the haor. Villagers including landless day laborers, sharecroppers, small and big farmers, youths and elderly people carrying local materials gathered at the embankment site even at night to save it. They used earth, bamboo, mat, jute/plastic bags, and sacks for repairing the embankment. Everyone in the village contributed to this community endeavour. Some people even donated their house fences to make the embankments stronger. A number of people brought bamboo from their house while others purchased it from the local market. Their concerted effort played a key role in limiting the extent of flood damages. By repairing the embankment people got one week lead time and could save their crops from flood damage. The people of Rongchi village said they had to spend sleepless night over protection of the half-mature paddy. According to local people none of the concerned authorities (BWDB or their contractor) appeared there. Only community people collectively were able to protect their single crop boro. It is an excellent way to gain community support and make a significant impact on their livelihoods.

Seeds

At the end of the monsoon the flood is over and different types of seeds/seedlings are sown in the field. Sometimes early flood damages crops spoiling the scope of procuring seeds. As a result, scarcity of seed hampers the growth of crops. To procure seeds in the adverse situation the people adopt the following measures:

Dapoge seedbed

The people of Bongshikunda have acquired the technique through good use of their traditional/indigenous knowledge. They usually opt for it when the area is affected by flood. With the *dapoge* seedbed it is possible to grow paddy seedlings within a short time. The *dapoge* seedbed is made in the yard of a household. Banana leaves or polyethylene sheets are spread on the ground to prevent moisture and seeds are sown on the top.

Seed storage methods

The local farmers of Bongshikunda practice traditional methods of seed storage. In most cases women carry out seed preservation related activities. Farzana Nasrin (2012) pointed out preservation of seeds is the heart of agriculture and traditionally used to be handled by the women. Various traditional methods have been identified through this study. The traditional seed storage practices include: storage in *motka* (big sized clay pot), *Payela* (earthen pitcher), '*dula*' (special container made of bamboo, plastic bag and cane). They preserve paddy seeds in *payela* and cover the mouth with dried cowdung to prevent pest attack. Some of them keep seeds in bottle gourd shell, plastic bags/containers, jute bags, etc. During flood, they preserve seeds in dried form in *dula* which is kept on *machan* or elevated platform. They also build extra ceilings underneath the main ones to store seeds and crops to protect from inundation. Local varieties of seeds namely, *boro*, *mongol*, *gachi*, *shail*, *begun bichi*, *birun*, *bashkur* are preserved in the house. Quality paddy harvested in the first stage is processed to be seed and preserved. Local households perceive seeds stored in earthen pots remain safe from the attack of pests. In this practice, varieties of seeds such as bottle gourd, stem amaranth, chili, lady's finger, snake gourd are sun dried and cleaned before storing in pots. To keep away from pests sometimes clay pots containing seeds are placed in hanging basket called '*Shika*'. It was observed some well-to-do households use '*beezghar*'- a separate house made of timber and planks for storage of seeds. Many farmers mix ash or neem powder with seeds as a means of pest control. Some households cover the mouths of seed containers with ash, clay, grass, straw and reed for the same purpose. Such type of arrangement is noticed in the villages of *haor* area.

Village-level grain banks

Some women-friendly adaptation measures include village-level grain bank, which has become popular in disaster-prone villages in the *haor* area. The grain bank is usually run and managed by village neighborhoods. The members store and borrow potato, onion and paddy in times of need and repay in kind. Grain bank seems to be the traditional coping mechanism and the recent revival of the system by a local NGO has been appreciated by the people of Antorpur and Batta villages.

Growing vegetable seedlings in pots

People in flood prone villages of Bongshikunda have a limited opportunity to grow vegetables in their homesteads, because the land remains extremely moist due to seasonal flood at the beginning of the planting season. To overcome the obstacle, village women grow vegetable seedlings in pots. They fill coconut shells, plastic bottles and clay pots with soil and manure in which vegetable seeds, especially eggplant, chili, sponge gourd and bitter gourd are sown. When seedlings are ready for transplantation and the land becomes dry enough, the seedlings are planted in the backyard garden. This practice, applied primarily by women, is found in the *haor* villages.

Rahima Begum (35) is a house wife of Khidirpur village of Dakshin Bongshikunda Union. Her family has 34 decimal lands of which cultivable land is 32 decimal and homestead is two decimal. Her family has now been living through farming. When the cultivable land including homestead yard went under water stayed 4/5 months every year, for their day to day demand they cannot grow any vegetables. As it is impossible to grow anything in the field, she adopted an indigenous method for vegetable cultivation in her homestead. A bamboo made basket was placed on strongly supported platform made of bamboo at the 3-4 feet height locally called "Payela". Payela was placed on the courtyard area. It was treated using local knowledge. Soil prepared through mixing with compost fertilizer and it put into the basket. Rahima cultivated bottle-gourd, cucumber, pumpkin, green chili, ladies finger bean etc. in the Payela. Rahima can cultivate three-time seasonal vegetables in a year through change of soil. The Payela has been an effective coping mechanism for Rahima's family. In this process Rahima has met her daily food demand as well as sold the surplus in the local market from which she has earned additional money.

Fishermen's coping practices

The villages being located in and around resourceful Tanguar Haor, the people in the study area have high extent of reliance on fishing. As can be seen from the survey data that 80.68% of households either fulltime or part time is involved in fishing. In the month of *Ashar-Bhadro* people have no agricultural work in this region. During the monsoon months agriculture laborers are engaged in fishing to cope with the vulnerable situation or to earn livelihoods. Traditionally, people catch fish from the *beel* surrounding the villages for subsistence.

As per current policy although no *beel*/haor beyond a specific size is supposed to be taken leased by individuals or powerful elites, but violation of this rule often takes place in the area. According to key informants, the powerful people apply to the authority requesting lease for a particular waterbody with the support of some loyal people afflicted with extreme poverty or using the false names of fishermen-group which is formed with ill motive. They identify few local fishermen or residents near the beels who have control over the community and form 'association' and apply through their name. Such an unethical step taken by the influential persons give benefits (mostly some cash incentive for once) only to a few people. Afterwards, the *beel* goes under the control of a dominating person.

Some of the poor fishermen of Tanguar haor shared how they have difficulties in earning their livelihoods: "*We have fallen in a helpless situation and there is no source of income for us to maintain our families,*" said a fisherman at Rongchi village under *Dakshin* Bongshikunda union. During the monsoon, when the vast areas go under water, the illegal leaseholders prohibit local fishermen to fish in the vast areas claiming that they are the leaseholder of the vast wetlands. The local people for their subsistence need to catch in the *beel* and *haor*. Sometimes they have to pay high price for it. The on-duty 'magistrate' and 'ansars' arrest them for catching fish in the *haor*. Their boats and fishing gears are destroyed. The fishermen's plights know no bounds. They are constantly threatened by the *beel* guards. Small scale fishers are trapped in a vicious cycle of absolute poverty in all considerations and bear the consequences of livelihood ill-beings (Deb Apurba Krishna, 2009).

Most of the fishermen in the study area capture fish individually during 'open capture' period till *Ashwin* (mid October) with small boats or without any boats using variety of nets.⁴ Afterwards, the leaseholders put restriction on fishing. When the restriction is imposed, fishermen can still catch fish in some water bodies through payment to the

⁴ Two distinct fishing seasons can be identified in the haor/*beels* such as 'Organized Catch' and 'Open Catch'. Organized Catch usually starts in Mid-November when the water starts drying up till end of March of the following year. The Open Catch season starts when the new water of monsoon comes from the upstream in May-June and continues rest of the year.

leaseholders until the 'Organized Catch' starts. During this event all the group members start fishing with big gears in their respective beels. In the months of *Agrahayan–Falgun* fishermen of the study area go to the beel together in a group (10-15 people) to catch fish using big nets. The individual leaseholders also deploy local and outside fishermen groups to harvest for them where the former gets 75% of the harvest. Mainly big fish are captured during 'Organized Catch' compared to 'Open Catch'.

The researcher observed people catch fish from the *beel* surrounding the villages for subsistence. Many fishermen do not have big nets, boats and fishing gears. They are the owners of 50% of boats, but in general fishermen use rented boats to catch fish. Boats are rented at Tk. 20 - 30 per day. There are some casual fishermen whose major occupation is agri-labor along with some other periodic labor work such as earth work, stone collection etc. In most cases, they capture fish with *tana jal* (small nets) and for own consumption. Children of these families also join the elderly persons.

The household members living in village around the *beels* catch (*gura icha*) small prawn, *meni*, *koi* around their homesteads for own consumption. If their catch is relatively large, part of it is sold at the local market. When the captured volume reaches 1-2 kg, they take it to the nearest market for sale. If they sell their catch in the market they get higher prices. They earn Tk. 150-200 per day. Price of small prawn per kg is Tk. 200-250 and big-sized prawn Tk 400 per kg. *Bair* (a kind of fishing gear) is used to catch big sized prawn. If the volume of individual catch is little, carrying it to a distant place is not economically viable. Some fishers appear to be comfortable selling their catch at their doorsteps to collectors without much bargaining or negotiation over the price. Some others carry to the local market by small boat.

Many local fishermen receive money in advance from certain buyers (locally called '*Nigari*') for which they are forced to sell their capture to them. *Nigari* roam around the *haor* villages with their boats to buy fish from fishermen. These collectors can be classified as follows: 'Small Nigaris' collect from *beel/haors* with their small boats. They roam around the fishing areas where fishermen catch fish. Their buying capacity is comparatively low. After collection, they bring it to a nearby *bazaar*, where they sell to small traders or *Arot* (whole sellers). 'Big Nigari' have comparatively large boats with storage boxes and ice. They are linked with large traders who supply in bulk to Dhaka or Sylhet. While conducting field study in a *haor* village, the researcher met one such *Nigari*

who has contract with around 70 fishermen to whom money is paid in advance in connection with fishing trade. The local fishermen who earlier receive money as advance or loan from a *Nigari* are bound to sell only to this lender at a cheaper rate as to repay their loans. This patron-client relationship continues as long as the trade is carried out.

Amir Ali is a Nigari. He purchases fish from different villages and sells the same to the local 'Arot' at Natunbazar. The local Arotdar (whole seller) supplies to Dhaka. He provided loan for 10 fishermen of Batta village to buy boats or nets on the verbal contract of sale fish to him. He gave each of them amounting to Tk. 1,000-3,000. They sell all the bulk of fish only to Amir Ali and pay back the loan. In order to repay their loans, the fishers often have to hand over their half catch. Though the fishermen can nominally bargain, they may not get the competitive price. Usually they receive a low price for their catch. Amir Ali only buys alive (jeol) koi fish from the fishermen of Batta who use 'daitta borshi'-a special fishing hook made of water hyacinth, bamboo stick and cotton. On the end of the fishing hook a dragon fly is used as bait to catch jeol koi fish. It attracts koi fish with bait and holds it alive (jeol) until fishermen return to the catch. The fishermen spend the whole day to catch dragon flies by hand. Fishing gear is usually placed in water in the evening and collected early in the next morning. Almost everyday Amir Ali collects koi fish from the village by boat, keep them in a drum filled with water and send to Dhaka via Nutunbazar-Madhyanagar Arot. Each small sized Koi is sold at Tk. 5 and big one at Tk. 20. On the day of interview Amir Ali bought koi fish for Tk. 1500. In Dhaka, the bulk will be sold at Tk. 2500-3000, said Amir Ali. Deducting all expenses, the net profit will be Tk. 600. This is an example of the patron-client relationships that fishers have with dadondar (money lender) in the haor region.

Reasons for the depletion of fish

As perceived by local fishermen and key informants, a variety of factors have led to the declining trend in fish stock. The small *beels* are leased out to non-fishermen. Some opined that every year leaseholders' application of de-watering method has resulted in the decreasing the productivity. They believe depletion of fish has nothing to do with the fishermen's traditional pattern of subsistence fishing practices.

Another reason as pointed out by local fishermen, stock of fish has gone down owing to illegal fishing by government enforced guards (Ansars) and some influential (IUCN,

2010). The local fishermen also admitted their involvement in catching fish fries to keep every individual's body and soul together.

In their words: "In the past we would have plenty of fish in the net during the rainy season, but now we get one or two from ten nets."

There is a destructive type of fishing practice present in the *haor* area, which is locally called '*uijja*' fishing. During the early monsoon, mainly in *Boishakh* (March-April) breeding season of fish appears. Then all kinds of fish from the *haor* and *beel* rush against the water which flows speedily from the upstream. This migration lasts for a few days only. So, the early monsoon is a very critical period for breeding. All the village people including women and children catch fish in the shallow water using fishing gears like *chai/bair* and even with their bare hands. Many people from other occupational groups also take this as a game and at the same time an opportunity to catch a huge quantity of fish within a short time.

As mentioned before, fishers are excluded from their rights to fishing due to illegal practices and negative role of local power structure. As a consequence, fishers either opt for fish related business like buying and selling fish or the business of dry fish. Not many fishermen can adopt this diversification because these are very capital intensive. Another way of diversifying is to share fishing with leaseholders. The stark reality is that shared fishing means catching fish for leaseholders. When fishers do not have any other options, they go for shared fishing, but usually do not get adequate remuneration.

Local Practices for Protecting Pond and Fisheries

People in the *haor* region especially the fisher community are habituated to catch fish from the nature, but these people are not accustomed to producing fish in ponds or open water. Due to decreasing trend of fish in the *haor*, nowadays people are becoming interested in culturing fish in ponds. Some people in this area started fish culture in their ponds from *kartik* to *Boishakh* when flood water recedes. They started tilapia, grass carp, karfu, briget, and carp farming in their ponds. During flood time production of cultured fish is hampered due to overflowing of ponds. People take the following measures to protect their cultured fish in ponds. Typically, people elevate pond banks to prevent outside water intrusion, and install fences to keep animals way. During floods, fish farmers fix nets and bamboo fences around their ponds to prevent fish from

escaping. If a pond becomes contaminated by outside water, it is fully bailed out. Then lime and uria fertiliser is applied to the dry pond bed for pond water treatment. Fish feed ingredients are made with 'bhushi' (wheat husk) and 'khoil' (mustard seed waste) mixture. For grass carp, they collect natural feed like grass and banana leaves.

Poultry and Livestock rearing

Livestock rearing, mainly as a dry season occupation, is undertaken by 19% of households. It is found that homestead based in-house poultry farming is the most common practice in the *haor* villages. Approximately, 58% of households rear chicken in their homestead premises. It is found that many people especially the landless raise goats and cows on sharing basis. Although many families rear cattle and ducks at household level, some of them (7%) go to the *haor* and keep cattle and/or flock of ducks (locally called *bathan*) there for the entire dry season of the year.

Moyna Kahtun aged 60, mother of three children and her poverty-stricken husband having old age complications could not manage two square meals a day in the past. Now she raises a bathan (flock) of ducks numbered about 500 in the haor. Everyday her ducks lay on an average 200 eggs which are sold in the local market. The ducks feed on rice bran, crushed rice and snails during Agrahayon-Paush. In Ashwin-Katrik when the haor water begins to dry up, ducks are brought back home from the field by trawler.

Collection of fodder grass for cattle from the *haor* is also an important livelihood activity of both poor and rich. The poor people usually sell a portion of the collected grass to supplement their family income. However, the respondents stated that they encounter problems relating to livestock feed shortage both in the dry and wet seasons. According to them, in the past, high and raised land (locally called 'kanda') in the *haor* was used for grazing during the dry season. But now it is controlled by individuals. Thus, access to such common land is gradually become difficult.

Local Practices for Protecting Poultry and Livestock

The biggest challenge is the collection of fodder for livestock which mainly lives on green grass that goes under water during flood. The respondents mentioned different vulnerabilities to poultry and livestock rearing in the *haor* area. The following figure shows major vulnerabilities to poultry and livestock rearing.

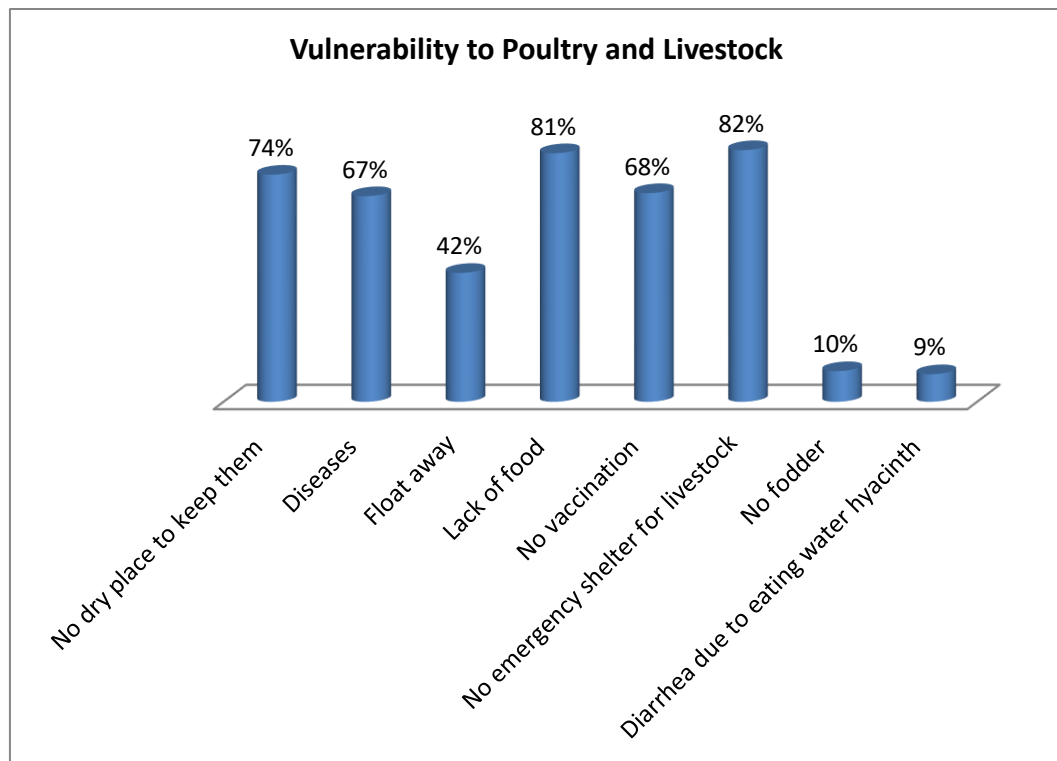


Fig. 4.6 Vulnerabilities to Poultry and Livestock Rearing

Disaster affects livestock in the villages. Due to flash flood and seasonal flood cattle food crisis begins. Different types of diseases break out and scarcity of sheds disrupts normal situation which causes death to poultry birds and livestock. As people remain vulnerable to these critical factors, they build their own coping strategies and mechanisms to deal with the changed atmosphere. The study found some mechanisms enacted by the households for protecting poultry and livestock.

To protect poultry birds from flood damage the households take some measures such as storing feed, keeping them along with cattle on the high stage; with people in a dwelling place; on *bhela* (banana raft) or on floating objects and vaccinating in advance. Besides, alternatively they even sell/slaughter the birds ahead of a calamity.

Similarly, in order to protect cattle from flood the households store fodder or procure green grass, concentrated feed, rice straw, kitchen byproducts; elevate cattle sheds with bamboo, wood, water hyacinth etc., shift the animals to some school and other high places and keep them on *bhela* or on some floating objects. There is a common practice to resort to *Kabiraj* (local healers), but careful households vaccinate their cows in

advance and consult veterinary physicians for treatment of diseases during and after flood. The domestic animals are sold ahead of danger if a family fails to ensure their safety.

It was observed that people use local knowledge to save their poultry and livestock as they are valuable assets. In maximum cases, animals are kept in elevated cattle shed. If necessary, they take their animal to elevated road during flood. They build makeshift shelters in the high and dry places and try to feed them as best as they can. Sometimes they even share their food with the birds and animals. Rice, straw, tree leaves; *kura* (rice bran) and rice water are provided for cattle as feed. When fodder is not available, water hyacinth is fed which may sometimes cause diarrhea to the livestock. Traditionally, in the winter months, residents of the area graze their cattle in the fallow land situated between paddy field and the *beel*.

Households of the study villages build a *khoar* (poultry shed) on the *chang*. They also construct high elevated pillars and build a poultry shed on it in the courtyard. They pile water hyacinth on banana raft and keep cattle on it. Paddy straw is piled up on elevated platform to build the structure locally called '*Kherer Pala*'. Banana leaf and water hyacinth are used as fodder. Village doctors provide vaccination, deworming and vitamin tablets.

If chickens get sick the remedies people came up with use simple indigenous methods that are frequently employed e.g. onions and garlic fed regularly, some use turmeric. To take precaution or treat ailing birds and animals they buy medicine from the shops located at the local *bazar* in Bongshikunda. Chickens are kept indoors if the weather is bad. Some households put chickens indoor under their cot or *dhaner gola* (paddy store made of bamboo and hay) at night. Some of them place them near *chula* during flood. Others also sell off their chicken at the time of a disaster.

Typically, cow shed floors are raised with water hyacinths, chopped banana sheaths and leaves. Bamboo mat is placed on the top to keep animals free from water and mud. This kind of preparation prevents animal foot disease which breaks out regularly during the rainy season. When the low-lying areas of villages are inundated by seasonal and severe floods, livestock is usually shifted to the high land of the locality, flood shelter or in other villages. In some cases, they send their cattle to relatives' houses. Mortality rate

of domestic animals increases during any disaster. So, some poor families try to avoid risk and sell livestock in an attempt to keep some money at hand.

Vegetable Cultivation

In the study villages, almost every house has some cultivable fallow land at the frontal yard. These lands are highly fertile and productive. Household members especially women (wives and young daughters) cultivate vegetables and short duration crop at these lands. The female respondents mentioned that cultivation of vegetables is very laborious; they have to plant seedlings carefully, regularly weed and irrigate, use pest control, and harvest the vegetables in time. The vegetable land requires extensive watering in the morning and evening. If the land area is large, it requires being cultivated. A farmer usually plows the land with cows. If the land is small, women prepare it using *kodal* (spade). They perform other activities which include plowing, harrowing, mixing and leveling the soil, sowing seeds or transplanting seedlings, weeding, threshing and protecting the yield from intruding animals.

The study revealed that some years ago household members especially women used to cultivate vegetables at the homestead and courtyard level for the purpose of consumption. But nowadays it has become a major livelihood source for many of them. Households having labor force go into vegetable cultivation because it is sufficiently profitable. There is acute poverty during January-March period when the sale of vegetables highly contributes to meet the needs of households.

The study found that the households grow in their courtyards monsoon vegetables viz. bottle gourd, sweet gourd, cucumber, pumpkin, *jhinga* (ridge gourd), *chichinga* (snake gourd), *dhundul* (sponge gourd), *chal kumra* (ash gourd), eggplants, long beans. The winter vegetables namely, cabbage, cauliflower, *sheem* (broad beans), *begun* (brinjal), leaf amaranth, *pui shak* (basella leaf), kang kong (*kolmishak*), chilli, potato, and tomato are grown. Short duration vegetables such as *lal shak* (red amaranth), *danta shak* (stem amaranth), spinach (*palangshak*), *mula* (radish), etc. are grown before cultivation of *boro* rice. Vegetables are primarily produced for family consumption. But the male members of some households sell the excess in the local *bazar*. The *pikars* (wholesellers) also roam around the village to buy vegetables. Vegetables were found profitable than regular crops in the study area and are possible to harvest before flash flood. Some

households were able to overcome poverty period with cultivation of the vegetables.

Rezia Begum lives in Antorpur village. The total number of her family is six (two sons, two daughters). Beside homestead she has only a very small plot land (six decimals). She started to grow vegetables in the homestead and adjacent area. Since vegetable cultivation is labor-intensive, all of her family members including her husband and children were engaged in it. In the year preceding the interview Rezia in her homestead had grown different types of vegetables and sold snake gourd for Tk.3500/-, bottle gourd for Tk. 2500/- and red amaranth for Tk. 1200/-. She had also raised different kinds of vegetable seedlings (brinjal, tomato and chilli) and sold them. She has been continuing vegetable cultivation for several years. Wholesellers/retailers come to her house to buy vegetables which are sold to consumers in the market. In fact, from this source she can earn satisfactory amount of money to support her family and to get rid of flood risks. Rezia spends this money to purchase day-to-day consumable goods and save money for the next flood season. Rezia said, "Vegetable growing round the year has enabled me to get regular income for which I can meet the needs of my family. I know how to produce vegetables abundantly in a tiny plot of land. Moreover, as I have savings, I do not face serious difficulty even at the time of flood."

Making fishing gears

About 17.47 % of households to earn their livelihoods are engaged in making fishing gears e.g., net and bamboo traps for selling to the fishermen. The fishing gears used in *haor* and *beel* are different types of nets popularly known as *tana jal*, current *jal*, *kone jal*, *jhaki jal*, *thela jal*, *berjal*, *shib/dharma jal*, various traps named *chai/bair*, *icha chai*, flash light, hooks namely, *daitta borshi*, *lar suta borshi*, *chonga*, *borshi* and spears viz. *teta*, *koch*.

Fish drying and trading

In the study villages, not all the fishermen dry fish commercially. Nearly 17.96% are found drying fish after *Kartik* (mid October) through *Chaitra* (mid March). Different species of fish are dried when the supply goes up and the price of fresh fish falls down at the local level. Most of these dry fish producers are also fishermen. Usually they process *icha*, *chela*, *chanda*, *tengra*, *puti*, *baim*, *chapila*, and *taki* fish through drying in the sun. Dry fish are of three types- a) *chepa shutki*, b) *shutki* and c) salted *shutki*.

Duck rearing

The practice of keeping indigenous duck is very common in the *haor* villages. With some natural advantages, the *haor* area is suitable for duck production. There are mainly two types of duck farmers. One is small household based and the other is large 'bathan' (flock) based. A small household keeps 2-20 ducks and a large one keeps at least 200 ducks. Small flocks are managed by household women members. Some households use a bit high land in the *haor* for duck rearing in the dry season (December-April). Women play an active role in duck farming. From the sale of ducks and eggs households on average earn Tk.1500 per month. Access to water bodies seems to be the critical constraint for them.

Machine driven rice husking

It was observed that during the monsoon some people visit the village by boat equipped with a rice husking machine which is utilized to deliver home service during the rainy season. They charge Tk 60/- for husking one maund of paddy. About 3.58% households are involved in machine driven rice husking by engine boat.

Selling goods by boat

Operating floating shops or boat shops is a unique livelihood activity in the study area during the monsoon. Vendors, in most cases women and children sell vegetables, home-made or locally available food and other household items by boat to the neighbouring villagers.

Rowing passenger by boat and goods transportation

The survey found that nearly 15% of household members are engaged in rowing passenger boats during the monsoon. Some of them are employed in engine boat/trawler as drivers/laborers. Boats are also used in stone and coal collection and transportation. As there are adequate opportunities for non-agricultural trading in *Uttar* Bongshikunda union, many people of the locality are involved in transportation and boat-based activities.

Non-farm day activities

The non-farm activities include all economic activities in *haor* areas except agriculture, livestock and fishing. It includes self-employment, wage employment, transport operation, shop-keeping, petty trading, etc. In total 39.17% households involved in non-farm activities in the study area.

Small trade

Home-based shop keeping is familiar in the study area. Traditionally the people in the area run small and petty trade locally called 'ferry business'. Usually women and men carry out this work in both dry and wet season. Many women are involved in ferry business, hereditarily performed for generations. Women carry out enterprise based activities in their villages and neighboring areas. They usually sell *chepa shutki* (dry fish), mustard oil, potato, onion, chilli, nuts, battle leaf, battle nut, etc. Women's traditional skills enable them to take up firewood making (local term of firewood is '*muitta*') in the areas where raw materials for the product are easily available.

Motor cycle riding

There is a provision for hiring a motor cycle to come at Bongshikunda Bazar from different places. Dozens of riders (most of whom are youths) along with their bikes wait for passengers. Two persons can sit on a bike behind the rider.

Local practices for food security

The study found that most of the households depend on agriculture and wage labor for their livelihood. In study areas, early flood comes in the monsoon season, it destroys the standing crops, which results a huge disaster to poor people. Vulnerable households that lack access to productive assets depend on irregular income or casual labour. Daily laborers, casual fishermen who are socially marginalized fall in this category. They live from hand to mouth and their main problem is food insecurity.

Survey of the study area finds that 60% of households experience food shortage at least five months a year. These households as a coping strategy often buy minimum quantity of staple food on credit, if possible, borrow food from others, take meals inadequately and remain unfed or half-fed. The FGD participants reported that food insecurity

becomes acute during *Falgun-Chaitra* (February-March), immediately before harvesting *boro* paddy. Households suffers from food insecurity mainly because of landlessness, seasonal unemployment, flash flood and subsequent crop damage. Season-based livelihood forces the local marginalized people to remain out of work for a considerable period of time, and as a result, they suffer for want of food.

Coping strategies for food during crises

Rural households in the study villages follow different strategies to cope with food insecurity. These are furnished below in the Table 4.27

Table 4.27: Coping Strategies for Food

Coping Strategies	Households n=175	Percentage
Depend on less quality food items	106	60.57
Reduce food quantity	102	58.29
Borrow money	108	61.71
Borrow food	103	58.86
Share meals with neighbors	87	49.71
Rely on casual labor	77	44.0
Engaging children in work	76	43.43
Sell cattle/livestock	31	17.71
Gather wild food	102	58.29
Consume seed stock preserved for next season	54	30.86
Sell household items	87	49.71
Sell labor in advance	54	30.86
Restrict consumption by adults in order for small children to eat	43	24.57
Depend on relief	54	30.86
Participation in cash/food-for-work programs	29	16.57

Source: Field survey data

The Table – 4.27 illustrates the measures taken for overcoming food insecurity situation during the lean period. The study found that women are responsible for adjusting household food security by changing their food consumption behavior. The study revealed that 58.29% of the poor households reduced or modified the amount of food per meal or reduce the number of meals per day in the lean season. The researcher also found that over 60% women rely upon less preferred food items during and after floods. The less preferred food items included *chira* (husked rice), *muri* (puffed rice), biscuits received as relief, and local leafy vegetables (*kalmi shak*, *pat shak*, *kochu shak*, etc.) which are available in the area. A commonly found flood coping strategy followed by large percentage of respondent for food security was that they take loans for buying food (61.71%), some others borrow food on credit (58.86%) only in two months (the period of

severe food insecurity). Other coping strategies include sharing meal with neighbors (49.71%); relying on casual labor for food (44.0%), engaging children in work (43.43%), gather wild food (58.29%); sell household items (49.71%); and sell advance labor 30.86%.

Heavy reliance on loans to combat food insecurity clearly indicates the scope for malpractices by money-lenders in the *haor* areas. During the normal flood period households try to be involved in alternative income sources to keep their existence near subsistence level. But in case of prolonged flood or early flood they switch over to austerity measures like increased dependence on credit and exchange of goods/commodities among households. If such sources are fully exhausted, then they dispose of their productive assets, which severely weaken their current and future income potential. Migration is the strategy taken by the poor as part of livelihood diversification. A study by Tulshi Kumar Das *et al* (2010) discovers that the major coping strategies the *haor* people adopt are borrowing money and food, reducing familial expenses and internal out-migration both in short run and long run.

Households' food intake behavior

This section presents the status of food situation in terms of availability as well as food consumption behaviour of the household members. The information regarding households' food availability, access and consumption was gathered and analyzed considering the seasonal effects over the year. The time period covered two seasons, viz., "Normal" (November-January and April-June) and "Lean" (February-March and July-October). The period February-March (before harvesting boro rice) is considered to be the lean season because food crisis usually becomes severe in this period.

The Table 4.28 shows that the most commonly adopted household food intake behavior in normal and lean season:

Table 4.28: Food Intake Behavior

Food Items	Normal Season n=175						Lean Season n=175					
	Morning		Noon		Evening		Morning		Noon		Evening	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Rice	141	80.57	175	100.0	175	100.0	156	89.14	109	62.29	116	66.29
Vegetable	95	54.29	167	95.43	153	87.43	31	17.71	56	32.0	64	36.57
Dal/Pulses	58	33.14	140	80.0	138	78.86	27	15.43	44	25.14	32	18.29
Potato	62	35.43	76	43.43	63	36.0	29	16.57	76	43.43	48	27.43
Small fish	141	80.57	153	87.43	141	80.57	86	49.14	112	64.0	54	30.86
Vorta (smashed vegetable)	168	96.0	172	98.29	133	76.0	141	80.57	20	11.43	79	45.14
Meat	-	-	46	26.29	32	18.29	-	-	16	9.14	11	6.29
Egg	19	10.86	35	20.0	27	15.43	18	10.29	119	68.0	9	5.14
Red/green chilli	157	89.71	103	58.86	49	28.0	164	93.71	-	-	62	35.43
Banana	46	26.29	-	-	-	-	58	33.14	-	-	-	-
Pitha (cakes)	24	13.71	-	-	-	-	20	11.43	-	-	-	-
Puffed rice	13	7.43	-	-	-	-	27	15.43	-	-	-	-
Flat rice	8	4.57	-	-	-	-	26	14.86	-	-	-	-
Dried fish	42	24.0	78	44.57	94	53.71	46	26.29	-	-	63	36.0
Seeds	5	2.86	-	-	-	-	81	46.29	-	-	-	-
Water plants	34	19.43	23	13.14	19	10.86	98	56.0	71	40.57	82	46.86

Source: Field survey data

The household members under this study usually eat rice, red and green chilli, banana in the morning. Sometimes they take *pitha* (cake). Eating rice is common during lunch and supper. They take fish or dry fish with rice. With rice, they like to have small fish like prawn/*gura icha*, *puti*, *chanda*, *koi*, *meni*, *tengra*, dry fish (*hidal*, *chepa*). Moreover, they take seasonal vegetables or *dal* (pulse) or *vorta* (smashed vegetables) alternately during lunch. Most of the poor households only have two meals a day--- in the morning and evening. During the lean period, they spend the day by taking a typical meal of rice and chillies. A large number of female respondents stated a heart rending fact that they only eat once a day, especially during the lean season. Ali Ahmed (2005) asserts that gender ideologies, customs, and food beliefs make women and girls nutritionally vulnerable.

Sources of main food items

This section looks into the sources of the main food, viz. rice, vegetables and fish/meat/egg. The distribution of households according to the sources (own production, purchase and other means) of main food items is shown in Table 4.29

Table 4.29: Sources and consumption pattern of main food items in normal and lean season

Food Item	Normal Season						Lean Season					
	Source n=175						Source n=175					
	Own Production		Purchase		Borrow		Own Production		Purchase		Borrow	
Rice	82	46.86%	65	37.14%	28	16%	36	20.57%	70	40%	69	39.43%
Vegetables	98	56.0%	77	44.0%	-	-	39	22.29%	86	49.14	-	-
Fish	143	81.71	32	18.29	-	-	95	54.29	24	13.71	-	-
Meat	44	25.14%	26	14.86	-	-	-	-	19	10.86	-	-
Egg	65	37.14%	42	24.0%	-	-	31	17.71	39	22.29	-	-

Source: Field survey data

As shown in the Table 4.29, the availability of major food items was found higher in the normal season than those in the lean season. About 46.86% of households reported that rice is available in all time during the normal season, while about 20.57% can manage it in the lean season. The seasonal difference was explained more explicitly for the food items like vegetables and fish/meat/egg (Table 4.29). It is found that in the lean season fewer households reported availability of all major food items (rice, vegetables/meat/egg) clearly indicating a seasonal variation in the consumption pattern of food. The proportion of households who obtained vegetables from own production was higher in the normal season than in the lean season, mainly due to shortage of land for vegetable cultivation.

How many days you can support your family with the crops you produce in your lands? In response to such a question the majority of families which own two *care* (32-64 decimals) of land or do sharecropping replied that they can afford to arrange six months' food from their own production.

