Assessment of Vulnerability of People in a Waterlogged Area of Bangladesh: A Case Study of Keshabpur Thana

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ABSTRACT

Water logging has been disrupting livelihoods of about one million people in Bangladesh during the past two decades. South-west region of the country is prone to water logging due to its vulnerable geographical setting and climate change. The worst hydro-geophysical vulnerability has been observed in Keshabpur Thana under Jessore district where over 85 percent of land has been water logged for over seven years. Study area of this research includes Trimohini, Sagardari, Bidyanandakathi and Sufolakathi Unions of Keshabput Thana.

This thesis attempts to assess the social and environmental vulnerability of people in Keshabpur Thana along with people's coping practices. These objectives have been achieved mainly through Participatory Vulnerability Assessment (PVA) method. The research also assessed the effectiveness of ongoing Government and Non Government projects in the area through questionnaire survey.

Marginal farmers and poor women have been identified as the most vulnerable groups. Their limited bounce back capacity makes them more vulnerable in waterlogged condition. It has been found that these two groups response differently during water logging as they are differently vulnerable. Access to institutions, institutional affiliation, coping related training facilities etc. largely contribute in developing their self esteem and developing their ability to bounce back from vulnerable state.

The major findings of the research revealed that agricultural livelihood, housing, food security and education are some socially vulnerable areas of Keshabpur Thana. Environmentally the area is also vulnerable due to the poor performance of drinking water, sanitation and health care facilities. People practice indigenous coping to survive in water logging, though there is a limited institutional effort in strengthening coping mechanism in the study area. Migration, unfortunately, is a new phenomenon in the Thana due to water logging induced livelihood loss.

The research identified some effective programs of Government Organizations and NGOs in context of water logging such as Kabodak reexcavation, canal excavation, community based embankment construction, reducing livelihood risk project and ring based vegetable gardening etc. Constraints towards reducing people's vulnerability have been identified as climate change, poor coordination between stakeholders, limited institutional coping, lack of gender sensitive initiative etc.

Finally, Keshabpur should be brought under a national regional plan in order to remove water logging. Facilitating drainage of water is the greatest perceivable coping, which is far beyond the capacity of individual person or a small water logged community. Only the authority can plan and execute an emergency water removal/drainage program. Finally, a gendered approach of integrated planning is necessary at all level for the actual benefit of the vulnerable population in Keshabpur.

ABBREVIATIONS

AAI	Action Aid International
ADB	Asian Development Bank
BBS	Bangladesh Bureau of Statistics
BWDB	Bangladesh Water Development Board
CC	Climate Change
CEGIS	Centre for Environmental Geographic Information Services
CEP	Coastal Embankment Project
CGC	Centre for Global Change
DAW	Division of the Advancement of Women
DFID	Department for International Development
DPHE	Department of Public Health Engineering
FGD	Focus Group Discussion
GBM	The Ganges, the Brahmaputra, and the Meghna (region)
GO	Government Organization
GTZ	Deutsche Gesellschaft fur Technische Zusammenarbeit
HYV	High Yielding Variety
IPCC	Inter-Governmental Panel on Climate Change
KII	Key Informants' Interviews
KJDRP	Khulna-Jessor Drainage Rehabilitation Project
LFA	Livelihood Framework Analysis
LGED	Local Government Engineering Department
NAPA	National Adaptation Programme on Action
NGO	Non-Government Organizations
NWMP	National Water Management Plan
OECD	Organization for Economic Co-ordination and Development
PRECIS	Providing Regional Climates for Impacts Studies
PVA	Participatory Vulnerability Assessment
RVCC	Reducing Vulnerability to Climate Change (Project)
SW	Southwest
TRM	Tidal River Management
UNCED	United Nations Conference on Environment and Development
UNDP	United Nation Development Program

UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations International Strategy for Disaster Reduction
VGF	Vulnerable Group Feeding
WARPO	Water Resources Planning Organization
WB	World Bank

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CHAPTER ONE

INTRODUCTION

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INTRODUCTION

1.1 Background of the Study

Historically Bangladesh has been subject to a variety of water related hazards, mostly in the form of flood, cyclonic storm surge, riverbank erosion, drought, and salinity (Ahmed and Mirza, 2000; Ali, 1999). Flood is the most common form of hazards of this low lying country. Flooding due to tidal surge is also very common especially in coastal Bangladesh. Among many attempts to control tidal surge, construction of embankment is a popular practice in coastal areas. Unfortunately, in many cases this attempt proved detrimental to the hydro geo-physical setting of south-west Bangladesh and gave rise to an adverse phenomenon named 'water logging'. Therefore, water logging is a form of flooding within the embankments caused by hydro geo-physical factors where water remains stagnant for long time due to increased sedimentation of riverbeds and reduced height differential between embankment and peak water level (Islam *et. al.*, 2004).

Water-logging- has been affecting about one million people in Bangladesh during the past two decades leading to large scale damages to crop, employment, livelihoods, and national economy (Rahman, 1995; Ahmed *et al.*, 1998). Water logging involves deterioration of drainage condition in coastal rivers of south-west Bangladesh causing difficulties towards maintaining livelihoods (Rahman, 1995). The worst hydro-geophysical vulnerability has been observed in case of Keshabpur Thana under Jessore district where over 85 percent of land within the embankments has been water logged for over seven years (CEGIS, 2006).

The Coastal Embankment Project (CEP) of early 1960s and the commissioning of Farakka Barrage in 1975 had a negative impact upon the geo morphological characteristics of south west part of Bangladesh (Sarker, 2004, DHV-WARPO, 2000) which accelerated the process of sedimentation in the riverbeds and sluice gates also became inoperable. The Kabodak River, which flows towards the west side of Keshabpur thana of Jessore District, is now silted up and cannot capable of containing river water into its bed. As a result the water is inundating the riverside unions of Keshabpur and

many new areas have become waterlogged in the last few years due to this riverbed situation. This leads to the sufferings of a large number of people from hunger and malnutrition in the study area.

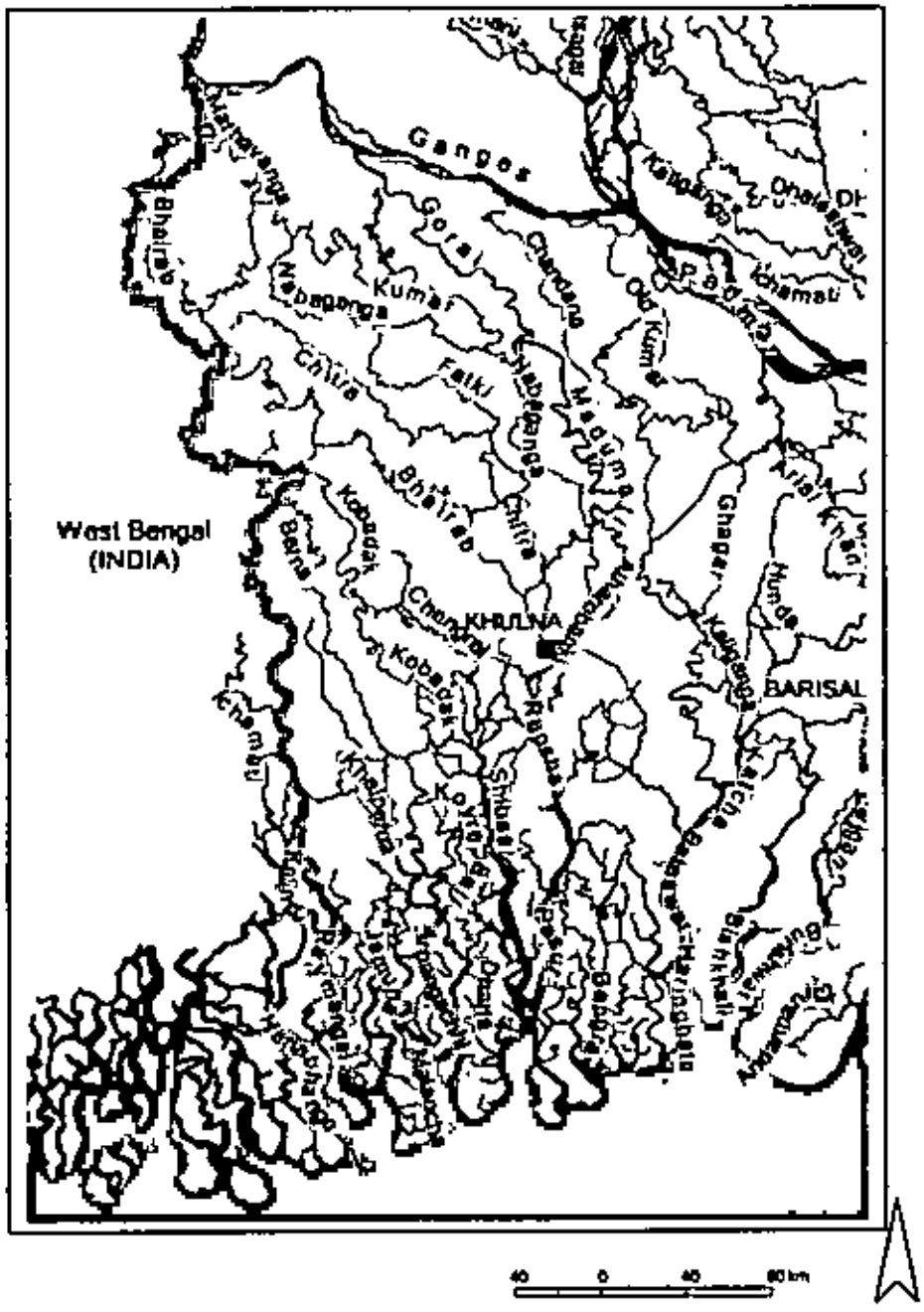
Moreover, Bangladesh is known as one of the most vulnerable countries across the globe under climate change. The water resources sector of the country would most likely be affected significantly due to anticipated changes (Ahmed *et al.*, 1998: Ahmed. 2005). Most of the adverse effects of climate change will be in the form of extreme weather events, while water-related hazards such as flood and water logging are likely to be exacerbated (Huq *et al.*, 1996; Asaduzzaman *et al.*, 1997; Choudhury *et al.*, 2005)

Therefore, Keshabpur Thana of Jessore district has been selected as the study area for this research. It is claimed that water related risks are disproportionately carried by those who are already socio economically and physically underprivileged and who have limited 'bounce-back' capacity (Rejve, 2006) Therefore, marginal farmers and poor women have been identified as the most vulnerable group under waterlogged condition in this research.

1.2 Geographic Context of Bangladesh and Water Logging Issue

Bangladesh is a low lying deltaic country criss-crossed by large numbers of rivers. Due to increased rainfall under climate change and at the same time rapid encroachment of wetlands, the country, especially the coastal region, is facing problem of water logging. For last few decades, embankments have been constructed and canals are being filled up to accommodate the increased population even in vulnerable coastal zone.

The Gorai River is the major distributary of the Ganges River, passing through the south west region, providing the majority of the dry season flow (DHV-WARPO. 2000). Main River systems of this region consist of the Gorai-Madhumati-Baleswar river system, the Gorai-Bhairab-Pasur river system, the Bhadra-Gengrail river system, the Hari-Teka-Mukteswari river system, Sibsa River, the Kabodak-Betna-Kholpetua river system and the Mathabhanga-Ichamati-Kalindi river system. These river systems criss-cross the region through a complex network of smaller rivers and rivulets (Map 1.1).



Map 1.1: Rivers in South-west Bangladesh

The south-west region is located in the coastal zone, and is significantly influenced by tidal effects. The entire region is monotonously flat, having very low elevation. According to available statistics on coastal zone, majority of the land is within one meter from mean sea level, the significant proportion of which again falls below high-tide level (Islam, 2005). This coastal region has been subjected to a plethora of hydro-geo-

morphological hazards which include poor drainage through its river systems, high rates of sedimentation on river beds, acute low flow conditions during the dry season, salinity ingress along the rivers, cyclonic storm surge, moisture stress in the dry season, rise in sea level, and to a lesser extent, flood (Halcrow-WARPO, 2001)

1.3 Historic Background and Nature of Water Logging

Water logging is not a recent problem in the study area. It has been developed over the years inspired by different hydro geophysical factors as well as human interventions. Several causes of water logging in keshabpur Thana have been identified. Among them frequent embankment construction, Coastal Embankment Project of 1960, commissioning of Farakka barrage, siltation of Gorai river and finally climate change were some important factors to aggravate water logging. Recently due to changing climate scenario, newer parts of south west Bangladesh are being affected by water logging. One of the worst examples of water logging is the western part of Keshabpur (Islam and Kibria, 2006). Though at this part water logging is mainly a consequence of Kabodak siltation, nevertheless climate change is a driving factor of coastal water logging according to many researchers (Islam, 2005, RVCC, 2003). Following sub sections describe the historical background of water logging in Keshabpur Thana.

1.3.1 Coastal Embankment project, 1960

The empolderment of coastal reaches through the implementation of the Coastal Embankment Project had a backlash that has been demonstrated by enhanced sedimentation within the riverbeds, which eventually choked up the rivers (Sarker, 2004; Islam *et al.*, 2004) In absence of coastal embankments, sedimentation could have otherwise happened naturally in the entire flood plain; thereby rapid lift of riverbeds could have been avoided. The process have been rather slow, however the results have been incremental and cascading. Not only the morphological process have been altered severely with adverse effect in terms of narrowing down of widths of rivers and estuary, it also reduced the height differential between the crest height of embankment and the peak water level. Following a few iterations of such cascading effects, the drainage capacity of the affected rivers has been shrunk significantly.

1.3.2 Farakka Barrage, 1975

However, the most dramatic hydrological effect has been observed in the region ever since the flows of the Ganges River have been withdrawn by the upstream neighbor India by building and commissioning of the Farakka barrage in 1975 (Mirza, 2004; Halcrow-WARPO, 2001).

1.3.3 Growing River Siltation, 1988

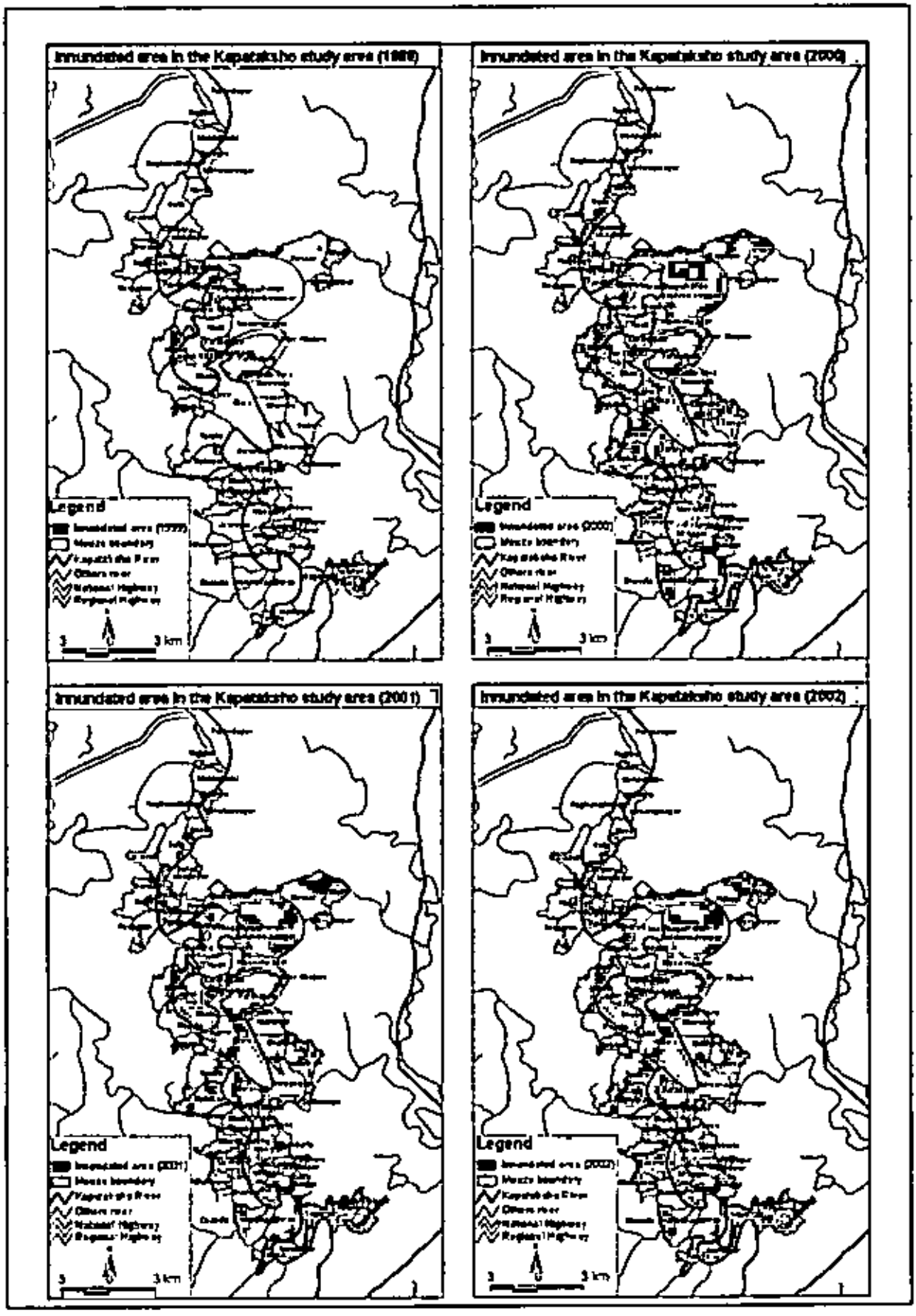
In the past,.The Mathvanga River was connected with the Kabodak River. But due to the construction work of British Railway, it became disconnected from each other (DHV-WARPO, 2000). Therefore, Water logging began to plague the area in 1987-88 as riverbeds rose alarmingly due to growing siltation (Halcrow-WARPO, 2001).

1.3.4 Gorai Disconnected from Ganga, 1996

The adverse impacts reached their height during the period between 1990 and 1996, when the Gorai River has been found completely disconnected from its tributary, the Ganges River (DHV-WARPO, 2000). Moreover, heavy siltation at the Gorai off take deteriorated the flow condition of the river. As a consequence, most of the smaller rivers in the region choked during every dry season, allowing salinity to penetrate inland towards north. How the study area became severely waterlogged after nineties has been shown in Map 1.2. This map is a demonstration of Kabodak river siltation and consequent water logging.

1.3.5 Kabodak Basin Water logging, 2001

Since 2001, severity of water logging is increasing every year and suffering of people is increasing simultaneously. These repeated flood situations in the adjoining water logged areas has already caused massive havoc at the very beginning of the last rainy season. The mixing zone between fresh water and brackish water has now been shifted towards north. During the dry season, a combination of extreme low flow and increased salinity accelerate the process of sedimentation in the river bed, which eventually choke the river and drastically reduce its drainage capacity. This is how drainage congestion becomes a regular phenomenon in the Kabodak river bank areas of Keshabpur Thana, resulting into over bank spillage during each peak monsoon. Consequently, the entire basin becomes waterlogged for eight months in the year. The extent of water logging throughout the study area during 1999-2002 has been shown in the following Map 1.2.



Map 1.2: Extent of water logging throughout the study area during 1999-2002; CEGIS'06

1.4 Causes of Water Logging

1.4.1 Water Board Project and Water Logging

In the early 1960s, a series of embankments were constructed as a part of the Coastal Embankment Project (CEP). Though the goal of the project was to protect the area from tidal surges, it had a negative impact (Sarker, 2004) Due to commissioning of Farakka Barrage in 1975, extreme low flow accelerated the processes of sedimentation in the riverbed (DHV-WARPO, 2000). It reduced the difference between the embankment height and peak water level. Sluice gates became inoperable due to sedimentation and wrong placement Therefore, once spillage takes place over an existing embankment, it inundates both agricultural lands and homesteads (Islam, *et. al.*, 2004).

1.4.2 Climate Change and Water Logging

Bangladesh is generally considered to be one of the most vulnerable regions in the world to climate change induced sea level rise. South west coastal region is vulnerable to climate change induced sea level rise due to low elevation from sea level and a continuous process of land subsidence (Huq, Karim, Asaduzzaman, and Mahtab, Ed., 1999). Some climatic factors have been analyzed below in order to depict the changing climatic scenario of Bangladesh:

1.4.2.1 Temperature

A regional climate model called PRECIS (i e Providing Regional Climates for Impacts Studies) simulation over India and part of Bangladesh indicated marked increase in both rainfall and temperature towards the end of 21st century under scenarios of increasing Green House Gas (GHG) concentrations and sulphate aerosols (Kumar, *et al.*, 2006). For temperature, warming appeared to be inevitable and increasing over time. The detailed result for Bangladesh suggests a warmer summer and wetter monsoon. However, the changes in temperature for 2020 were 1.4° C with a corresponding increase by 2.8° C by the year 2050 (Mirza, 1997).

1.4.2.2 Rainfall

Wetter monsoon has been predicted through different modeling for Bangladesh. An increase pre monsoon rainfall was observed for 2020 and 2050. The results were obtained from pre monsoon rainfall through a regional climate model in one recent attempt under a

south Asian regional modeling program to develop climate change scenarios for Bangladesh. Overall, the changes in rainfall for 2020 were 9.1% with a corresponding increase by 22.7% by the year 2050 (Asaduzzaman, *et. al.*, 1997).

These changes would have several critical impacts in the south west coastal region. The combination of reduced winter season precipitation and increased temperatures, resulting in higher evaporation rates, will reduce winter river flows (Houghton *et al.*; 1996). In addition to reducing the fresh water available for an expanding population, this could result in saline water intruding further inland along coastal areas, affecting natural ecosystem as well as food production system (ADB, 1994).

1.4.2.3 Sea Level Rise

For sea level rise, the scenarios have so far been largely speculative and not based on any detailed modeling. The OECD (Organization for Economic Co-operation and Development) study reiterated the fact that both subsistence and sedimentation would complicate the sea level rise scenario for Bangladesh. Moreover it emphasized that higher mean sea levels are going to increase problems of coastal inundation, inland flooding and salinization in the low lying deltaic coast. A review of literature and of expert opinion suggests that sediment loading may cancel out the effect of compaction and subsidence, so that net sea level rise may be assumed. The Bangladesh country study put the range at 30-100 cm by 2100, while the IPCC third assessment gives a global average range with slightly lower vales of 9 to 88 cm (Agrawala *et. al.*, 2003).

A further likely impact is that sediment transport characteristics of the river system would be altered. A sea level rise will exacerbate drainage problems in coastal zone (Mirza, 1997). This will occur in two ways. Firstly, existing flood control infrastructure was designed for historical water levels and tidal fluctuations. A sea level rise would reduce the tidal range within which outflow occurs, decreasing the total discharge during each cycle. Secondly, tidal meeting points will migrate further inland. These locations, where sediment deposition occurs, will impede upstream drainage and change drainage characteristics of the region (Choudhury *et al.*, 2005). A massive environmental and human disaster in southwest coastal region is looming on the horizon.

As the Jessore district is situated in the coastal zone, it would face increased water-logging due to increased flood volumes to drain and increased sea levels downstream. In addition the increased transport of sediments might also lead to sedimentation of riverbeds in the mouth of the estuaries, further hampering the drainage of the upstream rivers and estuary branches. South-western embankments might face *occasional tidal overtopping*, leading to saline water-logging within embanked areas (CEGIS, 2006). Various cause effect relationship towards increasing water logging under climate change has been shown in Figure 1.1.

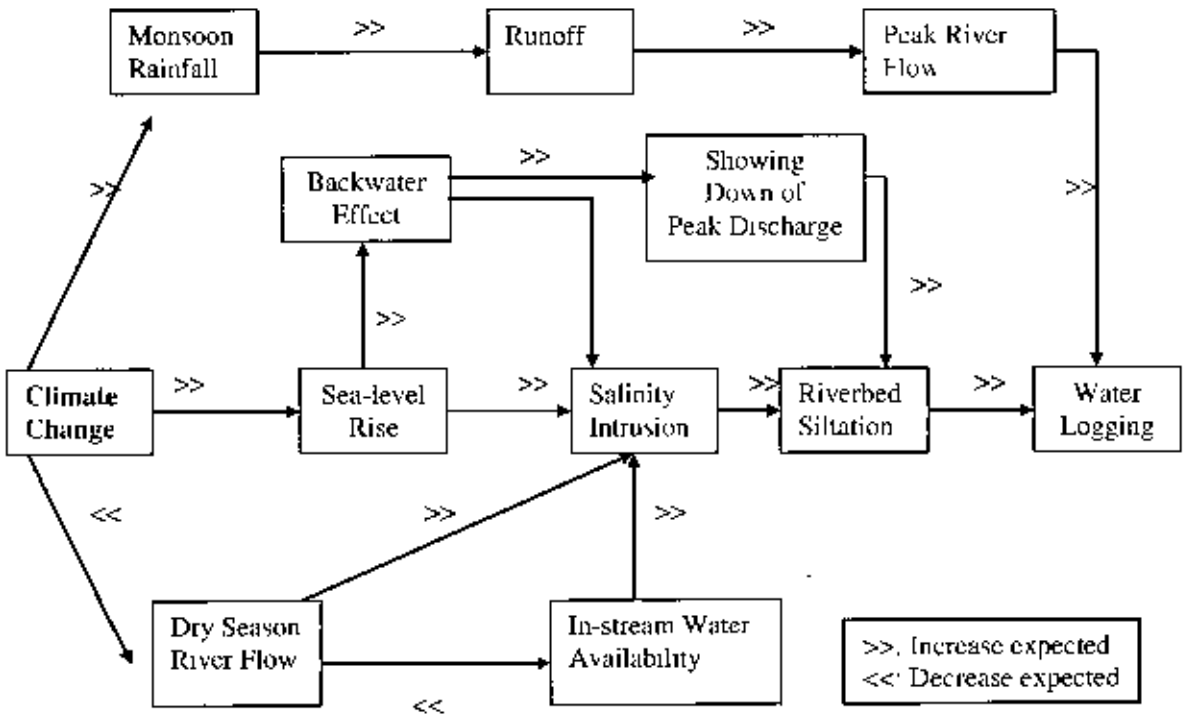


Figure 1.1: Schematic representation of various cause-effect relationships towards increasing water logging under climate change
(Ahmed *et. al* , 2008)

1.5 Impact on Life and Livelihood

As consequence of these changes, many socio-economic impacts might be observed. A higher incidence of socio-economic disasters might be observed due to increased extreme weather events such as: severe and prolonged rainfall, flooding and water logging. These events will result in increases in: loss of lives and livelihoods and hardship for the poor, in particular women and children; devastation of human settlements and national

infrastructure; and bottlenecks for national development due to frequent diversion of development budget to facilitate post-disaster rehabilitations. Higher risks for crop agriculture and the fisheries and livestock sector (due to floods, water logging and salinity intrusion) will pose risks to both livelihoods and national food security (World Bank, 2000; Asaduzzaman *et al.*, 2005). Loss of livelihoods and productive activities in the rural areas might lead to out-migration from rural areas (climate change refugees) (Ahmed *et al.*, 1998; Ahmad and Ahmed, 2000).