Food preservation techniques

The households in flood prone villages adopt a variety of strategies for food preservation. Most preferred saved food items are rice, flattened rice, fried rice, chili, onion, *gur*, potato, pumpkin, jute leaf, mango pickle, pulses, dry fish etc. They keep these in polythene bag, jute bag, plastic container and aluminium pots and store in the *machan*. The commonly practiced food preservation techniques are as follows:

It is found that the households keep rice and pulses in earthenware pitcher, aluminium jars and earthen container (*motka*). Some of them keep paddy in *duli* and put it on raised platform or *machan*. Households keep paddy in bamboo made container (locally called *payela*) and cover it with grass/leaves and polish it with mud and cowdung to make it air tight. They keep grinded rice in plastic container. Prior to floods, households store dry food such as *chira* (flattened rice), *muri* (puffed rice), grinded rice, *gur* (molasses), and dried vegetables. Usually, in most households, jute-made hangers - locally known as *shika* - can be found where they store these dry food products. Fish drying is the most common method of fish processing in the area. In all the study villages in and around Tanguar Haor people dry fish, mostly it is done within homesteads by open sun drying system. Primary objective of these households drying of fish is to preserve for crisis periods; only the surplus is sold. In *Dakshin* Bongshikunda huge amount of fish dried every year with a commercial objective. Fish drying is done during dry part of the year mainly from *Magh* to *Chaitra* and it is preserved for three to six months. People keep dried vegetables such as pumpkin, jute leaf, mango pickle on *machan* or in *Shika*. Seeds like been, *Kathli*, *Tishi*, dried in the sun and preserved in gourd shell, plastic container. Bunch of onion, garlic preserved hanging on the pillar of the house or keeping it in hanging nets or *Shika*. They keep chili, coconut in *duli* and put it on raised platform or *machan*. In most cases the food preservation works performed by women. People usually take these preparedness measures one or two months before flood.

Some farmers of the study villages mentioned that from the month of *Chaitra* to *Kartik* food crisis becomes acute. Income opportunities for the rural poor sharply decrease between *Falgun* to *Chaitra* and *Ashwin* and *Kartik*. In *Falgun-Chaitra* before the harvesting period nobody needs to recruit day laborers. In this critical time, economic hardship of the households which mainly depend on wage labor knows no bounds. So, without food preservation it is almost impossible for them to survive.

Households' surviving strategy during lean period

As revealed by the seasonal calendar *Falgun* and *Chaitra* (before boro rice harvesting) is the most severe crisis period in the *haor* area, when the marginal farmers and ultra poor people do not have any food at home to eat. It was found that household members adopt a number of coping strategies during lean period.

Gathering/collection of wild foods

The vast majority of the poor in the area depend on water resources for their subsistence. When the ultra-poor households cannot afford to buy normal food, they resort to other ways of coping. Often, they search for wild foods viz. *singra*, *shapla*, *deb*, *shaluk*, roots, or wild plants. These water fruits are eaten raw or boiled. Usually women and children make attempts to collect water fruits and plants from the *haor*. With procurement of fruits they often catch different kinds of small fish including small prawns. After fulfilling family requirements, they sell the surplus to the indigent. Many people collect these resources for earning livelihoods and for household consumption. Sometimes water fruits are sold in the market. People of all walks of life including children are seen collecting them. It is reported that in the study area one kg of *singra* is sold at Tk 100.

A woman named Anwara (35) from the village of Khidirpur shared,

“What can we do when we do not have food at all? Who can keep quiet on empty stomach? I go to Tanguar Haor along with my kids to collect singra though there are some restrictions. Now we have fallen in a precarious situation. If there is no fishing opportunity only 10 households of our village can afford to arrange food. During the month of Falgun-Chaitra we are left with no option but to leave our homes and migrate to other areas”.

A woman of Rongchi village stated

“I used to collect and eat singra owing to scarcity of rice, Male members and boys help us to get to the haor by boat and we collect deb, shaluk, singra from there. We boil these water fruits and take as food. My husband and son also sell them in the market in order to purchase other household essentials”.

Sharing of food

During the recent big flood people shared their foods with the neighbours; if any household had the ability to arrange two/three meals, it would try to feed the members of other poverty-stricken household in the true sense. The food items included rice, vegetables, pulse, etc. In this way, they helped one another and built up social cohesion.

Firewood and cooking

Supply of fuel for cooking is scarce in the area. Traditionally fuel items like small branches of trees, twigs, leaves, reeds, etc. were easily available in the area. Currently these are being replaced by the ones sold in the market. However, still people especially women and children in the study villages collect the above-mentioned items from the *haor* to cook food. In order to carry out uninterrupted cooking 98% of households preserves fire wood/fuel in advance.

Ujauri, *hijol/koroch* branches, grass, reed or *noi khagra*, leaves, cow-dung, *tush* (powder wood), wood are used as fuel in the study area. Dried *dholkolmi* or locally called *ujauri* is widely used as firewood in the area. Collection, preparation and preservation of firewood are basically women's job. The female respondents said they collect *ujauri* from *haor*, cut it into pieces and dry in the sun. Those who do not have their own cows pick cowdung from the grazing land. They make sticks with *ujauri* plants, cowdung is mixed with *tush* (powder wood) and dried in the sun. Locally it is called '*Muitta*'. Women's traditional skill enables them to take up firewood making (*muitta*) in *haor* area where raw materials is easily available. Often firewood is collected in advance. Households preserve bunch of cowdung sticks and *ujauri* for the rainy season. They keep these items hanging on the house ceiling. They prepare cake mixing *tush*, cowdung and grass, dry in the sun and preserve the substance in a plastic bag and put it on the *chang* or elevated platform for flood period.

Sometimes there is severe flood that submerges most of the houses in the village. Their hearths become unusable. Only those having homesteads higher than flood level are not affected. Such disastrous situation spoils cooking facilities of the affected households. The respondents mentioned some difficulties viz. no dry place; lack of space for storing fire wood; scarcity of safe place for makeshift hearth/stove; inadequate scope for preserving foodstuffs etc. In reply to a question about mechanism for cooking food during flood, 97% of the respondents stated arranging portable mud stove prior to any probable flood. It is placed on a cot, banana raft or any other suitable place inside the house. Usually women perform this job, though often their male counterparts heartily assist them. Female members carefully cook common food so as to save fuel and time. During flood, these can be moved around to where the water level cannot reach the

stove. Most women cooked inside the home. They also keep portable stove on *chang*, cot and even banana raft and cook on it at flood time.

4.4.2 Impact of Flash Flood on Livelihood Pattern

As mentioned before the *haor* is close to the Indian border and Meghalaya Hills where deforestation, natural and manmade, is happening everyday. As a result, rainfalls in Meghalaya have increased in the recent years. This has an impact over the early flashflood in Dharmapasha area. Flash flood can be divided into three phases, such as early flash flood, monsoon flash flood, and post-monsoon flash flood. Usually early flash flood inundates the *haor* causing *boro* crop loss, monsoon flash flood causes homestead loss, temporary displacement and damage to seasonal vegetables; and post-monsoon flash flood causes homestead loss, temporary displacement and harm to winter vegetables.

The researcher looks at how livelihoods are affected by the flood. This was done by comparing household strategies before and after the flood. The results show shifts in livelihood strategies between the pre-and post-flood periods. Flood causes serious impact both on social and economic aspects of livelihood of the households. Temporary displacement of household members has many social implications. It revealed from the seasonal calendar that the total income from different sources declined after the post-flood period. Income generation opportunity reduces greatly, during the flash flood. The amount of loan increased significantly during the post-flood period. People apparently increased the diversification of their livelihood after the flood had included various casual minor sources of income.

In the FGD sessions, agricultural laborers narrated when there is a rise of water level, nobody recruits them. It shrinks opportunities for wage laborers. Flood during the monsoon months of *Ashar* and *Shrabon* causes low income. In this period fishing becomes difficult and risky. Affected poverty-stricken households take loan on high rate of interest from '*gerostho*' to meet their basic needs. A day laborer-cum-sharecropper of Montola Bari, Rongchi village described his experience in respect of borrowing money in the following way:

“When employment opportunity remains scarce in Bhadro we depend on borrowing. We borrow on high interest rate from village Samity and ‘gerostho’ (land owners). If I borrow Tk. 1,000, I will have to pay interest amounting to Tk. 800 a year. I repay the loan by working continuously as a farm laborer in the following season. When there is no work, I take loan from NGOs. By taking loan from NGOs we purchase food, daily necessities and pay back the loan to the moneylenders”.

It is revealed from FGDs that in normal period, daily wages of an agri-laborer’s range from Tk. 200 to Tk 250. But in *Boishakh* during the harvesting season it increases up to Tk. 300-400. Early flash flood often washes away crops and people loses their harvest. When there is a possibility of early flash flood, land owners raise wages to compete for workers. It is difficult for owners to hire the required number of laborers on payment of high wages to reap the crops in such a critical situation. So, early flash flood creates a positive impact on the poor day laborers enabling them to increase income at least temporarily.

4.4.3 Changes in Livelihood Strategies in the Context of Social Change

The study revealed changes in livelihood strategies over the last few years. Changes in livelihood were mentioned in FGD:

As reported by some key informants that the introduction of small-scale irrigation facilities and high-yielding varieties of rice have brought about some changes in their food and livelihood security situation. In the past, the boro crop and other local varieties rice were often grown. Now modern varieties like hybrid Hira, BR-28, BR-29, BRR1 *dhan* 45 are produced. More and more people are taking up vegetable production as commercial basis. Commercial poultry was introduced in the area a few years ago. Some fishermen are now more involved in fish trading than fishing. During the monsoon season, innovative irrigation pump driven rice mills are very common in the study area. *Dheki*, local name for a traditional rice grinding means, now almost extinct. Rice is grinded into flour by automill instead of traditional *dheki* to make *pitha* (cakes).

According to local farmers, during the *boro* season they get 7-8 maunds of paddy per *care* (30 decimals) of land, whereas, in the same land average yield of hybrid varieties such as BR-28, BR-29 and *Hira* is minimum 20 maunds. However, the introduction of hybrid rice varieties has dramatically increased the cost of production with the

requirement of a lot of fertilizer, pesticide and irrigation. On the other hand, local varieties require less input cost and care. Per *care* (one *care* = 30 decimals) production cost for hybrid varieties is Tk. 5000, whereas per *care* total costs for boro production is Tk. 2000. The introduction of shallow tubewells (STW) has created an expansion of small-scale irrigation and therefore, become a popular means of irrigation. In the study area, most STWs are operated by the private owners.

According to the farmers of Antorpur village, irrigation in one *care* of land with private-owned shallow tube-well costs Tk. 500 excluding fuel expenses in a season. Irrigation in one *care* of land costs 3 maunds of paddy, if all the expenses are incurred by the pump owner. Sometimes deep drains are dug from the *haor* to the land to facilitate irrigation. In the past, traditionally farmers used to cultivate their fields with plows pulled by cows. Now most of the farmers use tractors to do the same job. Tilling one *care* (30 decimals) of land with a tractor costs Tk. 500. Net return from the cultivation of hybrid crops is very low. One maund of paddy is sold at Tk 650- 670.

Traditionally people cultivate vegetables at the household level for their own consumption. More and more people are taking up vegetable production as commercial basis. They sell vegetables at the local markets. Agricultural products are also sold by farmers to money lenders (to whom they are indebted) or to the village traders/*pikars*.

Poultry was almost entirely home-based, but commercial poultry was introduced in the area a few years ago. Some villagers buy chickens from the local market and sell at their village. Some fishermen are now more involved in fish trading than fishing.

Many people are now using irrigation pumps for paddy husking traditionally which was done by *dheki*. During the monsoon season, innovative irrigation pump driven rice mills are very common in the study area. This machine is also used for grinding spices like mustard, turmeric and red chili. *Dheki*, local name for a traditional rice grinding means, now almost extinct. For making *pitha* (cakes) people get rice grinded by the automill at Bongshikunda *bazar*. Rice is grinded into flour by automill instead of traditional *dheki* to make *pitha*. The increasing use of mechanical rice mills has lightened the work burden of women. Spices are no more grinded by traditional stone grinder. Paddy husking, boiling and selling it after processing at the local market once was a prime source of

women's employment, but the introduction of rice mills caused this employment opportunity to be lost.

The opportunities of off-farm labor have reduced the dependence on agriculture and led to further diversification of livelihood strategies. New roads have been constructed at Natunbazar, Gurgaon and Moheshkhola *bazar* in the study area. Many people from Rongchi, Khidirpur and Antorpur villages operate *thelagari* (push car). Some people carry passengers on their motorcycles on payment of fare. This has accelerated local communication system. At present boats and trawlers are used extensively to ferry people and transport goods across the rivers and canals. Paddy husking by auto machine, doing business and paddy husking by boat, irrigation by pump are some new additions to rural life in the *haor* area.

Changes in occupation in the past few years

Some new occupations have emerged such as mobile phone business and service centre, *bkash* service, mobile charge by solar power, renting shallow machine, transporting passengers by motorcycle, etc. Small-scale fish cultivation is mainly a secondary occupation for farmers at least for five months (*Kartik* to *Boishakh*). The researcher observed that the smaller paddy husking machines that are located on the boat usually deliver home services during the rainy season.

There are some farmers and agricultural labourers who temporarily shift to other occupations when they lose the crop due to flashflood, which is accelerated by their loan to *mohajan*. Under the circumstances, they are bound to sell out their agricultural land and become agricultural labourers, or sell their labour in other activities. Sometimes, they permanently or temporarily migrate to different places to earn their livelihoods. When a farmer sells out his homestead on account of crop loss and debt he is compelled to migrate and change occupation. The case of Sufiya Begum of Rongchi village is an example, who being unable to pay debt migrated permanently to Tangail to work in stone mining field.

4.4.4 Vulnerability of the Households in Terms of Economic Condition

This section examines the vulnerability of the households in the *haor* area in terms of economic aspects viz. access to market, insufficient scope for institutional credit and chronic indebtedness. The vulnerabilities are identified through ranking method.

Access to market

Local people cannot easily transport their crops, vegetables, small fish, chicken, egg, milk etc. to the market and get good prices from sale. Ultimately, they endure the suppression of the middlemen. In the winter season farmers sell locally grown vegetables at the local markets situated in Gurgaon, Moheshkhola, Notunbazar and Bongshikunda. But in most cases *pikars* usually buy items from the village. Small prawn or *gura lcha* which is abundantly caught in the beel with the help of light trap is sold usually by male members in those markets. They also trade in duck, hen, cow, goat, milk, egg at the local market. Different species of fish are sold in plenty at the nearest market or to *Nigari* who roam around the beel or village. They also buy other items from the village. A fisherman of Antorpur village mentioned *“I catch small prawn near my house. I sell it wherever good price is offered to me.”* Overall it is found that the local people have a nominal or very limited access to marketing opportunity.

Insufficient scope for institutional credit

Boro, the only crop of the study areas, has submerged due to untimely heavy rain followed by the flash flood that hit the areas on March 2017.

“I cultivated boro on around one hectare of land taking loans from a local lender. But the flash flood washed away all my investment. How will I repay the loan and where will I stand with my family now?” lamented Abdul Khair, 70-year-old farmer from Rongchi village.

Like Abdul Khair, farmer Moajjem Hossain, Abdur Rahman, Abdul Kader, Kafil Uddin and many others of the study area experienced the same fate. Most of them had borrowed money either from local *mohajon* as well as from different NGOs. As they have lost their only crop, their earning, the farmers can now see only a bleak future ahead.

The study reveals that poor people are mostly deprived of economy related amenities from the government. The key informants mentioned though government provided relief

materials including seeds and fertiliser and other agri-inputs to the flood-hit people, but many flood victims of their village hardly get agricultural services such as fertilizer, pesticides, loan and advance. The farmers are not aware of the bank loan facilities and most of them are afraid of paperwork needed to receive a loan. Small or marginal farmers usually do not have any collateral papers like land deeds. Even if they have documents, most of them are not updated.

A village man of Rongchi opined that

“We have no landownership; therefore, we are not eligible for government loan. Minimum one acre of land document needs to be provided for Khrishi Bank loan. In our life time, we will never be able to repay a loan. We have no property.”

Against this backdrop most of the female respondents (40%) have access to some kind of microcredit system. A number of microcredit service providers such as Grameen Bank, ASA and BRAC are found operating in the study villages, which provide loans especially for women. The poor people who have been organized under groups are entitled to get loans from these organizations. NGOs generally sanction loans during the lean period in *Boishakh* and *Joishtha*. Overlapping of NGO-membership is common in the area.

In most cases, after getting loans, the women members hand over the money to their husbands. Some women are doing businesses by themselves in the area. Some women of the study villages use the money to start micro business such as small shop, petty trade locally called ‘ferry business’, handicraft, paddy business and poultry farms in their courtyards. In many cases women operate small shops inside their houses.

Samity

The villagers have formed village-based organization called *samity*. In Batta village there is *samity* with 125 household members. So far Tk. Two lac has been accumulated as capital by this *samity*. Each member can take a loan @ 50% annual interest from the village *samity*. For a loan amount of Tk. 10,000/- the concerned borrower needs to pay in total Tk. 15,000/- annually.

In Rongchi village there is another *samity*. Each member deposits a minimum amount of Tk. 100/- monthly. *Samity* sanctions loans to the members only. Yearly interest rate is 80%. Profits are disbursed among the members as dividends. Apart from income

generation the *samity* also provides assistance for the poor families of the village like providing exam fees, medical expenses, marriage expenses, etc.

Chronic indebtedness

Almost 90% of the households reported taking loans during the year prior to the interview. Indebtedness ranges from Tk. 1000/- to 50,000/-. Households depend on borrowing in the month of *Bhadra*, *Ashwin* and *Kartik* (mid-August to mid-November) when there is hardly any employment. Households take loans primarily to maintain families during crisis or off-fishing period (in the dry season or at the time of flood). A significant number of households borrowed a large sum of money for medical treatment of their members. This amount continued to rise to 40-50 thousand. The records reveal the landowners borrow money for cultivation in *Agrahayan-Poush*. Furthermore, households borrow money for domestic purposes e.g. feeding family members just after a disaster, investing in land (land lease/purchase), fish business, education; carrying out agricultural work (crop production, purchase agriculture input, seeds, fertilizers); bearing expenditure for dowry and marriage; buying fishing equipment, boat purchase or repair, keeping poultry and livestock; constructing and repairing houses, boats; repaying loans taken from other sources, investment in business, education, etc. A woman of Rongchi village borrowed Tk. 60,000/- for medical treatment of her husband. For this loan, she had to give four *katthas* of the land in mortgage. She has to repay the loan with interest at the rate of 50% annually. If she fails to pay the money, she will lose her land.

Another woman of Rongchi village reported,

“Usually we need to pay interest on the amount of money taken as a loan from the moneylender. For a loan of Tk. 1000 I have to pay yearly interest amounting to Tk. 800. For fear of paying extremely high interest I try to avoid professional money lenders. So, in order to repay the existing loan taken from a particular NGO I borrow money from another NGO. If I fail to get money from any new source, then I reluctantly go to the mohajan to take a loan.”

Once the crops are lost or houses are damaged, households tend to take loans from *mohajans* or mortgage their land to *mohajans* for borrowing money. Some take loans from micro credit institutes to rebuild houses or to pay loans to others. Households are usually compelled to lend money from *dadondar* or *mohajan* on high interest rates. In fact, the situation pushes a lot of people entering into extreme poverty, as they cannot

repay high interest and lose their movable and immovable assets. The researcher observed various conditions of money lending systems prevailing in the area.

Table 4.30: Different Types of Money Lending Systems in the Study Area.

	Condition
1	If the money is taken from <i>dadondars</i> , in return the fishers are bound to sell all their catch to the concerned lenders at lower prices.
2	For taking a loan amounting to Tk. 1,000 the loanee needs to pay monthly interest of Tk.150 (15%).
3	Agricultural credit from <i>mohajans</i> , if Tk.2,000 is taken in <i>Agrahyan</i> , he or she needs to repay 12 maunds (37.5kg) of rice in <i>Boishakh</i> .
4	In another arrangement if Tk.1,000 is taken during <i>Ashwin</i> one needs to repay Tk. 2,000 in <i>Joishtha</i> (after 8 months).
5	For borrowing Tk 1000 from a money lender interest rate would be 50% i.e. Tk. 500 after six months. Locally it is called ' <i>dera</i> '.
6	For borrowing Tk. 1000 monthly interest rate would be Tk. 100. Locally it is called ' <i>batta</i> '.
7	If Tk. 10,000 is borrowed, double amount should be paid after one year.
8	If one maund of paddy is borrowed in <i>Boishakh</i> , one and half maunds should be paid in <i>Agrahyan</i> . If paid back in the next <i>Boishakh</i> then two maunds have to be paid.
9	If Tk. 1,000 borrowed, in the next working season the borrower should repay the same amount of money with one maund of paddy.
10	For a loan of Tk. 1000 yearly interest rate is Tk. 800

Source: Field survey data

A woman named Honufa Begum (55) from Ronchi village explained:

“For a long time, we've been borrowing from our neighbours at 'dera' system. If I take a loan of Tk. 1000, I have to pay back Tk. 1500. I had to borrow money from two NGOs --BRAC and ASA mortgaging my land to buy a motorcycle for Tk. one lac and five thousand. Now my son is earning money by carrying passengers on the vehicle. He is repaying the installments of loan. My son also bears household expenses.”

It is common that many poor households sell their valuable assets to repay the loans taken from moneylenders who are very rigid and realize amount of loaned money by any means. There are some incidents involving a number of poor people who lost all of their belongings including homesteads.

Md. Saiful of Khidirpur village in Dakshin Bangshikunda was forced to sell out his homestead.

Md. Saiful of Khidirpur village in Dakshin Bangshikunda borrowed Tk. 30,000 from different moneylenders. After two years, the amount stood at Tk. 65,000/- including interest. He could not return the loan in time and finding no other option he had to hand over the possession of his homestead to the moneylenders. He left the village along with his family for Sylhet to work there as a day laborer.

Parvin Akter of Rongchi village became the *de facto* household head due to indebtedness:

Bakul Miah (32) from Rongchi village was a local trader. He would buy fish from the village to sell it in Notunbazar local market. To expand his business, he took a loan of Tk. 80,000/- on high interest rate (80%) from different moneylenders of his village. Being unable to repay the loan he ran away from the village and took refuge in another district, Tangail. Now his wife Parvin Akter (28) lives in her father-in-law's land (one decimal) with three children. Parvin Akter has started a small shop in her house. With the income from the shop, she meets the household expenses. Besides, she also makes firewood which is sold to other households in the village. She gathers ujauri and cowdung from the haor to make firewood locally called 'muitta'. She sells 100 'muitta' for Tk. 100. Once she got a net profit of around Tk. 5,000 from selling 'muitta'. With this money she bought food, other necessary commodities and invested in her shop. A year ago, her children dropped out of school on account of financial crisis. Now they (aged 12 and 8 years) sell household items by a 'boat shop' from village to village.

A married woman (25 years of age) of Montola Bari, Rongchi village described how they managed to survive the flood:

"In Jaflong we used to work as stone laborer. We could earn on an average 500 taka per day." In the flood, we lost our land, home and we were forced to migrate to another place, Jaflong. The only school cum flood shelter in our village was overcrowded with the flood affected people. In Jaflong we lived in a rented house paying monthly Tk. 1000. There we used to work as stone laborers. We could earn on average Tk. 500 per day. The flood water had fully receded 4/5 months later and we returned home. Now we are again planning to go to Jaflong, because we have no work here. There is no opportunity to catch fish. If I migrate for the second time, I will probably have to leave my three children with mother-in-law. I have a debt of Tk. 50,000. The amount of interest will rise to Tk. 30,000 in

the month of Joishtha. I have to earn enough income to pay back debts. I borrowed the money for my husband's treatment. Now he is unable to do any hard work, but I am not physically weak. So, I will have to earn a lot to pay back the loan and provide assistance for my family members. In the month of Ashwin, I will go to Jaflong and stay there for four months. There is no scope of work in this village during this critical period. Then in Paush I will come back and join plantation activities from where I expect to earn around Tk. 300 daily."

Seasonal loan

Respondents mentioned some negative consequences of seasonal loan. According to them, seasonal loan is normally a riskier form of loan than other forms of loan. If anybody borrows in *Falgun* or *Chaitra*, he/she is compelled to pay back in *Joishtha* which is a harvesting period. People borrow for agricultural input like seeds, fertiliser for sowing mustard in *Kartik* and *Agrahayan*. This loan should be paid back in the next *Joishtha*.

The local people when face crisis due to unavailability of livelihood opportunities especially during flood time, they seek help from the affluent neighbors who try to respond positively. If any poor patient is in need assistance for medical treatment he/she can count on the generosity of some kind-hearted people of the locality. The poor villagers who participated in FGD from Rongchi village, Dakshin Bangshikunda, said: *"If we take loan from mohajon they take high interest; so, we lend money and food grains from our relatives and neighbors, we pay back when the harvest came in"*.

Control over local resources

Haor has been supporting and being the only natural resource in support of livelihoods of a large downtrodden human population of fishers and other poor people of the area (Anwar Hossain Chowdhury, 2003). The *haor* water bodies are broadly demarcated into two divisions: the core zone and the buffer zone. However, there is a clear dispute over the demarcation regarding identification of the Tanguar Haor boundary under official land tenure systems. Absence of a proper and officially approved boundary line puts the entire resource management system in jeopardy. Vested quarters are taking advantage of it. Even though the Tanguar Haor is forbidden for commercial leasing, the absence of a clear-cut boundary allows the local administration to lease out beels claiming that they are outside the core area. The general ban on resource harvesting means that local

communities are no longer allowed harvesting *haor* resources from the core conservation zone on a subsistence basis. During the monsoon period, the entire *haor* becomes inundated and at this time, it is impossible to demarcate privately owned land from *khash* water bodies. Local administration typically leases out the *khash* water bodies (*beel*) inside the *haor*, but leaseholders establish control over the entire *haor*. Fishers cannot catch fish in their own land during the monsoon period. Then the leaseholders thus become “water lords”. They expand their control over the *haor* areas as far as water is seen and they are so powerful that the poor fishers cannot challenge them. The local political leaders are connected with the leaseholders. Under the current policy and the existing power structure the poor fishers are thus excluded from their legitimate rights. The effects of policy changes in *jalmohals* management have resulted in the total exclusion of local fishers and other poor communities from wetland resource use, which have severely impacted their livelihoods. In the study area access to and control over *haor* resource are determined by the existing top down, bureaucratic management regimes. Local communities, which largely depend on wetland resources, are persistently excluded from access to and control over such resources. Common property becomes private property within the rent-based leasing system of waterbody (Khan SM Munjurul Hannan, 2011). A study by Anwar Hossain Chowdhury (2003) presents the most important cause of insecurity and conflict in Tanguar Haor revolves around use of *haor* resources.

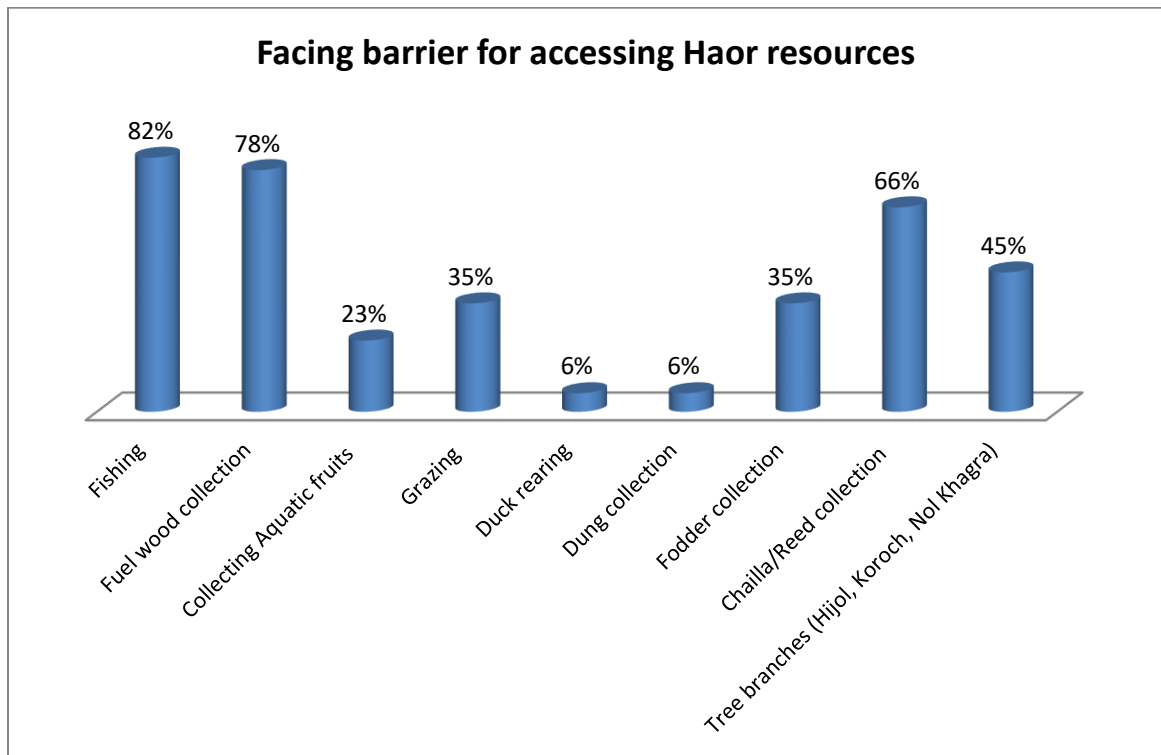
Although the government has placed a restriction on fishing in the main *haor*, catching in the surrounding *beels* is open. The poor fishermen have mainly been affected by the unlawful restriction imposed by the leaseholders on catching fish even in the surrounding *beels*. However, the fishermen can catch fish in some water bodies through illegal payment of bribes to the leaseholders. Only those *beels* that are controlled by powerful people allow fishermen to capture fish in this way. The local fishermen said that if they do not offer bribes to the *beel* guards, they snatch away their boats and fishing devices. They forcibly take the fishers to the *beel* owners’ house and physically assault (source: FGD with Fishermen group).

As mentioned earlier, most of the agricultural lands belong to individuals while the majority of the water bodies are owned by the government. Only some small water bodies are possessed by the local villagers. *Kanda* land is also under government

ownership on which there is no private claim. These plots of land are the community resources where cattle grazing, collecting reed and duck rearing activities take place.

About two thirds of the households living in the villages regularly visits the *haor* in order to collect natural resources that are considered to be their life-blood. It is a pity that now they do not get access there. They face constant threats from various quarters having vested interests. The Figure 4.7 shows barrier to the *haor* resource-based activities.

Figure 4.7: Facing Barrier for Accessing in Haor Resources



It is found that 82% of the respondents said that they faced obstacles while fishing, 78% faced hindrance during fuel wood collection, 35% faced difficulties at the time grazing cattle, 66% while *chaila*/reed collection, and 45% while collecting tree branches. These activities are supposed to be done freely in the area. But many respondents stated that because of torture inflicted upon them by a very strong group of people they cannot regularly carry out the jobs (duck rearing, grazing, dung collection, fuel collection, and food collection) in the *haor* to earn their livelihoods.

It is pertinent to find out who play the pivotal role in creating such obstacles. Table 4.31 shows that nearly 81.71% of the people found the obstacles coming from the lease-holders, 78.29% reported that beel guards harassed them, 37.14% faced entry restriction from the local influential persons.

Table 4.31: Factors Responsible for Creating Barrier

Factors of creating barrier	Number n= 175	Percentage
Lease-holders	143	81.71
Beel guards	137	78.29
Local influential person	65	37.14

Source: Field survey data

There is a conflict between leaseholders and the local farmers over the use of common resources. The following examples can illustrate this point.

One of the biggest disputes in the study area focused on common water resources in the beels. The leaseholders control water levels to maximize fishery production, which proves to be detrimental to rice cultivation carried out by the local people. Water levels are controlled artificially by building earth dams to keep it high in one area or low in another. After the monsoon passes, water in the haor begins to recede naturally, leaving behind fertile land that is suitable for paddy cultivation. Instead of allowing this to occur, the leaseholders would keep water levels high by erecting temporary earth dams in order to promote fish growth in the beels. This step interferes with the preparation of the local residents who cannot but depend on rice cultivation in the swampy land. Keeping water level high at the end of the monsoon is harmful to the cultivators who become bound to opt for delayed plantation of paddy seedlings. Moreover, the draining of beels in the winter months deprives rice growers of the facility for irrigation, and forces them to incur additional expense. This system of manipulating water level puts serious pressure on the livelihoods of the local residents and the issue leads to conflict.

The above section has discussed in detail livelihood portfolio of the households and their economic vulnerability. The next section presents strategies to overcome economic crisis.

4.4.5 LIVELIHOOD STRATEGIES TO OVERCOME ECONOMIC CRISIS

It was found that household members adopt a number of coping strategies to recover from disaster related losses. The strategies include use of social networks and relationships, livelihood diversification, reduction of expenses such as changing food habit, engaging women and children in work, advance labor, distress selling, borrowing, working for extra hours, temporary or permanent migration etc.

The following Figure 4.8 reports household coping strategies to overcome the crisis.



Fig. 4.8 Household Coping Strategies to Overcome the Crisis.

One of the major factors that help recover immediate losses is activation of social networks and relationships. Such a measure expedites opportunities to raise household income. Many of the agricultural workers are involved in day labor like soil digging or goods/commodities carrying. They also perform other labor oriented jobs such as stone and coal collection. Some also remain in running petty trades. Very poor women work as

maidservants at well-off households. Indeed, they become ready to do laborious and risky activities to raise income and overcome losses and damages caused due to flash flood.

Household members take a number of strategies including reduction of expenses such as changing food habit and engaging women and children in income generating activities. They save income of one member to pay installments and use income of other member for household expenditures. As a coping strategy, some ultra-poor people sell their labour in advance at low rate; others sell their household assets, etc. The study found that sometimes all household members seasonally migrate to other places in search of work. After working for five to six months, they return home with some savings so that they can pay installments on their loans to *mohajans*.

The household members take some 'austerity measures' in regard to food intake and use of resources. They take less food compared to their needs-- eat once instead of twice (Charles C Villinueva and Tulshi Kumar Das, 2010). Women sacrifice a lot as they take food after feeding all the members. Some of them take future risk to meet present needs i.e. selling household belongings, selling labor in advance, and taking loan at higher interest all these can be termed as 'Risk Transfer'. The study by Ali Ahmed (2005), shows with regard to household coping strategy for the risks and shocks like flood households try to smooth their consumption through saving, borrowing and altering feeding practices.

Livelihood diversification trend

The study explores livelihood diversification trend of the household. They take a number of strategies to recover from disaster related losses and damages. Ellis and Allison (2004) begin by exploring the benefits of the diversification of livelihoods, they observed diversification decreases pressure on local resources, enhances people's options. Suvit Yodmani (2000) emphasizes diversity in the sources of livelihoods is very important for increasing people's capacity to cope and recover.

Having more than one source of income (or food) is invaluable during times of stress, when some economic activities become impossible. Household members engaged in

agriculture undertake other work, such as making and selling handicrafts, fishing or small trade. As mentioned earlier, the study area belongs to a single-crop community. The only option available to them for diversification is to try improved varieties rather than local *boro* crop. The farmers cultivate improved varieties, such as BR-28 or BR-29, BRR1 45 for increasing production. Another example of livelihood diversification is related to paddy business. Some small farmers temporarily become traders, buy paddy from the local marginal farmers just after the harvesting period and sell to big businessmen at a profit. As mentioned before, fishers are excluded from their rights to fishing due to the current leasing policy and negative role of local power structure. As a consequence, fishers either opt for fish related business like buying and selling fish or the business of dry fish. However, diversification of this kind is very capital intensive. Another way of diversifying is to share fishing with leaseholders. The stark reality is that shared fishing means catching fish for leaseholders. When fishers do not have any other options, they go for shared fishing, but usually do not get adequate remuneration.

It is revealed from the data that a significant portion (39.17%) of respondents reported that they switch over to off-farm day laborer as an alternative income source. The study finds that diversification of livelihood contemplates through various off-farm labor such as boat operating (own); paddy husking (on engine boat), renting out shallow engine for irrigation, fish drying and trading, making and selling fishing gear, work as fishing labor; small trading (fish, vegetable, clothes), carrying passengers by boat/motor cycle, trawler driving; goods transporting by boat/van/*thelagari* (push cart); small shop on boat, renting boat, rendering labor in domestic chores, earth digging and carrying, etc. From the FGD and personal observations of the researcher it is apparent that households having young members tend to diversify their livelihoods. When there is no regular job opportunity, people work as day laborers in the houses of affluent families. Some of them are also engaged in earth digging and carrying.

The findings reveal that household members are changing their mindsets regarding choice of occupations. They try to do other jobs apart from what they have learned for generations. For example, in Rongchi and Batta village, some individuals of the fishing community are now engaged in other jobs including day labor though fishing is their inherited occupation. On account of shrinking income opportunities, Rajab Ali, marginal

farmer of Rongchi village along with his sons do the work of earth digging for extended period of time for loss recovery.

It is evident that agricultural laborers and fishers are involved in the activities connected with multiple sectors like day labor, small business and other self-employed occupations. Apart from working in other sectors, community people from study villages seasonally migrate to other places for work; though few households were bound to migrate permanently.

Social network and social capital

Flood effects are not confined to individual households alone; rather they affect the entire haor community, which necessitates concerted efforts for flood mitigation. The social network and social capital (Adger, Huq, Brown, Conway 2003) are the two pillars that maintain a community's togetherness and cohesiveness and keep its members strongly tied to one other during a crisis period. Ali Ahmed (2005) mentioned in this study that social capital has linkage with other capitals like economic capital. Almost all the respondents said that support of neighbors, family, and kinship networks to households in their resilience efforts is crucial and invaluable. In the remote study villages, the people's social network and social capital play an important role for flood risk reduction. The support provided by the community to their neighbors reflect in the forms of visible and invisible supports which can be classified as emotional (love, care, affection and closeness e.g. taking care of children, elderly people, PWDs) and tangible (money, food, transport, shelter, tools and equipment, taking care of belongings and domestic animals).

Engage women and children in income generating activities

As a coping strategy, households resort to engage women and children in income generating activities. During the busy harvest period, it is common for children to work in the fields and help their families. Since it is not possible for the poor families to hire extra workers, they depend on women and young members to do the small chores. In the poor family, children are usually engaged in income generating activities to enhance its income. School going boys carry out most of the animal husbandry work and participate in agricultural work (mainly pre-harvest activities such as sowing of seedlings and

weeding). In the study area, small children also work as hired laborers to rear cattle in other people's farms. The wage varies from 10 to 12 maunds (one maund=31 kgs) of paddy in six months. In some cases, children accompany adult members to help row boat and catch fish. Sometimes minor members do the job themselves without taking elderly persons' assistance. The task of collecting firewood such as grass, *ujauri*, cowdung, leaves, etc. from the *haor* is not limited to women only; girls join them as well. A farmer from Antorpur of Uttar Bongshikunda union said he cannot but ask his children to give a helping hand since the number of laborers in the locality is scarce and wages are high in *Boishakh*. A girl student from the same village said that she needs to carry noon-meal for her father who works in the field. A housewife of Rongchi village said, "The children of the family usually spend a busy time at home at planting time of the year. They help us to dry paddy, do household chores and carry food for elders to the field."

Sale of labor in advance

As a coping strategy, some ultra-poor people sell their labour in advance at low rate. There is a system under which the poor people in the *haor* area borrow money (fixing wages at Tk 120-150 daily) in the lean period from *Ashar* to *Ashwin* from the rich on condition that the concerned borrower would repay the loan by rendering labor during the plantation time when usually Tk. 180-200 is paid to a worker per day as normal wages. Though this process of sale of labor in advance helps the indigent people to survive when there is almost no scope of employment, they lose Tk. 50-60 every day. Later it becomes impossible for them to make up this loss; therefore, it continues to the subsequent years. Even wages may become higher during rice harvesting (250-300 taka) if the area faces scarcity of laborers owing to the threat posed by imminent flood. The borrowers must work for the lenders' agricultural lands on low wages until the amount is fully adjusted. The debtors by no means are allowed to sell labor in other places.

Distress sale of household items

Households react to the flood damage or loss by taking several measures. For example, to recover from property damage (e.g. house), caused by flash flood, households sell their assets including jewelries, livestock, poultry, trees, furniture (table, chair, alna, cot), paddy. Researcher found that some respondents sold their lands during crisis period

and mortgage their land to *Mohajans* to take loans. Some of the respondents sold livestock in an attempt to hold cash security for procuring food. Only few respondents informed that they used to spend their savings during flood and crisis period. As mentioned earlier, *Kartik* and *Chaitra* is the lean period. Families are apparently willing to undergo great hardship before they are compelled to sell household items. The researcher came across one family which sold tin of the house-roof and replaced it with thatch. Some people ran into debt so acutely that they could not come out of indebtedness at all. In fact, if there is massive loss, the flood affected people mortgage their landed property to professional money lenders to take loans on hard conditions. In most cases, they fail to repay the loans and sell the mortgaged land.

With regard to distress sale a male respondent stated

"I sold 10 pieces of corrugated iron sheet of my house for Tk. 500 to save my family. With the money, I purchased food. Later I replaced the thatched roof with tin borrowing money from NGO samity."

Doing laborious work for extended period

As a strategy to recover from loss and damage of flood affect some household members work for an extended period of time and engage themselves in laborious and risky work. Many of the agricultural workers are involved in day labor like soil digging or goods carrying. They also perform other labor-oriented jobs such as stone and coal collection. Very poor women work as maidservants at well-off household. Some of them work as casual day laborer in '*gerostho* house'. In this case women usually paid in kind such as rice and food. Indeed, they become ready to do laborious and risky activities to raise income and overcome losses and damages caused due to flash flood.

Reduction of household expenses

The flood affected people in study area take some 'austerity measures' in regard to food intake and use of resources. They try to recover from loss of asset and pay the installments of micro credit or loan, but they do not always have sufficient income to do it. Many of them often cannot afford to arrange three meals a day. Then many of the households reduce food intake so that they can save money to pay installments.

Ultimately, they become malnourished and lose physical strength. Women sacrifice a lot as they take food after feeding all the members. The respondents mentioned that they adopted this strategy during the last flood hazards.

Migration as a livelihood strategy

'For the marginal Haor households, seasonal migration is a grounded coping strategy to deal with environmental vulnerability' (Rhyhan and Grote, 2007; Kabir et al., 2008). During flood period (June through August), many household heads (76% male) go and stay in other city for working as agricultural laborer and other labor-intensive jobs to earn for their family. Since seasonal floods disrupt the traditional means of livelihood, the temporary migration strategy works as an adjustment mechanism for the poor households. They rush to those areas where there are scopes for utilizing physical labor on reasonable wages. So, for the people of Bongshikunda union belonging to this category seasonal migration is a crucial way of maintaining livelihood as well as coping with natural disasters. It enables the poor households to compensate for the loss of income from agricultural land to which damage is caused by any natural disasters. In this context, remittance contributes to economic diversification providing insurance against flood.

It was learned from household level interview and close observation of the researcher many people living in extreme poverty and some of them migrating to other places due to indebtedness, loss of property and scarce sources of income. When there is no work left in their own area after a disaster, people tend to migrate to Tangail, Comilla, Feni, Chittagong, Jajlong, Sunamgonj, Bholagonj, Dhaka, Bikrampur, Norshingdi and Sylhet to earn their livelihoods. It is further explored that in the study villages around 40% of the households resort to seasonal migration during the months of *Joishtha—Ashwin* when there is no employment opportunity. The interviewees were asked about the type of works the migrant family members usually adopt during seasonal migration. They spontaneously expressed the strategies they resorted to during seasonal migration. It was found that seasonal migrants become agricultural workers, day laborers, engaged in '*gerosther kaj*', potato harvesting, etc. Some of them are engaged in sand, stone and coal collecting, rickshaw peddling and *thelagari* pulling. Others want to be garments workers, fish-wholesale (*Arot*) workers, poultry farm laborers, masons, helpers, etc. It is

further explored that some household members altogether seasonally migrate to other places and after working for few months they return home with some savings so that they can pay loan.

Agricultural workers migrate twice a year during seeds sowing or seedlings planting and harvesting seasons. People from the study area migrate to other places and work on a contract basis to harvest paddy. They have good relationships with farmers of other districts through long-term networking which helps them to know the situation about the demands of laborers. In the month of *Joishtha* and *Ashar* they become agricultural workers to reap *Irri* paddy. In *Shrabon* they are engaged in plantation work. From *Kartik* to *Agrahayan* they move out in groups to complete harvesting. Again, in *Bhadro* they migrate to those areas where *Aush* paddy becomes mature to be reaped. The landowners often provide food and shelter for them. Daily wages range from Tk. 200 to 250. In *Kartik* they migrate to Bikarpur and Dhaka to plant seeds of potato. Some of them go to Sunamganj and Dhaka and work there as laborers in the vegetable wholesale center (*Arot*).

Profile of migrants

Almost 98% of migrants are male members. The migrants are in the age range between 25 and 40 and most of them are illiterate or have education up to primary level. They are poor, landless, wage and agricultural laborers, share croppers and marginal farmers in the *haor* areas as reported by other studies (Rabby et al., 2011). Seasonal migration is mainly undertaken by agricultural laborers -- above 80% of migrants work in the agriculture sector in both their homeland villages and destinations. The female migration is within the figure of 2-4%. Married women usually migrate with their families. People in the study area migrate to other places in groups for a period of 3-4 months, mostly during the monsoon. Table 4.32 depicts the seasonal migrants' profile in the *Hoar* area.

Table 4.32: Profile of Migrant Households

Attribute		Total amount of Migration Household n=87	
		Household Members n=87	Percentage
Age	<20	17	19.54
	20-30	33	44.83
	31-40	28	35.63
	41-50	9	10.34
	Total	87	100.00
Education level of MH head	Illiterate	66	75.86
	Primary	16	18.39
	Secondary	3	3.45
	Higher secondary	2	2.30
	Total	87	100.00
Land ownership	Landless	49	56.32
	Marginal	26	29.89
	Small	12	13.79
	Medium	--	--
	Large	--	--
Employment Status	In agriculture sector	72	82.76
	In other sectors	15	17.24

Source: Field survey data

This study notices how remittance from migrants enables their families to reduce disaster risk. First of all, a household intends to promote its infrastructural development so as to be safe at the time of any flood or catastrophe. Many household invested remittances in more diverse livelihoods such as run small shops, lease in land, raise cattle and deal in particular crops/commodities and thereby they reduce extensive disaster risk.

Seasonal migration of women

Women generally opt for alternative income opportunities such as agriculture (potato harvest, rice plantation), sand lifting, stone collection, serving as domestic help, brick breaking, sewing, jute bag making, ash selling, fish and vegetable vending, selling rice cakes and working in the readymade garment industry. Widows are far more likely than young women to migrate. In some cases, the whole family moves. Young women work at garment factories, usually accompanied by close relatives. FGDs reveal that female members' seasonal migration has been obstructed by cultural restriction, social norms, gender disparity and insecurity. Women encounter problems while men of the households migrate to other places to earn.

As stated earlier, in the *haor* area the ultra-poor household heads often migrate to earn their livelihoods during the crisis period. This is mainly a temporary or seasonal migration of ultra-poor and male members who usually come back to their families after the earning seasons are over. There may be some *de-facto* female headed households as a consequence of the absence of male members for a long time.⁵ That time, the female members have to take all responsibilities of the family. In the study areas, most commonly post disaster coping involve survive with foods and shelters. For that, women involved themselves in government or NGO sponsored “food for work” or “cash for work” programmes. The role played by women in the absence of male is not usually appreciated. All credit is often given to male migrants who earn money to support their families.

Respondents were asked about the problems they encountered while the male migrated to other districts. A significant portion of women (32.57%) reported that they feel mentally depressed and insecure when male members are migrated. Such women have less access to livelihood opportunities. Women headed families are socially neglected and abused or harassed. They cannot comfortably buy daily necessities from the local *bazar*. During the monsoon, it is difficult for them to go there, so they take help from their neighbors. If a woman finds a male going by boat, then she may request him to buy something for her family. The role played by women in the absence of male is not usually appreciated. All credit is often given to male migrants who earn money to support their families.

⁵ De facto female-headed households are those where the self-declared male head is absent for at least 50 per cent of the time. In these households, husbands or other male relatives may still play a role in basic decision-making and make varying contributions to household incomes. De jure female-headed households are those in which a woman is generally considered the legal and customary head of household. De jure households are usually headed by widows, divorced and separated. Typically, in de jure households, the female head of household is thought to have control over most household income and assets.

A woman named *Mossammat Fatema Akter* (25) whose husband (Joinul Miah) is away because of migration describes the experience of her daily life in the following way:

“We have four children, one son and three daughters. My husband works as a laborer at an Arot in Dhaka. He sends around Tk. four-five thousand per month to me and comes home on the occasion of two Eid festivals only. Earlier I used to go Bongshikunda bazaar to receive remittance through mobile flexi-load. Now this facility of bKash is available in the village. My relatives help me do some shopping from the market. I have to use boat to go from place to another during the Monsoon. Since I have no boat, it is very difficult for me to move in the rainy season. Sometimes I borrow a boat from the relatives living in our village. I live in a wrecked house, so when I feel insecure, I along with my children stay with my brother-in-law's house. In the past, my husband used to migrate for 5/6 months, but now he spends the whole year in the place of work. My husband always does not receive wages in time. As a result, he fails to send remittance every month. Then if necessary, I borrow money, rice and other items from my neighbors. I have to repeat such acts while waiting for remittance. I repay the loan after receiving money from my husband. All the year round my husband is away from home except for a few days; so, I manage the household chores with great difficulty. I do all household work alone. When I fetch water from another hamlet, I leave my children in the relatives' care. This morning there was no food in the house, so I borrowed rice from my sister-in-law. When we have scarce foodstuff, my children and I eat only rice and red chili paste’.

Conclusion

It is found that the people living in villages in Bongshikunda union primarily depend on two occupations, agriculture and fishing, for their livelihoods. During the monsoon, the landless people become engaged in fishing. During the dry season, the inhabitants of the study area carry out activities related to agriculture. Many of them depend on dry season harvest to survive during the rest of the year, when there is no other opportunity for income but some limited fishing.

Livelihood diversification has occurred in the area to some extent. More and more people are involved in non-farm labor activities. New activities like rice husking by machine, commercial vegetable cultivation, dry fish business, duck rearing is on the increase. All this transition helps avert the vulnerability experienced by many of the

landless poor families. The alternative sources of income are very crucial in getting rid of vulnerability and attaining livelihood security.

Through the field observation, it is evident that the use of social networks and relationships, exchange of labor, more interaction with local institutions such as Union Parishad, NGOs and *Samity* and livelihood diversification and out-migration are found significantly effective options to cope with the adverse effect of flood. However, loans from money lenders, less quantity and quality of meals, sale of labor in advance and household assets, mortgaging land, deploying children in activities are the vulnerable options to cope with the disaster. Suffice it to say these options are never considered to be viable for household resilience; the negative activities rather push them into jeopardy.

This section has explained economic condition of livelihood. The following section will discuss in detail social context of livelihood resilience.

4.5 RESILIENCE OF HAOR HOUSEHOLDS WITH RESPECT TO SOCIAL CONTEXT

This section presents vulnerability and resilience of the *haor* households from social perspective. Taking the view, it explores social capital, local practices for maintaining health and nutrition and children's education.

4.5.1 Social capital

The most crucial issues in livelihood of the *haor* households are coping with vulnerabilities and stress through the use of social capital. In reply to some questions the respondents in the flood prone *haor* area stressed on the importance of social relationship and networks to get rid of the vulnerabilities. The following examples may clarify this point:

Social solidarity

Social bond among neighbors is a great capital for them (Selina Hakim 2012). For example, the respondents of Rongchi and Batta villages stated that sometimes gangs of thieves reap paddy from the field at night. So, the villagers form some groups and guard the field themselves by rotation and protect paddy from being stolen. Sharing of boat is a common practice in the study area. Those who do not have own boats can use their neighbors'. Small boys often give a lift to women. The households with migrant male-

members or those households which have no boat often take help from others to buy daily necessities from the local *bazaar*.

Social capital plays an important role in finding a job on the boat. It helps secure a job when they migrate to other districts. Credit/loan from non-formal and informal networks is taken by the households to expedite their livelihood related activities. The non-formal sector includes local moneylenders and NGOs and the informal sector covers relatives, neighbors and local elites. Borrowing money without collateral is the proxy of social capital. Kinship relatives are important for borrowing food and money and most importantly, for seeking advice in respect of coping with an adversity.

In '*Paschim Para*' (West Hamlet) of Khidirpur village it is found that people help out most vulnerable neighbors who need house-post construction or house repair. In Rongchi village people constructed a bamboo-bridge in order to go from one hamlet to another. The well-off families provide assistance for the vulnerable people who need support for medical treatment, marriage, funeral, etc. The village samity also helps in this regard as much as possible.

In a village, everyone knows each other; even they have close linkage with the families in neighbouring villages. While traveling across the villages the researcher noticed such cordiality among the villagers. They cooperate, help, protect each other, and develop human bond. The study discovers some labor sharing practices.

In the villages where life and nature often come together to make things difficult, the concept of bonding is very important. As revealed by the study the villagers help a family to construct a new house, relocate household stuff, grow crops, process harvest and provide service for ailing patients at the time of unfavorable situation. They also help others by lending money, boat and carrying out all sorts of major activities such as providing physical labor for house construction and repairment, boat making and repairment, carry new boat to float in water, help lift the tin up to the house roof, put the boat into the water, etc. In case if any child drowns, many rush to the spot to join the rescue operation carried out to save the victim's life.

The following excerpt is an example of mutual assistance.

"If I help others in emergency situations, I would get the same response from others." – A man of Maijhpara, Khidirpur village

One of the female respondents of Maijh Para, Khidirpur village explained her experience about borrowing in the following way:

“If I do not have any item of food or a useful thing, I borrow it from a neighbor. Usually I need to borrow rice and spices at emergency, which I repay later. When we cannot go to the market on account of flood, we borrow essentials from our neighbors. Some days ago, I did most of my cooking on my neighbor’s hearth since mine was unusable.”

Many examples of social capital exist in the study area where most of the households collaborate with each other in respect of sowing seeds, planting seedlings in the land and harvesting crops. Traditionally this type of mutual assistance is common in the *haor* communities. During the sowing/planting season a landowner celebrates the occasion by entertaining all agro-based co-workers with rice and *pitha* (cake). A farmer of Batta village reported that following this system a group of 20 people completed plantation in his 10 *care* of land only in a day.

The marginalized poor, who have no land, receive material support like shelter, food, opportunity for work from their relatives and neighbors. There are evidences that the big land owners provide shelter for flood victims. The moral obligations to support the needy are central to rural life particularly in the study villages, not necessarily based on patron-client relationship.

“Who are the most helpful or generous people when you need monetary or other types of help?” In reply to this question the respondents mentioned, “Some neighbors, relatives and non-relatives are very cooperative and sympathetic. They lend money and food to others in need.” Needy people often can borrow money from a bit well-to-do neighbors for purchase of medicine or very essential commodities and repay the interest-free loan at the time of harvest. It is found that the neighbors help the families of low income with repairing house and raising house-plinth.

A female respondent of Batta village stated:

“If I do not have enough rice, I can borrow one maund (37.5 kg) from any of my neighbors to feed my family. If my paddy gets wet in flood water, I borrow dry paddy from others. After drying my paddy in the sun, I repay the crop.”

Forms of social capital

The present researcher observed that social networks provide support in coping with disasters. For instance, the people who suffer owing to shortage of food often rely on kin, neighbors for help. Labor as well as food sharing during all types of crises is a tradition in the villages under study. In times of stress, relatives living in the village become particularly important. The respondents stated that they try to cope with disasters taking help from the neighbors e.g. use of boat, moving to high land, procuring daily necessities from the market, house or *shako* repairing etc. Sufia (widow) is too poor to bear the cost of her house repairing. So, the neighbors' support for this work allowed her to have a better house to live in. It is a touching example of social capital.

Kin

Historically, people in the rural Bangladesh recovered from natural disasters through strong socially embedded institutions, like kin and family ties, primarily because of the absence of strong formal institutions (Zaman, 1989; Mutton & Haque, 2004).

Kinship relations are important for borrowing food and money and most importantly, for seeking advice and coping with adversity. Generally, the families of close relatives living in the same area and the people of neighborhood are on good terms. Cordial interactions regularly take place among them. Most of the affluent people stand by the less fortunate in season and out of season. If a poor family financially becomes unable to marry off its daughter, most of the villagers contribute to the arrangement her wedding ceremony. Traditionally, there is community people's participation in both wedding ceremonies and funeral rituals.

Neighbors

In a hamlet or village most of the households are related through kinship. The researcher's personal observations reveal the fact that neighbors play a crucial role in the support system. During an emergency, neighbors assist the people in most critical need. They help take ailing patients to the hospital by boat.

Patron-client relations

The patron-client relationship is a very common and vital support system prevalent in the locality. The relations of the poor with the rich like land owners, leaders, moneylenders

and *pikars*, fall in this category. Support is provided in the form of lending money, buying labor in advance, providing shelter, etc. For example, a *Nigari* or *Pikar* provide loans for the local fishermen and in return he gets the unilateral right to buy all fish from them at low prices. This sort of injustice (restricting the marketing opportunity) is always done to the poor by a section of the rich.

Networking

Natural disaster research streams highlight the role of social networks and relationships in post-disaster recovery (Adger, 2003; Ahamed, 2013). A thesis by Ali Ahmed (2005) shows networking and good relations with relatives and neighbors and having friends are crucial in achieving support at the time of need and in daily life. The researcher found that social networks and relationships helped the respondents' family to gain government scheme and to get jobs when unemployment was acute in the post-disaster period. Moreover, social networks and relationships help to obtain informal loan. Networking is important for the poor to obtain VGD cards and credit support from NGOs. Seasonal migration and access to working in the agriculture field, fish *Arot*, vegetable market in Dhaka are possible because of network support.

The present study also focuses on the role of social networks in expedite seasonal migration. Some migrants said that they had known a few persons in the destination place. It was known from the households that some of their members shifted to the urban areas with the help of close relatives or friends (strong ties) and established links and networks with the employers in the destination places.

The present researcher observed that the families of close relatives living in the same area and the people of neighborhood are on good terms. During an emergency, neighbors assist the people in most critical need. Transportation of severely ill patients or pregnant women is very difficult in *haor* areas. People carry ailing patient on their shoulder, or in a *chang* (wooden platform), or carry them in *thelagari*.

Norms and values

The present study identifies common traditional values among *haor* communities that include: sense of social bonding, sharing of hard work, respect for elders, hospitality, honesty, sense of religious life, and sacrifice for the poor. These values are believed to

be critical in directing people's behavior towards building community resilience in disaster prone haor villages. Traditional labor-sharing system is based on cultural norms of reciprocity. Sick people are supported by collecting money locally called 'hari dhora'. During any disaster, rich people donate money and emergency shelters to poor people because of moral obligations. The village samity provides support for the poor families.

A woman respondent of Maijpara, Khidirpur narrated how she stays in touch with her neighbors when there is a crisis.

"I am in a situation of conflict with one of my neighboring women, but I rush to her if she needs help in difficult situations such as delivery. If a child drowns or cattle shed collapses or any other mishap takes place, the affected family receives cooperation from all."

Social solidarity

It is found that there are many instances of social solidarity among the villagers. As revealed by the study, community people's pro-active action towards flood hazard is taken through solidarity and common identity. About 56% of the households associated with various organizations takes advantage from social capital to improve their economic condition. A significant number of respondents (40%) belong to the members of NGO Samities. About 30 percent of the respondents are involved with the Village Co-management Committee (VCC) formed under Community Based Sustainable Management of Tanguar Haor Project (CBSMTHP).⁶ The villagers have created a community-based *samity* (organization). Such organizations are formed with the primary

⁶ The Ministry of Environment and Forests (MoEF) started a unique project entitled "Community Based Sustainable Management of Tanguar Haor Project" (CBSMTHP), since December 2006. Under this project, community-based organizations, such as Village Co-management Committees (VCC), were established and community's access to sustainable fish harvesting was ensured through the project intervention. The project was aimed at establishment of a co-management system that would ensure both the preservation of key ecosystem functions and values as well as provide substantial livelihood improvements for rural communities. This CBSMTHP intervention strategy under the technical supports of IUCN Bangladesh is unique for wetland management in Bangladesh. Through this process, 74 village-based "Village Co-management Committee (VCC)" out of TH-dependent 77 villages, 4 union-based "Union Co-management Committee (UCC)", one "Central Co-management Committee (CCC)" and district-based one "Tanguar Haor Management Committee (THMC)" headed by DC of Sunamganj, national level one "Project Steering Committee (PSC)" headed by Secretary of MoEF" have been successfully established to ensure sustainable resource management of Tanguar Haor.

objectives to provide monetary assistance (mainly loan) for the members in crisis and difficult situations. The samity has accumulated their own fund to provide loan to the members. For example, there is about Tk. two lac in Batta village samity fund. Sometimes humanitarian assistance is extended to the poor for some activities such as marriage of girls, medical treatment for patients, students' exam fees, arrangement of funeral, etc. In Batta village the yearly Puja expenses are borne by this samity. Group members who can pay annual contribution according to the rules receive good benefits. The affluent members having considerable area of agricultural land, flocks (*bathan*) of ducks can invest Tk. twenty/twenty-five thousands annually. Apart from the village based *samity*, there are many other groups in the area. These groups are mostly non-formal small savings and credit groups organized by NGOs.

Social linkage

The present study examines examples of collective actions in the the *haor* area. The village people have their traditional knowledge in monitoring water level during any flood. They observe the increasing trend of water in the canal and *beel*. When they notice increase of water level in the canal near *bazaar*, immediately they disseminate the news to others. If there is a possibility of big flood, the youth groups help evacuate the most vulnerable elderly people, women, children, PWDs to a secure place. People work together to build a temporary embankment every year to protect crop fields from flood. The neighbors arrange treatment for the wounded during and after disaster. They also work together physically and donate materials to repair tube-wells and construct houses and latrines of the needy families. During flood under the influence of '*afal*' (strong wave) a huge pile of water hyacinth moves fast and erodes the homestead and house plinth. It was observed in Antorpur village the neighboring families shared their labor and resources to build bamboo palisades to protect their homestead from wave erosion.

Most people take part in clearing fallen trees after flood. In order to facilitate easy communication among the hamlets bamboo bridges are built utilizing local resources and self-labor. In a disaster situation, people help each other in whatever way e.g. they help carry paddy, rice, cow, goat, to the dry and high land. Those who have boat help other people to evacuate safely.

When flood water seems to breach the embankment that protects *boro* crop, the community people collectively do earth work or place mud to save it. Then they keenly observe the trend of flash flood. If it causes sudden demolition to the embankment and suffering to the people, they try heart and soul to take collective initiatives to rebuild or reconstruct the damaged assets. They raise community funds and those who are unable to contribute financially provide physical labor. In fact, the people in the study area collectively respond to flash flood hazard and rebuild the damaged common assets. Their firm and skillful collective response to flood hazards save and rebuild community infrastructure and assets which are the ingredients of social life. The researcher finds these collective actions often occurring spontaneously and informally with significant impact on the people's livelihood.

4.5.2 Local Practices for Maintaining Health and Nutrition

During the monsoon prevalence of diarrhea, malaria, typhoid, cold and cough, dysentery and fever are common. In the dry season, many people including children are attacked with cold and cough, skin diseases, fever, jaundice, pneumonia and chicken pox. Besides, pregnancy related complications are also common; female become helpless in these cases. Health care centers or hospitals are far away from the area. Because of widespread corruption the masses are deprived of the govt. facilities. Even the extremely poor pregnant women with ailment have rare access to adequate health services of the health centers. Normally the people go to local drug stores/pharmacies, village doctors, *upazila* health complex to take treatment. Doctors are not always available there. Moreover, poverty-stricken patients cannot bear the cost of medicine and transportation. There is hardly any arrangement of transportation for severely ill patients. During the dry season patients are carried through *chang* (wooden stretcher) and in the rainy season by boat.

Inaccessibility to healthcare and inadequate medical facilities are the major concerns of the people living in the study area. Unqualified village doctors and *kabiraj* (healers) are found to be the most popular source of healthcare. Village doctors are defined as informal healthcare providers or pharmacy owners at the local *bazar* practicing allopathic medicine. In the study area, the drug stores are available in the local markets at

Bongshikunda, Notunbazar, Moheshkhola and Gurgaon. The villagers go there to buy medicine usually prescribed by pharmacy owners/employees.

In severe cases, they go to Dharmapasha, Kalmakanda, Netrokona and Mymensingh hospital. In each village, there is one trained TBA. Most of the mothers reported to have delivered at home and in most cases these home deliveries, were assisted by untrained traditional birth attendant. Villagers have to travel several miles to reach the nearest health complex situated in Kalmakanda, seven miles away from village. The district hospital is in Netrokona which is about 65 km away from the village. It takes a long time to reach the doctor or hospitals, as generally they use boat, motorcycle as transport and that too is costly. During the monsoon, they take ailing patient to the hospital in engine boat. During dry season, it is almost impossible to cover this distance on foot with an ailing patient. Transportation of severely ill patients or pregnant women is very difficult in *haor* areas. They carry them on their shoulder, or in a *chang* (wooden platform), or carry them in *thelagari*. The neighbours accompany them during the journey. On an average, each household spends Tk. 5,000-6,000 to purchase medicines; cover doctor's fees etc.

The study findings reveal that inhabitants in the study villages carry out indigenous practices as a remedy for some common illnesses namely fever, cold, diarrhea, skin disease etc.

Fever

Many people in the *haor* area use herbs and medicinal plants – such as *tulsi*, *patahrkuchi*, *neem* -- to treat illness caused by flood. To ensure their availability, these plants are grown in homesteads, alongside other vegetables and trees in kitchen gardens or planted along homestead boundary. Mainly women are found carrying out this practice in almost every village of the study areas. A paper by BARCIK (2010) attempted to show the types of values the people attach to trees and plants such as religious and medicinal values of trees.

Cold and cough

The respondents are familiar with the use of medicinal plants such as *Tulshi* (basil), which they consider to be sacred and use it to treat common cold and flu. The juice of tulsi leaves with honey also helps to relieve headaches, allergies and cold. To get relief

from cough and cold *durba* grass and tulsi leaves are grinded, mixed with honey and taken orally.

Diarrhea

The local people depend on the *haor* water for drinking and other purposes. This is often not safe and hence pushes them into the risks of being attacked with water borne diseases. *Thankuchi* leaf is an effective cure for chronic dysentery. They also use *jabaful* (china rose) especially, to treat chronic dysentery. In case of diarrhea and dysentery they take home made saline.

Skin disease

Many people and children get scabies through constant contact of filthy water. To cure this disease, paste of neem leaves and raw turmeric is applied to the infected areas. This is commonly practiced by women in the study villages. They also eat fried neem leaves with boiled rice. To keep skin free from skin diseases one's body is washed with boiling water mixed with neem. Sometimes mustard oil is mixed with turmeric paste and applied to skin.

4.5.3 Local Practices for Children's Education

There is a government primary school in every village under the study except Antorpur. The students of Antorpur village go to the primary school situated in neighboring Nawabpur village. In the village of Bongshikunda the houses are dispersedly situated. During flood season, all children cannot come to a single school from far away areas.

The children cannot go to school regularly. They support their families as wage laborers and become engaged in reaping paddy, fishing, collecting cow-dung for use as fuel, etc. The *haor* area remains submerged during the rainy season making it difficult for the children to go to school. It is a stark reality that the school going children are also heavily involved as family agri-workers such as seed sowing, seedling plantation, paddy harvesting, cattle rearing, etc. In the *haor* area, enrollment of girls at the primary level is higher than that of boys. But dropout rate is high due to some reasons. Early marriage, involvement in the household chores, like fuel, water-fruit collection, fishing for daily consumption, etc. are obstacles to the continuation of education.

Students travel to school by small country boat and banana raft. However, in the rainy season parents do not allow their children to attend high school situated outside the village by small boat.

The following good practices are also observed in respect of children's education in the study villages:

In Rongchi village there are two hamlets-- 'Abuj Mia's Bari' and 'Abdul Alim's Bari'. When there is foul weather, the students of these small villages cannot attend school. The parents are so scared of boat capsizing that they do not allow their children to go to school. To compensate school education a private coaching center has been set up there for the time being. Altogether 30 students receive education from here.

In the village of Rongchi students face difficulty in reaching the center when they appear at the public exams (class five and eight and SSC). The examination center is located at Madhyanagar, far away from their village. As an alternative option people rent a boarding house for the students in Madhyanagar for the exam period. The students take their own chairs and tables with them by boat to the house.

Conclusion

The most crucial issues in livelihood of the *haor* households are coping with vulnerabilities through the use of social capital. In the villages under study sharing of resources within the community is a common practice to face flood. Many examples of social capital exist in the study area where most of the households collaborate with each other in respect of sowing seeds, planting seedlings in the land and harvesting crops. The researcher found that social networks and relationships helped to obtain informal loan, to get government scheme like VGD card, to get credit support from NGO, to get a job when the job crisis is acute in the post-disaster period. The present study identifies common traditional values among *haor* communities which believed to be critical in directing people's behavior towards building community resilience in disaster prone *haor* villages. Traditional labor-sharing system is based on cultural norms of reciprocity. Social bond among neighbors is a great capital for them. The present study examines examples of collective actions in the the *haor* area. When flood water seems to breach the embankment that protects *boro* crop, the community people collectively do earth work or place mud to save it. The researcher finds these collective actions often occurring spontaneously and informally with significant impact on the people's livelihood. The study findings reveal

that inhabitants in the study villages carry out indigenous practices as a remedy for some common illnesses namely fever, cold, diarrhea, skin disease etc. Mainly women are found carrying out this practice in almost every village of the studied areas. Some good practices are also observed in respect of children's education in the study villages. This section has discussed about social context of livelihood. The next section focuses on human capital.

4.6 RESILIENCE OF HAOR HOUSEHOLDS WITH RESPECT TO HUAMAN CAPITAL

This section presents resilience of the *haor* households in terms of human capital. In doing so it explores indigenous knowledge capital (knowledge and skills about management of hazard, history and risks). Resilient skills i.e. knowing how to swim; knowledge related to carpentry, masonry; bamboo weaving; boat/raft making, *shika* making; construction of '*machhan*' (elevated platform) to keep key belongings and small livestock safe from floods, local practices for fishing and agriculture. Technological coping strategies such as flood resistant houses; building houses on plinths and platforms; false roofs; *machan*, etc.

4.6.1 Indigenous knowledge capital

Local knowledge of disaster preparedness relates to the people's practical experience of their surroundings. Many people have direct experience of natural disasters (i.e. they have witnessed natural disasters) and/or indirect experience (i.e., they have been told stories of the past natural disasters). Constant observation of the local surroundings over generations gives the communities knowledge of the history and trend of natural disasters as well as ideas about changes in their own social and physical vulnerabilities over time.

In the context of disaster-prone villages in the study area the respondents have advantages including disaster experiences, which give them the ability to cope with, adapt to, and recover from disasters. For instance, people's knowledge on the location, time, duration, frequency, intensity, predictability of previous hazards plays an important role in building their resilience. When the rainy season comes, they observe the current of wave, danger level of water and can understand through the past experience which side of the village will be badly eroded.