Already the water logging in Kesahbpur Thana has severely affected the livelihoods of poor people. They lost their land based productive system and also their dwellings. Also the water logging in Keshabpur has a detrimental effect upon different sectors like sanitation, health, drinking water, food security, education etc. This destroys the social fabric and human dignity of marooned people, and influence perpetuation of poverty, especially among those vulnerable groups who depend on small land holding for their sustenance (Heijmans, 2001).

1.6 Rationale of the Research

From geographical perspective, Keshabpur thana of Jessore District is located in Kabodak River catchments. Historically the Kabodak River has been affected by regional and political decision which was, in most cases, detrimental to the hydrological condition of the region. As a result, the Kabodak soon lost its flowing capacity due to sedimentation. Keshabpur thana itself is within the Kabodak catchment as well as the region of high tidal influence. Regular 'joar vata' scenario made the sedimentation process of the kabodak easier and the catchments area including Keshabpur became waterlogged eventually.

Although the geo-physical aspects of vulnerability to climate change for Bangladesh is better understood, there have been only a few literature that describe vulnerability of social and economic sectors to climate change (Frickson *et al*., 1996; Asaduzzaman *et al.*, 2005). These works focused on the environmental issues of south west region but with a little focus towards the assessment of vulnerability issue. The researcher used Participatory Vulnerability Assessment tool to assess the socio-environmental vulnerability. Coping in general has been discussed in several researches but in this research coping has been analyzed from two different perspectives namely indigenous

and institutional coping. Also judging the effectiveness of different projects from poor people's perspectives is another new area where people had a scope to criticize as well as appreciate different institutional efforts. However, for the convenience of research, poor people have been categorized into two special vulnerable groups: poor farmers and poor women of the four unions of Keshabpur Thana.

As a matter of fact, Government is interested to conduct big budget projects towards the eastern side (*Bhabadaha*) of Keshabpur Thana where road network is suitable for donors to travel. But the western part of Keshabpur is always neglected by Government probably because of its poor communication facilities. From all these perspectives, this specific research is very much necessary in order to combat with waterlogged condition of western part of Keshashpur Thana.

However, under climate change variability, researchers have been warned that water logging is likely to be increased if the current trend of climate change is continued. Under such circumstances, the study area is under threat of severe inundation. As a result, the research is very much necessary under changing climate scenario in Bangladesh.

CHAPTER *TWO*

RESEARCH OBJECTIVE

&

CONCEPTUAL FRAMEWORK

Chapter Two

RESEARCH OBJECTIVE AND CONCEPTUAL FRAMEWORK

2.0 Introduction

The present chapter analyzes the objective of the research, literature review, study area and data collection procedure, data analysis, scope and limitation and the operational definitions of different important terms used in this research, etc. Present chapter also discusses about different dimensions of vulnerability.

2.1 Operational Definition

2.1.1 Water Logging

Water logging may be defined as flooding within the embankments caused by hydro-geophysical factors where water remains stagnant for long time due to increased sedimentation of riverbeds and reduced height differential, between embankment and peak water level. This involves deterioration of drainage condition in coastal rivers of south-west Bangladesh causing difficulties towards maintaining livelihoods (Islam *et. al.*, 2004).

2.1.2 Vulnerability

Vulnerability is a degree to which people is susceptible to harm on being exposed to a hostile factor. Also vulnerability indicates a state which arises from complex interaction between three elements: exposure, sensitivity and resilience (Ahmed, 2004).

Vulnerability is a term used to describe exposure to hazards and shocks. People are more vulnerable if they are more likely to be badly affected by events outside theirs control. Vulnerability defines the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a hazard (Wisner *et. al*, 2004). It involves a combination of factors that determine the degree to which someone's life, livelihood, property and other assets are put at risk by a discrete and identifiable event (or series or cascade of such events) in nature and society.

2.1.3 Social Vulnerability

Social vulnerability is an important concept, underscoring the ways in which, and reasons why, people's differential access to and control over resources (such as land, money, credit, good health and personal mobility, to name but a few) are closely interwoven with their ability to survive and recover from disasters (Enarson, 2002). The risk-scapes of hazards/disasters are also affected by poverty, population growth, land settlement into fragile areas, over exploitation of natural resources, inadequate communication structures and weak institutional bodies, global climate change (that is partially caused by human actions), as well as differential access to the kinds of information that could help people to protect themselves (GTZ, 2005).

2.1.4 Participatory Vulnerability Assessment (PVA)

Participatory Vulnerability Assessment (PVA) is a systematic process involving communities and stakeholders in in-depth examination of their vulnerability. Participatory Vulnerability Assessment (PVA) is a tool to assess Vulnerability (AAI, 2002).

2.1.5 Coping

An adaptive or otherwise successful method of dealing with individual or environmental situations that involve physiologic stress or threat (RVCC, 2003). Other than environmental factors, coping capacity also depends on financial ability and social context.

2.2 Research Objectives

Goals

To reduce water logging in Keshabpur Thana by taking effective policy decision.

Objectives

The specific objectives of the present research work are as follows:

(a) To assess the social and environmental vulnerability of people under waterlogged condition in the study area.

(b) To investigate the coping practice of vulnerable group in the study area.

(c) To find out the effectiveness of ongoing GO, NGO programs in response to water logging problem.

2.3 Understanding Participatory Vulnerability Assessment (PVA)

PVA (Participatory Vulnerability Assessment) is a systematic process that involves communities and other stakeholders in an in-depth examination of their vulnerability PVA not only allows integrate geophysical risks of the vulnerable people in question, it also considers all forms of assets, the absence of which can potentially increase vulnerability and/or the availability of which influences their empowerment and contributes to their resilience (Cannon *et al.*, 2003).

At the same time it empowers or motivates the community to take appropriate action. The overall aim of PVA is to link disaster preparedness and response to long-term development. The main essence of PVA can be summarized like this: communities know their situations best, so any analysis should be built on their knowledge of local conditions and they should be constantly given opportunities to enhance their resilience to difficult conditions.

2.3.1 Common sequential steps of PVA includes

(i) *Physical Observation*

(ii) *PVA Sessions*

(iii) *Key Informants' Interview (KII)*

2.4 Analyzing Different Dimensions of Vulnerability

Social, generational, geographic, economic and political processes, that influence how hazards, affect people in varying ways and with different intensities (Ahmed, 2004). Some groups are more prone to damage, loss and suffering in the context of differing hazards. Key variables explaining variations of impact include class, occupation, caste, ethnicity, gender, disability and health status, age and immigration status and the nature and extent of social networks. Changing the social, economic and political factors usually means altering the way that power operates in society.

The relative contribution of geophysical and biological processes on the one hand and social, economic and political processes on the other to vulnerability varies from disaster to disaster, as well as from one community to another and from one place to another.

Vulnerability can be increased through entitlements, political powerlessness or social exploitation and discrimination (Cannon *et al.*, 2003). The interactions of the different factors of vulnerability will determine people's capacities, access to resources and ability to realize their rights. Food security, housing condition, educational facilities, social interactions, displacement, agricultural production, employment security etc. determine the sate of socio-economic vulnerability. On the other hand the state of water, sanitation, health etc. determines the environmental vulnerability of a group of population.

The present research deals with such two especially vulnerable groups who have limited access to resource, information and have very limited capacity to bounce back from adverse environmental condition due to financial constraint. Poor farmers and poor women are, therefore, the target group.

2.4.1 Women's Context of Vulnerability in Reference to Physical and Social Setting

Under the prevailing social and economic circumstances, Bangladeshi women are lagging far behind than their male counterparts. Women's and men's responses to this crisis situation, as well as their abilities to cope with them to a very large extent reflect their status, roles and positions in society: because of gender based inequalities, girls and women are typically at higher risk than boys and men (UN, 2004; Enarson, 2002; Chew and Ramdas, 2004). A gender approach is therefore important to identify men's and women's differing vulnerabilities to crisis as well as their different capacities and coping strategies in order to design effective disaster management program.

The gender-poverty links show that 70 percent of the poor in the world are women and their vulnerability is accentuated by race, ethnicity, and age (Enarson and Morrow, 1998). When natural disasters and environmental change occur, women and men are affected differently because of traditional, socially-based roles and responsibilities (GTZ, 2005).

Women's role in communities is not formally recognized or accounted for in coping and relief efforts. Women's knowledge about coping with disasters, are often ignored (Dankelman, 2002). Strategies and policies to cope with disaster often neglect the gender dimensions of hazards and disasters and the current gender-climate change agenda. Women are poorly represented in planning and decision-making processes in disaster

policies, limiting their capacity to engage in political decisions that can impact their specific needs and vulnerabilities (Enarson, 2002, Climate Alliance, 2005).

2.4.2 Poor Farmers' Context of Vulnerability in Reference to Water logging

There are many ways in which poverty and disasters are interconnected. Livelihoods of rural poor are predominantly based on natural resources. Poverty forces them to degrade their environment, which in turn reduces opportunity to enjoy services of these natural resources on a sustainable manner. Since water logging is likely to jeopardize the availability of natural resources base, poor people's livelihoods will face significant challenges in near future (Ahmed. 2005).

In the nexus between poverty and water logging disaster, sustenance of decent living under invigorated extreme weather events would be severely questioned, especially in countries such as Bangladesh where pervasive poverty is prevailing. Frequently occurring natural hazards and occasional disasters are perceived to be the major causes of perpetuation of poverty in Bangladesh. Unfortunately, climate change will exacerbate both the frequency and extent of natural hazards, often in the forms of floods, droughts, riverbank erosion, salinity intrusion, water logging, and cyclonic storm surges (Huq *et al.*, 1996; Asaduzzaman *et al.*, 1997; Choudhury *et al.*, 2005).

Despite utmost efforts to reduce the net fraction of population under poverty by achieving MDGs and so on, there is a strong likelihood that the overall poverty level will only remain at the same level, if not deteriorate further, due to adverse impacts of climate change on poor and marginally better off people. Despite every conceivable mechanism to fight against poverty, water logging will compound the prevailing contexts of vulnerability and tend to perpetuate poverty.

In case of poor farmers, cultivation becomes always difficult under water logged condition. Those who can afford can plan to buy other places in dry land for cultivation. They may also think about starting a new business with whatever capital they have, but the extreme effect of water logging falls upon the poor farmers. Once water logged, the poor cannot start other job/business quickly due to their limited resources. They don't even get the share of fish business whereas the rich always become benefited. Poor

farmers' struggle continues even after recession of water. They have to invest more on it due to get back the actual fertility through the means of improved chemicals, pesticides etc. which is often impossible in case of poor farmers. Therefore waterlogged farmers, if poor, are the most vulnerable segment of population.

2.5 Conceptual Framework of Research

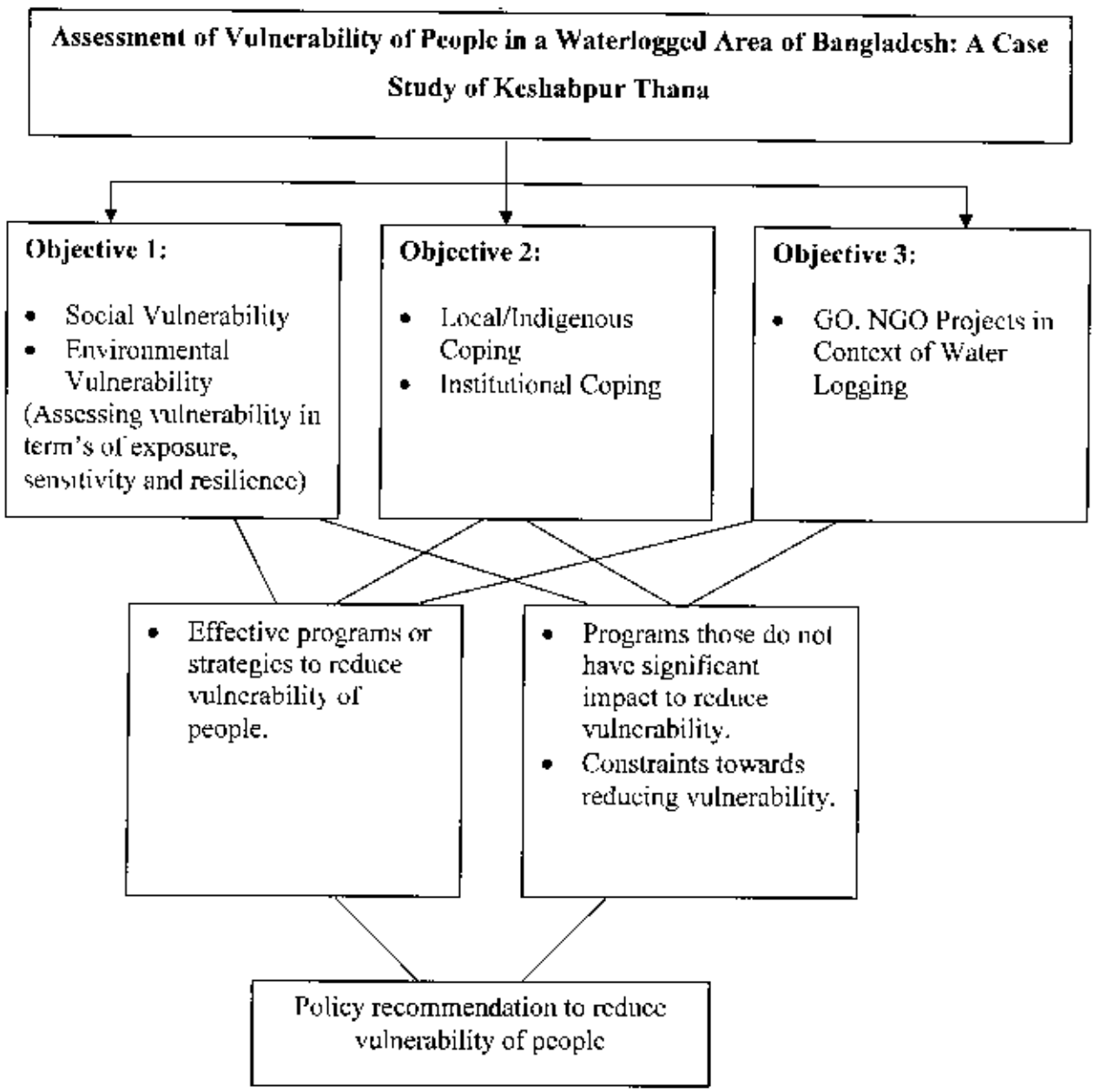


Figure 2.1: Conceptual Framework of Research

2.6 Literature Review

People's Vulnerability in Disaster has been analyzed in different studies. In context of Bangladesh, Participatory Vulnerability Assessment is a new concept but it has been proved very much effective to assess the vulnerability of poor community. Different aspects of vulnerability have been discussed in different studies and in many researches poor women and poor farmers have been identified as the most vulnerable group under water related disasters (Chambers, 2007; Kumar, 2002; DFID, 2004a; DFID, 2004b). Both the DFID studies focused on environmental indicators of vulnerability while other two reports were more concerned about the socio economic indicators such as housing, agriculture, education etc.

Assessment of vulnerability of people has been conducted by many researchers (Enarson, 2002; Kenward, 1999). The needs for incorporating perceptions of vulnerable groups in the assessment mechanisms are highlighted repeatedly (Kelly and Adger, 2000; Heijmans, 2001; Ahmed, 2004). One of the means to incorporate concerns of the vulnerable people and analyze their contexts is to employ the Participatory Vulnerability Assessment (PVA) technique which not only allows integrate geophysical risks of the vulnerable people in question, it also considers information about all forms of assets, the absence of which can potentially increase vulnerability and/or the availability of which influences their empowerment and contributes to their resilience (Cannon *et al.*, 2003). Canon mainly used social indicators of vulnerability such as empowerment, access to resource and information etc.

In many researches, it has been explained that since a large majority of rural Bangladeshis is dependent on crop agriculture for subsistence, the unavailability of land year-round and/or for a major part of a growing season due to standing water put agriculture based livelihoods of people in extreme hardship. Unfortunately, as in other forms of hazards in Bangladesh, rural women are the worst sufferers under water logging condition (Canon, 2002). Along with social indicators like food production and agriculture, environmental indicators such as health and sanitation also have been discussed in this research.

Many other researches showed the changing livelihood pattern of inhabitants in waterlogged areas of south west region of Bangladesh (Rejve, 2006). Some used

Sustainable Livelihood Framework to assess the livelihood pattern of wetland community (Scoones, 1998). Researchers described how waterlogged people invented hundreds of way to cope with their living environment. The focus was upon people's perception about their livelihood pattern, dependency on natural resources, their strength and weakness, opportunity and threat, their aspiration about alternative occupation etc ((Mahzabin, 2006). Social indicators of vulnerability like housing, food, education etc. were some major focuses of the above mentioned researches.

Different types of coping have been analyzed in different literatures (Ahmed, 2000 and Asaduzzaman *et. al.*, 2005). Agricultural coping is very much important in context of Bangladesh in order to maintain the food security. Many researchers attempted to discuss about the necessity of agricultural and environmental coping under any disastrous condition (Ahmed, 2000). Also other researchers emphasized on the institutionalization of coping mechanism (Huq, *et. al.*, 1998). In every case, economic indicators played a major role as financial ability is much related with one's coping capability. Few of such indicators were income and food security, agricultural production etc.

Very few researchers dealt with the projects in relation to water logging in Keshabpur. However, there are some projects which have been studied for several times in different studies due to huge budget investment. KJDRP was one of such project which was designed to protect south west Bangladesh from water logging. Many researchers criticized the Khulna Jessore Drainage Rehabilitation Project (KJDRP) and explored the social and environmental impacts of KJDRP on the south-west coastal region of Bangladesh. Such studies reveal that the embankment was constructed on an ecologically fragile river system and it ignored environmental concerns raised in the Summary Initial Environmental Examination (Kibria, 2006). On the other hand, some criticized the concept of embankment. Water logging has been mentioned as a result of embankment in different cases (Islam and Kibria, 2006). However, in most of the cases, environmental indicators of vulnerability like hydro geophysical context, drainage condition etc. was used.

Many researchers described the methods for community participation and explained the participatory Rapid Appraisal (PRA) and Rural Rapid Appraisal (RRA) method to the

readers (RVCC, 2003). Both space and time related PRA methods has been discussed and It also showed the application of the method through social mapping, venn diagram, resource mapping, trend analysis, livelihood analysis etc. (Chambers, 2007; Kumar, 2002).

Researchers in Bangladesh revealed that since water logging has disrupted agricultural activities, many people have had to change their main occupation in south west from agriculture to various non agriculture activities. Although people pursued whatever agriculture was possible, seeking employment in other occupations became necessary to make a living (Ahmed, 2000; Ahmed and Rahman, 1998). Economic indicators of vulnerability like income, food security etc. became more important in such researches.
Many researchers explained how women are differently vulnerable than their male counterparts in case of disasters. Research proved that water related hazards made women more vulnerable than any other segment of society (Canon, 2002). Many studies revealed the impact of climate change upon the vulnerability of poor people (DFID 2004a and 2004b). Others discussed vulnerability related theory and practices under any disastrous condition (Heijmans, 2001). In such gender studies, environmental indicators of vulnerability like health, sanitation etc. became the major focus of the research.

Recently some studies have been conducted also in Bangladesh which explained the concept of social vulnerability and how vulnerability is related with income, societal structure, religious and social values and even gender relation (Ahmad and Ahmed, 2000; Canon et. al., 2003 : Choudhury et. al., 2005). Moreover, environmental vulnerability has been analyzed in different literature. There are researches which explained how developing country like Bangladesh is environmentally vulnerable in water disasters (Mirza, 2003). The finding of these researches reflects that many places are geographically vulnerable in Bangladesh and the south west region is especially vulnerable for water logging disaster. Government studies in Bangladesh suggested gradual restoration of Gorai River in order to sustain the socio economic development of the south west region of the country (GoB, 2001) as envisaged in the future development scenarios of the National Water Management Plan (NWMP). In most of the national level research, food security and health were two mostly discussed indicators of vulnerability.

2.7 Study Area and Data Collection Procedure

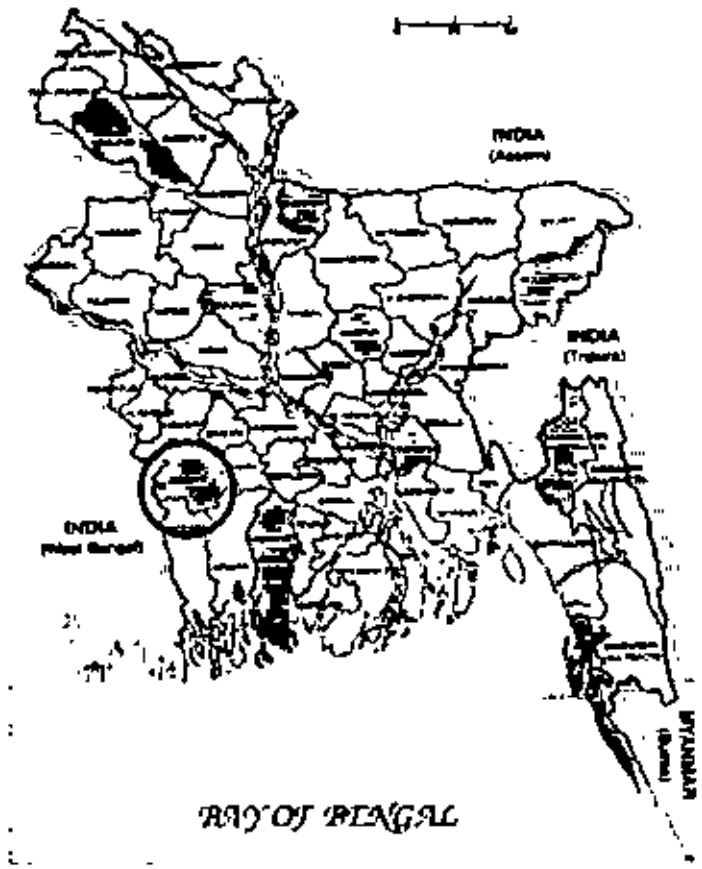
2.7.1 Selection of Study Area

The study has been conducted in Keshabpur Thana of Jessore District due to its high vulnerability to water logging for last seven years. Almost eight months in a year most of the area is inundated. The total area of Keshabpur Thana is about 258.53 sq km. The region is located in the coastal zone, and is significantly influenced by tidal effects. The region is monotonously flat, having low elevation. According to available statistics on coastal zone, majority of the land is within one meter from mean sea level, a significant proportion of which again falls below high-tide level (Islam, 2005).

Four unions of Keshabpur were selected for the survey namely Sagardari, Trimohini, Bidyanandakathi and Sufolakathi union. The first three are fully waterlogged while the last one is a partially waterlogged union of keshabpur Thana (Thana Information Booklet, 2008).

Both human interruptions upon nature and climate change are responsible for the water logging problem in South-East Bangladesh. '*Bhabadaha*' and '*Kabodak*' are two different contexts of problem in Keshabpur but both are related with the problem of Water logging. Two unions towards the east of Keshabpur are affected due to *Bhabadah* namely Sufolakathi and Pajia. On the other hand, due to the siltation of the Kabodak River, three unions in the western part of Keshabpur are affected: Trimohini, Sagardari and Bidyanandakathi. At present, the problem of Kabodak's siltation is severe than any other previous problems. Unfortunately, climate change will exacerbate the problem very soon.