Formal disaster management committee does not exist at village level. There is no organized search and rescue team in the villages, but during flood usually the local youths who have no formal training act spontaneously as volunteers and evacuate the affected people from the vulnerable areas to the high land.

4.6.2 Resilient Skills

Examples of skills that can contribute to natural disaster preparedness include knowing how to swim, local practices for fishing, knowledge related to carpentry (boat/raft making), bamboo weaving; construction of elevated platform called '*machhan*' to keep belongings, fowls, goats and sheep safe from flood, fishing crafts and gear; *shika* making; local practices for agriculture; flood resistant houses, building houses on plinth/platform; false roofs. Some resilient skills are explained below.

Almost everybody including children have the practice of swimming in the study area. When children are 6-7 years old, their families instruct them to gain the knowledge of swimming.

Local practices for fishing, fishing crafts and gear

In the *haor* area, local fishers understand fish behavioral ecology and they know how each fish species behave according to water density and temperature. Local fishers possess certain ecological knowledge what environment a particular species of fish likes and does not like, fish migrations in the rivers and movements to the *haor*, breeding places of particular species in the *khal*, beel or in the river, what measures can keep the fish inside the *haor* rather than migrating to another place (FGD with fishers).

The researcher observed the fishermen using the under-mentioned fishing crafts, gears and techniques in the villages: Fishing gears like net, huke, *borsha*, *bair* are used. A unique fishing gear called '*bair*' is used by the fishermen in the study area. Thin bamboo sticks and plastic thread are used to prepare this trap. '*Daitta Borshi*' is a very popular widely utilized fishing craft. It is a *fishing* hook made of water hyacinth (locally called '*germoni*'), bamboo stick and nylon thread. *Daitta* is usually 8-10-inch-long used as a float. As bait earthworm, grasshopper, tiny prawn, etc. in the hook are used. It is placed in the beel, paddy fields or canals. Fish are collected every 2-4 hours a day. Light Trap' is used at night to catch small prawn. Small prawn is very popular and abundance in the study area. A flash light is hanged out with the help of a bamboo pole, and the pole is

placed on the water adjacent to bank of river, beel, canal etc. Small prawns being attracted by the light come close to the surface of water. When many of them are gathered near the light source, fishers use push net to catch the fish. 'Thela Jal' is used mainly in the shallow water at the start of the rainy and before the dry seasons. 'Polo' is made of narrow bamboo sticks and cane. Its upper edge is narrow and lower edge is broad. Both the edges are open. The polo is immersed into knee deep water and then pushed up to the bottom. The local people place small traps made of bamboo rings and net (called 'gera jal') into the water stream. Although applying this method fish cannot be captured abundantly, a small amount caught helps people in the region to meet their daily needs. This practice is observed in Bongshikunda of Dharmapasha upazila.

The researcher learned from the local fishermen that in the haor villages the fishermen use indigenous technique to capture jeol (alive) koi fish using Daitta Borshi. The hook is made of thin bamboo stick. At the end of the hook a dragon fly is used as bait to catch jeol/koi fish. It attracts a koi fish to the bait and holds it (jeol) alive until the trapper (fisherman) returns to the spot. The fishermen spend the whole day to catch dragon flies by hand. Fishing gear is usually placed in the water in the evening and collected early in the next morning before 7a.m.

Knowledge related to carpentry (boat/raft making)

In every village, there is skilled person who can build/repair boat, houses.

Md. Hanif, aged 55, by profession is a carpenter. He does house, boat making and repairing. He has been doing this job for the last 10 years. In the past Hanif worked as a daily wage laborer. He can make 20 boats annually. The boat making season is from the month of Joishtha to Kartik (May to September). He earns Tk. 12,000-15,000 by making a boat. The house construction and repairing work season starts from Kartik-Boishakh. He can make 15-20 houses a year. Construction wages for a complete house range from Tk. 5,000 to 20,000 depending on the size of the house. Boat making and house construction work is seasonal; therefore, flood does not affect his income.

Making raft

Banana plants are grown widely in the haor areas. Generally, people grow these around their houses to get fruit. During flood season, banana plants are used as rafts. A raft is used during flood as a way of communication among the hamlets, villages and local

markets. Households keep raft handy for maintaining communication within short distances and for transferring sick and/or elderly people to safer places.

Shika making

One of the traditional handicrafts made by rural women in the *haor* villages is *shika* - a storage bag made of jute hung down from the ceiling of a house. Small *shikas* are used to store bottles, jars and cooking pots in the kitchen, while larger *shikas* containing quilts, *kanthas* and pillows are hung from the ceiling during the monsoon months.

Local practices for agriculture

The local farmers follow some agricultural practices to protect their crops from flood hazards:

Temporary embankment for protection of crops: The villagers in the *haor* areas try their best to protect their crops from flood. They raise the height of the dyke voluntarily. In some areas hundreds of people work day and night to make the surface of the dyke higher than flood level so that their crops are protected.

Harvest of half mature crop: The people try to harvest immature paddy during early flash flood. Sometimes they cannot do it due to shortage of laborers. That time labor wages go up. In such a situation, land owners (farmers) agree to give 20% of the paddy reaped to the laborers and in severe condition even 50% may be given to the workers.

‘Dhekikal’ for vegetable cultivation: *Dhekikal* is a local method of irrigation. The local farmers use ‘*Dhekikal*’ for vegetable cultivation.

Preparation of ‘Aile’ for potato cultivation: For potato cultivation, they prepare ‘*aile*’ or row in a straight line in order to facilitate sowing seed potatoes. A row ought to be placed at one-foot distance. Then plants are grown well and good yield is ensured.

Planting fast growing vegetables: Fast growing vegetables like cucumber, spinaches, lady’s finger, brinjal etc. are planted after flood is over.

Farmers jointly invest in a shallow machine: A poor farmer cannot individually purchase a shallow machine for his own use. Some small farmers jointly invest in a shallow machine to facilitate irrigation in their lands to grow crops, particularly paddy.

5.6.3 Technological Coping Strategies

Building flood resistant houses on plinths or platforms: The people living in the study area have knowledge of various methods to deal with prolonged monsoon flood. These are based on accommodating themselves to the flooding rather than trying to prevent it. The houses are typically built on mud platforms (or plinths) so that they remain above flood levels.

False roofs: According to the researcher's observation people use raised beds or *machan* as a living area when water enters their houses. They build extra ceilings underneath the main ones to store crops, food and fuel to protect from inundation.

Machan: The popular strategy for flood affected people's preparedness in the area is to build an indigenous elevated structure made of bamboo called '*Machan*' to keep their belongings such as household items, foods and goods safe from flood. If the flood level crosses the surface of house, people become compelled to stay on it. In the flooded areas people made their beds or boxes with long legs to keep their valuables out of reach of flood water.

Conclusion

The study finds resilience of the *haor* households in terms of human capital. In doing so, it explores indigenous knowledge capital, resilient skills and technological coping strategies. In the context of disaster-prone villages in the *haor* area the respondents have advantages including disaster experiences, which give them the ability to cope with, adapt to, and recover from disasters. Examples of skills that can contribute to natural disaster preparedness include knowing how to swim, local practices for agriculture and fishing, knowledge related to carpentry (boat/raft making), bamboo weaving; construction of elevated platform called '*machhan*' to keep belongings safe from flood, fishing crafts and gear; shika making; flood resistant houses, building houses on plinth/platform; false roofs. In this section, human capital of livelihood is portrayed. The following section provides details for the cultural context.

4.7 RESILIENCE OF HAOR HOUSEHOLDS WITH RESPECT TO CULTURAL CONTEXT

Of all the capitals discussed in this chapter, cultural capital is probably homogenously spread across the *haor* community. Social psychologist Lewin (1947) succinctly captured the idea that 'individuals not only think, feel, and see things from a personal perspective, but also from the standpoint of the group of which they are part'. The notion of cultural capital considers the fact that individuals who live in groups hold common beliefs which define their reality, not only as persons, but also as group members (Ellen 1982).

Cultural factors include risk perception and religious views, which are frequently connected. Understanding how people view risk is particularly important. The accumulation and application of knowledge are directed by vulnerable people's perceptions of the risks they face. Vulnerability is made up of multiple risks, not just the threat of hazards. Local beliefs and related practices can have both positive and negative effects on disaster preparedness.

This section examines vulnerability and capacity of the *haor* households with regard to cultural dimension that includes people's perception about disaster risk, ideas about food security, important rituals, traditional labor sharing system and food beliefs and taboos.

4.7.1 People's perception about disaster risk

People living in the study area in *haor* know they have to face flood every year and devastation may occur at some intervals but never give up. The following statement illustrates the thinking that shapes their capacity for resilience:

"Allah tests our faithfulness by floods and wants us to survive in danger. We cannot disregard HIS will! We lose everything (house, crops, poultry, cow, etc.) because of flood. But with the blessing of Allah, we again rebuild all these." (Sufia, 40, Antorpur village)

The inhabitants of the *haor* villages perceive disaster as part of their life. People of this region have accepted it as a reality and therefore have learnt to co-exist with flooding. Coping strategies have been inculcated through living with flood for generation. Through struggle with adverse situation they have attained the skills required to cope with flood. Their reactive response or coping strategy has become an evidence of the community's strength to face any challenge. They initially react to flood hazard by staying at home, unless the water level goes beyond their coping capacity. Even they decide to stay at

home by climbing on bamboo roof. Julie Dekens (2007) asserts it is essential to understand local perceptions of natural hazards which influence how people perceive and respond to natural hazards, risks and disasters.

Though their families face difficulties, but the respondents prefer to stay in their village for social and psychological reasons. The people do not want to leave their ancestral land because by no means they can bear separation from the own atmosphere. They have such an emotional attachment to their ancestral land. Here they can share sufferings with their relatives and neighbors, which has more psychological, rather than economic value. They believe, if they permanently migrate to other places, they will merely become 'floating' people without dignity. Despite hazard threats, people opt to live in their ancestral land with a hope that they will resume their normal life after the disaster. As one woman of Rongchi village opined:

"We will lose our own dignity if we migrate to a new place. Nobody will value us as we would be alien without our relatives there. It is a feeling of uprooting from our own land and become floating in an unknown place. If we leave our home, our own 'samaj' (community) will undermine us."

In the study community, there is a strong reciprocal relationship and bond among the families. Families can draw upon these community resources during a crisis as well as communities can assist families when in need. However, nowadays such a strong social bond is declining due to economic constraints. For all these reasons mentioned above the people prefer to stay in their own home though there is a perceived risk of disaster.

4.7.2 Perceptions about food security

"I would be happy if I have enough rice with vegetables or even with red chili three times a day." said a very poor woman of Khidirpur village

"We have no work in Chaitra and Kartik. We cannot afford to arrange three meals a day. If we can manage one meal, we divide it into three equal portions." Remarked a male respondent of Antorpur

To the majority of men and women, food security is meant eating rice, vegetables and fish daily. To the very poor it is just to have a full stomach. The expectation of a man is more than rice and red chili. A male feels food secure, if he can take vegetables, fish three times a day and meat once a week. A female feels food secure if she gets three

meals rice with curry (vegetables and fish). Women prefer to stock food at home rather than keeping money in hand. Their view-point is very simple. If there is food in stock, they will not have to ask their husbands to buy it. Such a situation gives them food security.

A female respondent of Batta stated:

“If men have money in hand, then they can spend it for different purposes other than buying food. But when we have food, we utilize it for consumption.”

To save lives the *haor* community people, particularly women try desperately to preserve food before the advent of flood. The table 4.33 shows women’s and men’s perceptions of food security.

Table 4.33: Women’s and Men’s Perceptions of Food Security

Economic status	Women’s perception	Men’s perception
Landless day laborer	<ul style="list-style-type: none"> i. At least rice once in a day with curry or red chilli ii. Stock of rice at home 	<ul style="list-style-type: none"> iii. Rice three times a day with at least one type of vegetable
Small landowners	<ul style="list-style-type: none"> iv. Enough food stocks at home such as vegetables and fish/poultry 	<ul style="list-style-type: none"> v. Rice three times a day with pulses, vegetables and fishes/poultry vi. Enough money to buy food or have a stock of food at home

Source: Field survey data

It is evident from the above examples that availability of rice is the dominant perception of food security among all groups of women and men.

4.7.3 Important Rituals

Rituals which are entry points into understanding cultural capital have a profound impact on the psychological well-being of the *haor* people. Different kinds of rites are observed in the villages under study mainly centre around uncertainty and risks associated with the daily life and livelihood. The notion of hazard risk is central to the observance of many rituals in the *haor* area. While local tarvellers enter the deep zone of the *haor* full of danger and uncertainty, extensive rituals take place to secure their safety. As illustrated by the local villagers they used to pray to God when they went fishing in the *haor or kanda* when there is a storm. Some fishermen shared that during a storm they kept themselves afloat holding the upside-down boat in the *haor*. The risk associated

with flood, lightning, thunderstorm, *afal* (strong wave) creates more or less anxiety among them, but their fear is minimized through some ritualistic behavior.

Table 4.34 shows some ritualistic behavior of the people in *haor* area with corresponding perceptions:

Table 4.34: Important Rituals Observed by Haor People

Recitation of the holy Quran	People take natural disasters as trials of Allah. They believe natural disasters are punishment of Allah to those people who are sinners. It is also a test for those who are believers. In order to get blessings of Allah they recite the holy Quran loudly. It helps them to overcome fear and stress.
Offering prayer in the name of 'Shah Sharfin'- the spirit of water	The villagers in the study area are profoundly influenced by the power of ' <i>Shah Sharfin</i> '- the mythical lord of water and wind. The ' <i>Peer Shah Sharfin</i> ' is worshipped with a hope to get rid of adversity in the <i>haor</i> .
Offering prayers and <i>milad</i> after a big disaster	With a hope that the big disaster will not return again.
They make promises to offer something to the ' <i>Peerer Dorga</i> ' temple.	They seek blessings from the mythical lord.
Paying tribute to the <i>haor</i> with some offerings called ' <i>Shinni</i> ' (prepared using flour, milk, banana, molasses, coconut splits) and float this tribute in the <i>haor</i> on a ' <i>kolar khol</i> ' or tiny banana raft.	People believe that in the <i>haor</i> there is a monster which needs to be appeased with some tributes. If the monster is calm down, their lives, crops, houses, livestock and poultry will be safe and protected. To get rid of sins they worship the spirit of water angel.
Beating drum, tin, utensil, etc.	They believe storm will go away hearing the sound. When people start making a sound with tin, utensils, it gives them a sense of bonding together against the strength of storm.

Source: Field survey data

People's perception about disaster is manifested in this research through their rituals performed to remove or drive away misfortunes or evil powers. So, the rituals related to uncertainty have become integral part of their life in the isolated *haor* villages. At the time of storm, they make loud sound with a metal objects or ring bell while offering prayer to God. During a storm, they make a lot of noise using wooden stick, tin, and utensils. The act takes their fear away. They believe storm will go away if they ring a bell and perform religious worship. The Holy Quran or other religious scripts are recited aloud frequently during storm. At the time of storm, they become scared and remember the Holy Spirit locally called '*Peer Sharfin*'. They offer *Azan* and *Milad* and pray in the name of '*Peer Sharfin*'- believed to be the spirit of wind and storm. The villagers in the *haor* area strongly believe in the power of this spirit who perceived to be the angel of

wind living in the mountain. They believe if they utter the name of '*Peer Sharfin*' it will make the storm calm. The researcher perceives that the prevalent belief may have emerged from Hindu cultural tradition. People in the study villages arrange special prayer (*milad mahfil*) before harvesting crops from land so that it is not damaged by flash flood. They believe storm will go away if they ring a bell and perform religious worship. When flash flood occur or enter into village, villagers goes to mosque, give warning for flash flood through *Azan*. They use microphone or mike of mosque to warn people against flash flood.

A female respondent of *Uttarpara*, Antorpur mentioned:

"Tufan (Tornado) sounds like a machine. Human noise compels it to disappear. We are not afraid of storm, because we have to live with it, fight against it. No one can help us if Allah is not with us. During a storm, we let our children take shelter under the cot so they won't get injured if the house collapses.

A metaphor is used by the people in the *haor* area to explain the tornado that looks like an elephant's trunk swaying down from the clouds to touch the *haor* water with its tip. Tornado is locally known as 'elephant' which blows away everything including boats, houses. When the inhabitants see the elephant trunk like tornado touching down the ground, they immediately start ringing the bell to become free from the catastrophe.

It is evident that observance of rituals presumably acts as an adaptive strategy to get rid of anxiety which can reduce many individuals' abilities to function effectively in dangerous and highly unpredictable situations. There are social implications to the observance of typical rituals. It strengthens the commonly shared ties and moral values, thus strengthening the 'solidarity' within the community through building up a group feeling.

4.7.4 Traditional Labor Sharing System

Though traditional labor sharing system is depleted in the changing socio-economic context, there still remains the practice in the remote *haor* villages. The village farmers voluntarily work together in other people's fields in planting and harvesting season on labor sharing basis. They cooperate with each other when there is labor shortage or wages are high.

4.7.5 Food Beliefs and Taboos

The study has documented various taboos and restrictions to food for women during pregnancy and lactating period. Some items of food are also recommended for them. The reasons involve aspects of cultural beliefs and taboos. Ali Ahmed (2005), in his thesis looks into how food beliefs and taboos, and gender affect nutrition adequacy.

Table 4.35: Taboos and Food Restrictions Regarding Pregnancy

Taboos	Perceived belief
There is a belief that pregnant woman should eat less.	Eating less than her fill will leave space for the baby inside to grow.
Lactating mothers are not allowed to eat <i>Mirka</i> (a species) fish.	This fish makes them sick.
Food preparation by pregnant women is forbidden during an eclipse	The act causes deformities to ear/mouth to their babies.
Avoiding pineapple and green papaya	These fruits cause miscarriage.
No food is given at all during the first day after delivery	To facilitate healing of the birth passage.
Mashed <i>kalijira</i> (black cumin-seed) and green banana are highly recommended	Believed to be effective for pain relief and produces plenty of breastmilk.
Some species of fish with scales such as <i>puti</i> , <i>kalibaush</i> , <i>ghonia</i> , <i>icha</i> are avoided	There is assumption that they will cause scratch marks on the baby's foot.
The mother is advised to eat dry food and rice with fried turmeric and onion once a day during the post-natal period.	The combinations of these items dry a woman's body. There is a notion that cake made of rice-flour helps wounds heal faster.

Source: FGD with women group

Through survey it is found that various dietary restrictions are imposed on the mother after the child's birth for three months. These restrictions vary depending on the sex of a newborn child. Pregnant mothers are given starch from boiled rice as extra calorie intake. It follows in the rural culture that children and men will be given priority over women for food. The nutritional status of pregnant women declines during the food-scarcity period.

Conclusion

The above discussion illustrates the vulnerability and capacity of the *haor* households with regard to cultural dimension that includes people's perception about disaster risk, ideas about food security, important rituals, traditional labor sharing system and food beliefs and taboos. People living in the study area in *haor* know they have to face flood every year and devastation may occur at some intervals but never give up. Despite hazard threats, people opt to live in their ancestral land with a hope that they will resume their normal life after the disaster. Different kinds of rites are observed in the villages under study mainly centre around uncertainty and hazard risks associated with the daily life and livelihood. The rituals related to uncertainty have become integral part of their life in the isolated *haor* villages. The researcher perceives that rituals may have adaptive value for the individual. There are social implications to the observance of typical rituals. Belief systems can help to create shared cultural attitudes and community spirit, which in turn can help the community to withstand natural hazards and risk disasters. Though traditional labor sharing system is depleted in the changing socio-economic context, there still remains the practice in the remote *haor* villages. The study has documented various taboos and restrictions to food for women during pregnancy and lactating period. This section illustrates the cultural context of livelihood. The next section provides an overview of institutional arrangements.

4.8 INSTITUTIONAL ARRANGMENTS TO MANAGE FLOOD RISKS IN HAOR AREA

Local community institutions are the key to adaptation, community self-organization process and in building resilience in the face of natural disasters. People in the study area live in remote *haor* villages have limited access to different organizations. Poor literacy and vulnerability to income makes them little aware about the programs of different organizations. Key officials as well as expert of disaster management of different government and non government organizations have been interviewed as key informants regarding their responses mechanism in *haor* area to manage flood risks. A Venn diagram was prepared with the villagers to explore the relationship with local people with the organizations and local influential persons.

Generally, all government agencies working in the affected areas come forward under the leadership of the *upazila* administration to help relief and rehabilitation work. There is a separate government department named "Haor and Wetland Development Board

(HWDB), has been delegated the mandate to coordinate the activities for integrated development in *haor* and wetlands in Bangladesh. Nevertheless, this department exists by its name not by its work. Other government organizations involved in flood risks management in *haor* area include Bangladesh Water Development Board (BWDB) for flood control, erosion protection and drainage related activities; Local Government and Engineering Department (LGED) for employment of disaster victims in road maintenance and tree plantation program, Improve irrigation through canal excavation, tree plantation; Project Implementation Office (PIO) involved in Food for Work (FFW), Test Relief (TR), Provide relief during and after disaster, rehabilitation of disaster victims.

The respondents of the study villages mentioned that during flood *Upazila* Parishad provide them reliefs in their villages. From experiences of field visit, it can be mentioned that remoteness from *upazila sadar* (sub-district centre) makes *haor* people less access to government services.

The Figure 5.8 is provided here to state the relationship among the available institutions, local important individuals and flood affected community; and their access to and frequency in which they visit to the institutions to get support regarding flood.



Fig. 4.9 Linkage with Institution

The above figure aptly shows that people in the study area have very frequent access to Union Parishad and Community Based Organizations (CBOs). They have also easy and frequent access to NGOs but have limited access to government organizations. It also shows that local leaders, *mohajan*, *dadondars* (moneylender), fish *bepari*/trader, village *samity* surround them.

Efficient and need based institutional support is not possible due to remoteness and isolation of the *haor* villages from *upazila* sadar. A report by Siddiquir Rahman *et al.* (2008) portrays a shocking picture of essential services in *haor* areas in Bangladesh. Local institutions are dysfunctional and do not provide necessary services. Deprivation from social safety nets and services forces the local people to rely on traditional

networks such as relatives, neighbors, *mohajan*, *dadondar*, etc. The villages in the *haor* region are not well attended by the government officials only except post disaster relief operation. The people do not generally go to the *upazila* complexes unless compelled. On the other hand, the government officials do not have appropriate motivation to travel to remote villages to see for themselves the problems and living conditions of the inhabitants. Adequate support from institutions as well as access of the poor people to the institutional remedies is much needed at the time of crises and adversities.

4.8.1 Services of Government, NGOs and Local Institutions in the Study Area

Government services

The mission of Ministry of Food and Disaster management is “to bring a paradigm shift in disaster management from conventional response to relief to a more comprehensive risk reduction culture and to promote food security as an important factor in ensuring the reliance of the community to hazards.

However, the people in the *haor* areas have little access to the basic services in compare to that of the people in the mainland. The venn diagram prepared with the village people aptly show that *upazila* administration, Bangladesh Water Development Board (BWDB), Local Government and Engineering Department (LGED), Project Implementation Office (PIO), *Krishi* (agriculture) Bank, Upazila Agriculture and Fisheries office, Agriculture Extension Office have an important role to manage flood in *haor* area. However, the government activities to manage flood are visible only in post-disaster response phases such as providing relief to the flood affected people, give out seeds and fertiliser for the next harvest. As a government institution, BWDB plays an important role to manage flash flood as well as river flood in *haor* area by constructing embankment, sluice gate etc.⁷ A number of submersible embankments have been

⁷ As a government institution, BWDB is entrusted to implement all the embankment erection and maintenance works with the funding from government of Bangladesh. Several studies reveal that strong wind generates strong current in the water, which caused significant washing out of soils at various points in the submersible embankments. In addition, people cut the embankments in many places to facilitate cross *haor* navigation, fishing. Therefore, embankment maintenance works is undertaken every year by BWDB during dry season. Though, BWDB are legally responsible to regularly monitor and if necessary supervise the embankment maintenance works, they largely remain absent during the embankment maintenance work and only visit the embankment maintenance works when it is completed. Another problem is, since the contractors live in outside the *haor* regions, they are not available for the emergency embankment repairing works during the flash floods.

constructed by BWDB to give protection against pre-monsoon flashflood. The embankments are made of such height, which restricts early flash water from entering into the protected area but will be merged as the monsoon moves its peak. As reported by key informants, for years, embankments have been damaged by floodwater, submerging low-lying areas and affecting crops. Every year government allocates funds to repair and reconstruct these embankments. However, because of negligence of the embankment maintenance works by BWDB, each year significant portion of *boro* paddy fields are flooded. The local leaders blame negligence and corruption in the maintenance works of the embankments. The field visit also revealed that, government made two significant changes in the embankment maintenance works in *haor* areas of Sunamganj in 2004. To accomplish the projects, BWDB introduced Project Implementation Committee (PIC) Approach. Although Local Government and Engineering Department and Project Implementation Office have some programs to manage flood risks but their role is negligible in remote *haor* areas.

Generally, the government activities to manage flood are visible only in response phases. When flood occurs, relief provisions are operated through Union Parishad in village level. Almost every year government provides recovery incentives for farmers, such as providing subsidized or free fertilizer and seeds. The problem with recovery incentives is that they are often insufficient. The recovery incentives are often also politicized (i.e., provided to selective farmers). As a result, actual victims mostly remain out of recovery incentives coverage. The Table (4.36) below shows the households in the study area received benefits from social safety net programmes in the last one year of data collection.

Each year significant area of Boro paddy field is flooded in Sunamganj because of the early flash flood by cracking and overflowing the embankments. A series of investigative study (Action Aid Bangladesh and CNRS 2007) identified corruption by the private contractors in alliance with the BWDB officials in embankment maintenance work as one of the major underlying reasons for these frail embankments.

Table 4.36: Social Safety Nets

Social Safety Nets Programmes	Number of Households n=175	Percentage
Did not receive any benefits	127	72.57
Old age allowance	25	14.29
Allowances for the widow, deserted and destitute	16	9.14
Disability allowance	11	6.29
General relief activities	39	22.57
Cash for work	48	27.29
Vulnerable Group Development (VGD)	48	27.43
Vulnerable Group Feeding (VGF)	67	38.29
Food for work	51	29.14
Employment generation for hard-core poor or 100 days	37	21.14
School feeding programme	119	68
Stipend for secondary and higher secondary female student	58	33.14
Rural Employment and Rural Maintenance Program	65	37.14
Total SSNPs		Average 27.82%

Source: Field survey data

Social Safety Nets Programmes (SSNP) is generally targeted to the poor. The local Union Parishad Member and Chairman mentioned that different packages are offered to the vulnerable people by the govt. safety net program and other schemes. Among the households covered by SSNPs include, allowance for old age (14.29%); the widow, deserted and destitute people (9.14%); disability (6.29%); general relief activities (22.57%); cash for work (27.29%); Vulnerable Group Development—VGD (27.43%); Vulnerable Group Feeding—VGF (38.29%); food for work (29.14%); employment generation (21.14%) for the hard-core poor in 100 days; 68% school feeding program; stipend for the secondary and higher secondary female students (33.14%) and rural employment and rural maintenance program (37.14%). This study takes the view that safety net program had a poor coverage because only 27.82% of households received some sort of help. But the covered people reported that it was very effective to reduce their food insecurity. The findings are consistent with the national figure. In the rural area, 30.12% of the households received benefits from SSNPs (HIES 2010).

In Batta village some roads were constructed under Food for Work (FFW) program by Project Implementation Office (PIO). In Rongchi village under Test Relief (TR) program of Project Implementation Office (PIO) rice was distributed to the local institutions i.e. school, mosque and temple for earth work. During the study period 30 households received such benefits. A budget is being prepared for the widow, elderly and disabled

persons' allowance, said the UP Member of *Dakshin* Bongshikunda union (Ward 6). He claimed that the earth work under '100 days' employment generation program was implemented by the local government. The respondents mentioned they did not have access to agricultural loan because they lacked land document to pledge as collateral.

The concerned UP representatives under the supervision of Chairman are responsible for distribution of government resources among the poor. There are complaints against them (UP representative) of mishandling the schemes immorally. One UP member of Batta village denied the allegation and claimed, "*I discuss with the village seniors and select the most vulnerable persons for the schemes accordingly*".

Flood and role of local government institutions

As pointed out earlier, the study villages are isolated and remote from Upazila *sadar* (sub-district centre), therefore people have very limited access to government services. Union Parishad is the only government institution poor people have easy access to get service at first during flood. However, UP's internal resource generation is so poor that, in reality, they solely depend on central government grants to maintain their existence and carry out some of their mandated functions. The UP chairman and members of Bongshikunda union said that their capacity was insufficient to tackle big calamities like the 2004, 2007, 2010 and 2014 floods. In recent flood, *Uttar* and *Dakshin* Bongshikunda Union Parishad (local government) have provided some relief material only. It was repeatedly mentioned by local representatives that resource constraints have always been an obstacle in their efforts to help the flood affected people. For lack of financial capacity to make decisions independently, the local institution is required to work under the guidance of the senior level institutions (*upazila* and district administration). As a result, it becomes difficult for the local institutions to allocate funds according to the deserving people's needs and demands.

As per the Standing Orders on Disaster (SOD), Union Disaster Management Committee (UDMC) is the front tier of government disaster management framework. There are specific guidelines for the planned activities (risk reduction, warning, onset of disaster, and post disaster) to be implemented in phases. The UDMC holds power to take initiatives in risk reduction and to respond effectively during disaster. But the UDMC functions as a weak body due to the factionalism.

It was observed that the UDMC members in *Uttar* and *Dakshin* Bongshikunda unions are not aware of the role, responsibility, and function of the UDMC. It was observed that the UDMCs do not function as a team; rather they function haphazardly, without much trust and confidence, these hinder the UDMC to function as a collective unit. Such factionalism results from the different political affiliation of UP Members and Chairman. Union Parishad members and chairman do not even regularly attend the UDMC meeting. Consequently, it results in weakening the bargaining power of the UDMC.

The local people expressed their dissatisfaction over the role of local government as they stated that they did not get fair services. They accused the UP Member of taking Tk. 100-500 as bribe for issuing cards but later he cheated some who had paid him. Only 67 people got VGF cards during the past one year of data collection, while many poor people yet to receive such benefits. Some people shared that relief materials are distributed only at the time of big flood but not at small scale disasters.

Respondents' opinions about local government service are stated below:

"We do not know whether government scheme was sanctioned for us by the UP Member. Once he promised me to give a VGD card, but two years have passed, I did not receive any." – a woman of Batta village

"Matbor (leader) distributes benefits among his followers. The UP member has allotted VGD in exchange for Tk. 2000 (bribe) violating the rule. Those who pay money get priority. We have no money; therefore, nobody treats us well." – A woman of Montola Bari, Rongchi

It is found that the ultra-poor households is deprived of receiving services from the local government. The Chairman is a political figure who primarily provides the govt. sponsored social benefits for the people having unconditional allegiance to him. The neutral, politically unconscious and people having sympathy to the opposition politics are often remain beyond the list of beneficiaries. The local people's common perception is that the government administered offices always protect the vested interest ignoring the poverty-stricken masses. It is time for the local government to function structurally or in a systematic manner where interests of the poor will be protected.

Here it needs to be mentioned that the UPs are linked with national disaster management framework through the UDMC. Many common people of the study area are

not aware of the institutional structure. This largely signifies that the local vulnerable group members have very limited information about the role, mandates and functioning of these disaster management committees in the grassroots level.

NGO services

Some reputed NGOs such as CNRS, CARE, CONCERN, *Shabolombi*, ERA, Grameen Bank, ASA, Brac, Caritas, POPI, Dustho Shashtho Kendro, Sun Cred, FIVDB, etc have some projects in the study area. Each NGO has its own program in the *haor* area. Around 40% respondents mentioned that they are affiliated with NGOs. The respondents mentioned that they are affiliated with NGOs mainly for credit facilities and relief. The above-mentioned NGOs areas of intervention include micro credit, skill trainings, disaster management, infrastructure (wave protection wall), plantation, health, water and sanitation, natural resource conservation, livelihood development, farming and irrigation program, solar energy, etc. By and large, their programs aim to improving the overall living conditions of the *haor* people. However, their interventions are too small compared to the broader needs of the people. Regarding flood management, their role is limited to provide relief only among their members during flood period. Often, there are problems in terms of necessary coordination. For example, it was observed that some NGOs form their own volunteer groups rather than strengthening the capacity of existing volunteers under UDMC. NGOs have different motivation than the governmental institutions. They have a certain number of beneficiaries at the community (if they are working with livelihood or health). During relief distribution, NGOs tend to give priority to their fixed beneficiaries. These beneficiaries also tend to receive relief from the government as they have been affected by the disaster. There is always a possibility of overlapping and duplication due to lack of coordination.

A project titled 'Flood Risk Reduction Activities in Sunamganj (FRRAS)' has been implemented (December 2006 – 31 March 2010) in haor area of Sunamganj by CNRS and CARE with funding support from SDC. The project started after the devastating flood of 2004. The project undertook following activities like protect agricultural crops from flash flood by making structural measures (e.g. building submersible embankments/re-excavation of canal/rivers) and non-structural (e.g., planting of swamp trees, i.e. Hijol and koroach saplings) measures. The project aims at capacity building of Union Parishad and Community Based Organization in managing DRR mitigation measures, promoting UP led development.

Conclusion

Institutional support and accessibility is crucial for development in any poverty stricken area. Remote places are even more susceptible to vulnerabilities. From the above discussion, it is obvious that government interventions are limited only in the prevention and relief phase of the disaster management cycle. NGOs involvement is also negligible although the NGOs have some good program in different phases of disaster management. From experiences of field visit it can be ascertained that remoteness from *upazila sadar* makes *haor* people less accessible to government services. There is a common feeling amongst the people that there is corruption and nepotism regarding the distribution of relief there. Due to the geographical remoteness of the *haor* area, villagers think that they do not always receive relief allotted to them.

Strong local or community-based institutions are necessary for immediate and effective disaster response and recovery, which can create opportunities for community driven initiatives. The researcher believes over dependency on higher level institutions may erode the capacity of local institutions and may reduce community voice. Therefore, enhancing autonomy of local institutions is a must for strengthening response capacity and community resilience to flood hazards in *haor* area (Mahed-UI-Islam Choudhury 2015). Assistance from GO and NGOs in terms of providing information and supplying certain critical inputs at the appropriate times would go a long way towards strengthening the ability of local people to respond more effectively to flood hazards.

This chapter has elaborately discussed the resilience of the households and *haor* community in terms of physical, natural, economic, social, human, cultural and institutional contexts. The next section provides detailed explanation of gender perspective.

4.9 Resilience of Women

It is evident from the in-depth interview and close observation of the researcher; women living in the study area are resilient. They build up resilience on the basis of their experience that they gain through their day-to-day hardship and struggles. They know they will have to face catastrophic floods every year but never give up. Nasreen (2012) observed although disaster affects all segments of population, there are gender variations to vulnerability and resilience during disasters. The following excerpt depicts mental strength of a woman.

“My husband was very sick, unable to do any laborious physical type of work. When flood inundated our village, I along with my husband and our son (12) migrated to Sylhet and involved in stone work. I shouldered the responsibility of earning because I was not sick like my husband”. - Nasima Akter (32) from Rongchi village

Women are the heads in around 18.42% of households where they take responsibilities for protecting houses and other belongings, taking care of children, elderly members and raising livestock (Nasreen 2012). It is women who adapt many of those strategies, which are crucial for their household survival (Nasreen, 2000, 2012). Traditional gender specific work such as carrying water, cooking, looking after children and animals become extremely difficult for women. Often there is no alternative because there are no men around to help and even if there are, they do not assist with women's work because of the powerful ideas of gendered division of labor (Nasreen, 2000). Elaine Enarson (2000) examines gender inequality is a significant contributing factor in the social construction of risk.

It is evident that flood affected women face the same event differently from their male counterparts, which may be largely attributed to their access to resources, taboos prevailing in the society, and the patriarchal norms. There are gender variations to vulnerability and resilience during disasters (Nasreen 2012). As revealed by another study (Rabiul Islam 2010) the differentiated impact of disasters on men and women is primarily caused by the existing gender inequalities.

As women are differently vulnerable than men under natural disasters, they also have developed their own 'survival coping' mechanisms (Climate Change Cell, DoE, 2009). Women possess a strong body of traditional knowledge, which is used in disaster mitigation and coping. Their traditional practices have passed the true test of time and have contributed immensely to reduce their immediate vulnerabilities against natural hazards. Nasreen (2000) in her study found that during floods women adopted many coping strategies which were related to their gender identity and the socio-economic position of their households.

The *de facto* and *de jure* women-headed households status (18% of the households in the study villages), forces them to take charge of the households. Desertion, widowhood, and sometimes having sick husbands are the reasons for women to be the head of households. Some women respondents reported that currently they have more options

to choose their own livelihood related decisions and strategies at household level being the head of households than the previous days, when their husbands were bread-earners. But they are not completely free from social obligation. Social stigma as well as the barring of women from normal activities leads them to household vulnerability. Cultural constraints prevent women from migrating to other districts alone or to take non-conventional occupations in their village, which further aggravates their vulnerability.

From the household level case studies, the researcher found that women as household-in-charge depended heavily on wild plants during crises. Extensive dependence on the water plants and fruits of the *haor* becomes very distinct for the poor households during food deficit periods. In the FGDs it was disclosed that in dire circumstances the poor women only boiled wild plants like *singara*, *deb*, *shaluk*, *kachu* as a replacement of rice. One woman respondent said, “*This choitra, we had only two meals a day for a week, one meal with rice, salt and chilli and the other meal with singra that we collected from the haor. We just boiled the singra added salt to it and ate*”. It is found that in case of short-term food shortages, women have to manage meals by borrowing, collecting wild food etc. They usually borrow from some neighbors, relatives, local NGOs, as they have pretty access to these sources. This indicates the important role women have in securing adequate food provision for their households.

This section deals with gender issues related to coping strategies of *haor* households. Analysis parameter of gender included, household decision-making, gender roles, women's role in household economy - how women manage food in absence of male, implications for household division of labour.

4.9.1 Household Decision Making

Table 4.37 shows the data representing women's role in household decision-making with regard to pre-during-post flood situation.

Table 4.37: Role of Men and Women in Household Decision-making with regard to Flood Situation

Decision	Household n= 175					
	Men		Women		Jointly	
	Number	%	Number	%	Number	%
Raising the plinth of the house					127	72.57
Preservation of food and fuel			175	100.0		
Child vaccination			67	38.29	20	11.43
Collecting wild food			159	90.86		
Joining the workforce	116	66.29	31	17.71	28	16.0
Borrowing food			84	48.0		
Borrowing money	66	37.71	53	30.29	37	21.14
Spending of borrowing money	96	54.86	13	7.43	47	26.86
Sale of product (vegetables, poultry, livestock, egg)	31	17.71	67	38.29		
Take cow as 'aadi bhaga'			28	16.0		
Daily necessities purchase	43	24.57	105	60.0	27	15.43
Land purchase/sale, lease in and out	54	30.86			12	6.86
Fishing equipment sale/purchase	146	83.43			11	6.29
Move to another place before or during hazard	123	70.29			34	19.43
Maintenance of family in husband's absence			83	47.43		
Repairing the house	74	42.29	38	21.71	63	36.0
Cleaning surroundings of courtyard	43	24.57	103	58.86	29	16.57
Migration of male	39	22.29			13	7.43

Source: Field survey data

To assess the status of women empowerment some special questions were put to the female respondents. The first question is about taking the important decision regarding move to another place before or during flood. About 19.43% of households reported the husband and wife jointly take a decision. The results show that women's participation is significantly higher in the following areas: preservation of food and fuel (100%); child vaccination (38.29%); collecting wild food (90.86%); borrowing food (48.0%); sale of products -vegetables, poultry, eggs (38.29%); taking cow as 'aadi' (16.0%); purchase of daily necessities (60.0%). In response to the question regarding the direct involvement of women in maintenance of the family in husband's absence, a good number (47.43%) of households reported that women have an active role in decision-making process. The findings obviously give evidence that women are highly empowered in household decision-making in the *haor* area especially in the absence of male.

4.9.2 Gender Roles

The research tries to explore which role women perform in normal and flood time focusing on Caroline Moser's 'Triple Role Framework'. Table 4.38 shows gender roles in normal and flood time.

Table 4.38: Moser Framework for Gender Role Analysis

Activities	Normal Time		Flood Time	
	Women	Men	Women	Men
Productive Work				
Pre-harvest activities				
Post-harvest activities				
Food and seed preservation				
Paddy business (on engine boat)				
Poultry and livestock rearing				
Fuel wood collection				
Rice husking by machine (on boat)				
Small shop keeping				
Duck rearing				
Fish drying and trading				
<i>Kantha</i> (homemade quilt) stitching				
Fishing gears (net weaving, making <i>chai, bair</i>)				
Fodder collection				
<i>Mateer kaj</i> (earth cutting)				
Vegetable gardening				
Collecting aquatic fruits and herbs (<i>deb, shaluk, singra, shapla</i>),				
Reproductive Work				
Care and maintenance of households and members (children, elderly, PwDs)				
Care for sick				
Prepare food				
Ensuring food availability				
Fetch water				
Preserve fuel				
Clean homestead areas				
Repairing cowshed				
Repairing house				
Plinth raising				
Bamboo fencing around homestead				
Community Work				
Building temporary embankment to protect crops				
Repairing tube well				
Evacuating vulnerable people				
Disseminating warning				
Guarding house				
Guarding the animals and other property				

Source: Primary data through field study

The findings reveal that significant segments of female respondents in the study area involve in productive aspects such as pre and post-harvest activities, poultry and livestock rearing, small shop keeping, duck rearing, *mateer kaj* (earth cutting), vegetable gardening, seed preservation, etc. Women perform reproductive chores such as care and maintenance of households and members; ensuring food availability (Rabiul Islam 2010); fetching water; preserving fuel; cleaning homestead areas; plinth raising; bamboo fencing around homestead; etc. Many of them are involved in disseminating warning; constructing temporary embankment to protect crops as community role.

In the study areas during floods, women constantly look after all family members and animals to ensure their safety. They construct high platforms for their safety, using the *chouki* (traditional bed) and bamboo. Some of the respondents transferred their family members to safer areas during flooded season.

Women of the study area are found performing various pre-harvest activities such as planting rice and making bundle of seedlings. They are involved in the rice transplanting process such as uprooting saplings by *kaste* (sickle), standing in a water-logged field to put seedlings into the soil by hand too. Usually the village women carry bunches of paddy saplings and their husbands sow them in the fields. In *Poush-Magh* (December-February) women make bundles of rice seedlings. Each of them earns Tk. 90-100 for 30 bundles a day. If wages paid in kind the women agricultural workers get two bundles out of every ten bundles. They sell rice seedlings in the local market.

Women are responsible for the post-harvest processing of food grains. Preservation of seeds is also their affair. The threshed paddy is gathered and bagged in the field mostly by women. They spread paddy in the sun to dry on a yard. After sun drying they store rice grain in a traditional storage structure called '*duli*' (bin usually made of bamboo mat). After sun drying the rice straw is piled in the field by women. Then they bundle and carry it back to the house to be used as fodder. In addition, they undertake all other tasks such as preservation of seeds, drying and boiling of paddy.

In the study area traditionally, subsistence vegetable farming is predominantly done by women. Harvesting vegetables is primarily performed by the wife and young daughters. Man usually plows the land with cows. If the land is small, women prepare the land using *kodal* (spade). Female members perform all other activities required for growing vegetables such as plowing, harrowing and tilling the land, mixing and leveling the soil,

transplanting, weeding, threshing, looking after livestock, etc. Vegetables are primarily produced for consumption; the excess is sold in the local *bazar* by male members.

Women are actively involved in livestock and poultry rearing. They rear cow, goat, hen, duck and ram. About 18.99% of the families in the village rear the cow. Men collect fodder but all other activities such as feeding and cleaning up cow-dung are done by women. Goat rearing is also done by women. Normally women (wife and daughters) and sometimes sons take care of goats. Poultry rearing is exclusively done by women.

Similar to that of crop sharing system, there is a very popular system called '*aadi*' (cattle share) in the *haor* area. In this system, a person (the first party) takes a cow as '*aadi*' or share from another person (the second party) and rears the animal. As per the agreement when the cow gives birth to a calf, the first party possesses it along with all milk. The second calf is retained by the second party (owner). If the cow becomes sick, the cost of treatment is borne by the owner. The cow has to be given back to the owner after the birth of the second calf. This system exists in most of the villages in the *haor* area.

In the study area women earn their living by *mateer kaj* (earth cutting) in another people's farmland. On average, a woman day-laborer makes Tk. 150-200 a day. In *Falgun* and *Chaitra* women work as earth laborers for the local government infrastructure development project. They earn Tk. 200 as daily wages from there. During the rainy season, a female worker makes *kantha* embroidery in three days for package wages of Tk.15-200. In *Ashwin* women make firewood locally called '*Muitta*' with cow-dung and *ujauri* and they sell it in the monsoon. In *Kartik* women go to beel to collect *ujauri/dholkolmi*. People come from very far villages to buy firewood. The usual price of 100 sticks is Tk. 100 or more. Women also rely on production of handicrafts such as cane and bamboo works.

Sonamoni Biswas (25) is a self-reliant woman. She is a mother of one daughter (8 months old). Her husband Bimol Biswas abandoned her (in local term 'Niruddesh' denotes abandonment) since last Ashwin. Sonamoni later came to know her husband married another woman in Bikrampur. Now Sonamoni produces handicrafts and earn money to maintain her family. Her products known as Payela, Bair, Chaloon, etc. are sold at Bongshikunda and Madhyanagar bazar on a good profit. She purchases raw materials namely bamboo, cotton from the local market. "We were poor and it was really difficult for

us to arrange two square meals a day. Now these handicrafts have changed my life. Now I can manage to eke out a living with what I earn”, said Sonamoni. This young woman of a broken family in the remote village of Tanguar Haor village through the acquired skills dreams of a new life for both of her daughter and herself.

The study found that the poor women preserve fuels, matches, dry food (such as rice, puffed rice, flattened rice, chili, pulses, gur, onion, and potato) and keep these in polythene bag, jute bag, plastic container and aluminium pots at home. Other important goods such as oil, ropes and medicine were preserved by them. Women often collect firewood to store in dry places for later use. Women also store fodder for domestic animals, seeds, food, blankets, which are also used to protect goats and poultry from flood water.

4.9.3 Women’s Role in Household Economy

The researcher noticed women’s economic activities playing a very critical role when the male-headed economy is on the verge of collapse. Apart from discharging normal duties, women firmly take part in some income generating activities to determine resilience of the household. Many women through engaging themselves in labor selling, small business running, paddy business (on engine boat), stone collection, bamboo craft, selling home-reared products, duck, poultry, livestock rearing, firewood selling, homestead gardening, small shop keeping, boat shop operating, fish drying and trading, *kantha* stitching, earth digging, domestic work, collecting reed, fodder, water fruit herbs, etc. contribute significantly to the safety net of their families.

If *boro* crop fails, most of the households face acute food shortage. Then the people of the *haor* are forced to adapt extreme coping mechanisms to overcome food insecurity. The role of women in ensuring food security is vital to the household economy in the study area.

Some women in responding to a question stated how they manage food in the absence of adult males who migrated to other areas. These toiling women mentioned that they had to borrow food, work as day laborers, take loans from NGO, use preserved food, work as housemaids in other people’s houses and collect wild food.

An elderly widow maintains her family through gleaning

Joytara Biswas (60) who is a widow hail from Batta village. She was deprived of her right to inherit to her husband's property. She now lives in her brother's land. She collects leftover crops (gleaning) from the farmers' fields after completion of harvest. At the time of interview Joytara has picked up about 6-7 maunds of left-over paddy from the haor fields. With this she can manage six months' food. For being destitute Joytara was allowed to glean left-over paddy in the fields belonging to rich landowners.

Poor women are more exposed to flood hazards and have fewer resources to protect their own lives, assets and livelihoods while looking after their families. They are also more dependent on natural resources for their subsistence.

4.9.4 Implications for Household Division of Labour

As revealed by the study, after flood the household members again rebuild their houses themselves. Some common diseases break out in this situation. They have their own practices. Women's responsibility and workload increase manifold during severe flood. They go to a long distance to fetch drinking water. In addition to the responsibilities outside the household, they have to look after others, especially--children, elderly and sick members, prepare meals every day. The situation even gets more difficult for the poor women-headed households. A research published by Climate Change Cell (2009) pointed out that because of women's marginalized status and dependence on local natural resources, their domestic burdens are increased, including additional work to fetch water, or to collect fuel and fodder. Oxfam GB's handbook (2011) shows during disaster women's workload, responsibilities increase and risk increases.

The majority of the women respondents stated what they need to perform immediately after flood water recedes. Women protect house plinth by constructing bamboo barricade covered with water hyacinth. They build 'machan' or bamboo platform inside the house, clean flood-damaged home, polish house floor with mud, repair house fence, clean the dirt from yard, repair cattle shed, make bamboo mats which are used for spreading on floor of cattle shed to protect cows from clay which causes foot infections.

4.9.6 Women's Social Capital

In crisis situation women's informal network plays crucial role for household level livelihood security. Food borrowing is mostly the affair of women. Interest free loan of small amount of money taken by the needy from kind hearted people is an operational definition for social capital in the context of the study area. But this sort of opportunity is not always available. Around 40% women respondents have affiliation with NGOs from where they receive loan and training on awareness.

So far, the above sections have provided detailed explanation of resilience of the households and *haor* community in terms of physical, natural, economic, social, human, cultural and institutional aspects. The following section presents explanation of relevance of conceptual framework used in the present study.

4.10 EXPLANATION OF RELEVANCE OF CONCEPTUAL FRAMEWORK

'The Resilience House'- an analytical framework for household resilience has been used in this study. The researcher has also employed the Sustainable Livelihoods Framework (adopted from Carney, 1998) to analyze the research issues. The study finds relevance of these conceptual frameworks to indigenous flood coping strategies of the *haor* people.

4.10.1 The analytical framework for the present research: 'The Resilience House'

The present study investigates household responses to disaster risk from resilience perspectives. While defining resilience at individual, household as well as at community level, the present study uses theories of resilience to analyze - what resilient households and/or communities look like? What are their characteristics in the context of the *haor* area? To the present researcher, a resilient household is one in which people can manage risk and recover from floods. The factors that influence resilience include natural, physical, economic, human, environmental, social, cultural, political and institutional.

As noted above the researcher has employed the 'Resilience House' as analytical framework for explaining resilience of household and community in *haor* area. The house has different corners i.e. *roof*, *building block* and *environment*. The roof of the house consists of absorption, adaptation and transformation capacities. The building block includes perception, attitudes and values; access to assets and resources;

knowledge, awareness, learning and livelihood options. The environment denotes natural aspect, markets, social networks, institutions, laws, regulations, governance, physical infrastructure, cultural norms and practices.

With this framework, the researcher intended to develop and implement assessments of resilience at the household and community level. The different corners of the 'house' i.e. *roof, building blocks, the environment* was analyzed with respect to the particular disaster context. The inter-linkages of different corners of the house have been closely observed. The "Resilience House" framework as illustrated by the researcher considers household as part of a broader community or system.

In defining the concept of resilience, the researcher has reviewed the 3-D Resilience Framework (Research and analysis from IDS 2012). The analytical framework proposes to use three components of resilience: *absorptive, adaptive, and transformative* capacity. The salient point of the framework is the fact that resilience emerges as the result not of one but all of these three capacities. These three dimensions constitute the 'roof' of the resilience house. Absorptive capacity means the ability to cope with and absorb the effects of shocks and stresses. Some examples of absorptive capacity of the people in study area include: households in the study area temporarily reduce their expenses following a drop in their income; they reduce the quantity of meals per day; they have developed community-based early warning system based on traditional knowledge; stock of emergency food such as households in the study villages preserve dry food; revolving funds generating through village level *samity*; etc. Adaptive capacity, that is, the ability of individuals or communities to adjust and adapt to shocks and stresses, but to keep the overall system functioning - e.g. when a household in the study area diversify its crops in order to respond to floods; adopting new agriculture methods (e.g. growing early variety crops, early seeding and transplantation, harvesting half matured crop, farmers jointly purchase shallow machine for irrigation, introducing *dapoge* seedbed method, planting saplings in abandoned pots, etc.); diversifying livelihood bases (engaging in off-farm labor); engaging in new social networks (membership of NGO samity, village-based samity, Tanguar Haor Samity); etc. Transformative capacity, i.e. the ability to change the behavior, practices and system fundamentally the way it works is no longer viable - for example, when a farmer or fisherman of the study area decides to stop farming and fishing and migrates to city to become day labor in Fish *Arot*, stone worker, farm labor, domestic helper, rickshaw/van driver, etc. From the past

learning, households in the study area now make houses with stronger structures; they elevate their houses more than the water level of the past few years. Individuals have also transformed their behaviors, such as they are trying to do other jobs apart from their traditional occupation.

It is important to note that flood hazards have differentiated impacts on households, even in the same village of the study area. Elaine Enarson (2000) explores residents are not equally at risk of loss and harm nor equally able to recover. Rashid and Shafie (2009) give explanation that social groups experience disasters differently, have differential access to resources, endowed with discrepancies in capacities to face disaster. It was found that a flood impact severely marginalized farmer households and drives these families to take transformative resilience strategy, while the same flood event simply required some absorptive resilience for another household in the same community. For example, in Rongchi village some poor families were bound to migrate to Sylhet to do stone work, whereas others in the same village followed absorptive strategies such as reducing their familial expenses.

Households in general are characterized by a certain combination of what the researcher would like to call “building blocks”. These include: perception, attitudes and values; knowledge and learning; livelihood options and access to assets and resources. It is observed that inhabitants of the study area have taken the natural disasters for granted and as part of their life. It is obvious that the households decided their own destinies by choosing to live in these flood-prone villages or they have no alternative option. From the in-depth interview, it reveals that though local residents face many challenges, they do not want to leave their ancestral land permanently. They have emotional attachment to their hereditary assets. When respondents were asked, which risks they find more intense, they opined that early flash flood severely destroy their crops, houses and badly affect their income opportunities.

The traditional practice of helping each other and mutual assistance system derived from strong traditional values are inherent in the study villages. For example, it is found that some affluent families help the most vulnerable families in crisis in the form of food, loan, employment, shelter etc. The village people help their poor neighbors to repair and rebuild their broken houses after flood. The researcher came into contact with a woman, probably in her seventies, who managed her livelihood by gleaning extra food-grain from

another people's crop field. In this case, the poor women did not face any difficulty in collecting food grain; rather she got moral support from the rich land owners. This is a clear evidence of community perceived values regarding sacrificing for their neighbors, who are the neediest and vulnerable.

The researcher has become sure through observation that the respondents' family level values are shaped by the existing cultural norms and practices of the community. These are frequently manifested through prevalent values and customs regarding women's outside work; food related taboos especially for pregnant women; ritualistic behavior during flood, storm and strong wave or *afal*, etc.

The surveyed households primarily depend on the *haor* natural resources (crops, fish, plants, grass, water fruits etc.) for their survival. However, they do not have free access to these resources. The leaseholders and authorities concerned put restriction on the use of *haor* resources. In the study area common property resources such as *beel*, open water-body, *kanda* land, *khas* land etc. are controlled by a few powerful groups. The poor families often do not hold right to land and water resources.

As evident from this study, the inhabitants of the study villages are rich in indigenous knowledge which is manifested in survival and livelihood strategies. Various forms of indigenous knowledge were identified in the four villages selected for this study. When threatened by a hazard, households and communities respond by making proper use of their knowledge and practices. Such a strategy allows the families at risk to mitigate, prepare for, respond to and recover from disasters. The traditional knowledge and practices which are embedded in day-to-day lives of the people in the study area are key to their resilience in the face of seasonal and flash floods. This traditional knowledge mostly undocumented has been transmitted orally from one generation to another.

Elders are the key bearers of knowledge in the community. The role of the elders is crucial as some have learned from previous experience how to read environmental signals; they know the history of previous disasters, when and where they occurred, what was the level of the water during the last flood, and so on. It is worth-mentioning here that male and female roles are distinct due to societal norms. Therefore, their knowledge and perception also vary. For example, men possess indigenous knowledge related to their productive role such as agriculture, fishing, whereas; women's knowledge

is mainly centered on household chores. Men have knowledge about fishing techniques; women deal with food preservation.

Households take a number of strategies to recover from disaster related losses. They try to be involved in other sectors apart from what they have learned for generations e.g. in Bongshikunda some small farmers temporarily become rice traders. Fishers opt for fish related business like buying and selling fish. The study finds that diversification of livelihood contemplates through off-farm labor such as paddy husking (on engine boat), renting out shallow engine for irrigation, fish drying and trading, making and selling fishing gear, work as fishing labor; small trading (fish, vegetable, clothes), carrying passengers by boat/motor cycle, trawler driving; goods transporting by boat/van; small shop on boat, renting boat, rendering labor in domestic chores, earth digging and carrying, etc. These alternative sources of income are very crucial for the households in averting vulnerability and attaining livelihood resilience.

To measure the resilience of household the 'environment' has been assessed. The natural environment can offer resources but also present threats to hazards (e.g. *haor* is a resource and also poses serious threat to life and livelihoods). As part of broader system or community household level values are shaped by cultural norms and practices. The state presents an important environment, with its policy, law, governance structures and the provision of crucial services to the community. But in practice, it is not functioning very well. Current resource management policy creates marginalization, exclusion and consequently livelihood vulnerability especially of the poor fishers and farmers of the study area.

As per government policy there are local disaster management committees (DMCs) at *zila*, *upazila* and union levels. The committees are supposed to play a proactive role in disaster management. But the *upazila* and union level committees were found almost inactive. The Union Disaster Management Committees (UDMC) at *Uttar* and *Dakshin* Bongshikunda did not hold any meeting during data collection period. The key informants viewed that chairman and members become active only during the post disaster emergency or relief work. The community people are not aware of the role of these committees.

There is a lack of infrastructure in the remote *haor* villages, which creates hindrance to disaster risk reduction. Now almost in every village a government primary school cum

flood shelter have been established. The high school and college are situated at union level. These places are widely used as shelters during flood. Though submersible roads are constructed in the *haor* area, within the village all roads are *katcha* and these are completely inundated during flood. Boats and banana rafts become the main source of communication. Before the advent of flood local people construct temporary bamboo bridges to link hamlets within the village.

The government institutions are viewed negatively by the local people. Their resentment was clearly expressed while the researcher asked them about the role of Bangladesh Water Development Board (BWDB) and government functionaries. The people are very unhappy about the embankment construction and repairing works by the contractors. However, the villagers disclosed without hesitation that the Union Parishad members and elders play a vital role at village level decision-making process.

The findings reveal that the people in the study area trust their neighbors and relatives than formal institutions. But the families gradually deplete their social capital after natural hazards followed by economic crisis. The respondents said that they have established good networking and linkages with *mohajan* in neighboring villages, landowners in other districts and owners of big shops in city areas where household members seasonally migrate. These extensive networks help them find jobs during flood. The respondents are well aware of how they can gain from association with these social networks in order to reduce disaster risks and build household resilience. It was observed that the households who could establish linkages and networks with individuals and institutions were able to reduce the risks from disaster to some extent. For example, the respondents who are the members of Tanguar Haor Samity and NGO samity receive various benefits in the form of credit, training, livelihood support, etc. The respondents who have good networking and linkages with landowners in other districts and owners of big shops in city areas help them find jobs during lean period.

Access to market can create new opportunities in the households enhancing absorptive and adaptive capabilities. It was observed that the local producers have no or very little linkages with big market. *Nigaris/Pikars (middlemen)* roam around the village from door to door in order to collect products such as fish, vegetables, milk, egg, chicken, duck, bamboo and cane items and fishing gears. Sometimes they provide loan for the local producers to maintain relationship. Then it is mainly characterized as *patron-client*

relation. In such a situation, most of the producers are bound to sell their items at low prices to *Pikars*/moneylenders which challenge coping capacities of local people.

The study finds there are some factors that hinder resilience building process of the people living in *haor* area. The *haor* community is a resource-dependent community. Livelihood of the community people depends on the resources provided by the *haor*. It is evident from this study that people's vulnerability to disaster not only stems from natural phenomena but also social structure, power relations and institutional arrangements create marginalization, exclusion, and livelihood instability given the local power structure. Recovery by local occupational groups like farmers and fishers from flash flood disasters is largely constrained by the uneven power structure. Local power operates on the basis of various resources of the *haor*. Institutions (both formal and informal) hold power and control resources. From the findings of this study it is evident that current institutional system creates marginalization, exclusion, and livelihood instability for the marginalized poor (Mahed-UI-Islam 2015). Consequently, they are excluded from common resources (e.g. water, fishery, plants, grazing land, duck rearing) as well as deprived from their legitimate rights of government services. The following figure illustrates how local power dynamics hinder resilience of haor community (Figure 4.11).

The figure (4.11) illustrates that resilience of *haor* community constrained by some factors such as crop loss due to flash flood, exclusion of local poor fishers from water bodies, the neediest people remain out of coverage of government scheme, meager income, marginalization, absence of community-based planning for risk reduction. The underlying causes of these factors are also shown in this figure.

4.10.2 Characteristics of Disaster Resilient Community

In defining household resilience, the researcher adapted to the particular study context i.e. *haor* area. In doing so, he followed some characteristics of a disaster resilient community adopted from J. Twigg's (2009). Some of the key characteristics include the following: -

Table 4.39: Characteristics of Disaster Resilient Community

Characteristics	Key Findings
Risk awareness of household members	Though vulnerable people living in the remote island like <i>haor</i> villages showed despair and fatalism during discussion, keen observations revealed the fact that they take preparedness measures before the impending disaster. From this perspective, the researcher draws conclusion that the people are aware of possible disaster, appropriate mitigation and preparedness measures. They have acquired this knowledge and skills over time, as a result of learning through accumulated experience. For example, every year they prepare for flood by elevating their houses from land. Keeping water level of the past years of floods in mind, they elevate their houses to a higher level. This clearly shows how community members prepare themselves for the impending disasters.
Early warning systems based on community Knowledge	There is a wealth of indigenous knowledge related to early warning in the <i>haor</i> area. According to community people they are able to forecast weather by observing the environment or to predict rain, storms and flood by observing the behaviour of certain animals and birds.
Households take long-term perspective	In most cases preparedness measures are taken considering immediate needs. In some cases, long-term strategies are also adopted. Some preparedness and mitigation measures taken by the local people have become routine annual activities e.g. every year they build bamboo bridge, elevate house plinth, etc.
Trust within community	Though social capital is depleted by economic hardship, strong social bonds and mutual trust still prevail among the villagers in the remote villages. The people affected by flood resorted to mutual help mechanisms for material and emotional support. For example, when there was no food in the house, households relied overwhelmingly on their neighbours and relatives.
Realistic attitudes towards risk and risk management	The researcher has observed prevalence of widespread superstitions among the people of remote <i>haor</i> region. But in other cases, he also noticed realistic attitudes shown by them towards hazards and risk reduction measures. For example, people believe that a ' <i>debota</i> ' who lives in the mountain ordains storm and cyclone to occur. Interestingly, at the same time these people do not always hold these irrational beliefs. They also demonstrate realistic attitudes and behaviour towards disaster risk management. They take preparedness related measures such as strengthening the house pillar and roof to make them more resistant to high winds so that they are not pulled away. They raise <i>machan</i> inside the house to take shelter on during flood. They reinforce their houses and preserve food that will enable them to eat without cooking at the time of disaster.

<p>Life protecting saving measures and possession of appropriate skills</p>	<p>The researcher observed that all the surrounding places are inundated during flood. Many children drown in the open water-filled fields when they make a venture to get entertainment during flood. To solve this kind of serious problem kids are taught how to swim at their early age by their parents. When a flood occurs, people take shelter on elevated platforms or <i>machan</i> in the house. The usual response to flood is to move to high land nearby the village.</p>
<p>Access to community-managed common property resources that can support coping and livelihood strategies in normal times and during crises.</p>	<p><i>Haor</i> is the source of common property resources during both the monsoon and dry season. People who live on subsistence fishing expected to have free access to the open water body or <i>beel</i> fishery resources. But commercial leaseholders hinder them from executing their rights. <i>Kanda</i> land is not privately-owned property which is classified as <i>khas</i> land. The household members under this study depend on <i>Kanda</i> land for fuel wood, fodder and duck rearing.</p>
<p>Reserve stocks of grain and other staple foods managed by households.</p>	<p>Almost every household consciously stores dry foods so that they can use them during flood period. Women are basically responsible for processing most food items for storage. Each of the households involved in agriculture has its own seed preservation methods. They have to suffer loss almost every year due to early flash flood. This in turn makes them become dependent on commercially available seeds.</p>
<p>Livelihood diversification including off-farm activities</p>	<p>Most of the studied household heads in the study villages are involved in more than one occupation. The study found that diversification of livelihood contemplated through off-farm labour such as small trading (fish, vegetables, clothes), ferry business (selling goods on boat or on foot), fish drying and trading, domestic work in <i>gerostho</i> house, earth work, bamboo craft, (paddy container, basket), boating, trawler/<i>thelagari</i>/tractor driving, shops on boat, paddy husking business on engine boat, motor cycle renting, goods transportation, engine boat labouring, renting shallow engine for irrigation, renting boat, migration etc.</p> <p>As a result of diversification options, the number of young heads of households is more self-employed than that of elderly ones. When there is no regular job opportunity, then the people work as day labourers in the house of affluent families. Some of them are also engaged in earth digging and carrying. Another example of diversification is related to paddy business. Small farmers usually buy paddy from other small and marginal farmers just after the harvesting period and sell it to big businessmen on some profit. It is evident that agricultural labourers and fishers are involved in work with multiple sectors like day labour, fish business, boat rowing and other self-employed occupations. Apart from working in other sectors, community people from the studied villages seasonally migrate to other places for work.</p>
<p>Adoption of hazard-resistant agricultural practices for food security</p>	<p>The farmers of the area are most vulnerable to flash flood, when their main crop <i>boro</i> paddy goes under water. The day labourers engaged in agro-based activities become jobless as well as deprived of income if flood hits during harvesting period. To combat the challenge, the cultivators usually go for early harvesting and cultivation in comparatively high land.</p> <p>Some farmers cultivate short duration rice variety in their small plot of land for saving their only one crop from flash flood. Another method they usually apply is early seeding on seed bed, when flood</p>

	<p>water recedes early. According to farmers, early seeding followed by early transplanting method can save their boro rice from flash floods.</p> <p>There are some adaptive and innovative farming practices observed in the studied area. To cope with the changed environment, farmers adapt diversified cropping pattern. They cultivate vegetables, spices, pulses during <i>rabi</i> season and harvest much earlier than <i>boro</i> rice in order to avoid flash flood.</p>
Access to basic social services (safety net services)	The study explored a poor coverage of safety nets programs in the studied households as only 27.82% of them received some sort of help from the program. But the covered households reported that the safety net program was very effective to reduce their food insecurity.
Security of land ownership/tenancy rights	About 16.84% of families have no land, 35.77% only have homestead land. Many poor landless people were left with no option but to take shelter in <i>khas</i> land or other people's land. Marginal farmers are either compelled to sell or mortgage their land due to indebtedness.
Adoption of physical measures to protect items of domestic property and productive assets	As a flood mitigation measure people in the study villages constructed elevated platform made of bamboo called <i>Machan</i> inside the house to protect household items, foods and goods. Household members keep their livestock away from flood water in the shelters constructed in high earthen mounds.
Available transport sufficient for emergency needs	During the monsoon season, small country boats are the only means of transportation. Those who have no boat need to borrow from others to accomplish daily necessities.
Households aware of the legal obligations of the government and other stakeholders in respect of providing protection	The respondents are aware of the kind of help government should provide when disasters strike. They think government should protect them from disaster and provide them with adequate relief, seeds and fertiliser. However, local people have lost trust in government functionaries mainly because of malpractices and apprehension about sound distribution of the government sanctioned amenities among them.
Indigenous, traditional, informal communications channels.	As revealed by the study, various types of dissemination methods have traditionally been used within the <i>haor</i> communities to warn the villagers about impending disasters. In Bongshikunda, villagers make loud noise as a sign of alert. Warnings are conveyed by beating metal objects such as tin, announcing through mosque mike, house-to-house dissemination of warnings, personal interaction. Community groups often monitor the level of water during heavy rains. In case of danger, people residing in vulnerable houses are informed by shouts and knocks on their doors. Men usually exchange information of early warning through their tea stall <i>adda</i> (gossiping) at local <i>bazar</i> , women interact with their neighbours while doing household chores or casual courtyard meeting. In such way, local people disseminate flood alert and warnings using their indigenous communication channels and react swiftly when flood approaches.
Access to sufficient quantity and quality of water for domestic needs during crises.	The remote villages face water scarcity though there are some tube-wells most of which were inundated during the previous floods. So, the people rely on rain water and surface water of the <i>haor</i> . Traditional water purification methods practised by the study households include three <i>Kolshi</i> method, using <i>fitkiri</i> /alum, boiling water, solar disinfection method, etc.
Stability in economic	Income opportunity drops tremendously when early flash flood

activities and employment levels.	destroys the only crop. During the flood season when there is no opportunity of work, people migrate to other districts in search of work. Off-farm day labouring is also an important form of livelihood for a good number of households in the area.
Local transport links with markets for products, services protected against hazards.	Some people in the study area move to big <i>bazars</i> at Madhyanagar, Kalmakanda by trawler or engine boat. But the members of poor households cannot travel to a long distance with their products because of high transport cost. Therefore, they rely on middlemen for selling their products.
Mutual assistance systems with community and other formal structures dedicated to disaster management.	<p>The households and village-based organizations have no close linkage with formal institutions such as local disaster management committees and govt. departments; therefore, households primarily depend on informal networks during crises.</p> <p>Neighbours, relatives, kin and village groups are an important source of support in the area, especially for women. The respondents reported that in crisis moment they received food, money and emotional support from the relatives and neighbours. Lending money for medical expenses was also reported. However, it also became evident during informal interview that though relatives living nearby have the intention to help, economic constraints sometimes do not allow them to do so. Increased poverty as well as deteriorating livelihoods of the people seems to have affected mutual help among the relatives and neighbours.</p>
Collective knowledge and experience of management of previous events (hazards, crises).	In the context of disaster-prone villages, the <i>haor</i> area, local people have advantages including disaster experiences, which give them the ability to cope with, adapt to, and recover from disasters. For instance, knowledge and skills on hazards, hazard history, and hazard risk of the households are important resource in building their resilience. When the rainy season comes, they observe the current of wave, danger level of water and with gathered experience they can understand which side will be badly eroded.
Household asset bases (income, savings) sufficiently large and diverse to support crisis coping strategies	Poor families having limited resources are less able to cope effectively with disaster. So they are bound to take austerity measures such as distress selling, labour in advance, reducing quantity and quality of meals, etc.
Existence of community/group savings and credit schemes, and/or access to micro-finance services	Various micro-credit groups are operating in the villages under study. The villagers have created their own village-based organization called <i>samity</i> . Apart from providing loan these organizations also arrange humanitarian assistance for the poor.
Access to money transfers and remittances from household members working in other regions or countries.	About 30% of the members of the households seasonally migrate to other districts every year. These families have one or more migrant members. They send money to their families in the villages. The remittances from migrants play an important role in allowing their families to reduce disaster risk. It is found that households living in the flood exposed <i>haor</i> region, when receive remittances make sensible risk reducing investment decisions. Some households strengthen housing and invested in diverse livelihoods including opening a small shop, leasing in land and thereby reducing disaster risk.
Adoption of hazard-resilient construction and maintenance practices for	People adopt hazard resistant practices for the following activities: plinth raising of the house, constructing barricade around the homestead, building <i>machan</i> , bamboo bridges, livestock shelter,

homes and community facilities using local labour, skills, materials and appropriate technologies.	<i>beez ghar</i> (grain storage), crop protection embankment, adding extra pipes to tube-wells, etc. People share their labour, skills, materials and technologies for all these activities.
Infrastructure and public facilities to support emergency needs (e.g. shelters, secure evacuation routes).	Some people move to school buildings cum flood shelters found within convenient distances from their villages. But these shelters may not have enough space to accommodate all flood victims at a time. So, a number of people move to the places outside the village to take shelter.
Resilient and accessible critical facilities (e.g. health centres and hospitals).	Hospital or health centre is far away. It is risky to take an ailing patient to the hospital from the remote village.
Locally owned or available transport sufficient for emergency needs (e.g. evacuation), at least in the event of seasonal hazards; transport repair capacity within community	Boat is the only means of transportation during the monsoon. For evacuation purposes people share other people's boat. Many villagers have transport repair capacity. Everybody knows how to make a banana raft which is extensively used for internal communication within hamlets and villages.
Emergency shelters for livestock.	During the previous big flood people in the study area took shelter on high land, embankment, road, and mountain valley along with their livestock and belongings.
High level of community volunteerism in all aspects of preparedness, response and recovery; representatives of all sections of community.	During and after hazards village youths act spontaneously as volunteers. Many of them are not trained. Mostly the voluntary activities take the form of informal help.