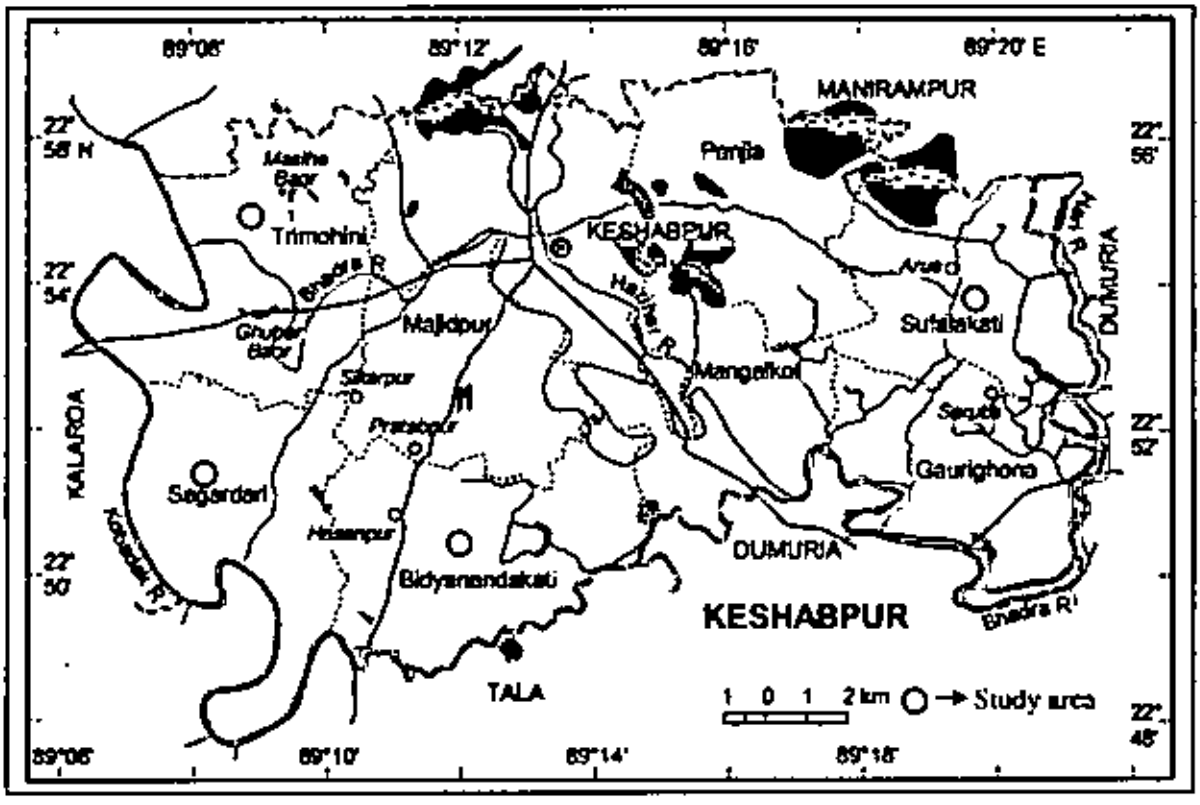
2.7.2 Description of Study Area



Map 2.1: Location Map of the Study Area

Jessore is located in the south west region of Bangladesh. India is on its western part, Shatkhira and Khulna to the south, Jhenaidoh and Magura to the north and Narail to the east. River Bhairab, River Kabodak, River Chitra are the major rivers in this district. Keshabpur is one of the Thanas of Jessore District. The total area of Keshabpur Thana is about 63857 acre which is equivalent to 258.53 sq. km or 157.70 sq. mile. or 25,853 hectare. There is Manirampur thana to the north, Tala to the south, Dumuria to the east and Kalaroa to the west. Main rivers are Harihar and Chengrail; Keshabpur thana consists of 9 union parishads, 142 mouzas and 143 villages. (Keshabpur Thana Information Centre, 2008).

Map 2.1 shows the location of study area. However, Map 2.2 is the map of Keshabpur Thana where four selected unions are indicated with legends.



Map 2.2: Union wise Map of Keshabpur Thana

Demographic Statistics

Population in Keshabpur is 200,229; among them male are 51.16% and female 48.84%; Total number of households is 40,000. Birth rate in Keshabpur is 1.48 %. Total number of farmers' family is 29,142. Almost 65% are Muslims and others are Hindus in the area (Banglapedia, 2006).

Mainly four unions in Keshabpur were selected for the study namely Trimohini, Sagardari, Bidyanandakathi and Sufolakathi. Waterlogged population in these four unions was 10100, 7100, 6060 and 4200 respectively (Keshabpur Thana Information Centre, 2008).

2.7.3 Methods of Data Collection

Two types of data have been collected- primary data and secondary data.

2.7.3.1 Primary Data

(1) Conducting PVA

Participatory Vulnerability Assessment (PVA) is a systematic process that involves communities and other stakeholders in an in-depth examination of their vulnerability. Common sequential steps of PVA includes-

(i) Physical Observation:

Each PVAs began with general observation of the area, approach by a transact walk. These physical observations formed the basis of analyzing people's vulnerability contexts.

(ii) PVA Sessions:

The main field visit for the thesis was conducted in Keshabpur of Jessore. The researcher visited and conducted PVA related activities in Keshabpur from November'2008 to January'2009. Four Focus Group Discussions were conducted in four selected unions. However, in each session, the researches had separate discussion with men and women group.

Participatory Vulnerability Assessment have made it clear that the realities and priorities of poor people are often different from those supposed for them by the professionals and policy makers. One of the major challenges in PVA has been to enable the realities and priorities of the poor and marginalized people to be expressed and communicated to policy makers. This requires that the poor and marginalized people are enabled to analyze their condition and identify their priorities in ways which allow them to freely express their realities, and to generate proposals that are feasible, credible and persuasive to the policy makers. Participatory Vulnerability Assessment is a major innovation in this direction. Different vulnerability aspects have been discussed during FGDs such as the state of their employment security, food security, cropping system, seasonality mapping of livelihood aspects, problem tree, historical profiling, access to institutions (through

venn diagram), health status including sanitation and drinking water, their aspiration in the future etc.

While conducting PVA, different participatory tools is used in each phases such as focus group interviews, historical profiling, timeline, vulnerability mapping, seasonal calendar, concept mapping, Venn diagrams, community action plan etc. Efforts have been made to have PVA sessions with economically challenged groups (i.e., marginal farmers) as well as with poor women in the study site. 'Close interactions' with people provided information on types of vulnerability, perceptions regarding physical aspects of vulnerability, ranking of vulnerability, seasonality mapping of livelihood aspects, cropping system, employment, food security etc. Similarly, Venn Diagrams have been drawn to understand and record the status of institutional integration and empowerment of the vulnerable people. Three indicators of vulnerability have been analyzed in the session namely:

a) **Social Vulnerability:** variables were food security, housing condition, educational facilities, social interactions, displacement etc.
b) **Economic Vulnerability:** variables were agricultural production, employment security, etc.
c) **Environmental Vulnerability:** variables were drinking water, sanitation, health etc.

(iii) Key Informants' Interview (KII):

Organizing Key informants' interview was one of the necessary steps. Different Key informants' interviews have been conducted with Water Development Board of Keshabpur, local LGED, DPHE, Thana Statistics office, Thana Project Implementation Office, Social welfare office, Fisheries office, Agricultural Extension office, Thana Nirbahi Office etc. Also different NGOs of Keshabpur have been interviewed in order to understand their contribution towards facing the challenge of water logging and their work in coordination with government.

(2) Questionnaire Survey

In order to explore what GOs and NGOs are presently doing in that area, interviews with local people and NGOs were conducted. Whether the government and NGO initiatives for combating water logging in the area are effective or not have been judged from the local inhabitants through questionnaire survey. All structural and non structural interventions was identified and their before and after project scenario was compared. Important variables in this regard were any changes in lifestyle such as employment and food security, educational status, health status; etc.

Sample Selection

Thana Information Booklet, 2008, published the list of waterlogged households of Keshabpur Thana. Three unions were mentioned as fully waterlogged namely Trimohini, Sagardari and Bidyanandakathi with a waterlogged population of 10,100, 7,100, 6,060 respectively. Sufolakathi was mentioned as partly waterlogged union where waterlogged population was 4,200. Almost 5,500 households of these unions were identified as 'very poor' according to the own survey of Thana Information office (Thana Information Booklet, 2008).

Here the very poor households were categorized according to many factors like income, their history of livelihood loss, age, number of disable persons in the family etc. The selected households shifted to refugee centers at least once in their lifetime due to extreme water logging. This was one of the major criteria of selection of poor households by the Thana Information office. About 5% of these very poor households have been taken as the sample for questionnaire survey. Therefore, the sample size of the questionnaire survey was 270 households. The target group of this research includes only the poor farmers and poor women headed households of these unions. Almost 180 poor farmers' families were interviewed through random selection while number of female headed household was 90 for the survey.

2.7.3.2 Secondary Data

The background information on water logging related issues and peoples' vulnerability (individual /household/community levels) have been collected and synthesized, as a primer of the research. The ongoing Government and Non Government projects aiming at

reducing water logging in the study area were also explored through literature survey. Maps, images and government project related data were collected from Bangladesh Water Development Board and other offices. Also important data and information have been explored from different NGO offices working in that area such as 'People's Forum on Water logging', '*Srijony Uloshi Shongstha*' and 'Centre for Global Change'

2.7.3.3 Data Analysis and Preparation of Thesis Report

Finally data have been analyzed using different software Microsoft office and excel were useful for report preparation and graph representation. Necessary maps are also attached with the thesis.

2.8 Scope and Limitation

The research did not include entire Keshabpur Thana rather only four waterlogged unions were selected for the study. More specifically, the research was only for the poor households of those unions. The research did not include village level study; rather union level information was incorporated in order to make union wise comparison from social and environmental point of view. Poor farmers and poor women were the target groups. It was a people's perception based research; it has been tried to put local ideas and local coping strategies to combat with water logging. Both PVA and household surveys have been applied for assessing people's vulnerability and their coping strategies under water logged condition. But in case of judging effectiveness of different programs in context of water logging, questionnaire survey was the only method.

However, as most of the area of Keshabpur was waterlogged it was difficult to do house to house questionnaire survey for the researcher alone. That is why researcher employed more people to complete the questionnaire survey within short time. Also boat transportation of the area was not easy and also costly enough. People in the study area still has been suffering from the effect of water logging that is why in principle they are not in a condition to discuss the issue frankly rather they want to have assistance to recover the situation. During time of data collection researcher faced such challenges that she had to convince people in such a grave condition.

2.9 Organization of the Thesis

Chapter one focuses on identifying and analyzing the research problem. It includes specific goals and objectives of the research along with the justification and limitations of the study. A detailed theoretical framework has been presented in this chapter by clarifying important terms and ideas. Analyzing different dimensions of vulnerability, discussing impact of climate change upon the south west region, understanding PVA etc. are some key issues discussed in the first chapter.

Chapter two describes the methodology of the research. Literature review, data collection process, data analysis technique etc. have been presented here with description and flow diagrams. This chapter also addresses specific research questions for the study. It also describes the location of the study area, its demographic statistics, climate and river of the area, settlement type, occupation, transportation, physiographic information, education, water and sanitation status, land use etc.

Chapter three describes the social and environmental vulnerability of people under waterlogged condition. This chapter unfolds the field findings with detail graphical analysis Prioritizing the problems faced by water logging, discussing different aspects of vulnerability with examples and case study, revealing water logging induced migration in the study area etc. are some major issues analyzed in this chapter. Both the poor farmers' and poor women's vulnerability have been discussed separately. Vulnerability has been assessed based upon three elements: exposure, sensitivity and resilience. Different social and environmental indicators like housing, livelihood, education, health, energy security etc. has been discussed with graphs and field statistics. Finally, after discussing every indicator, it has been tried to put a union wise comparison of data. Hence, most vulnerable union has been tried to find out through this chapter.

Chapter Four includes the coping strategies practiced by the people in the study area. The indigenous coping techniques have been learned from the field study and presented in this chapter with photographs and sketches. This time also, coping by men and women was discussed separately. Housing coping, livelihood coping, crisis coping, water and sanitation coping etc. have been analyzed. Also institutional efforts in adopting coping

mechanism have been discussed. GO, NGO and community initiatives regarding coping related training have been identified and discussed in this chapter.

Chapter Five reveals the programs in context of water logging in the study area by GOs and NGOs and their working mechanism. Different GO and NGO institutions involved in the activities in context of water logging have been identified and analyzed with their detail activities and working mechanism. People's access to different institutions at times of extreme water logging is presented in this chapter with diagrams. Also local people's role in decision making process regarding local water projects, their working mechanism and GO-NGO-local people's coordination etc. are some major issues discussed in the chapter. Most importantly this chapter analyzes people's perspectives in judging the effects of ongoing projects in the study area through some quantitative analysis.

Finally, *Chapter Six* discusses the summary of findings, recommendation and conclusion of the study. This also focuses on the areas where there are still scopes for further research.

CHAPTER *THREE*

SOCIAL AND ENVIRONMENTAL VULNERABILITY OF PEOPLE UNDER WATERLOGGED CONDITION

Chapter Three

SOCIAL AND ENVIRONMENTAL VULNERABILITY OF PEOPLE UNDER WATERLOGGED CONDITION

3.0 Introduction

The first objective of the research was to assess the social and environmental vulnerability of waterlogged people in Keshabpur Thana. This chapter would try to depict the vulnerability situation in Keshabpur by analyzing different social and environmental indicators. The indicators have been analyzed under three broad spheres in order to assess vulnerability; 'Exposure', 'Sensitivity' and 'Resilience' are three broad spheres under which all indicators have been judged. Union wise analysis was possible as questionnaire survey was conducted in all four unions.

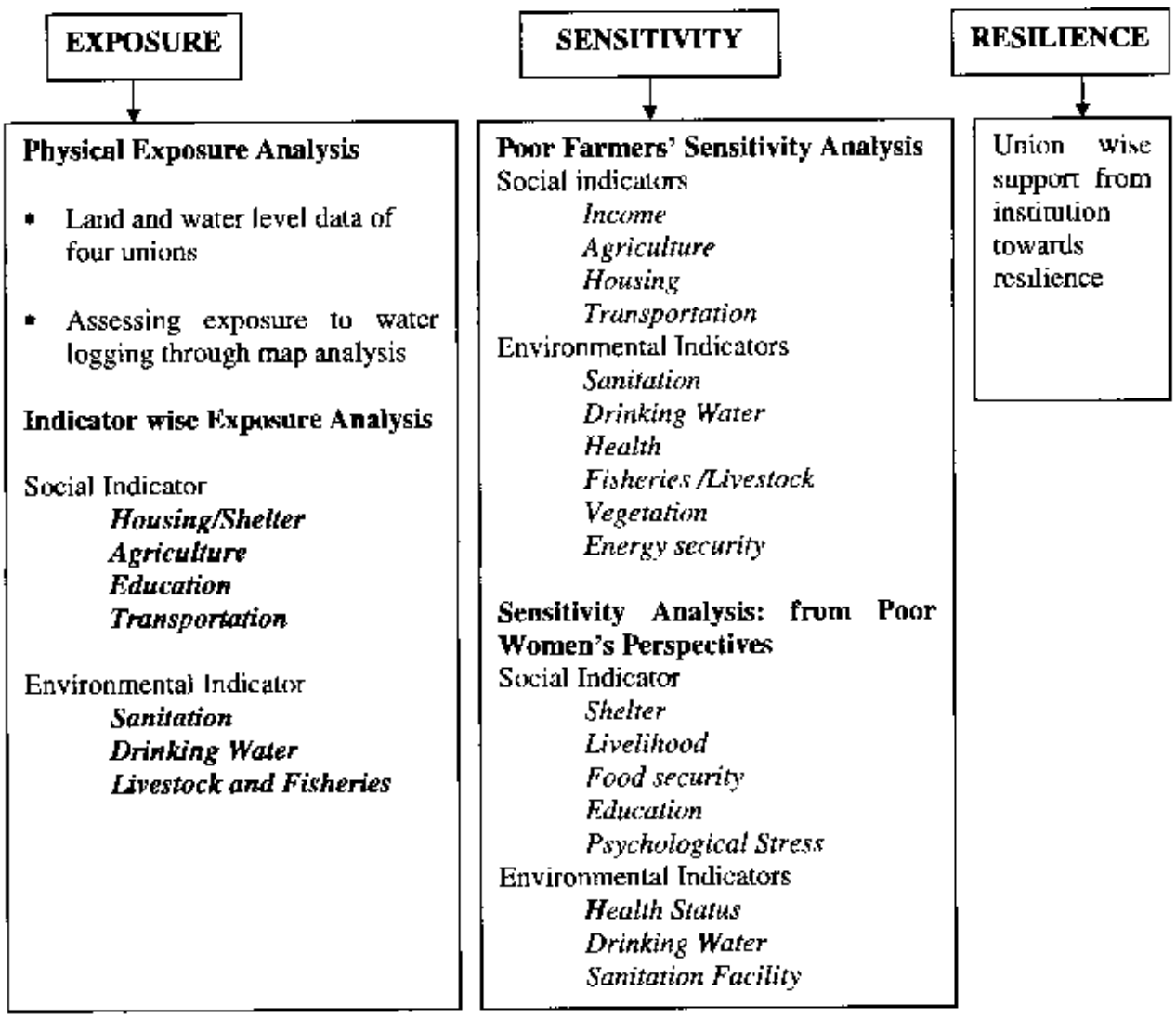


Figure 3.1: Different Indicators to Assess Vulnerability under Three Broad Spheres

Different tools have been used to gather information regarding each indicator. The tools were:

1. Participatory Vulnerability Assessment (PVA)
    - Focus Group Discussion (FGD)
    - Key Informants' Interview (KII)
    - Case Study
2. Questionnaire Survey

For assessing people's vulnerability, the major tool was PVA (FGD, KII, case studies etc.) rather than questionnaire survey. However, also questionnaire survey supplied important information to achieve the objective.

Photo 3.1: Glimpses from FGD: the major part of PVA

Analyzing Different Indicators under Three Broad Spheres:

3.1 EXPOSURE

This sphere will deal with the physical vulnerability; for example how much these unions are exposed to hazards, their land and water level, distance to Kabodak River etc. Assessing exposure to hazard was the first step to understand how differently the unions are exposed to water logging.

3.1.1 Physical Exposure Analysis

3.1.1.1 Land and water level data of four unions: How they are physically exposed to water logging

Trimohini

At present this area is one of the severely water logging affected area in Keshabpur. Through visual observation and consultation with the local people it was understood that river depth had reduced significantly due to continuous deposition of silt on the riverbed during last 25 years. Average 4 to 5 ft of stagnant water was found in the river reach while in the early nineties these values were about 1.5 to 1.8 ft (CEGIS, 2006). The land level falls between moderately high to moderately low category (SRDI, 2009).

Sagardari

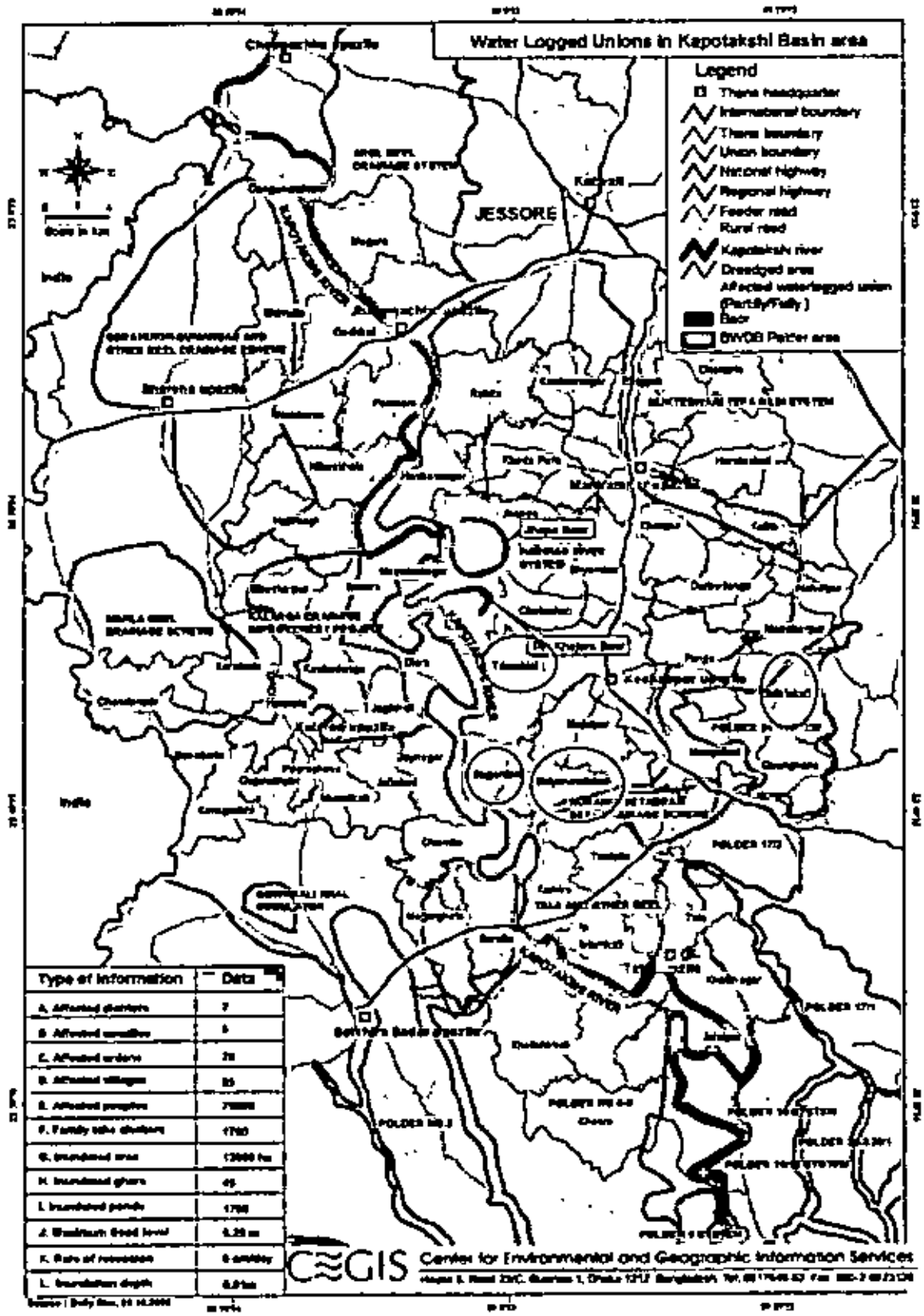
In the Sagardari union, eastern part is relatively higher elevation than the western part. As a result no drainage congestion problem was found in the eastern side but in the western side slight drainage congestion was found along the River Kobodak. In Sagardari, tidal effect is found but it is more distinguishable in spring tide than in neap tide. The land level falls between high to moderately low category (SRDI, 2009).

Bidyanandakathi

Bidyanandakathi is situated in the eastern part of Sagardari union. As this union is not very closely located with Kabodak, water logging condition is slightly better than other two Kabodak side unions. Specifically the eastern part of Bidyanandakathi is almost inundation free and at times of extreme water logging, the water level remains .05 to 1 ft. The land level falls between high to moderately low category (SRDI, 2009).

Sufolakathi

Sufolakathi is situated to the west side of Keshabpur Thana. Inundated parts are less compared to other three unions. The land level falls between high to moderately high category (SRDI, 2009).



Map 3.1: Water Logging in Kabodak side Unions; Source: CEGIS, 2006

3.1.1.2 Assessing exposure to water logging through map analysis

Centre for Environmental Geographic Information System (CEGIS) developed maps over time in Kabodak basin area which has been used to find out the physical vulnerability of the unions towards water logging. Some unions are more exposed geographically towards Kabodak River and some are situated far away from the river. Maps have been given in this section.

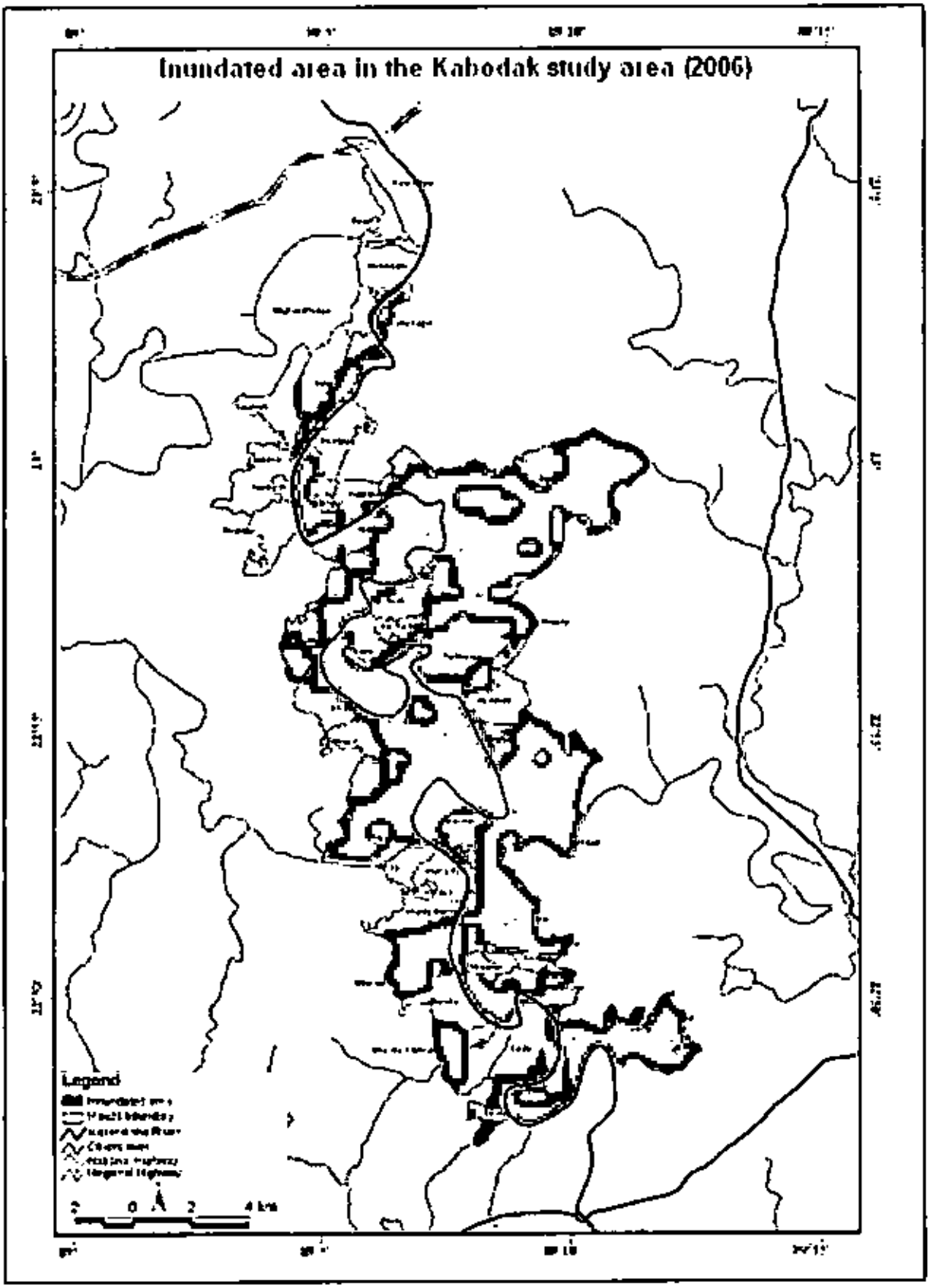
Map 3.1 shows the 2006 water logging scenario in Kabodak side Thanas including Keshabpur. Trimohini and Sagardari have been shown as two extremely waterlogged unions that time. These two unions are geographically located at the river bank and The Kabodak has been touched both the unions. Map 3.2 also depicts the water logging scenario of the study area (CEGIS, 2006). In terms of exposure, water logging vulnerability is much less in Sufolakathi than other three unions. Because Sufolakathi is not a river side union and possess a good road network.