Source: Field survey data

4.10.3 The Sustainable Livelihoods Analytical Framework

The present research employs “Sustainable Livelihoods Framework” (adopted from Carney, 1998) as theoretical underpinning to search for broader meaning of findings. The Sustainable Livelihoods Framework presents a number of factors that impact on livelihood strategies and outcomes and also emphasizes the many relationships between these factors. Central to the framework is a pentagon of interchangeable livelihood assets or capitals (i.e., natural, social, physical, financial, and human capitals) that can be utilized for achieving self-determined outcomes of livelihood strategies in order to reduce the vulnerability of households and communities to natural hazards. This framework has been useful to assess the vulnerability context of the *haor* area; to identify livelihood assets or capitals the *haor* people possess, the prevailing social,

institutional and organizational environment, livelihood strategies the *haor* people deploy and the outcomes they achieve. The sustainable livelihood framework focuses more on people's strengths, abilities and capabilities than on their weaknesses. This idea resonates with the concept of resilience which also focuses on capability rather than vulnerability.

The present research has identified livelihood assets or capitals of the households. According to the Framework, access to the capitals is mediated by transforming structures (i.e., levels of government, private sector, civil society) and processes (i.e., laws, policies, culture, institutions, power relations), which are also perceived to be contributing factors to the vulnerability of livelihoods. It is found that as a mediating structure the formal institutions not playing a very significant role on people's livelihood in the study context, however, the informal network such as kin, relatives, neighbors, village *samity*, *mohajan*, *dadondar* have more influence. The respondents who received benefits from various institutions such as safety net, new agriculture method, rural infrastructure development program was able to build resilience. Under the process, laws and policies have no direct impact on the people's livelihood; however, the cultural context, local institutions and power relations play an important role on livelihoods of the local people. For instance, it was found that though government banned the leasing system of the Tanguar *haor* in 2000, access to the *haor* resources still is controlled by the powerful group(s) of the area.

In the present research understanding livelihoods do not just mean looking at people's main sources of employment or income. It is concerned with all the different activities and choices within the household and community, which provide food, health, income, shelter and other benefits. In the study area people capitalize their social network and social capital. In this way they procure food, money and take shelter in emergency period. Livelihood resilience means the diversity of people's livelihood options available to them. The research findings show that the families having more than one earning member or the families involved in multiple income sources are more resilient to disasters. Families who have members working outside the village are also secure.

Livelihood strategies change over time in the context of ecological, demographic, cultural and socio-political changes. It is no exception in the study area. Few occupational changes have occurred in the area over the last few years such as paddy husking by

machine, solar energy, irrigation pump, poultry farm, high yielding rice varieties, fish culture, commercial vegetable cultivation, ferrying passengers and goods transportation by trawler, carrying passengers by motorcycle, etc.

Household strategies vary according to time, season, and situation. The households determine and design strategies reviewing the previous strategies and incorporating lessons learned from the past experience, sometimes changing strategies to face a new situation. The present research has attempted to analyze household livelihood strategies considering these issues. For example, it is found that in the study area as a coping strategy, households increase labor supply within the family. Other strategies adopted by the households include livelihood diversification, new agricultural method and seasonal migration.

The livelihood strategy in the *haor* areas is unique. The natural environment has set the tone of their life, coping with disaster and adapts to continue livelihoods in dire circumstances and in the face of calamities. *Haor* livelihoods are more or less dependent on the sustainability of the natural resource base. It is difficult for a household to cope in a disaster situation when assets and social capital are depleted. The seasonality of a resource base is an important determinant and inherent feature of *haor* livelihoods. It is evident from the above discussion that *haor* households develop a long-term livelihood strategy and use short-term coping strategies as well.

4.10.4 Assumptions

Natural disasters are primarily managed by local community in the remote *haor* region.

The people in the study area have been coping with floods and other natural hazards from time immemorial. They have acquired some traditional knowledge through which they are able to cope with flood and its adverse effects. They learn this knowledge through the process of interactions and mutual exchange of views that take place in the family and community. The findings show that external assistance is not the principal support on which most people survive and recover during and after various disasters such as early flood, monsoon and post-monsoon flash floods and the seasonal flood. Rather, it is the local knowledge of the people that mainly determines their both survival and recovery. The local people have to survive on their own capacities and initiatives

because in critical environmental conditions external assistance cannot reach their doors quickly due to disrupted communication and isolated island like villages. Aftermath rehabilitation is also very crucial for the community people.

Development interventions always neither consider local knowledge, practices, customs and values nor harness or capitalize capacity of the local people.

Flood risk reduction interventions should be building upon local knowledge and adaptive strategies for improved flood management in the *haor*. If these valuable aspects are ignored, it is unlikely to achieve long-term benefit. Without ensuring the participation of most vulnerable groups, no development intervention can bring sustainable result. Taking indigenous knowledge and wisdom of the local people into consideration is a pre-requisite for ensuring their participation in development. The recent initiative of the government co-management approach which is being practiced in Tanguar Haor area can illustrate this point. A co-management system for the Tanguar Haor is in place which conserves ecosystem and provides improvement of livelihoods for rural communities. But this initiative faces a number of challenges. Failing to recognize the socio-economic diversity of the community is a serious obstacle to make the community-based organization functional and inspire the community to protect resources.

Women's knowledge, capacity and resilience are often unrecognized.

As revealed by the study, women in flood prone *haor* area take the lead role to build a disaster-resilient household and community in contrast with the stereotyped images of women as passive victims in the aftermath of a disaster. Women are among the most affected by disasters. Existing gender inequalities along with social class, race, ethnicity, and age, put them at high risk in various stages of disaster. Women are portrayed as the victims of disaster, and their central role in response to disaster and post disaster reconstruction is often overlooked. But there is no doubt they are the invisible force of resilience. The findings show in study villages before the flood season, women try to make their houses more resilient to disasters by reinforcing outside walls with locally available resources, increasing the plinth level of house and elevating the level of cow sheds. Women preserve fuels, dry food at home and prepare portable mud stoves (locally called *alga chulla*) for future use. They often collect firewood to store in dry

places for later use. During disasters, women constantly look after children, elderly and PWD family members, and animals to ensure their safety. In the study area, women prepare elevated platforms for family members. When a household faces a food crisis during or after flood, women are responsible for adjusting household food consumption by changing the type of food eaten or by consuming less. When male members become unemployed, daily work for women increases even more as they have to manage resources, feed the family and look after the elderly. In the post disaster period, many women migrate as an adaptation strategy. In post disaster situation women are engaged in rebuilding houses, re-stocking livestock, securing an income, repaying borrowed money, treating affected family members, and restoring other aspects of life such as children's education. Women carry the responsibility of ensuring drinking water needs of the family during the long flood period which last six to seven months a year. The study observes that the social networks of women provide emergency survival support during floods. They are the first to provide nursing care to the most affected family members, before any relief work begins. Women in *haor* area play a major role in risk and emergency management. Taking care of the family in emergencies, taking children and animals to safety, and the storage of food and other essential items, are some of the functions carried out entirely by women in such situations. Women resort to various mechanisms to survive the difficult conditions. Women contribute in a variety of forms, along with their regular chores of preparing food, collecting water and fuel wood. Women contribute to make a household and community disaster resilient in the following three phases, namely: *preparedness phase, response phase and recovery phase*. Unfortunately, roles of women and girls are often unrecognised. But their skills and contributions are crucial in this field. The activities presented here prove that females are capable to make a community disaster resilient.

4.11 Household Level Case Studies

The present researcher examines the mechanisms the *haor* people use to re-establish their livelihood functions using indigenous coping strategies. This section, based on empirical observations, puts forward some actions taken by the households in a crisis period. Such coping actions are intricately related to livelihood resilience. Here the researcher illustrates 'intensive household level cases' that provide details about the real-life struggle in the *haor* villages. The real names of the women respondent in case studies have been withheld to protect their identity and to avoid stigmatization.

Usha Rani's Alternative Livelihood

Usha Rani lives in Rongchi village with her husband and three children. One daughter who is married lives separately. Her husband is a mental patient and unable to do any work. They have homestead land of one *katha* (1.65 decimals) only. Their house is made of thatch with tin-roof. Usha Rani maintains her family with very low income (on average Tk.1,000) from the sale of medicine. She buys some common medicine at wholesale rate from Moheshkhola *bazaar*. To avoid boat fare (seems high to her) she walks about three miles twice a week from Rongchi to Hamidpur village to reach her customers. So, during the monsoon she does not carry on the trade. Usha Rani collects wild plants namely *singra*, *shapla*, *deb*, *shaluk*, *ujauri*, *chaila*, *ugli* (used for fencing) from the *haor*. She manages household chores before she goes out. Every year before flood Usha Rani protects her house plinth by constructing a barricade with bamboo and water-hyacinth. During the previous big flood, she stayed in the house on a *machan* constructed just prior to the calamity. Somehow, she tried to save her cow. She had to collect fodder like water-hyacinth and leaves by banana raft. She kept her cow on the pile of water-hyacinth, fed the animal medicine to save from water borne diseases.

Kartik to *Joishtha* she can earn. In the lean period, she had to borrow money, rice, firewood from the close relatives and neighbors for a short period. She refunded all items in the work season as per commitment. The villagers know her to be an honest and simple person. Once she borrowed money from a moneylender of the neighboring village. Then she was compelled to pay high interest. If paddy borrowed for long time 50 percent extra had to be paid as interest. But for short term loan (15 days) no extra paddy need to be given. She mainly borrowed from relatives and neighbours and also from

other villages. They give money as a fellow villager and well acquaintance. Landless Usha Rani supports a family comprising four members including the mentally retarded husband. To earn her livelihood, she has chosen two marginal occupations upon which one cannot easily depend.

The Case of Laxmi Rani

Laxmi Rani (45) is a widow. Her husband died four year ago. She has four members in the family. She married off two daughters. One son lives with her. She possesses only homestead area, and has no cultivable land. She lives in Batta village since 1995. Laxmi shared that she usually falls in food crisis twice a year during lean periods and at the same time, she and her family decrease their earning sources, and as a result, affecting her and her family members tremendously. *Falgun* and *Chaitra* is the leanest period. When there is no work in the monsoon, she has to borrow money or food from others. They take one meal a day. In addition, taking less preferable food items, reducing amount of food per meal and starving were the regular practice during the months of crisis. During the study period, daily income of her family was Tk. 250 and she had to pay most of income to purchase food. Her family income was so poor and insufficient that she could not provide good foods like fish, meat, egg, fruits, etc., to her children. She mentioned that it is very difficult to maintain a family with this poor income. During the flood, Laxmi used to borrow food from neighbors. Sometimes she borrowed from local moneylenders for the survival of her family. Although the interest rate was very high, she preferred this loan as it was easily available. Laxmi lives in only one room house and she also keeps her ducks and chickens under the cot of the same room. She works as domestic helper in a farm owners house. She does floor polishing, cleaning and firewood (*muitta*) making. In the dry season, she collects cow-dung, *ujauri*, *chaila*, *denga* from *haor*. She also collects *binna* (*khagra*) for house fencing. While collecting these resources, she faces restrictions from beel guards. She picks left over paddy from the field in *Boishakh* and *Joishtha*. Thus, she collects 7-8 *maunds* of paddy in *Boishakh* and *Joishtha*. It covers her four months' food. For the last two years Laxmi has been rearing a cow which she took as '*bhagi*' system from the owner. As per the contract the first calf of the cow along with milk produced will be possessed by Niasha. The second calf will be given to the owner of the cow. Laxmi has taken these alternative livelihoods to reduce the impact of flood hazards.

The Case of Taramoni (widow)

'Taramoni', a widow, mother of three children (one son and two daughters). She married off one of her daughters. The only son who lives at Kalmakanda after his marriage does not take care of her. Another daughter 'Parboti' (12) lives with her in Batta village. She has homestead land of nine decimals. Taramoni grows vegetables in her homestead land all the year round. A portion of the land remains submerged in the monsoon. In her plinth and courtyard, she grows pumpkin, snake gourd, bean, sponge gourd, and banana. The low land goes under water during the monsoon there she grows onion, potato, chili, garlic, lady's finger. With this production, she can meet the family needs. Growth is comparatively high in the winter and she can sell the surplus. Her daily earning stands at Tk. 40-60 in rainy season and Tk. 30-40 in the monsoon. Taramoni collects *ujauri* plant from *Kartik* to *Chaitra* to be used as firewood. She mixes cow-dung with *ujauri* to make '*muitta*', which is sold at Tk. 100 for 100 sticks to the well-off families. Her teenage daughter Parboti collects water plants such as *shaluk*, *deb*, *shapla*, *singra* in the knee-deep water of the beel. To collect these water fruits, she borrows a boat from any intimate person and takes help from some boys on the condition sharing of her collection. To meet the requirement at the time of flood Taramoni preserves dry food items like puffed rice, pumpkin, bean seeds, til, mango bar, red chili, potato seeds, garlic in bottles and hang them inside *shika* (jute nets) for the flood season. Besides, she also keeps jute-sticks for the purpose of fencing house and using as firewood. Above flood water level she made a bamboo stand in the house on which her household items are kept.

The Case of Rahima Begum

Rahima Begum (35) is a housewife of the village Khidirpur of *Dakshin* Bongshikunda Union Parishad under Dharmapasha *upazila* of Sunamgonj district. Her family has 32 decimal lands of which cultivable land is 30 decimal and homestead are two decimals. Her family has now been living their live through farming. When the cultivable land including homestead yard went under water stayed 4/5 months every year, for their day to day nutrition demand they couldnot grow any vegetables. As it is impossible to grow anything in the field, she adopted a method called '*Payela*' for vegetable cultivation in her homestead. Bamboo made basket called '*Payela*' were placed on strongly supported platform made of bamboo at the 5-6 feet height. The '*Payela*' was placed on the

courtyard area. It was treated using local knowledge and was filled with organic fertilizer. Soil prepared through mixing with compost fertilizer and put into the basket. Mainly bottle-gourd, cucumber, pumpkin, green chilly, lady's finger, bean etc were grown in the *payela*. Rahima Begum and her family cultivated three-time seasonal vegetables in a year through change of soil and they could earn 600-700 taka in between three seasons of the year after mitigating their family demand. Sufficient vegetable has been producing that able to fulfill nutrition need in every season. Rahima Begum's family sold their excess vegetable to market thereby generated some income. In this process Rahima Begum has met her daily nutrition demand as well as sold the surplus in the local market from which she has earned additional money. The Payela method of hanging vegetable gardening has been an effective coping mechanism for Rahima's family. This cultivation method provides more production with far less expenditure than traditional agriculture. During flood period, as the family has not any alternative livelihood option, this cultivation supported their livelihoods.

The Case of Bobita Rani Biswas

Bobita Rani's house (having an area of two *katha*/3.30 decimals) is situated in an isolated small land locally called '*Agla Bari*' which looks like an island in the *beel*. The small *Agla Bari* is like an island in the beel. Only two houses in this small land. One house recently has blown in the storm. Bobita's house has concrete pillars, bamboo fences and tin roof in a two *katha* land. Her husband Sanjit Biswas is an agro-worker. The couple has two minor children. Every year Sanjit migrates to Tangail for agricultural work in *Ashar* and comes back in *Vhadro*. He sends money regularly by mobile phone *bkash*. Bobita lives with her mother-in-law who always keeps an eye on the kids so that they do not drown in the flood water. When there is big flood, Bobita shifts along with her belongings to the main land of the village. Bobita takes some flood preparedness measures at her small homestead area. In *Joishtha* she and her husband worked together to protect their house plinth with bamboo barricade and *ujauri*. In the homestead she has sown some vegetable and fruits. She collects firewood (*ujauri*) from *haor*. Bobita goes to Bongshikunda bazar by hired boat to buy commodities for her family. She buys seeds from the local market. She also preserves vegetable seeds (stem amaranth, radish, gourd) in her house. Bobita grows vegetable from *Agrahayan* to *Chaitra*, therefore, she does not need to buy. It was observed that she has kept rice, oil etc. on the cot. Clothes are hung on the house post. She has installed a ring slab latrine.

She got it from an NGO. Bobita borrowed money (Tk. 10,000) from Grameen Bank to make her homestead high and to repair her house. Now she is repaying the loan in installments. She has already deposited Tk. 2000. Bobita is also a member of Tanguar Haor Samilty where she deposits savings every week. During the last flood season, she received 50 kg rice from this *Samity*. Bobita has solar connection in her house.

The Case of Hasne Ara

Hasne Ara (45) is a very poor woman. Her husband who was day laborer died three months ago. Now she is in the care of her elder brother. He donated two decimals of land to her through registration. Hasne Ara has four daughters. Two daughters are married. Other two read in primary school. She runs a shop to maintain the family. She has got financial assistance from an NGO. She invested Tk. 7000 in the shop and bought a cow for Tk. 16000. Hasne Ara purchases different types of goods for the shop from Madhyanagar, Moheshkhola, Bongshikunda, Bishorpasha *bazar* once a week and carry them by engine boat. She sells Tk. 200-250 daily. In the previous big flood, the water reached the surface level of the house plinth. They stayed on the *chang*. She made a portable hearth using which she could prepare only one meal a day. Her brother gave her rice and other items of food. She borrowed one maund of paddy and repaid it in the following season. She did not have to pay interest. Hasne Ara used to stitch *kantha* (quilt) for two and half kg of rice and Tk.60. She managed livelihood of her family in such a way during the big flood.

The Case of Niasha Biswas

Niasha Biswas, aged 23 is a very poor widow from Antorpur village. Niasha has four members in her family. Her husband died 5 years ago. She had to struggle a lot for ensuring the survival of her children. She could not send her children to the school because of economic hardship. Now, two of her sons work as agricultural laborers, earn money for the family. Niasha herself raise livestock and poultry so that some additional money may be earned and that can help the family run smoothly. Livestock and poultry are sold before the monsoon starts as they die during the time of flood. Flooding in each year makes the poultry and livestock die enormously. Niasha says "I'm very much aware about it and therefore sell my livestock and poultry before flooding every year".

Niasha has no land of her own. So, her family lives in brother in law's land where she has built a small house. Niasha mentioned that her kitchen has no roof and is situated

outside of the main part of house. When the problem is aggravated due to excessive rain, she has to cook food from the neighbor's kitchen. In addition, the roof of her house has broken and she lives in a very distressed condition because of her housing condition. Her eldest son (Shyamol) works outside the home for three months (*Shrabon-Ashwin*). For the rest of the time he stays in the village. When there is an opportunity, he catches fish in the *haor*. Shyamol seasonally migrates to any suitable area of Chittagong, Dhaka, Tangail and Bikrampur to earn money through agricultural work related to rice and garlic seeds sowing, potato harvesting or giving household labor at a landowner's house.

It is evident from the above-mentioned case studies that women play a very significant role in household level coping strategies. Women's role become indispensable for the survival of household members during and after flood especially when male migrate to other districts for seasonal work. Widows, deserted women and women with a sick husband have to take charge of the family. At first, they try to join in the labor market. Sometimes they may force their children to do so. Women also try to maintain their livelihoods through other means, for example by earth cutting, cultivating land, work as housemaid, running small business. Women's traditional knowledge and skills has enabled them to cope with disasters for long without leaning on outsiders help. This traditional knowledge must be appreciated and their views need to be considered while planning for disaster risk reduction programmes.

CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS

The final chapter i.e. chapter five deals with summary of the findings, conclusion and recommendations. It provides the conclusions of the research on the grounds of findings and discussions presented in the previous chapter. In addition, this chapter also offers recommendations.

5.1 SUMMARY OF THE FINDINGS

In the summary section, the essence is on presenting the key findings arising from the findings of the study. The issues covered in this section fall in the categories like demographic and socio-economic profile of the households; resilience of the households in terms of physical, natural, economic, social, human, cultural and institutional contexts; and gender issues. The key findings that have been explored through both quantitative and qualitative data are furnished below:

5.1.1 Demographic and Socio-economic Profile of the Households

This section presents a brief demographic and socio-economic profile of the sample households of four studied villages collected through survey. The average family size is estimated at 5.1. In the study villages, the number (18.42%) of female headed households is 13.2 %. The overall literacy rate in the villages under study is calculated as 33.12%. The cycle of economic activities in the *haor* region varies significantly with changes in the seasons. Members of most of the households carry out multiple livelihood activities apart from their primary or main occupation. Farming and fishing are usually considered the major occupations of the heads of households. As the nature of the demand for labor is highly seasonal, employment opportunities drop tremendously in the monsoon period. It is found that within the study villages households of flood-prone area are not affected equally as they vary in source and amount of income, household composition, and apply various coping strategies. The primary group of floods affected people consists of those who have to depend on agricultural labor since their only or major source of income is either on the fields of others or on their own small plots of land. The landless (0-.19 ha) and marginal landowners (0.2-0.9 ha) are around 89% of the total household. Most of the materials for making houses in the study villages come from the *haor* itself. The borrowing details of the households shows that 90.29%

households received loan during the previous 12 months preceding the day of enumeration. If they lose harvest due to early flash flood, they become compelled to sell property (e.g., cows, land property or other assets) to pay the loan. Statistical data show households' average expenditure is Tk. 8600 monthly. Some investment costs are borne by the households on yearly basis (e.g. plinth raising). Some costs such as medical treatment, meeting dowry/marraige expenditure exceed the ability of the poor day laborers. As a result, they often take austerity measures like selling property, borrowing loan at high interest, etc.

5.1.2 Physical Context

The most visible physical vulnerability of the study community means that they are exposed to hazard prone locations. The villages under the study belonging to Tanguar Haor region are situated in the remote places of Bangladesh. So, the physical infrastructure of most of the households has a look of poverty.

Location of the house

It is found 46% of HHs is located in high risk areas keeping them exposed to hazards. Absolutely landless and marginal households have no other option but to settle in unsafe location and they become the most vulnerable to flood hazards.

Local practices for flood prediction or early warning system (EWS)

Since flood is a regular annual phenomenon in the villages of *haor* area, people have rich amount of knowledge regarding prediction of rain and flood. There are mainly twofold typologies of the early warning system which are presently practiced in the study area: i) weather predictions on the basis of environment and ii) weather predictions depending on the behavioral change in animals. Perception of women and men regarding EWS is quite distinct. Men perceive early warning or signal in relation to their daily livelihood activities whereas women visualize it through their close bond with the nature. Local people disseminate flood-alert and warnings using indigenous communication channels and resort to the tested mechanisms for safety or survival when flood appears at their door-steps. In case of flash flood they have very short lead time of few hours only.

Local practices for protecting lives

Drowning in the flood water is a common phenomenon in the *haor* area. There is a danger of traveling by small boat during high tide in the *haor*. In any disastrous situation, the most vulnerable groups in the *haor* area include women, children, the elderly, and people with disabilities. Children in such circumstances are extremely vulnerable. In all the villages families adopt some good practices to protect their children: e.g. constructing fencing barriers across the door, around veranda and courtyard to prevent children from unintended access to flood risk areas. Flood poses substantial social and mental stress to the elderly people that may continue over extended periods of time. This sort of calamity challenges their psychosocial resilience and breaks down morale. The results of this study indicate that though aged persons are vulnerable, they have resources and capacities as well. The study reveals some older men and women have a greater knowledge of indigenous coping practices and risk-reducing practices.

Local practices for protection of houses and homesteads

Every year during the flood season, there is some degree of damage to homestead or village mounds. Before the commencement of flood season people in the study area usually raise the plinth of their houses (89.71%). Often the family members plant trees like *hijol*, *koroch* and *dholkolmi/ujauri* tree around the homestead to increase its stability to face erosion caused by strong wave or *afal*. They construct frame around the house to protect it from erosion during floods using plants, water hyacinth, which is reinforced with bamboo and earth. In most cases house protection initiative is carried out by individual household members, but the issue of common interest e.g. constructing a barricade around the people's cluster-homestead area for its protection is often done by them collectively.

Local practices to have access to water and sanitation

Despite the fact that Tanguar Haor is a large wetland, people do not have access to safe drinking water. Usually most of the tube-wells of the study villages go under flood water during flood. The villagers mentioned installing tube-wells on high ground or raising the platform to deal with this catastrophe. To keep the hand pump of a tube-well above the probable highest level of water people add additional pipe(s) under community initiatives. Many of them (93.14%) use boiled water or purify with alum. It is found some

households harvest rain water traditionally (16.57%). It was found that rain water harvesting, *three-kolshi* method, solar disinfection method are some good examples of adaptation practices of the people in the study area. The villagers have some good practices for sanitation facilities. During flood, some of the respondents made temporary toilet with bamboo, wood and gunny bags or polythene sheet. They raise the ground with earth a little higher than flood level and then install low cost sanitary toilets on there. They raise the plinth of toilets by piling up earth considering the highest flood level.

Local practices for protecting household assets

During flood people living in the *haor* villages keep valuable items like food, clothes, grain, etc. on elevated structure locally called '*machan*'; they hang pillow, bedding (wrapped with polythene) against the ceiling (locally called '*dharna*') of the house; keep utensils in *Shika* (hanging jute net). Some of them keep animals on raised platforms during flood as a flood mitigation measure. They use elevated *dhaner gola* (paddy container) to keep their grain safe from flood water.

Local practices for protecting documents

Valuable documents including land records, certificates, books, etc. are most susceptible to flood. To protect valuable documents people adapt practices based on local knowledge. People keep valuable documents (wrapped with plastic sheets) on the ceiling and to the house post hanging. Other methods include keeping them inside the bamboo stem (its mouth is wrapped with a plastic sheet or cloth); keeping important documents (wrapping with polythene) on elevated shelf or raised platform; some of them keep documents in trunk. Documents stored in this manner are protected from rain or flood.

Local practices for communication and transport

During the monsoon, small boats and floating crafts made of banana stems are the only sources of communication in the villages. People use engine boat to go far away places but to move within the village they use raft made of banana stem, '*hater nouka*' or country boat. Families possessing no boat often depend on other people's boat or sometimes they borrow it from them for the purpose of traveling. Every year, there are incidents of boat capsizing and drowning. People plant Banana trees which are used for making rafts. These serve both as transport and shelter. Small country boats under

private ownership are used to meet emergency needs (e.g. evacuation). In the village, there are carpenters who make boats.

Local practices for protecting infrastructure

Flood cause damage to different types of infrastructures like embankment, education and religious institutions, village roads, bamboo-bridge, tube wells, etc. Community people take collective initiatives to protect these infrastructures from the menace of flood waves. It revealed from field data that protection of the embankment is the primary concern of the community to save the crop from flash flood. Sometimes crops are harvested early due to early flood or flash flood when embankments are not sufficient to save the crops from flash flood. The villagers had to build temporary bamboo bridges on their own initiative to facilitate their mobility within the boundary. In some cases, people construct bamboo bridges by collecting money and materials from the community people who contribute to the initiatives as per their abilities.

5.1.3 Natural Context

More than two-thirds of households in Tanguar Haor is either directly or indirectly dependent on the haor. Data show 80.68% people of the study area go to the *haor* to catch fish and 82.27% of people go to *haor* to cultivate lands and produce crops. Apart from fishing and agricultural purposes, there are other important jobs which attract the local people to *haor*. Various plants and fruits locally known as *chaila*, *reed*, *ujauri*, *singra*, *deb*, *shapla*, *shaluk* that grow in *haor* are of good use to the local communities. These wetland plants are used as food, fuel, fodder, medicinal plants, materials for fencing/thatching, making boat/raft, protecting village mound from waves, and trap for fish. In *Falgun-Chaitra* prior to harvesting of *boro* rice opportunities for income become scarce. Then indigent households go to the *haor* with a view to collecting wild fruits and plants. During the dry season, a considerable number of people go to the *haor* to graze their cattle (19%) and to keep the duck *bathan/flock* (5.83%).

There is a growing conflict over procurement of resources between the community people and the local influentials. The researcher has noticed that the self-serving force dominated social power structure excludes the marginalized from sharing the scarce resources.

5.1.4 Economic Condition

This section examines livelihood portfolio of the households, their economic vulnerability and strategies to overcome economic crisis.

Livelihood portfolio of the households in the *haor* area

Households in the study area need at least two sources of income, because occupational engagements vary in the dry and flood seasons. The survey conducted in four villages of Tanguar Haor area to measure people's livelihood options finds 82.27% of households engaged in farming (both cultivation of owned and leased land and also a day laborer), while 80.68% either as primary or secondary source dependent on fishing. Non-farm day labor provides additional income for 39.17% of the families, while small business activities are a source of income for 34.23% of the families in the villages surveyed.

Farmer's coping practices

The findings show a considerable number of households of the villages have cultivable land (on average 32-64 decimals) and they are involved in crop production. In most cases, landless or people having a very small plot of land, earn their livelihoods by cultivating others' land. This practice of sharecropping locally called '*aadi bhaga*' characterises the economy of the study area. A sharecropper may lose contract if he fails to protect crop from flood owing to inadequate care and vigilance. In the study area, only crop *boro* always face the risk of early flash flood damage, sometimes which comes early, just before the rice harvesting and farmers do not get time to harvest their crops. To cope with this adverse situation local farmers though in small scale follow some adaptive and innovative farming practices. Some of these good practices are based on farmer's traditional knowledge and some are new technology based transmitted from concerned authorities to the farmers. During FGD session, local farmers indicated they adapt various methods. They cultivate short duration rice variety in their small plot of land for saving their only one crop from flash flood. Another method they usually apply is early seeding on seed bed, when flood water recedes early. According to farmers, early seeding followed by early transplanting method can save their *boro* rice from flash floods. Crop damage due to flash flood is a big threat to the people, especially who work as sharecroppers and landless laborers.

Local practices for protecting crops and seeds

Two major factors help people develop their adaptive capacities in agriculture-- crop intensification and diversification. It was observed that in *Dakshin* Bongshikunda farmers practiced mixed cropping of oil seeds (mustard) with paddy. It is found that though the floods cause a severe effect, people are still able to recover some harvest or income because of crop intensification. As a crop diversification strategy, with single rice they accommodate other crops, vegetables, pulses, oil-seeds in the same land. To cope with the changed environment, farmers adapt short duration rice variety (BR-45, '*jagliboro*' a traditional variety) for saving their only one crop from flash flood. They cultivate vegetables, spices, pulses during *Rabi* season and harvested much earlier than *boro* rice to avoid flash flood. To have maximum benefit the farmers sow in the low-lying lands local varieties of seeds and some HYV in slightly high lands so that harvest can take place early. To mitigate crop damage (after flood) they reap pre-mature crops. These adaptation practices not only help reduce the negative impact of flood, but also considerably secure people's livelihoods. To protect crops the local farmers take actions collectively. In *Dakshin* Bongshikunda union people try to construct embankments in front of water streams to stop the water flow.

Seed storage methods

The local farmers of Bongshikunda practice traditional methods of seed storage. Various traditional methods have been identified through this study. The traditional seed storage practices include: storage in *motka* (big sized clay pot), *Payela* (earthen pitcher), '*dula*' (special container made of bamboo, plastic bag and cane). Some of them keep seeds in bottle gourd shell, plastic bags/containers, jute bags, etc. During flood, they preserve seeds in dried form in *dula* which is kept on *machan* or elevated platform. Many farmers mix ash or neem powder with seeds as a means of pest control. Such type of arrangement is noticed in the study villages in *haor* area.

Fishermen's coping practices

During the monsoon months agriculture laborers are engaged in fishing to cope with the vulnerable situation or to earn livelihoods. The local people for their subsistence need to catch in the *beel* and *haor*. Sometimes they have to pay high price for it. The on-duty 'magistrate' and 'ansars' arrest them for catching fish in the *haor*. Their boats and fishing gears are destroyed. They are constantly threatened by the *beel* guards. Many local fishermen receive money in advance from certain buyers (locally called '*Nigari*') for which they are forced to sell their capture to them. The local fishermen who earlier receive money as advance or loan from a *Nigari* are bound to sell only to this lender at a cheaper rate as to repay their loans. This patron-client relationship continues as long as the trade is carried out.

Reasons for the depletion of fish

As perceived by local fishermen, a variety of factors have led to the declining trend in fish stock. The small *beels* are leased out to non-fishermen. Some opined that every year leaseholders' application of de-watering method has resulted in the decreasing the productivity. The local fishermen also admitted their involvement in catching fish fries to keep every individual's body and soul together.

Poultry and livestock rearing

It is found that many people especially the landless raise goats and cows on sharing basis. Although many families rear cattle and ducks at household level, some of them (7%) go to the *haor* and keep cattle and/or flock of ducks (*bathan*) there for the entire dry season of the year. Collection of fodder grass for cattle from the *haor* is also an important livelihood activity of both poor and rich.

Local practices for protecting poultry and livestock

To protect poultry birds from flood damage the households take some measures such as storing feed, keeping them along with cattle on the high stage; with people in a dwelling place; on *bhela* (banana raft) or on floating objects and vaccinating in advance. In order to protect cattle from flood the households store fodder or procure green grass, concentrated feed, rice straw, kitchen byproducts; elevate cattle sheds with bamboo, wood, water hyacinth etc., shift the animals to some school and other high places and

keep them on *bhela* or on some floating objects. It was observed that people use local knowledge to save their poultry and livestock as they are valuable assets. In maximum cases, animals are kept in elevated cattle shed. If necessary, they take their animal to elevated road during flood. They build makeshift shelters in the high and dry places and try to feed them as best as they can. Sometimes they even share their food with the birds and animals. When the low-lying areas of villages are inundated by seasonal and severe floods, livestock is usually shifted to the high land of the locality, flood shelter or in other villages. Mortality rate of domestic animals increases during any disaster. So, some poor families try to avoid risk and sell livestock in an attempt to keep some money at hand.

Vegetable cultivation

In the study villages, almost every house has some cultivable fallow land at the frontal yard. These lands are highly fertile and productive. Household members especially women (wives and young daughters) cultivate vegetables and short duration crop at these lands. Vegetables were found profitable than regular crops in the study area and are possible to harvest before flash flood. Some households were able to overcome poverty period with cultivation of the vegetables.

Fish drying and trading

In the study villages, not all the fishermen dry fish commercially. Nearly 17.96% are found drying fish after *Kartik* (mid October) through *Chaitra* (mid March). Different species of fish are dried when the supply goes up and the price of fresh fish falls down at the local level.

Duck rearing

The practice of keeping indigenous duck is very common in the *haor* villages. Women play an active role in duck farming. Access to water bodies seems to be the critical constraint for them.

Machine driven rice husking

It was observed that during the monsoon some people visit the village by boat equipped with a rice husking machine which is utilized to deliver home service during the rainy

season. About 3.58% households are involved in machine driven rice husking by engine boat.

Selling goods by boat

Operating floating shops or boat shops is a unique livelihood activity in the study area during the monsoon. Vendors, in most cases women and children sell vegetables, home-made or locally available food and other household items by boat to the neighbouring villagers.

Rowing passenger by boat and goods transportation

The survey found that nearly 15% of household members are engaged in rowing passenger boats during the monsoon. Some of them are employed in engine boat/trawler as drivers/laborers.

Non-farm day activities

The non-farm activities include all economic activities in *haor* areas except agriculture, livestock and fishing. It includes self-employment, wage employment, transport operation, shop-keeping, petty trading, etc. In total 39.17% households involved in non-farm activities in the studied area.

Small trade

Home-based shop keeping is familiar in the study area. Traditionally the people in the area run small and petty trade locally called '*ferry business*'. Many women are involved in *ferry business*, hereditarily performed for generations.

Motor cycle riding

There is a provision for hiring a motor cycle to come at Bongshikunda Bazar from different places. Dozens of riders (most of whom are youths) along with their bikes wait for passengers.

Local practices for food security

Survey of the study area finds that 60% of households experience food shortage at least five months a year. Food insecurity becomes acute during *Falgun-Chaitra* (February-March), immediately before harvesting *boro* paddy.

Coping strategies for food during crises

Rural households in the study villages follow different strategies to cope with food insecurity. The major coping strategies as mentioned by the respondents include: over 60% depend on less quality food items, 58.29% reduce food quantity while, 61.71% of the respondents admitted to take loans for buying food, some others borrow food (58.86%); they share meal with neighbors (49.71%); rely on casual labor for food (44.0%), engaging children in work (43.43%), gather wild food (58.29%); sell household items (49.71%); and 30.86% sell advance labor.

During the normal flood period households try to be involved in alternative income sources to keep their existence near subsistence level. But in case of prolonged flood or early flood they switch over to austerity measures like increased dependence on credit and exchange of goods/commodities among households. If such sources are fully exhausted, then they dispose of their productive assets, which severely weaken their current and future income potential. Migration is the strategy taken by the poor as part of livelihood diversification.

Food preservation techniques

The households in flood prone villages adopt a variety of strategies for food preservation. Prior to floods, households store dry food such as *chira* (flattened rice), *muri* (puffed rice), grinded rice, *gur* (molasses), and dried vegetables. Usually, in most households, jute-made hangers, locally known as *shika*, can be found where they store these dry food products. Fish drying is done during dry part of the year mainly from *Magh* to *Chaitra* and it is preserved for three to six months. In most cases the food preservation works performed by women. People usually take these preparedness measures one or two months before flood.

Households' surviving strategy during lean period

Falgun and *Chaitra* (before boro rice harvesting) is the most severe crisis period in the *haor* area, when the marginal farmers and ultra poor people do not have any food at home to eat. It was found that household members adopt a number of coping strategies during lean period.

Gathering/collection of wild foods

When the ultra-poor households cannot afford to buy normal food, they resort to other ways of coping. Often, they search for wild foods viz. *singra*, *shapla*, *deb*, *shaluk*, roots, *kui*, or wild plants. Usually women and children make attempts to collect water fruits and plants from the *haor*. After fulfilling family requirements, they sell the surplus to the indigent.

Sharing of food

During the recent big flood people shared their foods with the neighbours; if any household had the ability to arrange two/three meals, it would try to feed the members of other poverty-stricken household in the true sense. In this way, they helped one another and built up social cohesion.

Firewood and cooking

Supply of fuel for cooking is scarce in the area. In order to carry out uninterrupted cooking 98% of households preserves fire wood/fuel in advance. Collection, preparation and preservation of firewood are basically women's job. Often firewood is collected in advance. In reply to a question about mechanism for cooking food during flood, 97% of the respondents stated arranging portable mud stove prior to any probable flood. It is placed on a cot, banana raft or any other suitable place inside the house. Female members carefully cook common food so as to save fuel and time.

Impact of flash flood on livelihood pattern

The researcher looks at how livelihoods are affected by the flood. This was done by comparing household strategies before and after the flood. The results show shifts in livelihood strategies between the pre-and post-flood periods. Flood causes serious impact both on social and economic aspects of livelihood of the households. Temporary

displacement of household members has many social implications. It revealed from the seasonal calendar that the total income from different sources declined after the post-flood period. Income generation opportunity reduces greatly, during the flash flood. The amount of loan increased significantly during the post-flood period. Flood during the monsoon months of *Ashar* and *Shrabon* causes low income. In this period fishing becomes difficult and risky. Affected poverty-stricken households take loan on high interest from '*gerostho*' to meet basic needs.

Changes in livelihood strategies in the context of social change

Introduction of small-scale irrigation facilities and high-yielding varieties of rice have brought about some changes in their food and livelihood security situation. In the past. More and more people are taking up vegetable production as commercial basis. Commercial poultry was introduced in the area a few years ago. Some fishermen are now more involved in fish trading than fishing. During the monsoon season, innovative irrigation pump driven rice mills are very common in the study area. The introduction of shallow tubewells (STW) has created an expansion of small-scale irrigation and therefore, become a popular means of irrigation. More and more people are taking up vegetable production as commercial basis. Poultry was almost entirely home-based, but commercial poultry was introduced in the area a few years ago. Some fishermen are now more involved in fish trading than fishing. Many people are now using irrigation pumps for paddy husking traditionally which was done by *dheki*. The increasing use of mechanical rice mills has lightened the work burden of women. Paddy husking by auto machine, doing business and paddy husking by boat, irrigation by pump are some new additions to rural life in the *haor* area.

Changes in occupation in the past few years

Some new occupations have emerged such as mobile phone business and service centre, *bkash* service, mobile charge by solar power, renting shallow machine, transporting passengers by motorcycle, etc. Small-scale fish cultivation is mainly a secondary occupation for farmers at least for five months (*Kartik* to *Boishakh*). The researcher observed that the smaller paddy husking machines that are located on the boat usually deliver home services during the rainy season. There are some farmers and

agricultural labourers who temporarily shift to other occupations when they lose the crop due to flashflood, which is accelerated by their loan to *mohajan*.

Vulnerability of the households in terms of economic condition

This section examines the vulnerability of the households in the *haor* area in terms of economic aspects viz. access to market, insufficient scope for institutional credit and chronic indebtedness.

Access to market

Local people cannot easily transport their crops, vegetables, small fish, chicken, egg, milk etc. to the market and get good prices from sale. Ultimately, they endure the suppression of the middlemen. In most cases *pikars* usually buy items from the village.

Insufficient scope for institutional credit

The study reveals that poor people are mostly deprived of economy related amenities from the government. The farmers are not aware of the bank loan facilities and most of them are afraid of paperwork needed to receive a loan. A number of microcredit service providers such as Grameen Bank, ASA and BRAC are found operating in the study villages, which provide loans especially for women. Some women of the study villages use the money to start micro business such as small shop, ferry business, handicraft, paddy business and poultry farms in their courtyards.

Chronic indebtedness

Almost 90% of the households reported taking loans during the year prior to the interview. Households take loans primarily to maintain families during crisis or off-fishing period (in the dry season or at the time of flood). Once the crops are lost or houses are damaged, households tend to take loans from *mohajans* or mortgage their land to *mohajans* for borrowing money. Some take loans from micro credit institutes to rebuild houses or to pay loans to others. The researcher observed various conditions of money lending systems prevailing in the area. It is common that many poor households sell their valuable assets to repay the loans taken from moneylenders who are very rigid and realize amount of loaned money by any means. The local people when face crisis due to unavailability of livelihood opportunities especially during flood time, they seek help from the affluent neighbors who try to respond positively.

Control over local resources

During the monsoon period, the entire *haor* becomes inundated and at this time, it is impossible to demarcate privately owned land from *khash* water bodies. Local administration typically leases out the *khash* water bodies (*beel*) inside the *haor*, but leaseholders establish control over the entire *haor*. Fishers cannot catch fish in their own land during the monsoon period. Then the leaseholders thus become “water lords”. They expand their control over the *haor* areas as far as water is seen and they are so powerful that the poor fishers cannot challenge them. About two thirds of the households living in the villages regularly visits the *haor* in order to collect natural resources that are considered to be their life-blood. They face constant threats from various quarters having vested interests.

Livelihood Strategies to Overcome Economic Crisis

It was found that household members adopt a number of coping strategies to recover from disaster related losses. The strategies include use of social networks and relationships, livelihood diversification, reduction of expenses such as changing food habit, engaging women and children in work, advance labor, distress selling, borrowing, working for extra hours, temporary or permanent migration etc. One of the major factors that help recover immediate losses is activation of social networks and relationships. Such a measure expedites opportunities to raise household income. Household members take a number of strategies including reduction of expenses such as changing food habit and engaging women and children in income generating activities. As a coping strategy, some ultra-poor people sell their labour in advance at low rate; others sell their household assets, etc. The study found that sometimes all household members seasonally migrate to other places in search of work. They take some ‘austerity measures’ in regard to food intake and use of resources. Some of them take future risk to meet present needs i.e. selling household belongings, selling labor in advance, and taking loan at higher interest all these can be termed as ‘Risk Transfer’.

Livelihood diversification trend

The study explores livelihood diversification trend of the household. They take a number of strategies to recover from disaster related losses and damages. As mentioned earlier,

the study area belongs to a single-crop community. The only option available to them for diversification is to try improved varieties rather than local *boro* crop. Another example of livelihood diversification is related to paddy business. Some small farmers temporarily become traders, buy paddy from the local marginal farmers just after the harvesting period and sell to big businessmen at a profit. Fishers are excluded from their rights to fishing due to the current leasing policy and negative role of local power structure. As a consequence, fishers either opt for fish related business like buying and selling fish or the business of dryfish. Another way of diversifying is to share fishing with leaseholders. It is revealed from the data that a significant portion (39.17%) of respondents reported that they switch over to off-farm day laborer as an alternative income source. The findings reveal that household members are changing their mindsets regarding choice of occupations. They try to do other jobs apart from what they have learned for generations. It is evident that agricultural laborers and fishers are involved in the activities connected with multiple sectors like day labor, small business and other self-employed occupations.

Social network and social capital

In the remote study villages, the people's social network and social capital play an important role for flood risk reduction. The support provided by the community to their neighbors reflect in the forms of visible and invisible supports which can be classified as emotional (love, care, affection and closeness e.g. taking care of children, elderly people, PWDs) and tangible (money, food, transport, shelter, tools and equipment, taking care of belongings and domestic animals).

Engage women and children's in income generating activities

As a coping strategy, households resort to engage women and children in income generating activities. In the poor family, children are usually engaged in income generating activities to enhance its income.

Distress sale of household items

To recover from property damage (e.g. house), caused by flash flood, households sell their assets including trees, cows, ducks, hens, furniture (table, chair, alna, cot), paddy,

agricultural land and mortgage their land to *Mohajans* to take loans. In most cases, they fail to repay the loans and sell the mortgaged land.

Doing laborious work for extended period

As a strategy to recover from loss and damage of flood affect some household members work for an extended period of time and engage themselves in laborious and risky work. Many of the agricultural workers are involved in day labor like soil digging or goods carrying.

Reduction of household expenses

The flood affected people in study area take some 'austerity measures' in regard to food intake and use of resources. Households reduce food intake so that they can save money to pay installments.

Migration as a livelihood strategy

Since seasonal floods disrupt the traditional means of livelihood, the temporary migration strategy works as an adjustment mechanism for the poor households. So, for the people of Bongshikunda union belonging to this category seasonal migration is a crucial way of maintaining livelihood as well as coping with natural disasters. In the study villages around 40% of the households resort to seasonal migration during the months of *Joishtha—Ashwin* when there is no employment opportunity. Seasonal migration is mainly undertaken by agricultural laborers -- above 80% of migrants work in the agriculture sector in both their homeland villages and destinations. Many households invested remittances in more diverse livelihoods such as run small shops, lease in land, raise cattle and deal in particular crops/commodities and thereby they reduce extensive disaster risk. There may be some *de-facto* female headed households as a consequence of the absence of male members for a long time. During this period, the female members have to carry out responsibilities of their families.

5.1.5 Social Context

This section presents vulnerability and resilience of the haor households from social perspective.

Social capital

Social bond among neighbors is a great capital for them. Social capital plays an important role in finding a job on the boat. It helps secure a job when they migrate to other districts. Credit/loan from non-formal and informal networks is taken by the households to expedite their livelihood related activities. Borrowing money without collateral is the proxy of social capital. As revealed by the study the villagers help a family to construct a new house, relocate household stuff, grow crops, process harvest and provide service for ailing patients at the time of unfavorable situation. They also help others by lending money, boat and carrying out all sorts of major activities such as providing physical labor for house construction and repairment, boat making and repairment, carry new boat to float in water, help lift the tin up to the house roof, put the boat into the water, etc. Many examples of social capital exist in the study area where most of the households collaborate with each other in respect of sowing seeds, planting seedlings in the land and harvesting crops. There are evidences that the big land owners provide shelter for flood victims.

Forms of Social Capital

Labor as well as food sharing during all types of crises is a tradition in the villages under study. The respondents stated that they try to cope with disasters taking help from the neighbors e.g. use of boat, moving to high land, procuring daily necessities from the market, house or *shako* repairing etc.

Kin

Kinship relations are important for borrowing food and money and most importantly, for seeking advice and coping with adversity. Generally, the families of close relatives living in the same area and the people of neighborhood are on good terms.

Neighbors

During an emergency, neighbors assist the people in most critical need. They help take ailing patients to the hospital by boat.

Patron-client relations

The patron-client relationship is a very common and vital support system prevalent in the

locality. The relations of the poor with the rich like land owners, leaders, moneylenders and *pikars*, fall in this category. Support is provided in the form of lending money, buying labor in advance, providing shelter, etc.

Networking

The researcher found that social networks and relationships helped the respondents' family to gain government scheme such as VGD cards, credit support from NGOs and to get jobs when unemployment was acute in the post-disaster period. Moreover, social networks and relationships help to obtain informal loan. This study also focuses on the role of social networks in expedite seasonal migration.

Social solidarity

As revealed by the study, community people's pro-active action towards flood hazard is taken through solidarity and common identity. When flood water seems to breach the embankment that protects *boro* crop, the community people collectively do earth work or place mud to save it. The researcher finds these collective actions often occurring spontaneously and informally with significant impact on the people's livelihood.

Social linkage

The village people have their traditional knowledge in monitoring water level during any flood. If there is a possibility of big flood, the youth groups help evacuate the most vulnerable elderly people, women, children, PWDs to a secure place. People work together to build a temporary embankment every year to protect crop fields from flood. The neighbors arrange treatment for the wounded during and after disaster. In order to facilitate easy communication among the hamlets bamboo bridges are built utilizing local resources and self-labor.

Local practices for maintaining health and nutrition

The study findings reveal that inhabitants in the study villages carry out indigenous practices as a remedy for some common illnesses namely fever, cold, diarrhea, skin disease etc. Many people in the *haor* area use herbs and medicinal plants – such as *tulsi*, *patahrkuchi*, *neem* -- to treat illness caused by flood. Mainly women are found carrying out this practice in almost every village of the study area.

5.1.6 Human Capital

This section presents resilience of the *haor* households in terms of human capital. In doing so it explores indigenous knowledge capital, resilient skills and technological coping strategies.

Indigenous knowledge capital

In the context of disaster-prone villages in the study area the respondents have advantages including disaster experiences, which give them the ability to cope with, adapt to, and recover from disasters. For instance, people's knowledge on the location, time, duration, frequency, intensity, predictability of previous hazards plays an important role in building their resilience.

Resilient skills

Examples of skills that can contribute to natural disaster preparedness include knowing how to swim, local practices for fishing, knowledge related to carpentry (boat/raft making), bamboo weaving; construction of elevated platform called '*machhan*' to keep belongings, fowls, goats and sheep safe from flood, fishing crafts and gear; shika making; local practices for agriculture; flood resistant houses, building houses on plinth/platform; false roofs.

5.1.7 Cultural Context

This section examines vulnerability and capacity of the *haor* households with regard to cultural dimension that includes people's perception about disaster risk, ideas about food security, important rituals, and traditional labor sharing system and food beliefs and taboos.

People's perception about disaster risk

People living in the study area in *haor* know they have to face flood every year and devastation may occur at some intervals but never give up. The inhabitants of the *haor* villages perceive disaster as part of their life. Through struggle with adverse situation they have attained the skills required to cope with flood. Despite hazard threats, people opt to live in their ancestral land with a hope that they will resume their normal life after the disaster.

Perceptions about food security

To the majority of men and women, food security is meant eating rice, vegetables and fish daily. Women prefer to stock food at home rather than keeping money in hand. Their view-point is very simple. If there is food in stock, they will not have to ask their husbands to buy it.

Important rituals

The risk associated with flood, lightning, thunderstorm, *afal* (strong wave) creates more or less anxiety among them, but their fear is minimized through some ritualistic behavior. Rituals related to uncertainty have become integral part of their life in the isolated *haor* villages. During a storm, they make a lot of noise using wooden stick, tin, and utensils. The act takes their fear away. They believe storm will go away if they ring a bell and perform religious worship. It is evident that observance of rituals presumably acts as an adaptive strategy to get rid of anxiety which can reduce many individuals' abilities to function effectively in dangerous and highly unpredictable situations. There are social implications to the observance of typical rituals. It strengthens the commonly shared ties and moral values, thus strengthening the 'solidarity' within the community through building up a group feeling.

5.1.8 Institutional Arrangement to Manage Flood Risks in Haor Area

As *haor* people live in remote areas they have limited access to different organizations.

Services of Government, NGOs and Local Institutions in the study area

The government initiatives to manage flood are visible only in post-disaster response phases such as providing relief to the flood affected people, give out seeds and fertiliser for the next harvest. When flood occurs, relief provisions are operated through Union Parishad in village level. At the union level these incentives become politicized (i.e., provided to selective farmers). As a result, actual victims mostly remain out of recovery incentives coverage.

Flood and Role of Local Government Institutions

Union Parishad is the only government institution poor people have easy access to get service at first during flood. For lack of financial capacity to make decisions

independently, the local institution is required to work under the guidance of *upazila* (sub-district) and district administration. As a result, it becomes difficult for the local intuitions to allocate funds according to the deserving people's needs and demands. It is found that the ultra-poor households are deprived of receiving services from the local government. The local people's common perception is that they always protect the vested interest ignoring the poverty-stricken masses.

NGO services

The respondents mentioned they are affiliated with NGOs mainly for credit facilities and relief. By and large, these NGOs' programs aim to improving the overall living conditions of the *haor* people. However, their interventions are too small compared to the broader needs of the people. Often, there are problems in terms of necessary coordination.

5.9 Resilience of Women

Women are the heads in around 18.42% of households where they take responsibilities for protecting houses and other belongings, taking care of children, elderly members and raising livestock. Women possess a strong body of traditional knowledge, which is used in disaster mitigation and coping. Their traditional practices have passed the true test of time and have contributed immensely to reduce their immediate vulnerabilities against natural hazards.

Gender Roles

The research tries to explore which role women perform in normal and flood time. The findings reveal that significant segments of female respondents in the study area involve in productive aspects such as pre and post-harvest activities, poultry and livestock rearing, small shop keeping, duck rearing, *mateer kaj* (earth cutting), vegetable gardening, seed preservation, etc. Women perform reproductive chores such as care and maintenance of households and members; ensuring food availability; fetching water; preserving fuel; cleaning homestead areas; plinth raising; bamboo fencing around homestead; etc. Many of them are involved in disseminating warning; constructing temporary embankment to protect crops as community role.

Women's role in household economy

Apart from discharging normal duties, women firmly take part in some income generating activities to determine resilience of the household.

Implications for household division of labour

Women's responsibility and workload increase manifold during severe flood. In addition to the responsibilities outside the household, they have to look after others, especially-- children, elderly and sick members, prepare meals every day.

Women need to perform immediately after flood water recedes. They protect house plinth by constructing bamboo barricade covered with water hyacinth. They clean flood-damaged home, polish house floor with mud, repair house fence, clean the dirt from yard, repair cattle shed, etc.

Women's social capital

In crisis situation women's informal network plays crucial role for household level livelihood security. Food borrowing is mostly the affair of women. Interest free loan of small amount of money taken by the needy from kind hearted people is an operational definition for social capital in the context of the study area.

5.2 CONCLUSIONS

This study aims to reveal that indigenous knowledge as well as experience of the community people is a precious resource that can support the process of disaster preparedness and response in cost-effective, participatory and sustainable ways. It is imperative to understand, acknowledge, respect and recognize the whole process as a valuable tool for reducing disaster risks in the study area.

The present study has analyzed the problems experienced by the individuals, households and village community of the flood affected *haor* area during and aftermath of flood, their preparedness and mitigation initiatives, coping mechanisms and adaptation strategies, and emergency response. The study answers the questions formulated to discover natural hazards like floods are being managed primarily at household and community levels depending on the people's own capacities. Answering the questions, it is found that the people have developed local knowledge and coping strategies to reduce the negative impact of flood hazards over many years. However,

there are some lacks of initiatives and overall capacity of the local people, especially in creating opportunities to interact with others and to get access to external resources. It was found that many poor households have no links with other groups and institutions outside the village. Because of the households' inability to build and maintain their social capital, many of them fail to cope with flood impacts and become resilient.

The researcher captures the idea that understanding local knowledge and practices of the *haor* community may help identify what is needed and acceptable locally and how people's participation can be solicited to ensure their support for external action. Integration of indigenous knowledge in existing practices and policies encourages the participation of the affected community and empowers its members to take the leading role in all disaster risk reduction activities. Additionally, this study confirms the concept that efficient management of the flood risks seems to be difficult without taking into consideration the invaluable indigenous knowledge of the local people. Based on this, the study recommends the following steps for further development of disaster management endeavors considering the expertise of local people.

5.3 RECOMMENDATIONS

The recommendations are offered on the basis of findings and discussions as follows:

5.3.1 Recommendations for policy makers

Despite possessing rich traditional knowledge and experiences the communities in the study area are given very little attention by disaster planning mechanisms. Conventional efforts to mitigate the negative impacts of floods often tend to focus on infrastructural development (e.g. in the study area crop protection embankment, submersible roads, school cum flood shelter, culverts, village protection wall) or technological solution (such as sophisticated early warning systems). These solutions obviously save lives and livelihoods when hazards affect the *haor* communities; however, they need to be complemented by actions to address the underlying components of vulnerability i.e. human, social and cultural factors that influence risk and contribute to turning a hazard into a disaster (Wisner et al., 2004).

In order to ensure the safe access of the local people to natural resources, the small powerful groups' *de facto* control over *beel* and *haor* based natural resources should be abolished. In concurrence with the present government policies careful initiatives should be taken to establish the rights of the poor fishermen to natural resources of the *haor* and its surrounding areas. Proper authority must foil any conspicuous attempt taken by the local powerful group(s) to exclude the poor from possessing natural resources. Government's special attention is required to strengthen local institutions, giving full autonomy to local institutions so that they can mobilize and generate enough financial capital to respond to a disaster.

Avoiding bureaucratic complexity and corrupt practices easy loan for agriculture must be provided for the small and medium farmers. To halt depletion of fishery resources commercial leaseholders must not be allowed to dry up the canals and *beels* for the purpose of catching fish. Destructive fishing practices such as using current *jal*, *uizza* fishing should be banned by authority. Awareness building and advocacy related initiatives need to continue as well.

5.3.2 Recommendations for Practitioners

The following recommendations are offered for practitioners in the field of flood risk reduction.

01. Life Protecting Measures

Early warning system should be established in consistent with local knowledge and dissemination practices. Informal communication channels and local institutions can be used for this purpose.

The school cum flood shelter is not adequate to the needs of the flood affected villagers. Big flood shelters should be constructed in the neighboring villages with adequate facilities. The common infrastructure e.g. primary school and high school building outside the village which are used as flood shelters during emergencies should be renovated by involving the local community and institutions.

02. Structural Measures

It is revealed that house protection and repair related activities are normally carried out by the individuals and households. The people take concerted efforts to construct or

rebuild community infrastructures such as *katcha* roads, bamboo bridges, education and religious institutions, etc. Necessary support encouraging the existing community endeavors with regard to protect these community infrastructures must continue. It is found that every year in the study area crop protection embankment collapses due to flood. During this emergency period, the local people work together to repair the embankment to protect crops. Material and technical support should be provided by Water Development Board and the local administration to enhance this community initiative. It is suggested that, the embankment erection, maintenance and repair should be done by involving community people. Therefore, community participation should be ensured in the flood risks management of *haor* area. Support is needed for village protection from *Afal* (huge water wave) through construction of village protection wall (like protection wall constructed at Rongchi village). It is needed to initiate social afforestation to reduce disaster damage.

03. Agriculture and Fisheries

The agro-based marginalized people such as agricultural day laborers are susceptible to livelihood vulnerability due to loss of income opportunity. To protect the livelihood of these poverty-stricken people it is essential to protect agriculture. Promotion of early varieties of paddy seeds is important for crop diversification. Introduction of short duration *boro* variety fully secure from flash flood must improve the livelihood of the people of the *haor* area. Flood tolerant crops should be promoted. Local experience and knowledge ought to be considered along with modern scientific knowledge for agricultural development. Thus, people will be more encouraged to accept innovative additions. Agricultural technology and input support should be made available to them.

In the study area, there is land which is comparatively high and usually fallow (locally known as *Kanda*). These plots of lands offer bright prospect for crop diversification and intensification. These fallow '*Kanda* Lands' are also found potential areas for growing some kinds of vegetables. Poor people's access to *kanda* land should be ensured. The study therefore recommends that vegetable cultivation should get high priority while considering adapting new crops. Utilizing the fallow land and increasing cropping intensity in high land is essential for agricultural production.

04. Livelihood Diversification

In reducing the disaster risk on livelihoods, it is important to create employment opportunities for the marginal farmers and fishers. Promoting access to skills and technologies along with providing necessary backup support is the key to create new employment opportunities for the seasonal unemployed people. Facilitation of trade-based training is important to involve seasonally unemployed people in the income generating activities. There is a need to strengthen the asset base of households aiming at enabling women to increase their resilience to the negative impact of flood.

The study recommends few livelihood options emphasizing the support for duck, poultry, cow and goat rearing, fish culture in order to reduce pressure on natural resources. The small farmers should receive training from the concerned govt. and non-govt. agencies on advanced agricultural methods for crop and vegetable production. Relief program following flash flood should cover agricultural input support.

Creating value chain for some selected trades such as duck, fish and vegetables is very potential income generation options for the people in the *haor* area. Cash and food for work, subsidy, etc. need to be arranged during lean period to ensure food security.

05. Reducing Dependence on Middlemen

The people of the study area were found heavily relying on middlemen for marketing of their products such as fish, dried fish, vegetables, eggs, chicken, handicrafts, etc. They are often deprived of fair prices. To overcome the problem alternative sources of credit for the small producers, fishermen need to be created so that they reduce borrowing from the middlemen. The study suggests that improving access to the retail market and link groups with nearby wholesale market have to be facilitated so as to enable the local producers to get fair prices.

06. Education and Health

The findings indicate that students' drop out rate is high in the study area due to a number of reasons such as transportation problem during the monsoon (parents are reluctant to allow their children to travel by boat or banana raft), labor intensification within the family (poor parents employ their children to enhance income). Some essential steps should be taken to increase school attendance with the arrangement of mid-day meal, school transportation facility (boat is convenient for the *haor* area). Need-

based academic calendar for the *haor* area introducing the monsoon vacation instead of summer schedule may be helpful to adjust class routine and avoid seasonal interruption. Introduction of floating school or school on boat (Brac has introduced such boat school called '*Shikkha Tori*') for drop out students especially for girls is expected to increase literacy rate in this remote *haor* region.

Everybody knows carrying an ailing patient to the hospital is difficult. To address this problem health camp may be arranged in the remote *haor* villages at regular intervals. Water ambulance can be an alternative option for carrying ailing people, especially pregnant mothers. To reduce risks in health sector it is important to ensure the supply of sufficient lifesaving medicine, water purification tablets and saline during post flood period. The village doctors need to acquire necessary skills through undergoing training to become paramedics and give initial medical treatment to the local patients.

07. Water and sanitation

There is a scarcity of potable water in the *haor* area even during the flood season which results in breaking out of water borne diseases. To mitigate this problem rain water harvesting is one of the best options. Technologically viable, health hazards free and low-cost rain water harvesting individually or collectively may be the best option for the community people. Public Health Department of the govt. in association with voluntary organizations may take adequate steps to make this innovative method popular and acceptable to the society. Pure drinking water and water purification tablets distribution is also necessary during and after flood. Connecting required number of pipes to tube-wells in low-laying areas and installing latrines above flood level are preconditions for primary health care. Water sealed latrines should be installed on high land. Floating hygienic toilet construction methods should be demonstrated by the concerned authority.

08. Protection for the most vulnerable people

The most vulnerable people of the study area were found to be deprived of safety net benefits (VGD, VGF, etc). Proper measures must be taken to do justice to them. These vulnerable people also have capacities to perform numerous roles in the family and community. For example children are able to disseminate messages, identify risks, draw maps; elderly people have knowledge and experience of disaster risk reduction, long experience of living with flood, hazard history, good at caring for dependent children;

physically challenged persons have capacity for performing many tasks (e.g. it is found in the study village a physically challenged person can fish in *beel* and collect firewood by boat). Through disaster risk reduction efforts government and NGOs should utilize the capacity of children, elderly persons and PWDs. They should not merely be considered to be passive recipient of relief; they may become active contributors to their families and community's well-being.

09. Local institutional structure for disaster management

In Bangladesh, Union Disaster Management Committee (UDMC) is the lowest tier to oversee any calamity related affairs. Though there is a proposal for formation of ward level committee, no measure has yet been taken regarding the issue. Taking the condition of the isolated and island like villages into consideration, this study proposes to form Disaster Management Committee at the grassroots level in *haor* area. This committee will run independently and maintain coordination with the UDMC for village development work. To avoid duplication NGOs working in the same villages should support the existing committee instead of forming a new group. Capacity building program should be taken for the village committee members. Every village committee should select volunteers to expedite its activities. NGOs may be encouraged to facilitate village committees with a view to establishing linkage with higher level committees namely UDMC, *Upazila* Committee and various GO and NGO service providers. The village committees should hold community meeting to identify the needs and problems of women and vulnerables groups. The village committee with the support of union committee members should initiate to feed these findings into union level disaster management plan. The research findings show that at present roles performed by the local government at *Uttar* and *Dakshin* Bongshikunda unions are mainly centered on post disaster relief operation. The UDMC is not active and people are not aware of their roles. In this case, government's special attention is required to strengthen local institutions, giving full autonomy to local institutions so that they can mobilize and generate enough financial capital to respond to a disaster. Union and *upazila* disaster management committees should be more proactive. These local disaster management committees should prepare risk reduction plans contemplating the needs of community people. Vertical and horizontal coordination among village level committee, volunteer

group, and union and *upazila* committee is essential to reduce disaster risks at the local level through mobilizing community resources as well as generating external funds.

10. Gender Specific Role

It is found that during and after flood women face various types of problems that are different from their male counterparts. Women's gender specific role such as ensuring food, water, cooking, firewood collection, caring family members create extra pressure on them during flood. To reduce the burden of women's workload and to address women's practical needs some need based solutions should be identified by the actors involved in disaster management in the study area. For example, ensuring drinking water at their doorsteps, improved cooking stove, installation of hygienic latrine, maternity health services will make women's life easy. Relief materials, nutritious food (if possible, cooked), water purification tablets, sanitary napkin considering women's need may be provided.

There is a need to strengthen the asset base of households aiming at enabling women to increase their resilience to the negative impact of flood. It is found that women adopt many flood coping strategies, which are crucial for household survival. It is important to ensure involvement and participation of women in policy and decision making, sharing their experiences for flood risk reduction. It can be done through creating an opportunity for women's participation and leadership on various committees at village, ward and union levels. Women's problems and needs should be considered in hazard risk assessment, risk reduction plans, implementation and evaluation. Risk reduction measures should be taken based on women's specific problems and needs. To enable women to take leadership in disaster management, they need to be trained on disaster preparedness and developed as volunteers. Furthermore, it is imperative to encourage them to take leading role in relief operation.

Finally, the main objectives of the study are to explore the use of indigenous knowledge and practices in the *haor* area to reduce the adverse impact of flood disasters. It is revealed by the study that the poor people of the study villages are extremely vulnerable to flood hazards in both physical and social terms. However, they possess certain coping skills and show resilience to disaster losses in various perspectives. The adaptive capacity of the local communities has been severely curbed by a number of socio-

economic and political factors of which the mention-worthy are natural resource degradation, marginalization and exclusion of the poor from natural resources by the powerful groups. Effective management and access of the poor to natural resources and enhancement of autonomy of local institutions are required for building resilience of the people living in remote isolated *haor* villages.

Understanding local knowledge and practices can help identify what strategies are needed and acceptable locally and how people's participation can be solicited to ensure their support for external action. Integration of indigenous knowledge in existing practices and policies is expected to vibrate the participation of the affected community and empower its members to take the leading role in all disaster risk reduction activities. The study finds that external assistance is not the principal means through which most people survive during and recover after various disasters such as early flood, flash flood and the monsoon floods. Rather, it is the local knowledge of the people that determines their survival during flood and in the immediate aftermath of the calamity. The present research firmly believes that efficient management of the flood risks will be truly effective and meaningful if consideration is attached to the local people's enormous abilities as well as their invaluable indigenous knowledge.

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Interview Schedule

Indigenous Flood Coping Strategies towards Livelihoods: A Study in Haor
Area of North-East Bangladesh

Researcher

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Institute of Social Welfare and Research

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General information:

Name of the Respondent : _____

Age :

Name of HH head : _____

Address Village:..... Para (Hamlet):.....

Union: Uttar Bongshikunda Dakhsin Bongshikunda

Upazila: Dharmapasha Zilla: Sunamganj

Household Members: Total = Male = Female =

Local orientation : For how long have you been living in this locality? Years

Section 1. Demographic and Socio-Economic Profile of the Households

1.1 Demographic Profile of the Studied Households

Sl. No	Name	Relation with HH	Sex 1-M, 2-F	Age (yrs)	Marital Status	Education	Occupation		Income (monthly)	
							Normal time	Flood time	Normal time	Flood time
	A	B	C	D	E	F	G	H	I	J
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

Code:

B* Relationship: 1. HH head, 2. wife, 3. son, 4. daughter, 5. father, 6. mother, 7. brother, 8. sister, 9. daughter-in-law, 10. son-in-law, 11. grandson, 12. nephew, 13. niece, 14. father-in-law, 15. mother-in-law, 16. brother-in-law, 17. sister-in-law, 18. Others (please mention)

E* Marital status: 1. Unmarried, 2. married, 3. divorced, 4. separated/ abandoned, 5. widow, 6. polygamist, 7. NA

F* Education: Actual years of schooling/education completed viz. 1 = class one completed; 2 = class two completed; not applicable = 99; no education = 00

G*, J*: Occupation: 1. Cultivation (owned and leased land), 2. Agri-worker also a day labourer, 3. Fisherman, 4. Non-agricultural labor, 5. Small trading, 6. Ferry Business (selling goods by boat or on foot), 7. Livestock rearing , 8. In house poultry, 9. Duck rearing in Bathan, 10. Fishing labor arot, 11. Fish drying and trading, 12. Vegetable gardening, 13. Ferrying people by boatman, 14. Engine Boat/Trawler driver/laborer, 15. Constructing bamboo bridges (machan) for crossing canal, river, 16. Bamboo craft, (paddy container, basket, 17. Fishing gears (net weaving, making chai, bair), 18. Sewing, 19. Thelagari Driver, 20. Horse Cart, 21. Buffelo Cart (carrying paddy), 22. Motor cycle rent, 23. Domestic worker in gerostho house, 24. Carpenter (boat, house), 25. Mechanic/technician, 26. Fish cultivation, 27. Fuel wood collection and sell, 28. Collecting fruits and plants from haor, 29. Fodder collection, 30. Paddy husking business (on engine boat), 31. Selling goods on boat, 32. Harvesting paddy on sharing contract, 33. Stone-related work, 34. Coal-related work, 35. Sand-related work, 36. Beel guarding, 37. Earth work, 99. others (please mention)

1.2 Landholdings of the Households

1.3 Land ownership (lands operated/owned) by the households (Tick)

A. Land category	B.Types of ownership	C. Area/size of the land	
		None	Decimal
Homestead			
Cultivable lands			
Other (please specify)			

Ownership code B*: 1 own/record, 2. Khas (government owned), 3. Family's common property (yet to be divided), 4. Lease in, 5. Live in other's land, 99. Others (specify.....)