Trimohini is the most vulnerable union due to water logging in Keshabpur as it is a closely located riverside union. Again, Sagaradri is more exposed to affected area of Kabodak river basin, and the area is geographically more vulnerable to water logging than Bidyanandakathi. The table 3.1 represents the union wise vulnerability situation of Kesahbpur Thana under waterlogged condition.

Table 3.1: Union wise water logging vulnerability

Name of union	No. of total villages	No. of affected villages	% of affected villages	No. of affected families
Trimohini	16	08	50	2,801
Sagardari	17	12	71	3,658
Bidyanandakathi	24	05	21	4,615
Sufolakathi	17	2	12	2,743

Situation Report, Concern Worldwide, 2006



Map 3.2 Inundated areas in Kabodak Basin, 2006; Source: CEGIS, 2006

3.1.2 Indicator wise Exposure Analysis

3.1.2.1 Social Indicator

3.1.2.1.1 *Housing/Shelter*

During the prolonged water logging of 2008, 3500 people from Trimohini, 2900 from Sagardari, 1300 from Bidyanandakathi and 450 from Sufolakathi union shifted to the refugee shelter (Thana Information booklet, 2008). Analyzing this figure, it is clear that Trimihini union was in the most vulnerable position under water logging in the previous year.

Most of the destructed houses were found in Trimohoni followed by Sagardari and Bidyanandakathi. Sufolakathi union was clearly in a better position in terms of housing situation. The table 3.2 represents the number of permanently inundated houses in different unions during the prolonged water logging of 2006.

Table 3.2: Union wise statistics of inundated houses

Name of unions	No. of totally inundated houses in water logging, 2006
Trimohini	700
Sagardari	580
Bidyanandakathi	260
Sufolakathi	90

Source: Thana Information Office, 2008

However, if the number of partially inundated houses was considered, the number would have been more than the above figure. Trimohini, however, was the worst affected union in terms of housing situation during the water logging of 2006.

3.1.2.1.2 *Agriculture*

Union wise comparison reveals that people who changed their livelihood due to water logging were mostly from Sagardari union (65%) followed by Trimohini (27%) and Bidyanandakathi (8%). No one in Sufolakathi had to change occupation due to water logging.

3.1.2.1.3 *Education*

Social capital issue

If number of school going children is concerned, then it is 2525, 1775, 1515 and 1050 in Trimohini, Sagardari, Bidyanandakathi and Sufolakathi respectively. In terms of both exposure and sensitivity, Trimohini bears highest vulnerability in children's education sector; though in Sufolakathi the situation is comparatively better. In Trimohini union, total 19 primary schools are inundated while in Sufolakathi the number is only 12 (table 3.3).

Table 3.3: Union wise water logged scenario of educational institutions

Union	No. of fully inundated primary schools	No. of partially inundated primary schools	Total no. of inundated schools
Bidyanandakathi	6	11	17
Trimohini	15	4	19
Sagardari	9	6	15
Sufolakathi	10	2	12

Source: Thana education office, 2008

3.1.2.1.4 *Transportation*

Photo 3.2: Waterlogged roads in Keshabpur

In the recent prolonged water logging of 2008, no roads were above water in Trimohini and Sagardari union. The only one pucca road was above water in Bidyanandakathi which was used as the shelter for homeless people. From transportation point of view, Sufolakathi is in a better position as it has roadways connected with national highways. No major roads were inundated last year in this union. The above photo (Photo 3.2) is a common scene in Trimohini union. Farmers of this union complained that marketing of agricultural products is greatly hampered due to water logging in major roads.

3.1.2.2 Environmental Indicator

3.1.2.2.1 Sanitation

Data from Local DPHE in Keshabpur reveals that at times of prolonged flooding of 2006, large numbers of latrines had gone under water. The statistics is given in the following table 3.4:

Table 3.4: Union wise sanitation scenario in Keshabpur

Name of unions	No. of inundated latrines in water logging, 2006
Trimohini	1307
Sagardari	1567
Bidyanandakathi	2210
Sufolakathi	390

Source: DPHE, Keshabpur, 2008

3.1.2.2.2 *Drinking Water*

According to the department of public health, about 57% of tube wells have been tested in Keshabpur. Among them 8336 are found safe and the rest 10394 tube wells are contaminated. Number of identified male patients are 165 who are suffering from arsenic related skin diseases. The Number of female patients is 105. The department of public health identified total 270 arsenic patients in Keshabpur. Though most of the people are taking tube well water, but the main problem is that those tube wells are located far away from each other and people have to struggle all day long to reach those tube wells.

However, those who are not using tube well or well are in a more vulnerable condition as they actually use polluted water of courtyard, pond, river etc. Percentage of such person is highest in Sagardari union, followed by Trimohini, Bidyanandakathi and sufolakathi (figure 3.2).

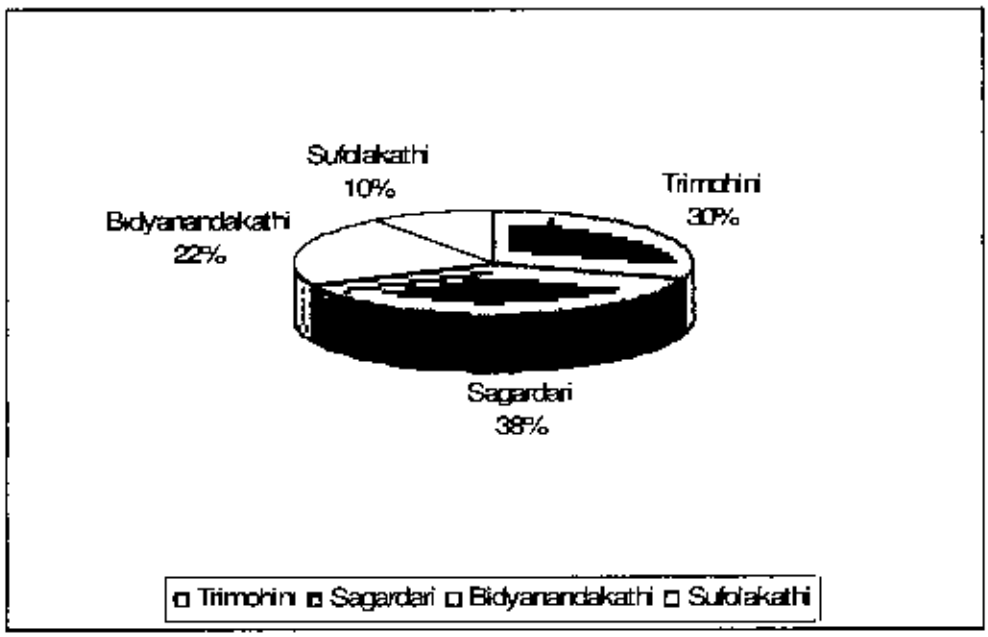


Figure 3.2: Union wise percentage of people drinking polluted water

Source: Questionnaire Survey, 2008

3.1.2.2.3 *Fisheries and Livestock*

In terms of fisheries, water logging has been helping the poor households in Jessore. People are getting benefit from open water fishing in Keshabpur. In FGD people said that although the fish grow well in standing water, it becomes a nightmare for the investors once the fish is escaped from captivity. Therefore, the wealthy people can no longer use their ponds for aquaculture. The following table shows the number of affected fish farmers in study unions (table 3.5).

Table 3.5: Number of affected fish farmers in study unions

Union	No. of affected fish farmers
Trimohini	1023
Sagardari	890
Bidyanandakathi	630
Sufolakathi	246

Source: Thana Information Office, 2008

Maintaining livestock is another major hassle under water logged condition. Providing feed, fodder and safe drinking water becomes a nightmare for most of the population. Those of whom tend to maintain cattle heads as draught animals, due to loss of agricultural lands they sell their cattle. By loosing assets such as livestock and standing trees, economic vulnerability of poor households only aggravates. 5% of the respondents feel that livestock is the most vulnerable segment in waterlogged condition (questionnaire survey, 2008-2009).

3.2 SENSITIVITY

This section will discuss about the sensitivity issue of different unions due to water logging. Intensity of problems may be different in different unions in spite of having similar exposure towards water logging. In other words, different places might be exposed in the same manner but they might have different sensitivity towards water logging because of their different social, educational and economic condition. These things have been highlighted in this section. All four unions have been analyzed in order to assess their different sensitivity. Both social and environmental indicators have been used. In every cases union wise data have been tried to put. This section also depicts how poor farmers and poor women are differently vulnerable under waterlogged condition.

3.2.1 Poor Farmers' Sensitivity Analysis

Waterlogged situation, depending on the duration, can potentially destroy land based production system, as has been observed in Keshabpur. Therefore, water logging particularly influence perpetuation of poverty, especially among those who depend on small land holding for their sustenance.

Fig 3.3: Poor farmer's perception regarding intensification of water logging problem in Keshabpur with an approximate time lag of about 15~20 years. (FGD, 2008)

From the FGD involving poor and marginal farmer representatives of Keshabpur, it appears that most of the lands in the area are inundated year round. However, the intensity of water logging varies seasonally: all the lands undergo deep water during peak monsoon, while in the dry season the water column on the lands are generally knee high and the roads and other notable infrastructure become inundation-free. The seasonality map of water logging intensity (in relative scale) is provided in Figure 3.3.

Different indicators of poor farmer's vulnerability have been analyzed to predict sensitivity of poor farmers group:

3.2.1.1 Social Indicators

3.2.1.1.1 *Income*

While analyzing monthly income and expenditure of people in keshabpur (figure 3.4 and 3.5), it was very shocking that expenditure was higher than income. From the field experience, one thing was clear that people were very interested in taking loan. So, loan and micro credit were some common component of their everyday living. The following charts show the differences among their monthly income and expenditures. Most of the respondents earn 1500 to 2500 per month but expense is more than 2500 per month. This is such a small amount of money that they become bound to live with socially humiliated status in the form of taking loans.

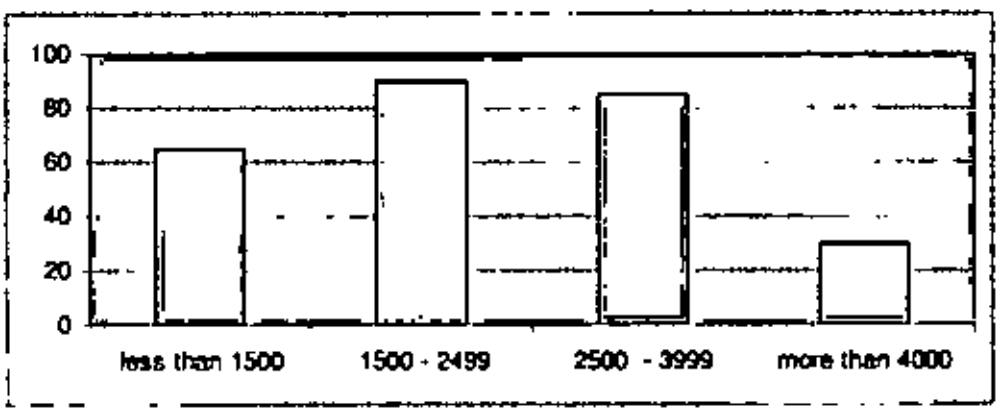


Figure: 3.4: Monthly Income in taka in Keshabpur Questionnaire Survey, 08

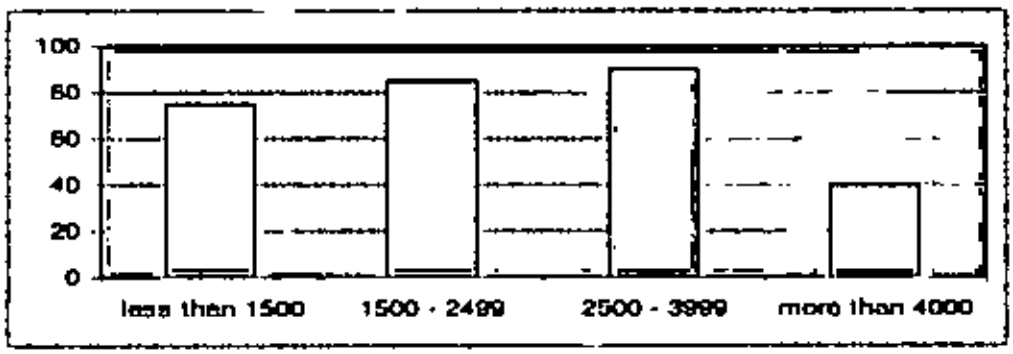


Figure: 3.5: Monthly Expenditure in taka in Keshabpur Questionnaire Survey, 08

While analyzing union wise data, it was found that People of Sufolakathi union were of higher income range than other three unions. Respondents from Trimohini union recorded lowest income level (less than 1500 on an average). The result is a demonstration of different economic condition of people of different unions.

3.2.1.1.2 *Agriculture*

When the peak period for HYV Aman transplantation approaches (usually in early August), the lands are mostly water logged and a significant proportion of the lands are left fallow. Forfeiting Aman season hits poor farmers hard and reduces their food security. Similarly, those of whom find employment as agricultural labours, they face food insecurity due to loss of employment.

Unfortunately, the farmers face the second blow when their opportunity for Boro production is significantly diminished due to salinity in groundwater aquifers. Boro crop now a day provides the best yield compared to other paddy crops. When Boro potential is diminished, poor and marginal farmers find it extremely difficult to maintain food security. Likewise, agricultural labours also face the similar fate, though at a much bigger extent. Photo 3.3 is a common scene of Keshabpur where a farmer is collecting destroyed crops from the field due to water logging.

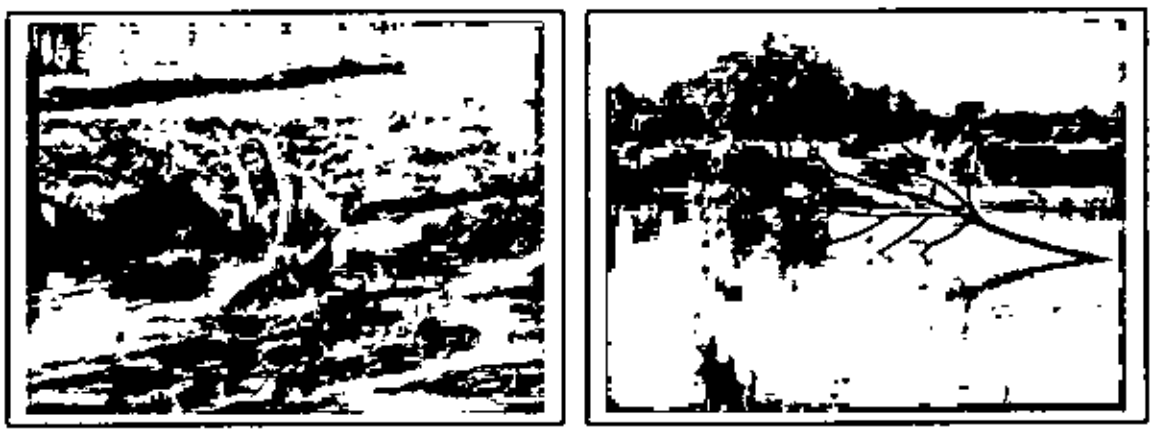


Photo 3.3: Waterlogged Agricultural land and farmer collecting destroyed crops

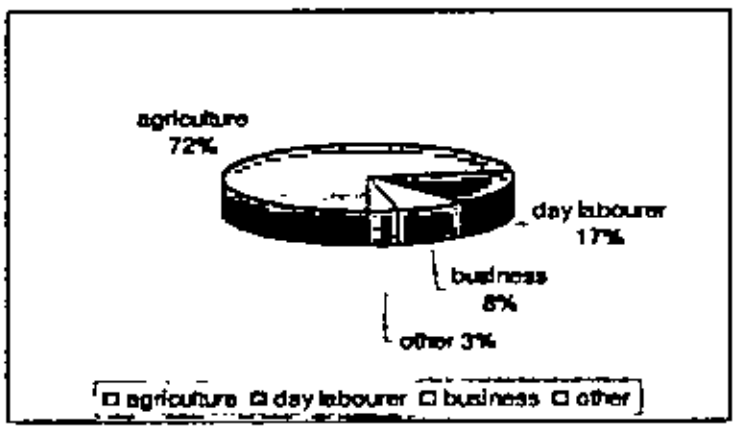


Figure: 3.6: Occupation distribution in Keshabpur;

Source: Questionnaire Survey, 08-09

The above graph (fig 3.6) shows the questionnaire survey result about the occupational distribution in Keshabpur. About 72% of people are involved in Agricultural activities while only 8% are trying some business. 17% of surveyed population is day laborers who are mostly the victims of agriculture land loss due to water logging.

According to the questionnaire survey, 2008-2009, about 34% of the respondents changed their livelihood due to water logging. Among them 60% are now day laborer, 10% are involved in fish business, 20% are involved in shop keeping and others (3%) are involved in small business. It is to notice here that about 7% of the respondents are now rickshaw

or van puller in the area. There are many families found where the main earning members of the families are now rickshaw puller in Jessore town or in Dhaka City and all of them were involved in agricultural activities before 2000 when Kabodak River was not silted.

3.2.1.1.3 *Housing*

Other than food and employment security, poor households experience many other forms of vulnerability due to water logging condition. Poor people's houses are naturally poorly built, which rot during prolonged water logging. Inundated roads and other physical infrastructures are severely damaged in water logged conditions. Biomass based walls and earthen walls are completely destroyed even in one water logging event and the family members easily become homeless. Poor and marginal people find it difficult economically to reconstruct their houses, fully knowing that their efforts will again be destroyed in the next water logging period. During questionnaire survey, about 5% people said that housing is the most vulnerable sector due to water logging in the area.

3.2.1.1.4 *Transportation*

Under water logged condition, the only mode of communication is navigation. However, frequent boat ride can be quite costly. Alternatively, one has to purchase a boat to maintain uninterrupted communication with the neighborhood. Participants in FGD said that for a poor and marginal household, such an alternative isn't viable either. Lack of communication often aggravates their problems.

Problem of transportation is a cause of lack of access towards different facilities, complained participants of the FGDs. They complained that though the eastern side of keshabpur Thana is now free from water logging, government is still interested to undertake development projects in that part of Keshabpr. This is probably because donors can easily travel that part other than this waterlogged portion. Participants urged that government should construct major roads in higher ground.

3.2.1.2 Environmental Indicators

3.2.1.2.1 *Sanitation Facilities*

In permanent water logging condition, most of the latrines are found to be destroyed by standing water. The poor are forced to defecate in open water that surrounds them, while the women in the family wait till dusk to avoid social harassment. Open defecation spread water borne diseases and skin ailments, especially when people need to bath in the same water. Though during FGD with women sanitation came as a big issue, poor farmers did not give much attention to sanitation during their discussion. Rather they were more interested to talk regarding their employment related issues.

3.2.1.2.2 *Drinking Water*

Source of drinking water is another major problem because, according to questionnaire survey, more than 17% people drink pond and river water. 12% use other sources among which courtyard water is also reported. Those, who take tube well water (59%), drink that water knowing that they might be affected by arsenic (fig 3.7).

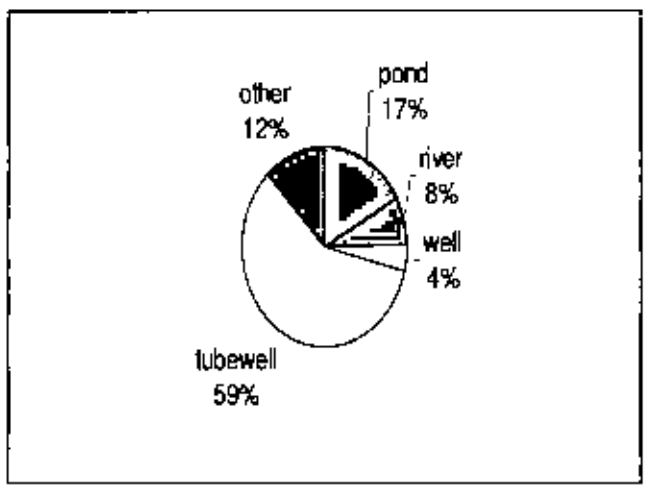


Figure 3.7: Source of drinking water of the people; source: FGD, 2008

3.2.1.2.3 *Health*

People want to have health care services. The KII involving local NGOs clearly said that qualified health care practitioners were not interested to stay in marooned conditions and

employments offered to them in this regard were not accepted. No wonder, the government's effort to keep doctors in their respective stations in the affected areas has so far been failed. The local health practitioners, mostly village doctors (i.e., *Palli Chikitshaks*) cannot treat the ailing people properly. Simultaneously, they consider the poverty status of the people and refrain themselves from prescribing costly but effective medicines. Consequently, the poor continue to suffer with ailments.

From FGD it is known that a village doctor use to treat a large number of skin patients in Keshabpur by prescribing cheap ointments, fully knowing that a large number of his patients would not be cured without antibiotic medicines. Since antibiotic medicines are costly, finds the cheaper solution as a compromise.

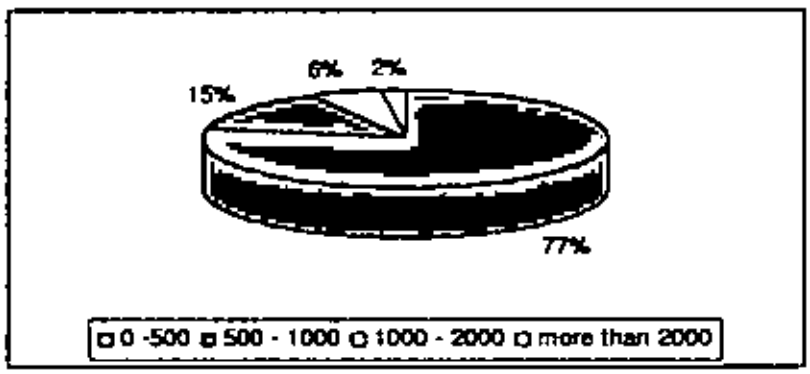


Fig 3.8: Monthly medical cost in taka in the past; (Questionnaire Survey, 08-09)

Previously, people had to spend 500 taka in a month on an average for treatment purpose (Fig 3.8). Unfortunately this average has been increased up to 1000 taka. Now Monthly medical cost is very much high compared to their income (Fig 3.9).

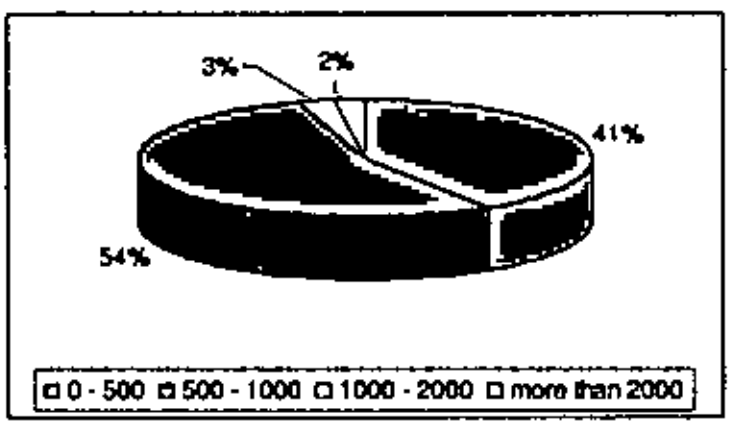


Fig 3.9: Monthly medical cost in taka at present; (Questionnaire Survey, 08-09)

While their average income is 2500 Taka per month many of them have to spend more than 1000 taka per month only for treatment purpose. This generated financial burden and economic hardship. According to the respondents, monthly medical cost increased on an average 500 taka per month in last ten years.