1.3 Housing Condition

A. Pattern	B. Construction materials
Floor	
Wall	
Roof	
C. No. of Room	
D. Kitchen	

Code: B* Construction materials: 1. Earthen: 2, brick: 3, concrete: 4, thatch: 5, wood: 6, bamboo: 7, reeds and plants, 8. jute stick, 9. tin: 10, tally: 99. others (please mention)

D* Kitchen: Inside-1, Separate-2

1.4 Household Assets

1.4.1 What types of assets do Households Possess?

1.4.1.1 Agricultural equipment:

- | | | | | | | | |
|------------------------------------|--------------------------|---------------------|--------------------------|----------------------|--------------------------|-------------------|--------------------------|
| 1. Plow | <input type="checkbox"/> | 2. Spade | <input type="checkbox"/> | 3. Crowbar | <input type="checkbox"/> | 4. Husking pedal | <input type="checkbox"/> |
| 5. Hollow basket for keeping grain | <input type="checkbox"/> | 6. Sickle | <input type="checkbox"/> | 7. Chisel | <input type="checkbox"/> | | |
| 8. Axe | <input type="checkbox"/> | 9. Chopper | <input type="checkbox"/> | 10. Hoe | <input type="checkbox"/> | 11. <i>Katchi</i> | <input type="checkbox"/> |
| 12. <i>Moi</i> | <input type="checkbox"/> | 13. Tilling devices | <input type="checkbox"/> | 14. Threshing device | <input type="checkbox"/> | | |
| 15. Water pump | <input type="checkbox"/> | | | 16. Power tiller | <input type="checkbox"/> | | |
99. Others (please mention.....)

1.4.1.2 Fishing Equipment:

- | | | | | | | | |
|-------------|--------------------------|-------------|--------------------------|----------------|--------------------------|-------------------|--------------------------|
| 1. Polo | <input type="checkbox"/> | 2. Chai | <input type="checkbox"/> | Flash Light | <input type="checkbox"/> | 4. Hook | <input type="checkbox"/> |
| 5. Push Net | <input type="checkbox"/> | 6. Lift Net | <input type="checkbox"/> | 7. Current Jal | <input type="checkbox"/> | 8. Triangular Net | <input type="checkbox"/> |
99. others (please mention.....)

1.4.1.3 Poultry and Livestock:

- | | | | | | | | |
|------------|--------------------------|---------|--------------------------|-----------|--------------------------|------------|--------------------------|
| 1. Chicken | <input type="checkbox"/> | 2. Duck | <input type="checkbox"/> | 3. Cow | <input type="checkbox"/> | 4. Buffalo | <input type="checkbox"/> |
| 5. Sheep | <input type="checkbox"/> | 6. Goat | <input type="checkbox"/> | 7. Pigeon | <input type="checkbox"/> | | |
99. others (please mention.....)

1.4.1.4 Domestic durable items

- | | | | | | | | |
|-------------------------------------|--------------------------|------------------------------|--------------------------|-----------------------------------|--------------------------|----------------|--------------------------|
| 1. Cot | <input type="checkbox"/> | 2. khat | <input type="checkbox"/> | 3. <i>Machan</i> /bamboo platform | <input type="checkbox"/> | | |
| 4. <i>kantha</i> (home made quilt). | <input type="checkbox"/> | 5. Almirah | <input type="checkbox"/> | 6. Trunk | <input type="checkbox"/> | | |
| 7. Table | <input type="checkbox"/> | 8. Chair | <input type="checkbox"/> | 9. Shelf | <input type="checkbox"/> | 10. Crockeries | <input type="checkbox"/> |
| 12. Clothes | <input type="checkbox"/> | 11. Big paddy boiling cooker | <input type="checkbox"/> | | | | |
| 13. Bamboo shelf beneath the roof | <input type="checkbox"/> | | | | | | |
99. Others (please mention.....)

1.4.1.5 Transport

1. Bicycle 2. Boat 3. Engine Boat 4. Motor Cycle
 5. Horse Cart 6. Van

1.4.1.6 Domestic valuables:

1. Solar Panel 2. Television 3. Mobile
 4. Sewing Machine
 99. Others (please mention.....)

1.4.2 Asset Ownership

1. No asset 2. Poor assets 3. Few assets 4. Countable assets

1.5 Water & Sanitation facilities

1.5.1 Sources and use of water

A. Soource	B. Use of water		C. Who fetches water
	Dry Sesaon	Monsoon	

Code: A* Sources: 1. Deep tube well, 2. tube well, 3. ring well, 4. rainwater, 5. *haor*/pond/canal/river, 99. other sources (please specify.....)

B* Use of water: 1. Drinking, 2. cooking, 3. washing clothes, 4. bathing, 5. washing utensils, 6. bathing livestock, 7. cleaning homestead, 99. Other sources (please specify.....)

C* Who fetches water: 1. husband, 2. wife, 3. son, 4. daughter, 5. other male members of the family, 6. other female members of the family

1.5.2 Type of latrine used the household members

A. Household members	B. Type of latrine used	
	Dry Season	Flood Season
Women		
Men		
Children		
Elderly		
Person with disability		

Code: B* Type of latrine: 1. *Pacca* (water sealed), 2. *Pacca* (non-water sealed), 3. Ring slab, 4. *Kancha*/Hanging toilet, 5. Boat/banana raft, 6. Open defecation (bush, field, backyard, *haor*), 7. inside the house, 99. Other sources (please specify.....)

1.5 Borrowing and Savings Pattern

1.6.1 Do you have borrowed money from anyone? (Yes-1, No-2)

1.6.2 In which months/period have to take loan?

1.6.3 Amount of Loan, Source and Usage

A. Amount of loan	B. Sources	C. Usage
Up to 10000 Tk.		
Up to 20000 Tk.		
Up to 30000 Tk.		
Up to 40000 Tk.		
Up to 50000 Tk.		

Code: B* Sources of loan: 1. Moneylenders, 2. relatives, 3. friends, 4. neighbours, 5. *pikar/nigari*, 6. NGO, 7. Village *Samity*, 8. Bank, 99. Other sources (please specify.....)

C* Use of loan: 1. '*Gerosthi*' or domestic purposes, 2. Feeding family members just after disasters, 3. Investing in land (land lease/purchase), 4. Agricultural/purchasing equipment, 5. Meeting treatment expenditure, 6. Meeting dowry/marriage expenditure, 7. Fishing equipment purchase, 8. Boat purchase, 9. Poultry and livestock purchase, 10. To rebuild/repair their houses, 11. To repay loan taken from other sources, 12. Fish business, 13. Investment in business, 14. Education, 15. Early flash flood, 16. Daily necessities purchase, 99. Other sources (please specify.....)

1.6.4 Do you have any savings? (Yes-1, No-2)

1.6.5 If yes please mention where do you deposit savings?

1. NGO 2. Commercial Bank 3. cooperatives
 4. Small earthen or plastic bank 5. Land Lease in 6. Village Samity
 99. Other sources (please specify.....)

1.6.6 Amount of savings

Amount	Put <input type="checkbox"/>
Up to 1000	
1000-5000	
5000-10000	
10000-20000	
Above 20000	

1.7 Average Monthly Expenditure per Household

1.7.1 How much did you spend last **month** on the following items?

Items	Monthly Expenditure (Taka)
Food	
Clothing	
Domestic necessary items	
Health/Treatment	
Fuel	
Transport	
Total expenditure	

1.7.2 How much did you spend last **year** on the following items?

Items	Yearly Expenditure (Taka)
Agriculture	
Education	
House construction/repair/rent	
Boat	
Fish/Poltry/Livestock	
Fishing Gear	
Land Purchase/Lease	
Business	
Lease	
Social Programme	
Total Expenditure	

SECTION: 2 VULNERABILITY AND RESILIENCE OF THE HAOR HOUSEHOLDS WITH RESPECT TO PHYSICAL ASPECTS

2.1 Location of the house

1. Exposed to high hazard risk areas 2. Moderate risk area 3. Low risk areas

2.2 Local Practices for Flood Prediction or Early Warning System (EWS)

2.2.1 How do you predict flood based on your observation of local surroundings?

2.2.1.1

2.2.1.2

2.2.1.3.....

2.2.2 What preparations do you take for the impending floods?

2.2.2.1

2.2.2.2

2.2.2.3.....

2.3 Local Practices for Protecting Life

2.3.1 What measures do you take to protect children during flood period?

2.3.1.1

2.3.1.2

2.3.1.3.....

2.3.1.4 Not Applicabe.....

2.3.2 What measures do you take to protect Elderly and Sick during flood period?

2.3.2.1

2.3.2.2

2.3.2.3.....

2.3.2.4 Not Applicabe.....

2.3.3 What measures do you take to protect PWDs during flood period?

2.3.3.1

2.3.3.2

2.3.3.3.....

2.3.3.4 Not Applicabe.....

2.3.4 Did you stay home or evacuated during the last big flood?

1. Stayed Home 2. Evacuated/shifted to other place

2.3.5 If stayed home please explain why?

- 1. There was very short lead time due to flood appeared very swiftly
- 2. There was no other place to go
- 3. To guard the house and property
- 4. Fear of losing houses and property by strong wave (*afa*)
- 5. High land already occupied
- 6. To take care of animals and properties such as cattle, paddy, and household items
- 99. Others (specify)

2.3.6 Why evacuated?

- 1. To save life 2. There was hardly any dry place to stay
- 3. Houses were completely inundated 4. They had nothing to eat
- 5. Communicaton disrupted 6. Problem of movement
- 7. Problem of staying in the house and taking food
- 8. No work opportunity 9. Problem for cooking
- 10. Fear of poisonous insect attack (big ants, snake, and rats) from dead trees
- 99. Others (specify)

2.3.7 If evacuated and shifted to other place please explain where?

- | | | | | | |
|---------------------------|--------------------------|------------------|--------------------------|----------------------|--------------------------|
| 1. School/flood shelter | <input type="checkbox"/> | 2. Other village | <input type="checkbox"/> | 3. In high road | <input type="checkbox"/> |
| 4. Near market | <input type="checkbox"/> | 5. Near mountain | <input type="checkbox"/> | 6. On the embankment | <input type="checkbox"/> |
| 7. Migrated | <input type="checkbox"/> | | | | |
| 99. Others (specify | | | | | <input type="checkbox"/> |

2.4 Local Practices for Protecting Houses

2.4.1 During flood period what do you usually do to protect the house?

- 2.4.1.1
- 2.4.1.2
- 2.4.1.3.....

2.5 Local Practices for Ensuring Water and Sanitation

2.5.1 Do you face problem for drinking and cooking water availability during flood?

(Yes-1, No-2)

2.5.2 If yes what coping mechanisms do they employ at hamlet/village level to ensure water availability?

- 2.5.2.1
- 2.5.2.2
- 2.5.2.3
- 2.5.3.4

2.5.3 What vulnerability do you face for sanitation and defecation during flood?

- 2.5.3.1
- 2.5.3.2
- 2.5.3.3.....

2.5.4 If yes what coping mechanisms do they employ at HH and Community level to ensure good sanitation practices?

- 2.5.4.1
- 2.5.4.2
- 2.5.4.3

2.6 Local Practices for Protecting Household Assets

2.6.1 During flood period what do you usually do protect household assets (*Kantha*, clothes, utensils, seeds, livestock)?

2.6.1.1

2.6.1.2

2.6.1.3

2.7 Local Practices for Protecting Documents

2.7.1 Before and during flood period what do you usually do to protect valuable documents?

2.7.1.1

2.7.1.2

2.7.1.3

2.8 Local Practices for Resilient Transport

2.8.1 During flood period what do you usually do to travel within and outside village?

Mode of Transport			
Dry Season		Flood Season	
Within village	Outside village	Within village	Outside village

Code: 1. Country boat, 2. Engine Boat, 3. Raft, 4. Motor Cycle, 5. Horse Cart, 6. TomTom Car

2.8.2 What kind of transport used for emergency needs (e.g. evacuation, supplies).

2.8.2.1

2.8.2.2

2.8.2.3

2.8.3 Do they have transport repair capacity with community? (Yes-1, No-2)

2.9 Local Practices for Protecting Infrastructure

2.9.1 What is the vulnerability to infrastructure (roads, bridges, school, shelter) of the village?

2.9.1.1

2.9.1.2

2.9.1.3

2.9.2 What measures are taken by the local people to protect infrastructure (roads, bridges, shelter)?

2.9.2.1

2.9.2.2

2.9.2.3

SECTION: 3 VULNERABILITY AND RESILIENCE OF THE HAOR HOUSEHOLDS WITH RESPECT TO NATURAL ASPECTS

3.1 Use of local resources for livelihood

Local Resources	Access to Resources		
	No access	Sometimes face restrictions	Free access
Access to <i>Khas</i> land for living and residence			
Use of <i>Kanda</i> land for grazing and cultivation			
Aquatic plants and fruits of haor			
Others			

3.2 Which natural resources they collect from the haor? What is the use of these resources?

A. Natural resources	B. Use
Land	
<i>Jalmohal</i> (canal, <i>beel</i> , haor)	
<i>Kanda</i> land	
Aquatic fruits (<i>Singara</i> , <i>deb</i> , <i>shaluk</i> , <i>shapla</i> , <i>kui</i>)	
Grass, plants (<i>chaila</i> , reed)	
Tree (<i>ujauri</i> , <i>arjun</i> , <i>neem</i> , <i>tulshi</i> , <i>hijal</i> , <i>koroch</i> , <i>nol khagra</i>)	
Water hyacinth	
Others	

Code: B* Use: 1. Agriculture, 2. Fishing, 3. Grazing, 4. Duck *bathan*, 5. Food, 6. Fuel, 7. Fodder, 8. Commercial, 9. Medicine, 10. House construction (fencing, roof), 11. Protection of house plinth, 12 Fishing tools, 13. Boat making, 99. Others

3.3 Has natural resources depleted? (Yes-1, No-2)

3.4 Reasons

3.4.1

3.4.2

3.4.3

SECTION 4: VULNERABILITY AND RESILIENCE OF THE HAOR HOUSEHOLDS WITH RESPECT TO ECONOMIC ASPECTS

4.1 Agriculture

4.1.1 What are the effect of flash flood and early flood on crops

4.1.1.1

4.1.1.2

4.1.1.3

4.1.2 Local practices for protecting crops from flood

4.1.2.1

4.1.2.2

4.1.2.3

4.1.3 How they preserve seeds?

4.1.3.1

4.1.3.2

4.1.3.3

4.1.4 If you take land for share-cropping what conditions you need to comply with?

4.1.4.1

4.1.4.2

4.1.4.3

4.1.5 Do you cultivate vegetables in the homestead? (Yes-1, No-2)

4.1.6 If yes what vegetable do you cultivate?

- | | | | |
|--|--|--|----------------------------------|
| Ladies Finger <input type="checkbox"/> | Potato <input type="checkbox"/> | Cauliflower <input type="checkbox"/> | Cabbage <input type="checkbox"/> |
| Ash Gourd <input type="checkbox"/> | Long Bean <input type="checkbox"/> | Tomato <input type="checkbox"/> | Raddish <input type="checkbox"/> |
| Spinach <input type="checkbox"/> | Stem Amaranth <input type="checkbox"/> | Water spinach <input type="checkbox"/> | Gourd <input type="checkbox"/> |
| Pumpkin <input type="checkbox"/> | Red Amaranth <input type="checkbox"/> | Arum <input type="checkbox"/> | Brinjal <input type="checkbox"/> |
| Carrot <input type="checkbox"/> | Basil <input type="checkbox"/> | | |

4.1.7 What type of flood tolerant crops they grow?

4.1.7.1

4.1.7.2

4.1.7.3

4.1.8 What adaptive agricultural practices do you follow for protecting crops from flood?

4.1.8.1

4.1.8.2

4.1.8.3

4.2 Fishing

4.2.1 What problems do you encounter while fishing in *haor/beeel*?

4.2.1.1

4.2.1.2

4.2.1.3

4.2.2 Who create obstacles while fishing?

1. Lease holder 2. Local influentials 3. Magistrte

4. Ansar 99. Others (specify)

4.2.3 Do you sell fish? (Yes-1, No-2)

4.2.4. If yes to whom?

1. To villagers 2. *Pikar/Nigari* 3. Local *Bazar* 4. Big *Bazar*

4.2.5 Do they make fishing equipments and sell it? (Yes-1, No-2)

4.2.6 If yes, what are those?

1. *Polo* 2. *Chai* 3. Hook 4. Net 5. *Bair*

6. Push Net

4.2.7 Whom they sell these equipments?

1. Villagers 2. *Pikar/Nigari* 3. Local Bazar

4. Big Bazar

4.2.8 Has fish population depleted? (Yes-1, No-2)

4.2.9 Reasons for the depletion of fish?

1. *Ujja* fishing 2. *Beel* leasing 3. Drying *beel* for fishing
4. Catching brood fish 99. others (specify)

4.2.10 How do you feel about the current *jalmohal* management (co-management) in compare to early days? (Good-1, Bad-2)

4.2.11 Reasons?

1. There is a controll of fishing in *haor* 2. Now we can fish in *beel/haor*
3. Reduced control of local powerful people
99. Others (specify)

4.3 Local Practices for Protecting Poultry and Livestock

4.3.1 What are the vulnerabilities to poultry and livestock rearing during flood?

1. Float away 2. Diseases 3. Diarrhea 4. Food Scarcity
5. '*Khura Rog*' 6. Lack of shelter 7. No dry place
99. Others (specify)

4.3.2 During flood period what do you usually do to protect poultry and livestock?

Protecting poultry

- 4.3.2.1
4.3.2.2
4.3.2.3

Protecting livestock

- 4.3.2.4
4.3.2.5
4.3.2.6
Not applicable

4.4 Local Practices for Food Security

4.4.1 How many days you can run your family with the crops you produce in your lands?

4.4.2 What coping strategies do you adopt for food during crises?

Sl. No.	Strategies	Rare	Sometimes	Often	Always
4.4.2.1	Rely on less preferred and less expensive food items				
4.4.2.2	Borrow money or food from friends/relatives/neighbours				
4.4.2.3	Borrow money from NGOs				
4.4.2.4	Borrow from mohajon				
4.4.2.5	Rely on casual labor for food				
4.4.2.6	Stop sending children to school for saving money or engaging them in work				
4.4.2.7	Sell cattle/livestock				
4.4.2.8	Gather wild food				
4.4.2.9	Consume seed stock held for next season				
4.4.2.10	Share meal with neighbors				
4.4.2.11	Send household members to eat at relatives/neighbors house				
4.4.2.12	Sell advance labor				
4.4.2.13	Sell lease/mortgage land				
4.4.2.14	Sell household items				
4.4.2.15	Restrict consumption by adults in order for small children to eat				
4.4.2.16	Limit/reduce amount of food per meal				
4.4.2.17	Reduce number of meals per day				
4.4.2.18	Skip a meal				
4.4.2.19	Sell trees				
4.4.2.20	Depend on relief				
4.4.2.21	Participation in cash/food-for-work programs				

4.4.3 Sources of Mian Food Items

Sl. No.	Food Items	Normal Time			Flood Time		
		A. Own Prod.	B. Bought	C. Others	A. Own Prod.	B. Bought	C. Others
1	Rice						
2	Vegetables						
3	Pulses						
4	Potato						
5	Fish						
6	Meat						
7	Egg						
99	Others (specify)						

Code: C* Others: 1. Share food with neighbors, 2. Borrow, 3. Relief, 4. Govt. Aid, 5. Food for work

4.5 Food preservation techniques

4.5.1 Do you preserve grain and other staple foods for crises period? (Yes-1, No-2)

4.5.2 If yes how do you preserve it?

A. Food Items	B. Preservation techniques	C. Who does this work
Rice		
Flattened rice		
Chilli		
Onion		
Mollases		
Potato		
Pumpkin		
Jut leaf		
Pickles		
Pulses		
Fish		

Code: B* Preservation techniques: 1. Dried in the sun, 2. Broiling, 3. Boiling, 4. hanging on rope, 5. preserved in plastic container, 6. Crushing, 7. put on raised platform or machan, 99. Others.....

C* Who perform theses works: 1. Self, 2. Husband, 3. Son, 4. Daughter, 5. Mother in law, 99. Others.....

4.5.3 Coping strategies for food during crises

Do you gather/collect wild foods from haor and forest? (Yes-1, No-2)

4.5.4 If yes what type of food?

1. *Singara* 2. *Deb* 3. *Shaluk* 4. Water lily
 5. *Jui* 6. Arum 99. Others.....

4.5.5 Who collect wild food?

- Self Husband Son Daughter Others

4.6 Fuel/Fire wood:

4.6.1 Do you preserve firewood for flood time? (Yes-1, No-2)

4.6.2 If yes plz tell what types of fuel wood you use?

1. *Ujauri* 2. Branches of hijol korocho 3. Grass
 4. *Nol Khagra* 5. Reed 6. Leaf
 7. Cowdung 8. *Tush* 9. Wood powder
 10. Coal 99. Others

4.6.3 Who collect/prepare?

1. Self 2. Husband 3. Son 4. Daughter
 5. Mother in law 99. Others

4.6.4 How do you preserve fuel wood during flood?

- 4.6.4.1
 4.6.4.2
 4.6.4.3

4.6.5 What do you usually do to cope with cooking vulnerabilities?

- 4.6.5.1
 4.6.5.2
 4.6.5.3

4.7 VULNERABILITY AND RESILIENCE OF THE HAOR HOUSEHOLDS WITH RESPECT TO ECONOMIC ASPECTS

4.7.1 What is the effect of flash flood on primary income source of the household?

- 4.7.1.1
 4.7.1.2
 4.7.1.3

Access to market:

4.7.2 Is there any opportunity to sell your produce in the market? (Yes-1, No-2)

4.7.3 If yes plz tell what type of product and where you sell it?

A. Items	B. Where you sell
Vegetables	
Fish	
Poultry	
Livestock	
Milk	
Egg	
Fishing gear	
Handicrafts (Plz specify)	
Others (Plz specify)	

Code: B* Where they sell product: 1. Pikars roam around the village, 2. Local bazar, 3. Big bazar

Borrowing:

4.7.4 Have you borrowed money at high interest rate? (Yes-1, No-2)

4.7.5 If yes what is the condition of interest?

4.7.5.1

4.7.5.2

4.7.5.3

4.7.6 How do you repay loan?

1. Re-loan 2. Selling HH assets 3. Selling land

4. Wage 5. Selling fish 6. Selling trees

7. Selling paddy 8. Selling vegetables 9. Business profit

10. Income through migration 11. Selling poultry and livestock

99. Others (specify.....)

4.8 Household strategies to overcome financial crisis resulting from flood hazards

Alternative livelihood:

4.8.1 What alternative income sources you are involved in during flood?

4.8.1.1

4.8.1.2

4.8.1.3

Social network and social capital:

4.8.2 When there is no work opportunity, family go through economic hardship, from whom you get support and how?

4.8.2.1

4.8.2.2

4.8.2.3

Labor intensification within the family:

4.8.3 Do women and children participate in economic activities during crisis? (Yes-1, No-2)

4.8.4 If yes what kind of work they do?

Activities	Women (√)	Children (√)
Pre-harvesting works (<i>khet nirano, gocha lagano, roa lagano</i>)		
Haouse maid		
Earth work		
Advance labor		
Livestock		
Fishing		
Fuel wood collection		
Drying paddy in the sun		
Others.....		

Advance labor:

4.8.5 Are you and your family members involved in advance labor? (Yes-1, No-2)

4.8.6 If yes plz tell what kind of work?

4.8.6.1

4.8.6.2

4.8.6.3

Distress selling:

4.8.7 Have you ever compelled to sell household assets during crisis? (Yes-1, No-2)

4.8.8 If yes plz tell what you have sold?

Land Household stuff Tin Livestock Poultry

Fishing gears Trees Transport

Others (specify.....)

Work for extended period of time and doing laborious works:

4.8.9 Do you have experience of working for extended period of time and doing laborious works?

(Yes-1, No-2)

4.8.10 If yes plz explain

4.8.10.1

4.8.10.2

4.8.10.3

Reduce expenditure, change food habit:

4.8.11 Do you change food habit in your family to recude expenditures? (Yes-1, No-2)

4.8.12 If yes plz explain

4.8.12.1

4.8.12.2

4.8.12.3

Migration as a Livelihood Strategy

4.8.13 Does anyone of your family migrate seasonally for income during flood? (Yes-1, No-2)

If yes plz explain:

Women				Men			
A. Where they migrate (district)	B. What type of work they do	C. How many days they stay away in a year	D. How their family benefitted?	E. Where they migrate?	F. What type of work they do	G. How many days they stay away in a year	H. How their family benefitted?

B*, F*: Type of work: 1. Agriculture, 2. Sand/stone/coal mining, 3. Garments, 4. Fish Arot, 5. Vegetable Market, 6. Rickshaw, 7. Van, 8. Day Labor, 9. Gerostho, 10. Potato cultivation, 11. Push car, 12. Poultry farm, 13. Mason, 99. Otehrs

D*, H*: How their family benefitted: 1. Meet family expenses by remmittance, 2. loan repayment, 3. land purchase, 4. House construction/repair, 5. Small business, 6. Health treatment, 7. Marriage of son and daughters, 99. Otehrs.....

4.8.14 What problems do you encounter while *men* of the households migrate to other places to earn?

4.8.14.1

4.8.14.2

4.8.14.3

SECTION: 5 RESILIENCE OF THE HAOR HOUSEHOLDS WITH RESPECT TO SOCIAL ASPECTS

5.1 Social capital

5.1.1 Can you give example of collective action or the entire community working together during flood?

5.1.1. 1

5.1.1. 2

5.1.1. 3

5.1.2 Who are the most helpful to you when you are in severe crisis and how they provide assistance?

5.1.2. 1

5.1.2. 2

5.1.2. 3

5.1.3 Do you have any linkage with any Samity/Organization?

Village Samity Tanguar Samity NGO Samity Fishermen Samity

99. Otehrs

5.2 Health and Nutrition

5.2.1 Where do you go for treatment?

Local Healers (*kabiraj, Baidya*) Village doctor Pharmacy owner

Health Center/Hospital

5.2.2 How do they carry ailing patient to helath center/hospital at far distant area?

5.2.2. 1

5.2.2. 2

5.2.2. 3

5.2.3 What are the local practices for treatment of common diseases?

Fever :

Cold and cough:

Diarrhea :

Skin disease :

Maternal health :

5.3 Children's Education

5.3.1 What are the vulnerabilities to children's education due to flood?

Cannot go to school Fear of boat drowning

Damage of education materials

5.3.2 In what activities children remain engaged in supporting their families instead of going to school?

Look after siblings	<input type="checkbox"/>	Work in others land	<input type="checkbox"/>	work in own land	<input type="checkbox"/>
involved as family farm workers	<input type="checkbox"/>	Livestock and poultry rearing			<input type="checkbox"/>
Collecting water fruit from haor	<input type="checkbox"/>	Collecting firewood			<input type="checkbox"/>
Otehrs (Plz specify.....)					

5.3.3 What good practices can be observed in respect of children’s education in the study villages?

5.3.3. 1

5.3.3. 2

5.3.3. 3

SECTION: 6 VULNERABILITY AND RESILIENCE OF THE HAOR HOUSEHOLDS WITH RESPECT TO HUAMAN ASPECTS

6.1 Human Capital (Indigenous knowledge capital)

6.2 Resilient skills

6.2.1 Do you and your family have the following skills that can contribute to natural disaster preparedness?

Swimming	<input type="checkbox"/>	Fishing technique	<input type="checkbox"/>	Local agricultural practices	<input type="checkbox"/>
Fishing crafts and gear	<input type="checkbox"/>	Boat/raft making	<input type="checkbox"/>	Making shika	<input type="checkbox"/>
Bamboo weaving	<input type="checkbox"/>	House plinth raising	<input type="checkbox"/>	Falls roof making	<input type="checkbox"/>
Machan	<input type="checkbox"/>	Otehrs (Plz specify.....)			<input type="checkbox"/>

SECTION 7: RESILIENCE OF THE HAOR HOUSEHOLDS WITH RESPECT TO CULTURAL ASPECTS

7.1 People’s perception about disaster risk:

7.1.1 Perception about disaster (*durjog*)

.....

.....

.....

7.1.2 Despite hazard threats why you opt to live in this hazard prone land?

To guard the house	<input type="checkbox"/>	Fear of stealing household stuff	<input type="checkbox"/>
Fear of losing dignity if migrate	<input type="checkbox"/>	Emotional attachment to ancestral land	<input type="checkbox"/>
	<input type="checkbox"/>		<input type="checkbox"/>

Family and neighborhood ties With a hope normal life will resume after disaster
Othehrs (Plz specify.....)

7.2 Perceptions about food security (Men and women)

7.2.1 What kind of food and how many meals a day will make you feel food secured?

- 7.2. 1.1
- 7.2. 1.2
- 7.2. 1.3

7.3 What are the rituals observed in the villages centre around uncertainty and risks?

7.3.1 Risks associated with flood, lightning and thunderstorm, strong wave (*afal*), and fishing in haor

- 7.3. 1.1
- 7.3. 1.2
- 7.3. 1.3
- 7.3. 1.4

7.3.2 Food beliefs and taboos with regard to pregnant mothers, lactating mothers.

- 7.3.2. 1
- 7.3.2. 2
- 7.3.2. 3

SECTION: 8 VULNERABILITY AND RESILIENCE OF THE HAOR HOUSEHOLDS WITH RESPECT TO INSTITUTIONAL ASPECTS

Involvement with local social organizations

8.1 Do you participate in social, political and other institutions? (Yes = 1, No = 2)

8.2 If yes what is that?

a. With whom	b. What are the services provided by this organization that help reduce flood risks?
Union Parishad	
NGO	
Tanguar Haor Samity	
Others (Plz specify)	

Code: B* 1. Relief, 2. Loan, 3. Agri inputs, 4. Food, 5. Medicine, 99. Others (Plz specify)

GO-NGO Services

8.3 What GO-NGO services are available pre-during-post flood period?

- | | | |
|--|---|---|
| 1. Relief, <input type="checkbox"/> | 2. Agri inputs <input type="checkbox"/> | 3. Aid <input type="checkbox"/> |
| 4. Financial <input type="checkbox"/> | 5. Tin <input type="checkbox"/> | 6. Food for work <input type="checkbox"/> |
| 7. Drinking water <input type="checkbox"/> | 8. Medicine <input type="checkbox"/> | 9. Clothes <input type="checkbox"/> |
| 99. Others (Plz specify) | | |

8.4 Safety net programmes

What are the benefits your family received in the last one year?

- | | | | |
|------------------------------------|---|---|---------------------------------|
| 1. VGD <input type="checkbox"/> | 2. VGF <input type="checkbox"/> | 3. FFW <input type="checkbox"/> | 4. CFW <input type="checkbox"/> |
| 5. Relief <input type="checkbox"/> | 6. Elderly pension <input type="checkbox"/> | 7. Widow Allowance <input type="checkbox"/> | |
| 99. Others (Plz specify) | | | |

SECTION: 9 GENDER

9.1 Role of Men and Women in Household Decision-making with regard to Flood Situation

Sl.	Decisions	Who take decision		
		Men	Women	Jointly
1	Collect food			
2	Raising the plinth of the house			
3	Preservation of food and fuel			
4	Child vaccination			
5	Collecting wild food			
6	Borrowing food			
7	Borrowing money			
8	Sale of product (vegetables, poultry, livestock, egg)			
9	Take cow as 'aadi borgha'			
10	Daily necessities purchase			

11	Land purchase/sale, lease in and out			
12	Fishing equipment sale/purchase			
13	Move to other place before or during hazard			
14	Maintenance of family in husband's absence			
15	Repairing the house			
16	Cleaning surroundings of courtyard			
17	Migration of male			
99	Others mention)			

9.2 Gender Roles

List of Activities	Normal Time		Flood Time	
	Women	Men	Women	Men
A. Productive Work				
Pre harvest activities				
Post harvest activities				
Food and seed preservation				
Paddy business (on engine boat)				
Stone and coal related work				
Poultry and livestock rearing				
Fuel wood collection				
Rice husking by machine (on boat)				
Small shop keeping				
Fish drying and trading				
<i>Kantha</i> stitching				
Fishing gears (net weaving, making chai, bair)				
Fodder collection				
<i>Mateer kaj</i> (earth cutting)				
Vegetable gardening				
Collecting aquatic fruits and herbs (deb, shaluk, singra, shapla),				
B. Reproductive Work				
Care and maintenance of household and members (children, elderly, PWDs)				
Care for sick				
Prepare food				
Ensuring food availability				
Fetch water				
Preserve fuel				
Clean homestead areas				
Repair cowshed				
Repair house				
Plinth raising				
Bamboo fencing around homestead				
C. Community Work				
Build temporary embankment to protect				

crops				
Repair tube well				
Evacuate vulnerable people				
Disseminate warning				
Guard house				
Guard the animals and other property				

9.3 How do women manage food during crisis period when the male migrate?

.....

.....

.....

9.4 What additional role women perform during and after flood?

- 9.4.1
- 9.4.2
- 9.4.3

9.5 Women's social capital

To whom you ask for help when your family face financial crisis due to flood?

- 9.5.1
- 9.5.2
- 9.5.3

Name of the Interviewer: _____

Date of Interview: _____

Signature of the Interviewer: _____

(It was very pleasant talking to you. Thank you very much for your time and providing valuable information).

Annex II Checklist for FGD

Focus Group Discussion with Farmers

- A. Early flash flood and impact on crops/livelihoods
- B. Local Practices for Protecting Crops and Seeds
- C. Coping with livelihood insecurities
- D. Livelihood diversity
- E. Access to resources (credit, savings groups)
- F. Control of *haor* resources
- G. Crop pattern
- H. Share cropping
- I. Local practices for food security
- J. Availability of Agricultural inputs
- K. The crop protection embankment
- L. Seed storage methods
- M. Households' food intake behavior
- N. Sources of main food items
- O. Food preservation techniques
- P. Access to market
- Q. Linkage with Institution
- R. Indebtedness
- S. Local practices for agriculture
- T. Labor Sharing System
- U. Migration as a livelihood strategy

Focus Group Discussion with Fishers

- A. Miseries of fishermen resulted from marginalization and exclusion
- B. Difficulties in earning their livelihoods
- C. Community collective efforts in disaster loss recovery
- D. Access to market and middlemen
- E. Reasons for the depletion of fish
- F. Local practices for protecting pond and fisheries
- G. Making fishing gears
- H. Surviving strategy during lean period
- I. Access to credit
- J. Indebtedness
- K. Control over local resources
- L. Depletion of natural resources
- M. Livelihood diversification trend
- N. Social network and social capital
- O. Linkage with Institution
- P. Migration as a livelihood strategy
- Q. Rituals, norms, values, taboos