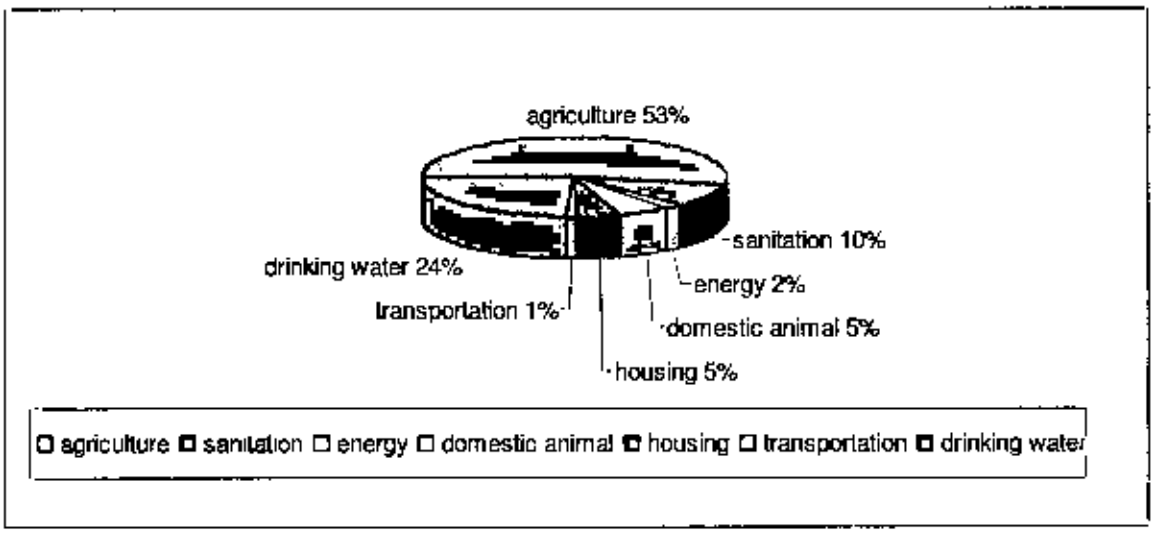


Figure: 3.10: Most vulnerable sector due to water logging; source: Questionnaire Survey, 2008

The above graph (Fig 3.10) is the result from the questionnaire survey. Here it is shown that along with agriculture sector, people feel drinking water and sanitation as two major vulnerable areas due to water logging. People in Sufolakathi union claimed that drinking water and sanitation are the two major issues where they need assistance from multilevel institutions but in other three unions loss of agricultural land was reported as the most vulnerable sector due to water logging (FGD, 2008).

3.2.1.2.4 *Vegetation*

Trees are regarded as assets for the poor people in rural Bangladesh. However, under water logged conditions, poor households lose their assets quite quickly. Farmers complained during FGD that most of the common species cannot withstand year-long water logged condition and perish easily. It is ironical that Jessore appears to be the most successful District in terms of vegetation cover, the water logged parts of Jessore is becoming devoid of standing trees.

3.2.1.2.5 *Energy security*

Poor households' vulnerability increase due to lack of energy security under water logging condition. Those of whom depend largely on biomass, due to lack of crop agriculture in the locality; they require cash to purchase biomass energy and to transport it to their households. This adds to their economic burden. However, according to questionnaire survey energy still is not a big problem in Keshabpur.

3.2.2 Sensitivity Analysis: from Poor Women's Perspectives

Since the nature of the problem is similar to that of flood, where the water remains standing throughout the year, existence within the waterlogged condition itself becomes synonymous to that of coping: women cope with such a persisting hazard in every minute of their existence in it. In a patriarchal society, males are just males, even in water logged conditions. Male members of the families often go to the nearby relatively higher and dryer places for employment; as transportation is not easy and is expensive, these people often stay at those places and do not frequently come back to their families. Even the male members show the attitude that they do not feel like staying every single day in this water logged situation. Only women are full time water-bound in this *'water world'*. This social reality makes the life of women more miserable coupled with insecurity. Food insecurity can be placed in the foremost problem as a consequence of unemployment and extreme poverty. Children suffer from acute malnourishment though mothers try to feed their kids with whatever they have, being themselves half fed or even starving.

Photo 3.4: Women in the Focus Group Discussion in keshabpur

In FGDs with women (photo 3.4) the following indicators have been discussed:

3.2.2.1 Social Indicator

3.2.2.1.1 Shelter

Water logging compels women to stay in marooned conditions for several months in a year. Women of the waterlogged households face different problems than other women of the society. In rural areas in Bangladesh, most of the mud-built houses are destroyed in water logged condition. This leads to social vulnerability of women who have to take shelters on embankments. Often families take shelter on the roof top of the house. Preservation of cooking fuel and food also become difficult.

Information on housing condition has been found in detail from FGDs. Almost 50% of the FGD participants said that they were living in Refugee centre that time as the recent water logging had destroyed their houses. The team also visited the refugee centers and women their also complained about sexual harassment in the refugee centers. Photo 3.5 shows some vulnerable houses in waterlogged condition in Keshabpur Thana.

Photo 3.5: Vulnerable houses in waterlogged condition in Keshabpur

3.2.2.1.2 Livelihood

Water logging has a far reaching effect on the social and economic status of women. In inadequacy of fodder, livestock rearing cannot be sustained which is often the means of livelihood of many women at rural areas. Homestead vegetable production also becomes difficult in waterlogged condition and therefore, women cannot plan quickly to upgrade their economic situation.

From FGD, it is found that economic activities and agricultural activities are greatly hampered in a water logged situation. As a result poverty is intensified which leads to food insecurity among the entire community; here women are the most affected segment of the population. If one tries to catch fish in a bid to avoid hunger, she can only do it after dusk to avoid social harassment. Women's work outside their homestead has been perceived derogatory for the family and such families pay the price when no respected bride groom wants to get involved in a marital relationship with a bride of that family.

3.2.2.1.3 Food security

During FGD poor women discussed about their food security. Women reported that food intake is generally high in the four months of dry season. Other eight months in a year, they have to suffer a lot in the waterlogged condition.

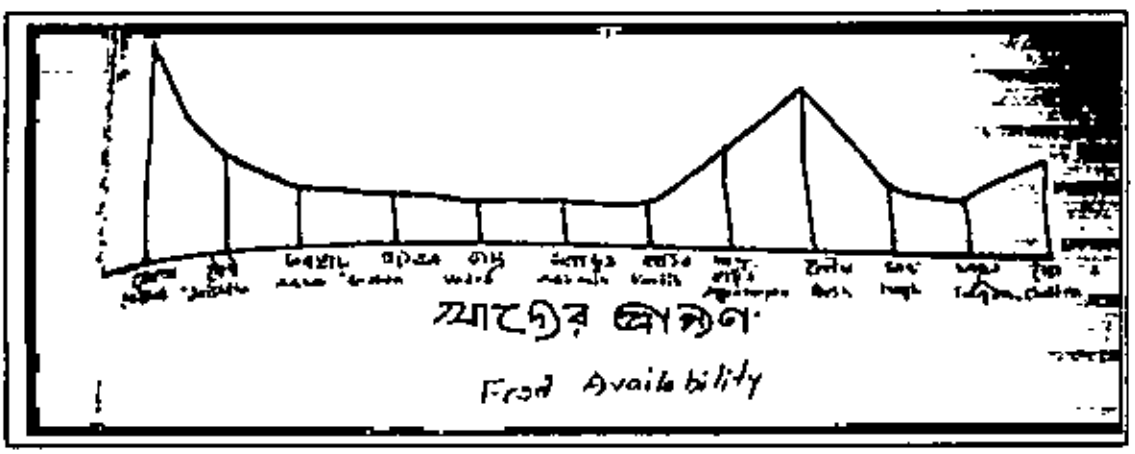


Figure 3.11: Food Availability Graph drawn by women; FGD, 2008.

Women reported that when water logging aggravates, most of their husbands go to Jessore in search of work and sometimes spend the entire water logging period in the Town. During that time women have to depend upon the small fishes and garden vegetables. Sometimes they have to spend whole day only by sharing boiled potatos. Figure 3.11 is the demonstration of women's food security in Keshabpur.

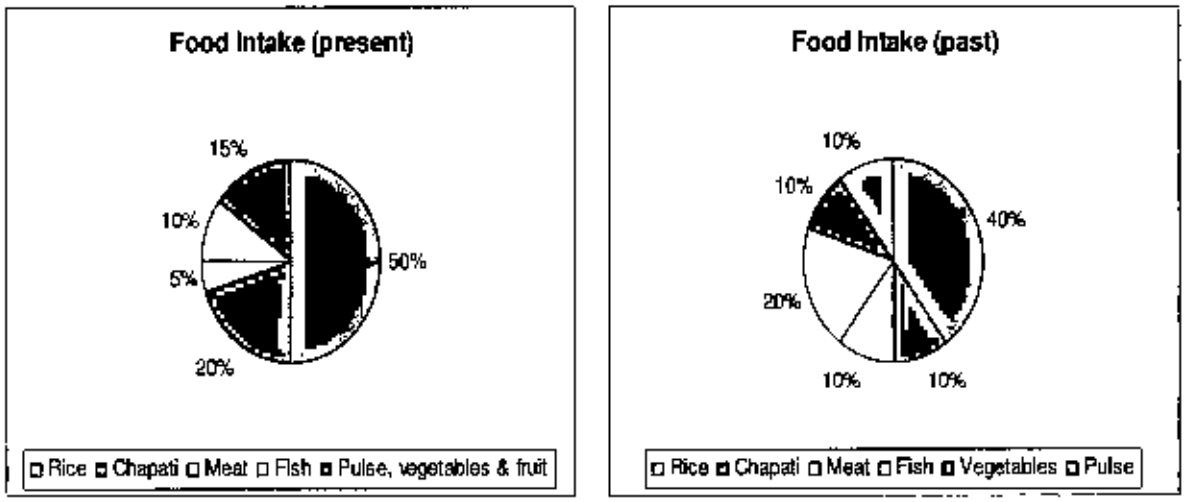


Figure 3.12: Food Intake of women (Past and present); source: FGD, 2008

By the word "security", only the availability of food 3 times a day is meant. Here, the question about quality of food does not come in. The focus group discussants have come to a consensus about the changes in their food intake both in terms of quantity and quality. As exhibited in figure 3.12, the protein intake has drastically gone down in recent years. It is alarming that their protein intake have gone down substantially, causing serious nutritional problems, especially to the children and growing, pregnant women (FGD, 2008).

3.2.2.1.4 Education

In areas which have been waterlogged most frequently, such as Trimohini and Sagardari in Keshabpur, children are reported to be growing up without even the opportunity of going to school. Such instances are illustrative of the dissipation, rather than the formation of human capital. While the rich can afford to send their children to school elsewhere, (e.g., urban centres, safe from flooding), the poor do not have such options. It is in this varied sense that women and children, particularly from the poorest social

groups, constitute the most vulnerable segment of the population. Photo 3.6 reveals the waterlogged image of Trimohini Girl's High School and a scene of an examination day where students sat for exam under open sky.

In FGDs, it was found that only 39% respondents send their children to schools. During FGDs respondents complained that inadequate transportation system is a major cause of drop out rate. They also said that preservation of educational materials is a difficult task under waterlogged condition.

Photo 3.6: One waterlogged School in Trimohini Union where students are sitting for their exam under open sky

Children and teachers of affected area informed that there are various reasons for decreasing the school attendance, as such:

- Schools are inundated
- Schools are being used as shelter
- Roads are inundated and there are no transport
- Lost of education material
- Lack of fuel (kerosene) to study at night
- Illness, diseases

When a problem is hampering children's education, it is actually creating constraints towards building social capital of a nation. When most of the schools are under water and the remaining are being used as shelter, then there must be some government plan to promote sustained educational activities in schools even in case of extreme water logging.

The refugee children in the shelters should be brought under the program so that they can achieve education during living in the refugee shelters.

LGED should come forward for building new school buildings specially designed for waterlogged region. Approach roads of schools should be high land. Another much related thing is that, if transportation system cannot be improved, these efforts will not be successful. Table 3.6 represents impact of water logging upon education along with current response and future needs:

Table 3.6: Consequence of Water Logging on Social Capital Issue

Education:		
Impact	**Response to date (by GO, NGO etc.)**	**Unmet needs and future needs**
• Increase drop out rates as people have moved to other areas • Some Schools have been closed for last six months where water has entered into the schools. • Children cannot appear in exams. • Text books and copies are lost. • Quality of education has disrupted. • Children cannot travel to schools because the area is water logged and they don't have enough money to pay for transportation.	No initiatives by any agencies in this sector so far.	This sector is not covered by any agency *Future Risk* • Education rate will decrease, especially in water logged area. • Increase social discrimination. • Some schools will be closed for ever because the school buildings are damaged.

3.2.2.1.5 Psychological Stress

During the FGD, some women from those families who were staying in refugee camp reported that they were facing problems with their husbands. They said that three families were sharing one room in the camp and their privacy was bothered. As they couldn't satisfy their counterpart in that crowded living place, it left an impact upon the behavior of their husbands and they were getting tortured physically and mentally by their

husbands. These are some untold realities which constitute the vulnerability of a major portion of rural women in Keshabpur.

Water logging halts all forms of social activities: marriages, ceremonies, social interactions - everything seem to be postponed during water logging condition. Nobody wants to engage herself in such activities especially when one has to negotiate standing water. There is hardly any scope for recreation. "*Who wants to accept such a life? Do you think we like it? We are simply forced to accept this unacceptable living conditions*", reminds one woman in the FGD. From FGD it is found that in a bid to avoid sudden slipping of young children into chest high stagnant water, women take every precautionary measure and often curtail the slightest opportunity to rest during the day. Often while going outside, women tie their kids with ropes or chains so that they dont drop into the water. According to the respondents, this action is inhuman which has a far reaching psychological impact upon both the mother and child. Collection of fuel and potable water become extremely hazardous for waterlogged women.

3.2.2.2 Environmental Indicators

3.2.2.2.1 *Health Status*

In the rural Bangladesh, most of the kitchens as well as latrines are situated outside the main dwelling unit and in waterlogged condition it becomes difficult to reach to the kitchens and in cases even to the latrines. All family members especially women cross the waterlogged courtyard several times a day in chest high water for cooking purposes. If one wants to avoid such hopeless cooking condition, she accepts cooking inside the house and shares unhygienic smoky exhaust with the children.

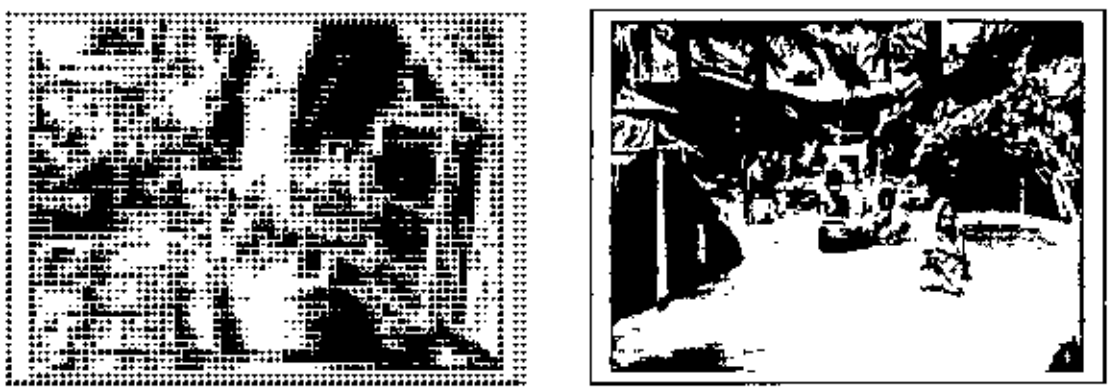


Photo 3.7: Waterlogged condition adversely affects women's health

Waterlogged situation often increases diarrhea, dysentery and skin diseases. Pregnant women cannot stroll in marooned condition, they are forced to stay back inside the house and ultimately fall victim to unhygienic reproductive health conditions. FGD with women revealed that, in many cases, people are not keen to establish a marital relationship with the women from water logging affected areas because those women generally suffer from skin diseases.

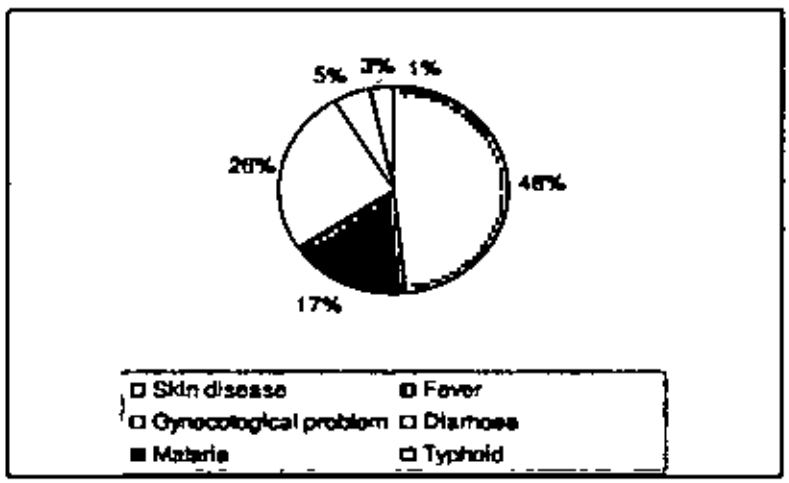


Figure 3.13: Common health problems in Keshabpur; Questionnaire survey' 08

The above graph (Fig 3.13) shows the survey result of major health problem faced by the inhabitants in Keshabbpur. From FGDs it was evident that skin disease, Gynecological problem and fever constitute the highest percentage of the health problems. It is to notice here that the huge area of the gynecological problem has been reported by the women community and they have reported that most of their problems remain hidden due to social prejudices and financial constraints.

Photo 3.8: Children affected by water logging induced skin diseases and diarrhea

During FGDs, these children (photo 3.8) were found very sick in the laps of their mothers. One was suffering from skin disease and another was suffering from neurological problems. The mother of the second one said that she frequently used to walk within the waterlogged courtyard with hip height water during her pregnancy. Photo 3.7 is a common scene in Keshabpur where most of the women have to cross waterlogged courtyards for doing daily works.

Unfortunately skin disease is one of the direct and prominent effects of water logging in Keshabpur Thana. Total 130 families found who had suffered from skin disease. The following graph shows the ratio of skin disease affected families in study unions. Most of the victims were found in Trimohini Union (fig 3.14).

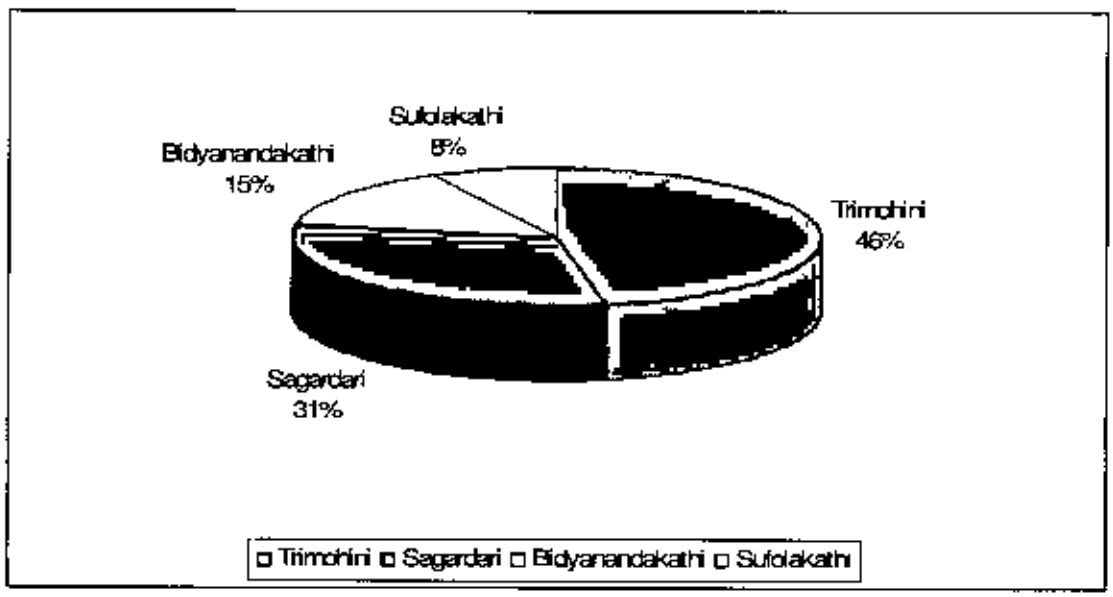


Figure 3.14: Union wise distribution of skin disease affected families

3.2.2.2.2 *Quality of Drinking Water*

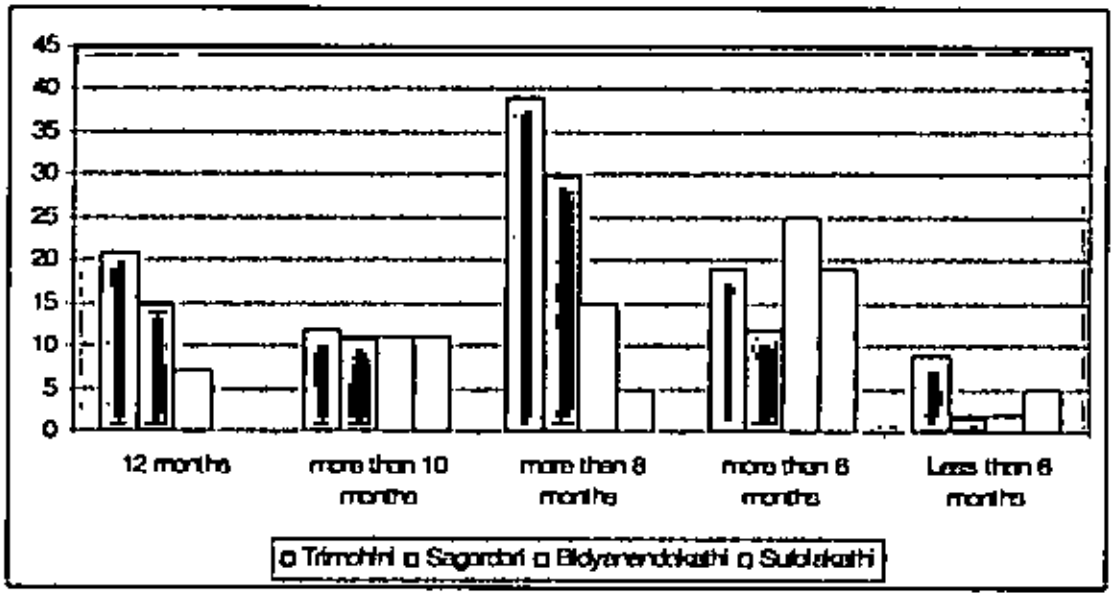


Figure 3.15: People's duration of suffering from drinking water problem per year (union wise); Source: Questionnaire Survey, 2008-2009.

Fetching water is another big issue especially for women community. They have to fetch water from long distance because deep tube wells are not closely located. One tube well serves more than 50 households in the community on an average (Upazila Information Centre, 2008). As a result women have to curtle their working hour for this job everyday. They reported that more than 8 months their land becomes waterlogged and in this period of time they suffer a lot during traveling the waterlogged area on feet. Drinking water is such an unavoidable issue that women become compelled to do the job even in case of pregnant and sick condition. Such situation certainly created negative health impact upon the women community.

Figure 3.15 shows the union wise data regarding people's duration of suffering from drinking water problem per year. About 45% people from Trimohini and 30% from Sagardari reported that they suffer from drinking water problem more than 8 months. In Sufolakathi the problem persists for 6 months on an average.

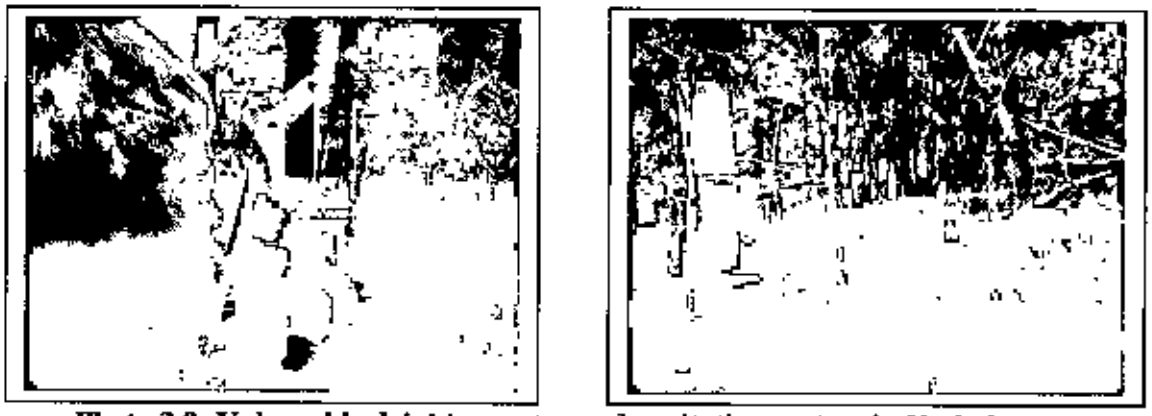


Photo 3.9: Vulnerable drinking water and sanitation system in Keshabpur

3.2.2.2.3 *Sanitation Facility*

Sanitation status is a major indicator for assessing vulnerability of women. Almost 36% of women go to secret dry land such as jungle or open field for defecation. From questionnaire survey it was found that 30% use kutcha latrine and 46% defecate in the pond/river. Only 2% use pucca latrine and others (9%) defecate directly at home so that nobody can see them at sunlight. At night they throw the liters into nearby pond or jungle (figure 3.16).

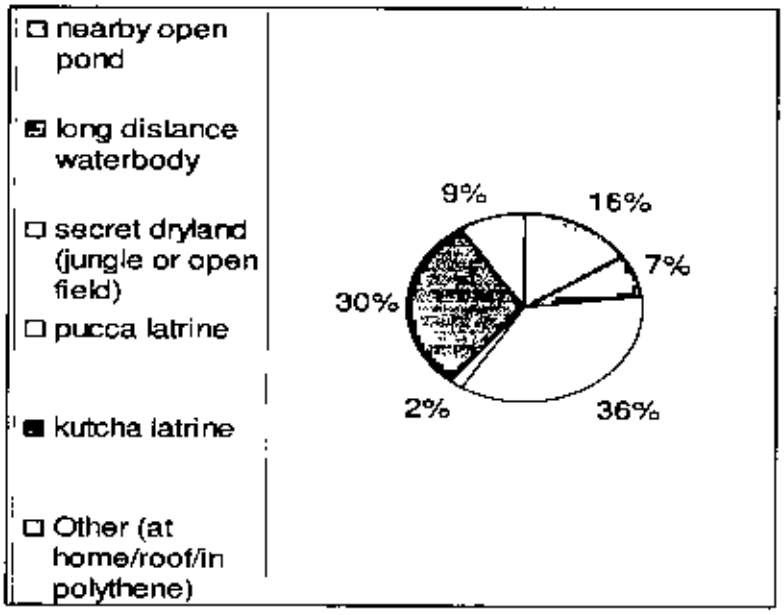


Figure 3.16: Defecation practice of local people; source: questionnaire survey, 2008

While analyzing union specific data, most of the pucca latrines were found in Sufolakathi union. Sanitation situation was worst in Trimohini where almost 90% reported that they use nearby secret dry land / jungle for defecatiou purpose.

3.3 RESILIENCE

Resilience indicates the ability to bounce or spring back into shape, position, etc. This is the ability to recover strength and spirit quickly. The term resilience indicates the state of social learning, self-organization and a capacity for a system to persist into the future. It has become fashionable to promote resilience as a strategy for building adaptive capacity in the face of the uncertainties of climate change.

However, people's resilience is directly related with their affiliation with institutions. Institutionalization makes them more capable towards decision making and thereby makes them resilient through empowerment. As a result this part would try to analyze union wise support from institutions towards resilience.

3.3.1 Union wise Affiliation with Institution

During questionnaire survey, only 29% households said that they are members of NGOs. 71% household is without any institutional affiliation (Fig. 3.17). Therefore, they cannot participate in decision making process of any development effort in the locality.

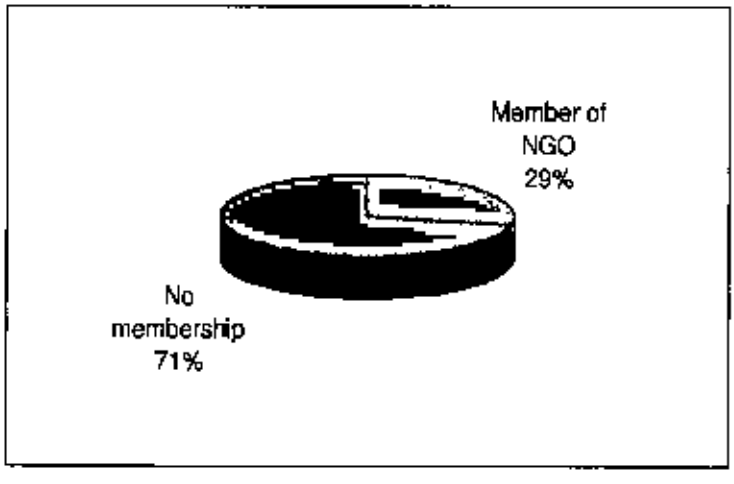


Figure 3.17: People's rate of affiliation with any institution,
Questionnaire Survey, 2008

NGOs like Asha, BRAC, Oxfam, Grameen bank etc. have their activities covering different unions of Keshabpur. In Sufolakathi Union, large number of people has been found who had some NGO affiliation. Table 3.7 shows the union wise NGO affiliation of people.

Table 3.7: Union wise NGO affiliation of People; source: Field Survey, 2008

Name of Union	Number of People with NGO Affiliation
Trimohini	21
Sagardari	23
Bidyanandakathi	02
Sufolakathi	34

Trimohini

In Trimohini, 21 people were found during the questionnaire survey who had some kind of institutional affiliation and training exposure. Such training generally includes ring based vegetable gardening, bamboo crafting, producing organic fertilizer (sanitary project) etc. People of this union said that they want to get more training on income generating activities but lack of productive land, according to them, is the main constraints towards implementing the effects of training.

Sagardari

In Sagardari, 23 people were found with institutional affiliation. People get training on medical tree plantation, ring based vegetable gardening, bamboo crafting, producing organic fertilizer (sanitary project) etc.

Bidyanandakathi

In Bidyanandakathi, only 2 people were found during the questionnaire survey with institutional affiliation and training exposure. Samadhan is an active NGO in this union. Among their important activities device distribution to disables in water logging is significant. This program is certainly an attempt to bring capacity of the vulnerable.

Sufolakathi

Reducing livelihood risk project is one of the most successful projects of this union. This is a multi donor attempt to bring resilient housing with safe water and sanitation, productive gardening and fish pond facilities. This project enhanced the capacity of people to withstand with water logging and also introduced a system of comprehensive livelihood.

Union wise condition of resilience can be easily predicted by analyzing chapter five later.

3.4 Water Logging Induced Migration: A New Phenomenon developed in Keshabpur

Water Logging is destructing rural livelihoods in Keshabpur. As a result, people are choosing migration as a suitable coping strategy leaving their counterparts alone in the village. Such a situation is creating social vulnerability for women. There are cases where the male members of the family went to Dhaka or other cities in search of livelihood but never came back. The general idea is that they might find new partners in big cities.

There are cases in Keshabpur, where the male members of Hindu families migrated to India. But in most cases, the families are unaware about the present situation of the migrants. In this way, many poor women are spending days with uncertainty and large social vulnerability.

3.4.1 Case Study 1

Jahanara Begum is a 20 years old young housewife of Sagardari union of Keshabpur. She had a happy family till last year with a little son named Sumon. Her husband Abdur Rashid was a small farmer of Keshabpur. Unfortunately he lost his livelihood due to water logging and could not sustain with farming. He decided to change occupation and started business of *Fuldani*. He wanted to start the business of *fuldani* but for that he needed some amount as investment. As a result he borrowed money from local micro credit organization. Unfortunately, his business failed and he could not repay the amount of loan. He soon tried to involve in agricultural works in order to make some earning from agricultural production based activities. But the reality was that, his land was unsuitable for producing crop due to prolonged waterlogged condition. Finally he took a hard decision; he leaved the place secretly leaving his family all alone in the village. He had no way but taking this decision because he was supposed to repay the loan amount very soon

but he was unable to do that only because his source of livelihood was destroyed due to water logging. His wife Jahanara Begum is now totally helpless. She now works as a maid servant in the local chairman's house. According to Jahanara, people try to take advantage of her helplessness. She feels very insecure at night at home. Jahanara could not dream of such a life at such a young age and now she looks older than she actually is. She also has to take care of her old grandmother in law and she informed that Jahanara suffered a lot while taking her grandmother to the refugee camp in the recent water logging. She didn't have money to pay the rent of boat for reaching to the camp. At last she made a *vella* herself and finally could reach to the camp with her son and grandmother. According to Jahanara, people in Keshabpur are habituated to being waterlogged very often but it always becomes more difficult for a single female headed household.

3.4.2 Case Study 2

When the team was visiting River Kabodak, the sign of devastation was prominent along the river bank. The rows of destroyed houses and people's attempt to repair the structures were telling us about the people's capacity to bounce bank. Kahinoor Begum is one of the

inhabitants of Trimohini. She lives without her husband with three daughters and two sons. The team met Kohinoor when she was trying to repair her destroyed house with a piece of rope and some bamboos. In the past, she used to sell lemons at market. Due to recent water logging, she not only lost her house but also lost two valuable lemon trees which was the only source of her livelihood. Kohinoor's husband was a farmer in Keshabpur but he lost his agricultural field five years ago due to water logging. For maintaining livelihood, he leaved Keshabpur and he is now a rickshaw puller in Jessore. Kohinoor has to manage the whole family all the year round. Kohinoor said that they returned from the refugee camp that day. They were supposed to stay some more days at the camp but it was very uncomfortable to stay with three young

daughters with other two families in the same tent. She was very worried regarding the marriages of her daughters.

She told that few years ago they had crop fields in Keshabpur and her husband used to earn well and enough to maintain the family. But now the situation changed due to prolonged water logging condition. Kohinoor's husband Halim Miah used to visit twice a year but for the last one year he did not visit and also did not pay anything to the family. Kohinoor begum doubts that He might have another family in Jessore town and that is why he is now not interested to come back again to this waterlogged area. According to Kohinoor, probably Halim Miah has found a safer and drier land where life is much easier than being entrapped in a waterlogged region like Keshabpur.

3.4.3 Case Study 3

Rowshan Aktar Galib Is an old man living in the sen para of Sagardari union of Keshabpur thana. Mr. galib used to sell fruits and vegetable of his own garden in the local market in the past. But now the entire courtyard of his house has been water logged. All

the land based productive system has been destroyed. After loosing his vegetable garden, he started working on other people's field as agricultural laborer. But during the prolonged water logging of 2008, most of the agricultural land went under water. As a result, he again became unemployed. His son is now a rickshaw puller in Dhaka City. Unfortunately the son has stopped sending money to the family for last few years. The poor old man lives alone with his old wife and now he is worried about the health of his wife. According to him, senpara is now so badly waterlogged that his wife cannot be taken to the hospital in case of emergency as the main roads are under water. In this way, the people of Keshabpur thana has been trapped within water logging.

3.5 Conclusion

Water logging at Keshabpur has a far reaching effect upon the life of the inhabitants. Water logging not only creates physical vulnerability but also destroys social relations and creates socially vulnerable segments. Impacts can be categorized as 'direct and short term impact' and 'far reaching impact'. Direct impacts may be household destruction, health effects as skin diseases, income loss etc. But the far reaching impacts are more acute and dangerous such as the health impacts on new born, migration decision of the principal household, drop out rate at schools etc. Undoubtedly, the most vulnerable people like marginal farmers and poor women suffers the most in Trimohini amongst the four unions of Keshabpur and impacted by water logging more than any other segment of society. Sufolakathi, on the other hand, is in a better condition in terms of exposure, sensitivity and resilience to water logging.

CHAPTER *FOUR*

COPING PRACTICE OF WATERLOGGED PEOPLE

Chapter Four
COPING PRACTICE OF WATERLOGGED PEOPLE

4.0 Introduction

Coping is an adaptive or otherwise successful method of dealing with individual or environmental situations that involve physiologic stress or threat (RVCC, 2003). Other than environmental factors, coping capacity also depends on financial ability and social context.

Coping practices are often spontaneous and immediate response of the vulnerable people to different shocks. People practice their coping with the assets they have. The livelihood conditions of the people largely depend on the ownership of or access to capital by households which broadly determines their capacity, scope and survival strategy. Well being of people and in particular the freedom they have to choose how to use their assets for income generating activities depends to a large extent on their vulnerabilities, or the risk they have to be unable to cope with changes in their environment that are beyond their control (extreme water logging for example).

In this thesis, coping is a way of struggle even within extreme waterlogged condition which helps them to fight with adversity

Different types of coping have been identified by questionnaire survey and FGDs during field survey. Local people in Keshabpur have developed their own coping strategy since last few decades They don't know the meaning of coping, they only know that they have to live and for that they have to fight with water logging. Coping for them, therefore, is the other meaning of survival. Figure 4.1 shows the source of respondents' coping lesson which is found from Questionnaire Survey.

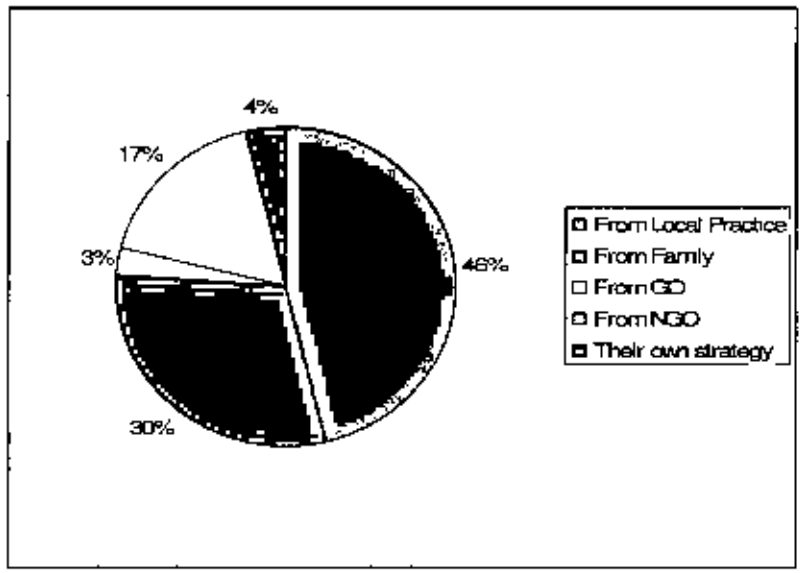


Figure 4.1: Source of People's Coping Lesson; source Questionnaire Survey, 08

The above graph shows that most of the people in Keshabpur practice coping spontaneously learned locally. NGO initiative is also significant because almost 17% of the respondents informed that they learned new strategies of coping from NGOs. Government's involvement here is very much negligible- only 3%.

However, effective coping strategies help the poor in a great way to reduce their vulnerability. Figure 4.2 shows different types of coping practices adopted by people in Keshabpur:

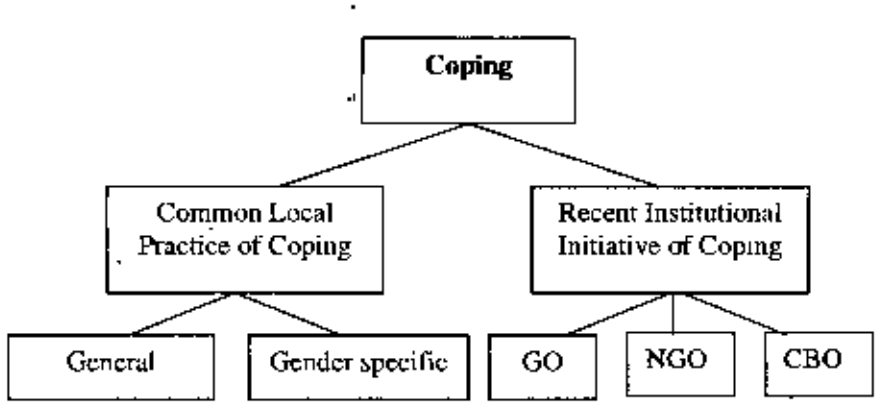


Figure 4.2: Different types of Coping in Keshabpur

4.1 Common Local Practice of Coping

Types of coping are always different in case of men and women. Women are generally given the responsibility to safeguard virtually everything valuable as well as perishable in moist conditions. They take care of themselves, maintain household physical security, maintain the well being of the children and elderly people, nurse young children, prepare food and still do everything psychologically possible to maintain household harmony.

In Keshabpur, where the prevailing water logging condition is continuing for years, they 'live through the water world' amid otherwise hopeless circumstances, even when their male counterparts are in pursuit of earning money and avoiding the water world during the peak water logged conditions. However, During FGDs and household surveys, team found different opinions and views from men and women. As a matter of fact, these two segments of population cope in a different way but 'survival' is one of the common mottos of each group. Common coping techniques of people in Keshabpur have been discussed below:

4.1.1 General Coping Strategies

4.1.1.1 Structural Modification

To cope with water logging people generally build houses with fences made of bamboo (*'muli'* bamboo) and wood. The foundation floors of the houses are raised so that water does not enter very easily, until it attains a certain level.

Photo 4.1: Houses with Raised Platform

Most of their houses are made of mud wall including plinth, CI sheets roof with few bamboo sticks, with no pole in the houses. So, once the water reaches to the mud made house plinth, it just collapses. In case of mud built houses, inhabitants raise the platform

from 1.5 to 3 feet on an average (Questionnaire Survey, 2008-2009). Most of the houses use stairs to reach main dwelling (Photo 4.1). Vegetation upon the roof is very common in Keshabpur as productive land is limited. Roofs are also constructed of straw and brick cement (Tali).

Average Plinth Height Information

The photo is showing a 2.5 ft plinth height which is very common in major waterlogged area. Plinth height also increases up to 3 ft. People reported that they have to change their plinth height twice a year to adjust with the level of water. According to the Local People, after the siltation of Kabodak River in 2000, people are now more prone to water logging and they are now bound to adopt new strategies relating to housing related coping.

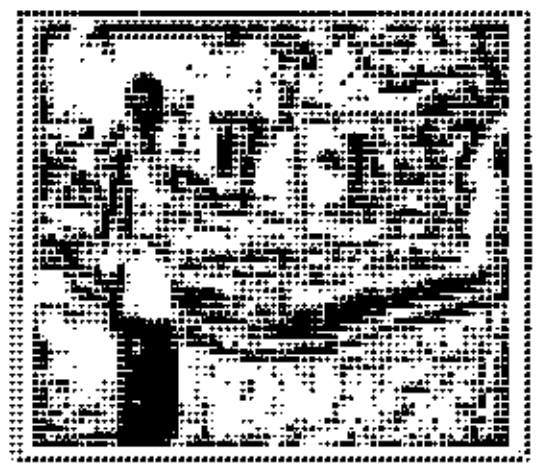


Photo 4.2: Strategies to avoid direct exposure of land

Men and women work together to build houses. People generally try to build houses upon a certain height level. Those, who can afford, increase the plinth of the home by depositing mud on the ground and those, who can not, just increase the household height by bamboo pillars (Photo 4.2). In Keshabpur, houses inside the embankment has ceiling-like raised/ high platforms, locally termed as "*Darma*", which offer safe storage for all their valuables: ownership documents/ deeds of lands, other important papers/ documents, dry food e.g. fried swollen rice ('*Cheera*', '*Muri*' etc.), rice, and pulse, salt, sugar ('*gur*'),

matches, candle, kerosene, quilt/'*kantha*', etc. (Photo 4.3). Women climb up the bamboo made stairs and fetch anything needed as many times as required (FGD, 2008).

Photo 4.3: Protecting valuable documents in *Darma*

In case of the extreme poor people, unfortunately the meaning of coping is actually nothing but shifting to the refugee shelter. Other than making any permanent arrangement of durability, very poor families generally find no ways other than rebuilding their houses (with weak foundation) after coming back from refugee shelters.

4.1.1.2 Coping in Agricultural Sector

In the case of crop-agriculture, late varieties of 'Aman' rice viz. 'Kazal-shail', 'Raje-shail'(both black and golden), 'Chapraish', 'Kartik-shail', 'Dholamota', 'Leiccha', 'Nazir-shail' are sown with a view to coping with water-logging. During the water-logging period cattle are reared/ kept by raising the floor. Seed-beds are also prepared by raising the piece of land with soil/ mud. In some places crop-land is raised to some extent for cultivating winter crops ('*rabi*' crops). In many areas as a precautionary and safety measure, the levees (sides) of the fishing ponds are raised up to a certain level so that fish cannot leave the ponds (Questionnaire survey, 2009).

From FGD it is found that when the area is extremely waterlogged, people generally get involved in the 100 days work program of government and get daily basis salary such as 100 tk per day. They become engaged as day laborer for road construction, canal digging etc. This is one of the most common ways of coping who lost their existing livelihood.

Ring gardening, floating vegetation etc, are some new technologies which are recently being practiced by the local farmers (Photo 4.4). The details of these new technologies have been discussed in chapter eight.

Photo 4.4: Livelihood Coping by Avoiding Land for Production (Ring Gardening)

4.1.1.3 Income / Livelihood Coping

Households adopt a wide range of strategies to cope with crisis. Immediate after/ during the crisis people use to take credits from relatives/ neighbours, often they take loans from local "*Mahajans*" (i.e., rich persons) with high interest (usually 100 tk. interest per month for 1000/tk. of loan) to face the emergency needs. Especially when diarrhea and other diseases breaks out, they go for informal loans During such crisis situation, they sell their homestead trees, lands, jewelries. Of course selling lands are the last resort for them.

Most of the participants presented in the FGD were landless and marginal. Day laborer's daily income was not more than 30 tk. They cope by changing their occupation in waterlogged period such as farming to van pulling. Sometimes van pullers also do not find ways to drive as major roads becomes inundated. In such situation people migrate to other area for earning livelihoods. Migration is a new technique of survival in Keshabpur as land based production system is almost destroyed. The target groups in the research are now more interested to switch job or migrate elsewhere in search of job. But in most of the cases, extreme poor do not even have that much money which is needed to start a new business or migrate.

Almost 17% of the respondents said that their male counter part had gone to Jessore town and Dhaka City in search of work as they lost their current livelihood in Keshabpur (questionnaire survey, 2009). Migration started only few years ago, according to the respondents. Most of the respondents think that the siltation of Kabodak River in 2000 is responsible for the rural livelihood loss and only for this people are leaving the area.

4.1.1.4 Sanitation Coping

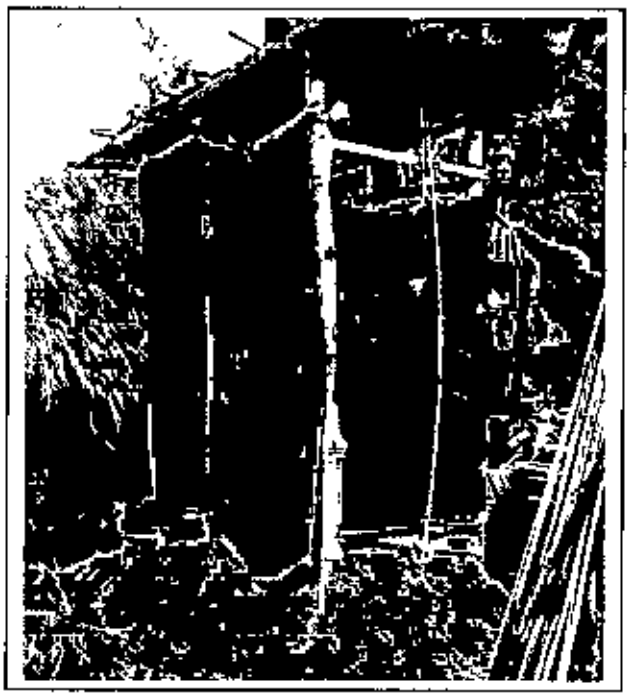


Photo 4.5: Sanitation coping by increasing the ground level of latrine with mud

Sanitation coping is a big issue, especially for women (it has been discussed in detail in section 4.1.2.2). During water logging, most of the latrines become inoperable. Then people generally have to go to nearby field or jungle for defecation purpose. Unfortunately, the most common practice, in extreme waterlogged condition, is to defecate directly into the courtyard's water (FGD, 2008). One of the common coping practices is to increase the ground level of latrine with muds or woods. Photo 4.5 is one of such examples.

4.1.1.5 Coping with Drinking Water

Among 18730 tube wells in Keshabpur thana, 800 tube wells were completely inundated during the 2006 water logging. Rainwater is now harvested in some areas of the Keshabpur with a view to using as drinking water. Besides this, branches of trees are stored on "*Darma*" to be used as firewood for boiling pond-water. During water logging, water is made purified by some families either by boiling or by using alum ('*fitkiri*'). But most of the people are not that much aware in Bangladesh.

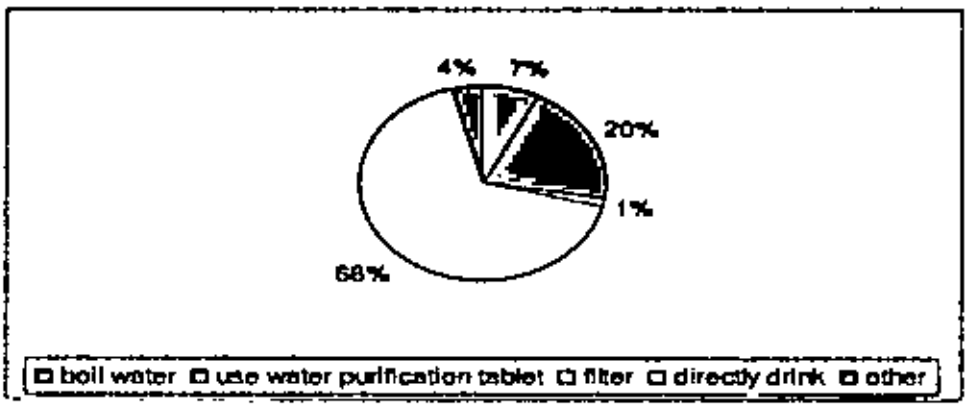


Figure 4.3: Water purification strategy in Keshabpur Questionnaire Survey, 2008

Water purification system is very much poor in the area. Most of the people drink water directly from pond or river etc. (68%), 7% boil, only 1% filter and 20% use water purification tablet (Fig 4.3). Water purification tablet has been distributed by IDO and Muslim Aid in Trimohini Union.

4.1.2 Gender Specific Coping

There are some coping strategies which are specially adopted by women of the study area. During FGDs it was evident that women were interested to talk about some unique coping strategies which were different from that of male participants. Women were more focused on the coping strategies related to drinking water, sanitation, cooking etc. However such gender specific coping strategies are discussed below:

4.1.2.1 Coping with Drinking Water

Fetching safe drinking water becomes another major daily hurdle. If the household tube well is inundated and/or contaminated, the woman goes to the neighbors' courtyard to collect safe drinking water. But if the distance is very long, it is the female members of the family who travel a long distance on foot (sometimes with children) only to fetch safe water. To cope with water pollution, sometimes water is purified by water purifying tablets (FGD, 2008)

4.1.2.2 Sanitation Coping

Sanitation is a big problem for the women in Keshabpur. During prolonged waterlogged condition, women cope by hiding inside the house all day long and go outside to defecate at night time. Women suffering from menstruation use unhygienic pieces of cloths inside homes and wash them in dirty water. The ultimate health impact is obvious and dangerous. In the FGD women said that they often defecate on a paper inside the house and then throw that to the open water later on. Many women also defecate on the roof of the house. This is the common picture of so called coping of rural women in Keshabpur.

4.1.2.3 Household Coping

When the waterlogged condition deteriorates with excessive rainfall, women use to shift all the household utilities on a bed where all the family members not only use to live but also cook. One way of popular coping is taking shelter on the roof of the house (photo 4.6).

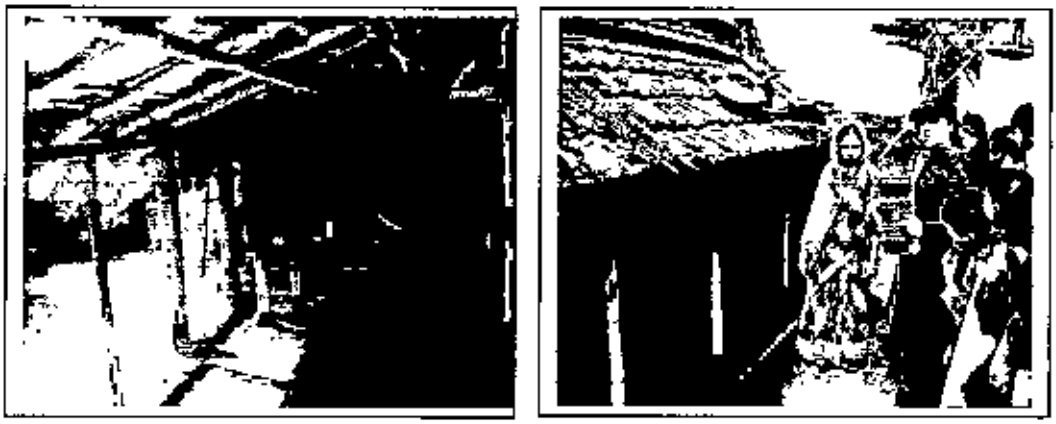


Photo 4.6: Women struggling to cope with water logging

Cooking becomes a hazard; especially if biomass based cooking stoves are being used. Ovens are made using mud, tin, and cement and kept on "*Darma*" in order to use during waterlogged period/ flood time.

Cooking is done on a higher platform

Kitchens are constructed on top of beds using those ovens, which the participants have learned from mimic demonstration/ publicity performed in mass communication campaign. Cow dung is their main source of energy. Those who don't have livestock use branches of tree. Cooking on roof top is a common coping in case of extreme water logging. The above picture shows the higher platform for kitchen.

4.1.2.4 Livelihood Coping

Most of the women presented in the FGD were very poor, without any savings. They maintain their livelihood by borrowing money in case of hardship and sell their assets. Rearing pigeon in the roof of the house is a common coping practice by women as land based production is difficult. Producing vegetables in *Macha*, rearing chicken and ducks (if some dryland is available), handicrafts etc. are the common techniques of survival practiced by rural women. Women continue to maintain poultry and livestock Feeding these animals require extra bit of effort on the part of the women.

4.1.2.5 Managing Kids in Water Logging

Women have to invent new coping strategies in order to rear children Sometimes women go outside leaving their children alone at home. The elder child has the responsibility to take care of others. If the mother feels insecure to leave them alone, she has to take all of them with her. Some mothers, while going outside, tie their kids with ropes at home so that they don't drop at water. One woman reported that during the last prolonged water logging, she used to tie plastic water bottle with her five months old daughter so that in case of accident she did not sink into the water.

4.2 Recent Institutional Initiative of Coping

From Focus Group Discussion it was evident that most of the people in Keshabpur thana does not get any institutional help in adopting coping in water logging. Most of them use local technologies without any training from GOs or NGOs. Only 21% of the participants said that they had got training or institutional help in adopting coping strategies (figure 4.4).

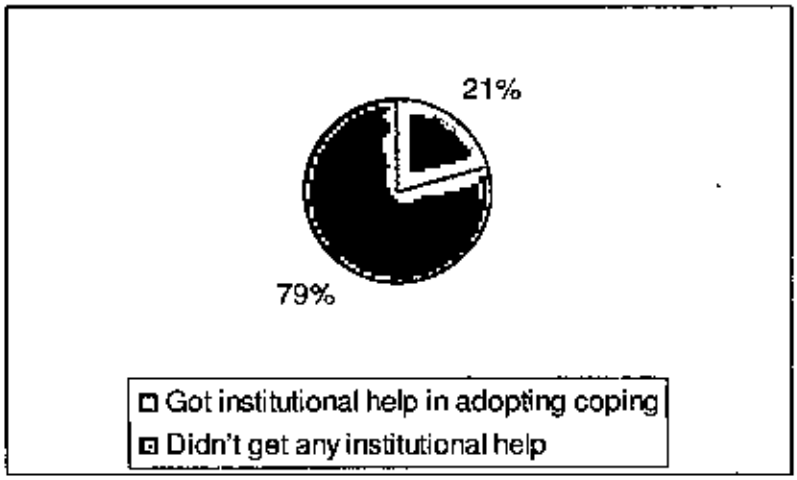


Figure 4.4: Institutional Effort for Adopting Coping Mechanism; source: QS, 08

4.2.1 NGO Programs

During FGDs and household survey, people mentioned about few GOs and NGOs who taught them effective coping strategies. Key Informants' Interviews (KII) in different organizations revealed that NGOs such as IDO, Uloshi Srijony Shongho, People's Forum on Water logging, Muslim Aid and *Shamadhan* are involved in disseminating coping techniques among local people. Mainly these NGOs are actively involved in popularizing coping activities in the area.

Housing and livelihood

Samadhan trained people in all the four Unions on how to increase the height of house and how to build durable houses. They also taught people how to overcome livelihood difficulties during extreme water logging through establishment of floating gardening, ring gardening etc. Both the ring and floating gardening are types of coping in waterlogged area invented by local NGOs and these technologies have been proved very effective. Local people found ring gardening very useful in places where lands are mostly waterlogged and is not suitable for ground vegetation.

Ring based vegetable gardening is a popular way of coping. Women informed that they are getting excellent benefit from these two technologies as it does not require exposure of land. This is an innovative technologies invented by local people and NGOs. In this process, big cement rings are filled up with sufficient amount of suitable soils. These

rings with soils are then used to plant trees and vegetables. This particular technology reduces the risk of water logging as vegetation is accepted to grow at a higher level than the ground. This technology is demonstrated by different NGOs among the villagers such as *Uloshi Srijony Shongho*, People's Forum on Waterlogging and *Samadhan*.

Health and drinking water

However, health awareness is a big issue at which NGOs are actively involved. IDO and Muslim Aid distributed water purifying tablets among two unions namely Komorpur and Trimihini. They also taught and trained people on other water purification technologies. However, rainwater harvesting was also demonstrated by few NGOs but could not be successful in Keshabpur.

Cooking Technology

Muslim Aid took a program of demonstrating sustainable oven operation in waterlogged areas of Trimohini. People in Trimohini now practice those safety measures in cooking technology. They use oven which has slightly higher plinth than that of other areas.

4.2.2 GO Programs

Housing and Livelihood

Reducing Livelihood Risk Project is a big budget project locally operated by Samadhan NGO funded by CDMP, EC, DFID, GoB, UNDP etc. The activities of this program are limited to Trimohini, Bidyanandakathi, Sagardari, Pajia and Sufolakathi union. This program includes increasing the ground level of homestead (so that water cannot enter into house), tree plantation, increasing the level of pond bank, fish cultivation, vegetable gardening, constructing *Macha*, Duck rearing etc.

This program aims at developing a comprehensive lifestyle by increasing the ground level of homestead and thereby increasing the social security. The soil used for increasing the homestead height is taken from a nearby place where small pond is created automatically. Upon that pond people are practicing floating gardening and the pond is being used for fish cultivation as well. In this way, this project teaches how to utilize a small space to its fullest. This is a very good example of increasing people's capacity towards better coping

condition in waterlogged condition. However, this project is discussed in detail in the next chapter.

Management of Refugee Camps

Government establishes refugee camps along the side of the main roads or embankments during extreme waterlogged condition. Government also construct temporary tube well and latrines for refugee families. Taking shelter to refugee camps are the techniques of coping during severe water logging. People find no ways other than leaving their ancestral home in waterlogged condition. They have to adjust themselves with other families in one single room (Photo 4.7). Often they have to live together along with their live stocks in the same room. Hence, struggling for survival is the other name of coping for people in Keshabpur (FGD. 2008).

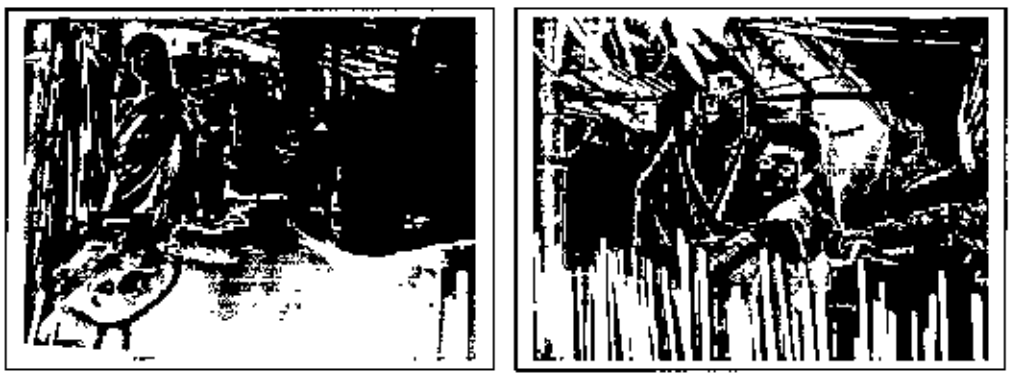


Photo 4.7: Women taking shelter at refugee camp

4.2.3 Community Based Coping Effort

People in Keshabpur have developed their own coping mechanism through the years. They understand that community level efforts should be much effective than household level coping efforts. From this idea, inhabitants of Trimihini and Sagardari established an example of community based coping effort which saved life of many people from water logging and ensured agricultural production. In this effort, people constructed an embankment with polythene, plastic and bamboo and restricted water from overflowing the crop field. It protected bighas of land from the detrimental effect of water logging

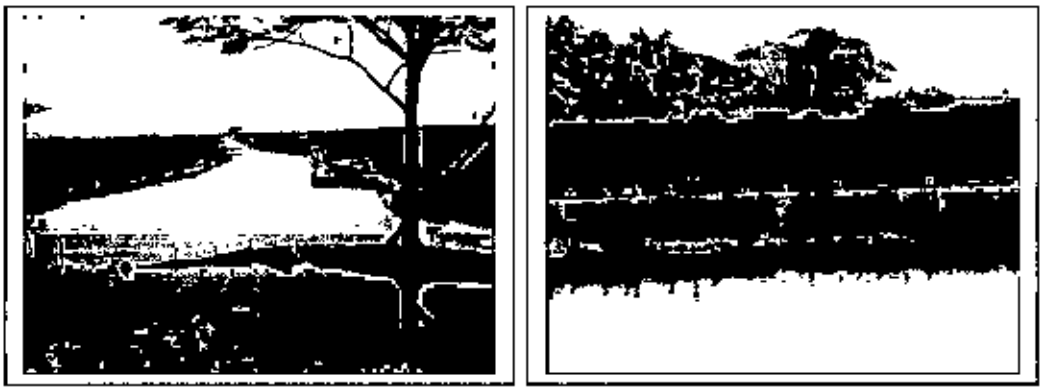


Photo 4.8: Community based Coping Effort

Photo 4.8 is a very good example of how local people can participate in the development process with their limited resources. In this case, people contributed money for buying polythene, bamboos etc. and those, who couldn't, just became involved in the physical labor. That is how this effort became successful and now thousands of people in Trimohini and Sagardari are getting the benefit. They are getting crops after a long period in their locality (FGD, 2008)

4.3 Conclusion

"We do not cope, we just try to survive. Who wants to live like this?" snapped a young woman in Keshabpur. She just represents thousand other people in the water logged area. Coping is, therefore, the other meaning of survival for the Keshabpur dwellers. However, Government and other institutions should come up with other necessary training and skill development program for promoting better coping strategies in the affected areas. The following table 4.1 summarizes the findings regarding coping efforts in Keshabpur Thana.

Table 4.1: Coping Strategies in Keshabpur and people's Source of Learning

Problem Area	Strategies of Coping	Source of Learning of Strategy	Comment
Social Indicator			
Housing	Increase height of the floor	Local practice	Both GO, NGO and Local People are involved.
	Increase plinth level up to 1.5-3 ft.	Local practice, GO, NGO	
	Use of stairs to reach main dwelling	Local practice	
	Use of ceiling-like raised/ high platforms, locally termed as "*Darma*", which offer safe storage for valuable materials.	Local practice	
	Cooking is done on a higher platform.	NGO	
	Taking shelter on the roof	Local practice	
	Shift to refugee center	GO	
Agriculture	Late varieties of Aman are sown	Local practice, NGO	Government initiative is negligible.
	Seed beds are prepared by raising the ground	Local practice	
	Crop land is raised to cultivate winter crops *('Rabi crop')*	Local practice	
	Change occupation	Local practice	
Income/ Livelihoods	Taking loans generally with high interest rate	Local practice	
	Sell valuable household assets	Local practice	
	Ring based vegetable gardening	NGO	
	Increase the level of pond bank and fish cultivation	GO, NGO	
	Migration	Local practice	
Food Security	Construction of community based embankment to protect cropland from water.	CBO	Local people were the main stakeholder
Education	Classes and exams are taken in main roads under open sky	Local practice	Drop out rate is increasing.
	Students use polythene bags for carrying their books	Local practice	
Transportation	Frequent use of boats	Local practice	Popular practice
Survival	People tie plastic bottles to the new born to avoid sudden drowning	Local practice	
	While going outside, some people tie their children with ropes in order to avoid sudden sleeping.	Local practice	

Probleam Area	Strategies of Coping	Source of Learning of Strategy	Comment
Environmental indicator			
Drinking Water	Use of water purification tablet	NGO	NGOs are doing well
	Use of fitkiri	Local practice	
	Rainwater harvesting	NGO	
	Boil water	Local practice	
	Fetch water from long distance	Local practice	
Sanitation	Increase ground level of toilet	NGO, GO	GO initiative is negligible.
	Defecate in the field/ dry land at night	Local practice	
	Women suffering from menstruation use unhygienic pieces of cloths inside homes and wash them in dirty water	Local practice	
	defecate on a paper inside the house and then throw that to the open water	Local practice	
	Defecate on the roof	Local practice	
Health	Consult local health care centers	Local practice, NGO	NGOs have significant programs in health awareness
	Using cheap ointments is common in case of skin disease	Local practice	

The above table summarizes the coping strategies of local people in Keshabpur. From the table it is evident that structural modification and sanitation are two areas of popular coping in the area. People themselves develop coping strategies according to their needs. Very few institutional efforts are on progress. However, NGOs recently took some initiative regarding livelihood coping whereas government efforts are poor in popularizing coping techniques in the area. Institutional effort from government side is necessary in case of strengthening people's coping capacity in the area.

CHAPTER *FIVE*

EFFECTIVENESS OF GO-NGO PROGRAMS IN CONTEXT OF WATER LOGGING

Chapter Five

EFFECTIVENESS OF GO-NGO PROGRAMS IN CONTEXT OF WATER LOGGING

5.0 Introduction

Water logging in Keshabpur is a result of people's inability to develop a functional working mechanism among all the stakeholders (Kibria, 2006). No doubt, Water Development Board has been designated for the purpose of maintaining effective drainage system in Keshabpur but as a matter of fact, this government organization is only involved in constructing embankments and polders. Other than this, they are not interested to adopt any other innovative technologies. Besides, they are not interested to involve people in the overall process. As a result, the system as a whole, excludes the participation of local inhabitants and thereby any development efforts are becoming useless.

This chapter tries to find out the effectiveness of ongoing GO, NGO programs in response to water logging problem in Keshabpur Thana. For this purpose, the following tools have been used:

- Different government and non government organizations have been interviewed as Key Informants regarding their programs in response to water logging in Keshabpur.

- At the same time local people have been asked through questionnaire survey regarding their perspective about the effectiveness of ongoing projects. During filling up the questionnaire, people gave scores against the before and after project scenario. Two different scales have been used to understand people's perspective regarding the effects of project, which has been discussed in detail in section 5.10. Questionnaire survey has been conducted in Trimohini, Sagardari, Bidyanandakathi and Sufolakathi Unions of Keshabpur Thana.

5.1 Different Government Institutions involved in activities in context of water logging Problem

5.1.1 ***Water Development Board*** is the principal organization involved in drainage related activities. The responsibility of this organization is:

a) To construct polders and embankments
b) To manage the sluice gates (through Water Management Association-WMA)
c) To conduct the maintenance of sluice gates
d) To remove silts from rivers by dredging; etc.

5.1.2 ***Agricultural Extension Office*** is involved in distributing fertilizers and seeds to the affected farmers Office only distribute this to those who have land below 2.5 acre and who are *Kabodak affected**. Field Assistant Officer is designated to communicate with local farmers to assess their needs and problems.

5.1.3 ***Department of Social Welfare*** is one of the significant agencies run by Government. This department undertakes their activities in waterlogged union to help the poor, old and disabled vulnerable groups. Department of social welfare is involved in distributing old allowance, disable allowance, freedom fighter allowance etc. They also operate micro credit among poor and acid victims and a good number of Mother care centre (64) in keshabpur. At times of severe water logging and disasters, Government also gives free mother and child care in these centres.

Government is also involved in micro credit program among disables. 114 disables so far have been given loans. This amount so far is about Tk 1377587. Micro credit program of the department of social welfare is limited only to the female members of 64 mother care centers. There are 10-15 members in each center. Repayment period is 10 months and there is 10% service charge applicable upon all the members. The following table 5.1 shows the allowances disbursed by the department:

Table 5.1: Allowances given by the Department of Social Welfare

Name of Allowance	Amount (Tk/month.)	Number of beneficiaries so far
Old Allowance	220	615
Disables' Allowance	300	3379
Acid Victims' Allowance	200	02

Source: Department of Social welfare, Keshabpur, Jessore, 2008.

5.1.4 ***Department of Public Health, Keshabpur*** is responsible for distributing safe drinking water to the inhabitants and to ensure safe sanitation system. According to the officials, there are total 2334 arsenic affected tube wells and among them 2291 are running presently. There are 496 safe (arsenic free) tubewell in Keshabpur, according to the Government statistics. Among them only 479 is functional and the rest of the 17 are out of order. Government is not taking any steps to combat arsenic in the area, only some deep tube wells are under construction both by GOs and NGOs. In the past, JICA tried to operate some projects in Keshabpur but they could not be successful.

In Keshabpur 25 to 50 households share one tubewell. Moreover, Government is constructing shallow tube wells in the refugee camps due to its low cost and the vulnerable refugees are suffering the most.

5.1.5 ***Local Government Engineering Department (LGED), Keshabpur*** is undertaking small irrigation program for water logging affected farmers. Small water resource development activities are also under operation These activities are managed by the Water Management Cooperative Association. LGED is also involved in sluice gate management, road and embankment construction, canal excavation etc.

5.2 Different Government Programs

5.2.1 Tidal River Management (TRM)

Under the coastal embankment project Government built numbers of embankments along Hari and Kabodak River. Though the goal of the project was to protect the area from tidal surges, it had a negative impact. Due to commissioning of Farakka Barrage in 1975, extreme low flow accelerated the processes of sedimentation in the riverbed. It reduced the difference between the embankment height and peak water level. Sluice gates became inoperable due to sedimentation and wrong placement. Therefore, once spillage takes place over an existing embankment, it inundates both agricultural lands and homesteads.

Under this circumstance, there was an embankment in waterlogged Bhainar beel in the past. Considering the detrimental effects of embankment this time public protested this effort and cut the embankment. Surprisingly enough, this act proved to be effective for the villagers. They got crop that year because the land level increased due to sedimentation from river. River also became more navigable by withdrawing its silts into the beel area. This particular concept is known as TRM which is totally local people'e invention. BWDB later adopted this technology and implemented TRM in Beel Khukshia of Shufolakathi Union. As a result the beel has become 20-25 ft deep

The basic idea of TRM was simple: to allow tidal flow into wetland basin, known as *jowar-bhata khelano* (free play of tidal flow) in local vocabulary, and releasing the tidal flow back to the river. As a result of this process, sediments carried tidal flow deposits on the wetland basin instead of riverbed. The process has been continued for several years (usually three years, the duration depends on the size of the wetland basin). It has gradually raised the land on the wetland basin with formation of alluvial soil from silt. This was a unique system of tidal flow and sediment management. The TRM has prevented sediment deposition on the riverbed and has ensured the drainage and smooth navigation in river channels. TRM is a popular concept of combating with water logging problem and has been implemented in beel Khukshia of Keshabpur.

However, people did not receive the full benefit of this project. It has been observed that there are small canals inside the beel area which has not been well maintained by BWDB. As a result, those canals have been clogged and the silt from river could not cover the

entire beel. Only 50 bigha was silted instead of 100 bigha of beel area. Thus, TRM could not appeal to its optimum benefit.

Photo 5.1: TRM in Beel Khukshia and its Sluice Gate

TRM first started at Beel Kedaria in 2002 covering 800 hectare land (photo 5.1). It stopped after three years as a result of public protest. Eventually in 2004, rivers became silted due to the closing of the project. Director General of Water Board visited Keshabpur to monitor the situation and decided to undertake TRM again upon Beel Khukshia under the KJDRP-G Zone. There was a mixed reaction from people's part this time. They wanted the implementation of TRM but in other's *Beel* instead of their own *Beel*. Finally west Beel Khukshia was decided as the project area in 2005. Even Survey was completed through CEGIS. But again under the pressure and protest of local people, the TRM project was stopped.

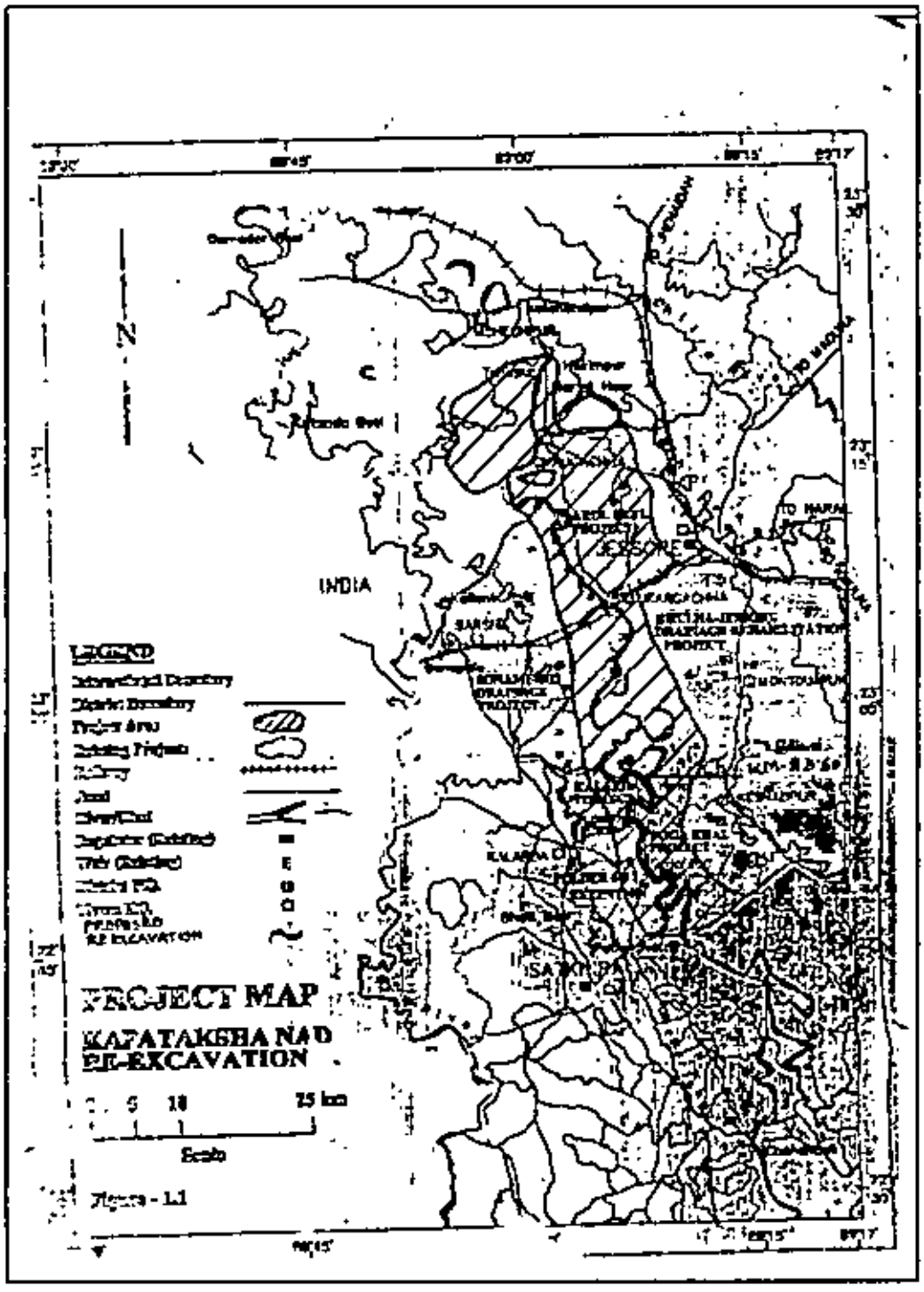
Government realized that they should be strict this time to implement TRM. At the last stage of BNP Government, Minister of the Environmental Ministry called meeting with the District commissioners and Chairmen and announced that those, who will protest, will be arrested. Thus TRM started in Keshabpur. However, mixed reaction has been found from people's part regarding this project.

5.2.2 Kabodak Re-excavation Project

Kabodak Re-excavation project is going on in Keshabpur. In the past, The Ganges used to have free flow and the south west of Bangladesh was called Ganges dependent area. The Gorai River was connected with the Ganges but due to construction of Rail line in British Period, this river became disconnected from The Ganges. Kabodak is one of the branches of this Gorai River. Unfortunately, Gorai became disconnected from the Ganges and became silted up along with its branches like Betna, Bhairab and Kabodak.

Once a mighty and potential river, the Kabodak, in its 75-kilometre way has now narrowed down to assume the shape of a canal. Over the years, encroachment of the riverbank by land grabbers and obstruction of its flow by fish farmers also hastened its death.

However, The Re-excavation work of the Kabodak River has been initiated in the year 2003-04. Government is involved in undertaking and monitoring digging operation. Excavation is going on at Patharghata point of Kabodak River. Dredging only at one point is very much insufficient because considering the size of the river Government should start re excavation work at other different points. The map of ongoing re excavation project has been given below (Map 5.1).



Map 5.1: Kabodak Re-excavation Project

5.2.3 Government's Canal Excavation Project

There are good numbers of small canals in Keshabpur which are quickly silted up as their connected rivers also become silted up due to geological reasons. The proper maintenance of these canals is necessary in order to keep the land free from water logging. Therefore, Government's canal excavation project has been completed recently.

Government has taken this 69 crore taka project for the overall water logging management of south- west part of Bangladesh. In this project Water Board dug a good number of canals in the area. As a result water could recede through the Khoksha River. 24 no. polder in Keshabpur is under this project and the length of the polder is more than 26 kilometer. People have got harvest after 7 years and the Army Chief of Bangladesh has recently inaugurated the harvesting session in keshabpur.

5.2.4 Water and Sanitation Development Program

DPHE developed deep tube wells in different unions of Keshabpur. DPHE also developed toilets for marginal farmers' family in Trimohini, Bidyanandakathi and sagardari. The main goal of the project was to serve at least 80% of the population with healthy water and sanitation facilities. Unfortunately they could not reach to their target Very few respondents have been found who use pucca latrine. Therefore, the outcome of the project is very poor. In 2007, Government provided some toilets in the refugee camps and recently in 2008 they organized training program for constructing low cost sanitation technology. Under this program, Government showed how to make ring slabs and also showed the ways of marketing of the product in commercial basis.

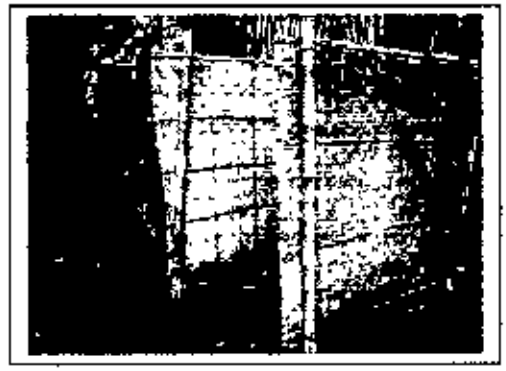


Photo 5.2: Government's water and sanitation program

5.3 Different Non Government Organizations (NGOs) involved in activities in context of water logging Problem

The Involved NGOs in Keshabpur are:

- People's Forum on Waterlogging
- Uloshi Srijony Shongho
- Centre for Global Change
- Muslim Aid
- Oxfam
- IDO
- BRAC
- Samadhan: etc.

NGOS in Keshabpur are mainly involved in awareness raising program in Keshabpur. Big budget projects are mostly undertaken by Government. NGOs initiate high ambitious projects only when they get government support. Some local NGOs have major programs such as Samadhan, Uloshi Srijony Shongho etc. Also some national level non government organizations work to help people in fighting with water logging problem such as Oxfam, BRAC and Centre for Global Change etc. These organizations work independently but cannot implement programs locally without government (WB) permission.

5.3.1 Uloshi Srijony Shongho is a local NGO working for combating water logging in south west Bangladesh as a whole. It is involved in raising awareness program, local fund generation program to excavate canals and construct embankments, disaster risk reduction, relief and rehabilitation etc. They have programs in every unions of Keshabpur.

5.3.2 Centre for Global Change is a national level research organization who is mainly concerned with environmental issues in Bangladesh. CGC is involved in reducing water logging and salinity problem from the south west Bangladesh in collaboration with other local partners. Also relief and rehabilitation, arranging regular dialogues among stakeholders, governments and other development partners, arranging local level workshops etc. are some prominent activities of this organization.

5.3.3 People's Forum on Water Logging is a local organization in Jessore. This NGO is focused on water logging issue of Keshabpur, Manirampur and Abhaynagar. Raising people's awareness, generation of local fund through local cooperatives and associations, utilizing these funds in case of emergency, housing rehabilitation program, Income generating training, adopting community based open water fish cultivation etc. are some activities operated by this NGO in Keshabpur. They are mainly focused on three unions: Trimohini, Sagardari and Pajia.

5.3.4 Muslim Aid, Oxfam, IDO and BRAC are mainly involved in relief and rehabilitation operation in Keshabpur in disaster situation. Their activities include distributing food items, baby foods, water purifying tablets, construction of tube wells in refugee camps etc. are significant. Oxfam and BRAC are also involved in micro credit operation in a limited number of unions.

5.3.5 *Samadhan* is a leading NGO in Keshabpur working to combat water logging through different programs. *Samadhan* undertakes following activities:

- Credit program (rural micro credit, micro enterprises, livelihood restoration project and agriculture project).
- Water and Sanitation
- Preparedness Effective Emergency Response (PEER)
- Relief and rehabilitation
- Livelihood risk reduction
- Embankment construction
- Introducing floating garden to people
- Income generating training
- Device distribution to disables in waterlogged area
- Construction of deep tube well

Samadhan is involved in wide range of development activities in Keshabpur but unfortunately their works are limited only to two unions namely Sufolakathi and Panjia. Other worst affected unions like Trimohini, Bidyanandakathi and Sagardari are receiving benefit at limited scale.

5.4 Different NGO Programs

5.4.1. Ring Based Vegetable Gardening

Ring based vegetable gardening is invented by local NGOs and these technologies have been proved very effective. Local people found ring or floating gardening very useful in places where lands are mostly waterlogged and is not suitable for ground vegetation. Ring gardening is a local innovative technologies invented by local people and NGOs. In this process, big cement rings are filled up with sufficient amount of suitable soils. These rings with soils are then used to plant trees and vegetables. This particular technology reduces the risk of water logging as vegetation is accepted to grow at a higher level than the ground. This technology is demonstrated by different NGOs among the villagers such as Uloshi Srijony Shongho, People's Forum on Water logging and Samadhan.

Main objective of this project was to create employment opportunities for male member of the affected family and use of their water stagnant fallow field round the year by setting rings one after one and as accordingly established 100 nos. of ring or hanged garden in the community levels (photo 5.3).

Photo 5.3: Ring Based Vegetable Gardening:
An NGO initiative to sustain livelihood in water logging

5.4.2 Water Supply and Sanitation

Some NGOs namely Oxfam, BRAC, Muslim aid, IDO, Samadhan etc. are running programs on safe water supply and sanitation. There was a project undertaken by Samadhan, where the local NGO representatives demonstrated the ways how to establish safe latrine which will in turn produce organic fertilizer for the nearby crop field (photo 5.4)

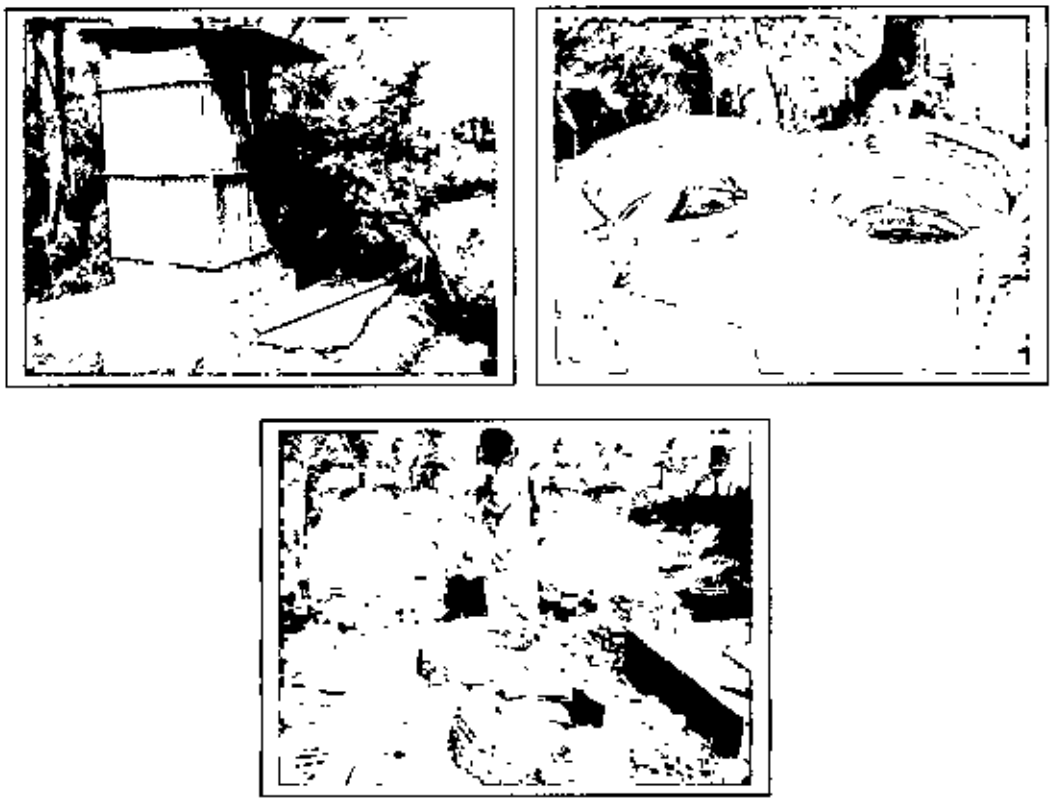


Photo 5.4: Producing organic fertilizer from human excreta

In Keshabpur, Government has taken sanitation development program where human excreta are being used as field fertilizer. Here Government converted some kutcha latrine into pucca and produced bio fertilizer. All such latrines are established nearby crop field and after processing the excreta in a chamber, those are directly dumped into the field.

This combined approach is beneficial both for human health and sanitation and also for increasing crop productivity. This particular project has been operated in unions namely Sufolakathi, Sagardari and Trimohini. According to local people this project has many

beneficial effects but they complained that NGOs implemented the projects in limited numbers of households. It has been observed that those who are the members of some NGOs have got the benefit. Otherwise, the general population did not get the actual benefit from the project.

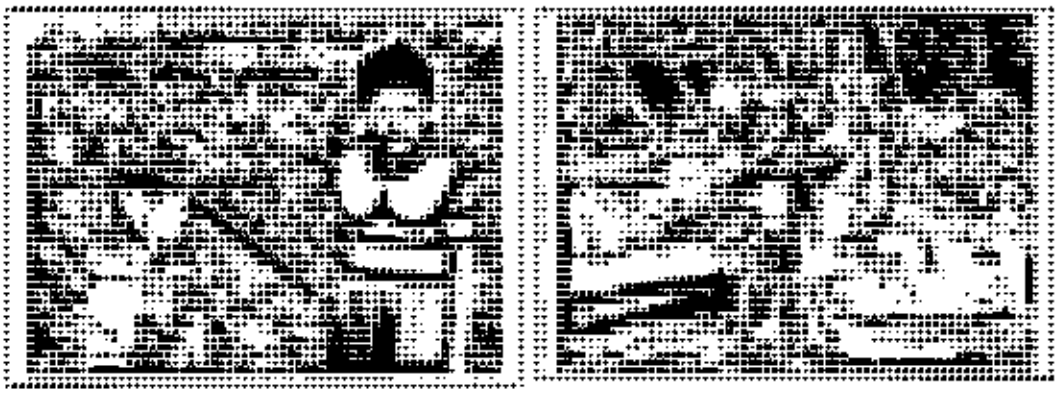


Photo 5.5: NGO program on water supply

Muslim Aid and Oxfam mainly distributes water purifying tablets to the severely waterlogged areas, whereas BRAC, IDO and *Samadhan* are involved in constructing deep tube wells in some unions of Keshabpur. Identifying arsenic affected tube wells and constructing new ones was an ambitious project of *Samadhan* but the operation was limited only to three unions namely Sagardari, Trimohini and Sufilakathi.

5.4.3 Establish Bamboo Crafts for Vulnerable Community

Muslim Aid and IDO jointly introduced training program for making bamboo crafts in waterlogged areas. The main objective of this program was to develop professional skills for those affected farmers who lost their agricultural land in water logging. The trained men and women are now producing huge number of different variety of bamboo crafts (component for fishing) and selling in the nearest market.

Recently, Bamboo-made elements are greatly used as construction material of houses in Keshabpur Thana. As mud is now vulnerable as a construction material under the context of water logging, people are now using bamboo for house construction. As a result, this project has been popularized in many unions of Keshabpur where unemployed people are now involved in establishing bamboo crafts and its marketing (photo 5.6).

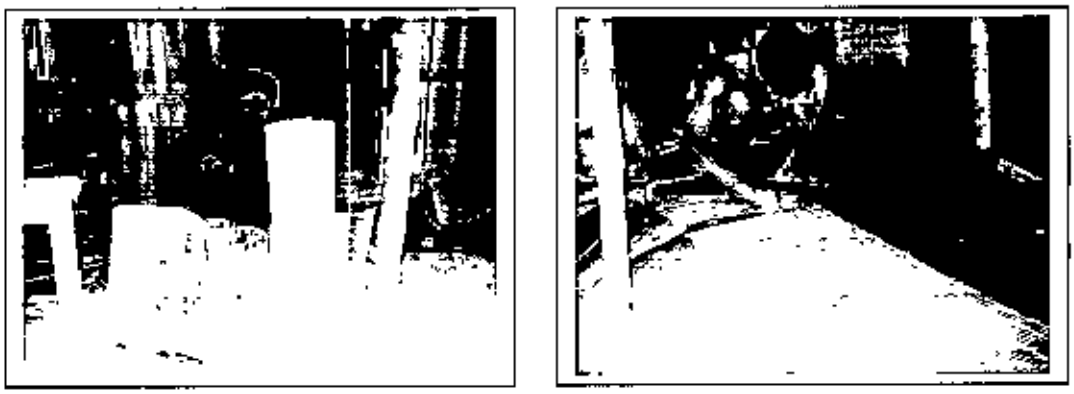


Photo 5.6: Producing Bamboo Crafts

5.5 Multi Donor Project

5.5.1 Reducing Livelihood Risk Project

This is a big budget project locally operated by Samadhan NGO funded by CDMP, EC, DFID, GoB, UNDP etc. It can be called a multi donor project funded by government but executed by local NGOs. Model houses developed in different unions. Homestead ground rose considering flood level by earth filling of the 16 nos. selected houses, those are now risk free from flood/water logging. Government established 15 nos homestead mini pond by constructing dykes, from where actually the house raising earth have been cut and 15 nos. ponds are now under fish cultivation, which are reducing livelihood risk for the people. They also established 16 nos. pucca hygienic latrines in 16 nos. raised houses and the people are now risk free (photo 5.7).

Government established 16 nos. year round vegetables garden in the raised homestead, those which are now risk free and reducing their livelihood risk. This project also established 01. no. cattle fattening projects instead of homestead mini pond due to unavailability of homestead land for earth cutting. In Bidyanandakathi, people learned about some medical plant and they became interested and planted some trees in their homesteads.

Photo 5.7: Reducing Livelihood Risk project

5.5.2 Community based Open Water Fish Cultivation

This is also a comprehensive program executed by the local people, NGOs and funded by CDMP, GoB, UNDP, DFID and EU. Here open water bodies are used to fish cultivation and the profit is shared by the owners of the beel / water body and local inhabitants according to their level of participation. Some NGOs give assistance and training to people regarding fish cultivation such as *Uloshi Srijony Shongho*, Pani Committee, *Samadhan*, Oxfam etc.

Most of the water bodies remain useless during water logging. As a result NGOs executed this project in order to properly utilize those water bodies as alternative asset. Another vision of the project was to utilize the local human resource in the project so that this particular project could be a source of income for local unemployed population. As a result active participation of vulnerable people was ensured in this project. Samadhan and People's Forum on Water logging mobilized the local people for their survivability and

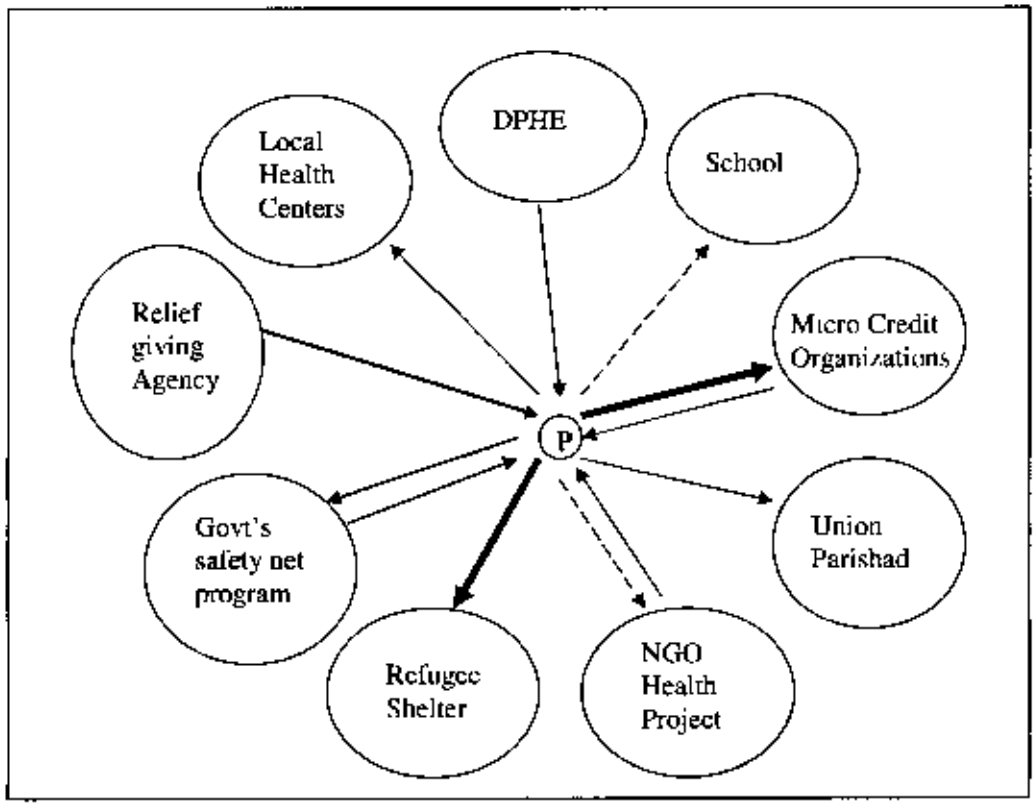
introduced open water fish cultivation to reduce livelihood risk for poor and marginal people of water logged areas. As part of it a committee named "Village Development Committee" has been formed. This project is locally managed by this committee.

Photo 5.8: One location where Open Water Fish Cultivation project is going on

This project is specially designed for serving the people of waterlogged region. As land based activities are difficult, government and also NGOs are interested in water resource development activities so that vulnerability of poor and marginal people can be reduced to some extent. Different community operates this project in different unions of Keshabpur such as Shufolakathi, Pajia, Bidyanandakathi and Trimohini

5.6 People's Access to Institutions: Experience from Field Visit

During FGDs, Venn Diagrams were drawn in order to understand people's access towards different institutions in the society. People in extreme waterlogged situation find them helpless when they cannot find ways other than waiting for relief. According to most of the participants of FGD and the local respondents, those organizations are useful who give relief. It seemed that they would be happy if they get relief other than any permanent solution. A Venn diagram was drawn indicating the institutions people go to in a disaster situation (figure 5.1). This diagram showed to where people go during disaster and in which frequency.



P stands for 'People' of Keshabpur during disaster.

- Very frequently visit
- Frequently visit
- Often visit
- Occasionally visit

Figure 5.1: People's Access to Institution (Venn diagram drawn during FGD)

Different institutions have been described below where people go during disastrous condition:

5.6.1 Micro credit organization

In an extreme waterlogged situation people generally loose their livelihoods As a result at first they go to micro credit organizations with the hope that they will have some loan. The above diagram shows that people frequently visit to micro credit organizations during extreme waterlogged condition. Also sometimes these organizations visit the waterlogged areas by themselves. This happens mainly to collect the repayment of loan from people. There are many micro credit organizations working in Keshabpur namely BRAC, Asha, Grameen Bank, Oxfam etc.

5.6.2 Union Parishad

UP chairmen and members call emergency meeting in extreme water logged condition and arrange relief distribution. People generally go to he UP office to collect the relief and for this they have to wait in a long queue. People go to union Parishad during disaster also because most of the chairmen of the Unions distribute blankets to the poor families in Keshabpur. Also some people go to union Parishad in search of information regarding some alternative occupation under safety net program of government.

5.6.3 Government's Safety Net Program

In Keshabpur, many people are earning money after loosing their agricultural livelihood by joining the 100 days' program of Government where everyone gets 100 tk each day in exchange of labor. Government generally runs this program during a disaster situation to maintain people's livelihoods. People can find information and other assistance from Union Parishad.

5.6.4 DPHE

Department of Public Health & Engineering (DPHE) constructs shallow tube wells in the refugee camps during disasters. In most cases, the ratio is 1 tube well for 30-40 families. The situation of sanitation under disastrous condition becomes worst and people do not get sufficient assistance to develop safe latrines. As a result, women become more vulnerable under disastrous condition. DPHE constructs temporary sanitary latrines in refugee camps

5.6.5 Relief giving Agencies

Both local and national level NGOs come to distribute relief, while some also distribute water purifying tablets. Also Government send relief to help the water logged people. People in Keshabpur greatly depend on these reliefs for their livelihood. During the visit in a refugee camp at Sagardari union, people informed that they are completely jobless and now they can only depend upon relief, loan giving agencies and government's safety net program. However, there were families in the camp who depend only upon relief for their survival.

5.6.6 Water Board

According to the respondents, Water Board never comes to visit the severely waterlogged affected areas. People are also not interested to go to WB as they believe that it might not going to help them. In a nutshell, the role of water board in disastrous condition is almost negligible. There is no access of people to this principal government agency.

5.6.7 Local Health Centers

People want to have health care services. From field survey it has been found that qualified health care practitioners were not interested to stay in marooned conditions and employments offered to them in this regard were not accepted. No wonder, the government's effort to keep doctors in their respective stations in the affected areas has so far been failed. The local health practitioners, mostly village doctors (i.e., *Palli Chikitshaks*) cannot treat the ailing people properly. Simultaneously, they consider the poverty status of the people and refrain themselves from prescribing costly but effective medicines. Consequently, the poor continue to suffer with ailments. However, in extreme waterlogged conditions, people find no ways other than going to those doctors in health centers for treatment.

5.6.8 School

In extreme waterlogged area, children cannot go to school because most of the schools are then used as refugee shelters. Under these circumstances they have to sacrifice their schools even for months. Therefore, the status of this institution has been marked as 'occasionally visit' in the diagram.

5.7 Institutional Affiliation of people

During questionnaire survey, only 29% households said that they are members of NGOs. 71% household is without any institutional affiliation (discussed in chapter three).

5.7.1 Economic and Social Status of People involved with NGO

People who are members of some NGOs certainly get some extra benefits than others. For an example, members of NGOs get micro credit benefit during extreme water logging. Those affiliated members also get preference while distributing relief materials. During field survey, it has been observed that people who have some land generally become eligible for membership in NGOs. Unfortunately, large number of people is loosing their agricultural and homestead land due to water logging in Keshabpur and taking shelter at Refugee camps. During field visit, the team found an NGO activist visiting the camp for collecting installment of loan (see the photo 5.9). It was heartbreaking to see the situation because the female member was almost helpless thinking that how she would repay the loan amount when she had already lost her home in water logging.

Photo 5.9: NGO activist in Refugee camp to collect Installation amount of loan

However, NGO affiliated people in Keshabpur get extra benefit in case of getting micro credit, participating in decision making, livelihood training etc. Only those, who have some kind of NGO affiliation, are called during meetings of development projects in the area. Affiliation in an organization gives them better status than other and, no doubt, improves their 'self esteem'.

5.8 Working Mechanism of GO, NGO and Local People in Keshabpur

5.8.1 Working Mechanism of Government Organizations

Government Organizations such as Water Board generally undertakes big budget projects. Water Board is the principal government body to solve water logging. They are mainly involved in constructing embankments and sluice gates.

Water Board works through Water Management Federation (WMF) (at zonal scale) and Water Management Associations (WMA) (at thana level). WMA consists of President, secretary, members etc. Such associations generally get registered from the Department of Cooperative Associations. The extension branch of WB controls all the activities of WMA. By identifying local problems, the WMAs call meeting at Union Parishads and find solutions along with WB. WMA works through Water Management Groups (WMG) (at village level) (figure 5.2). WMG conducts meeting each month. Members deposit 10 tk every month which goes to the President's account of the association. This account works as the funds generated to undertake local development projects.

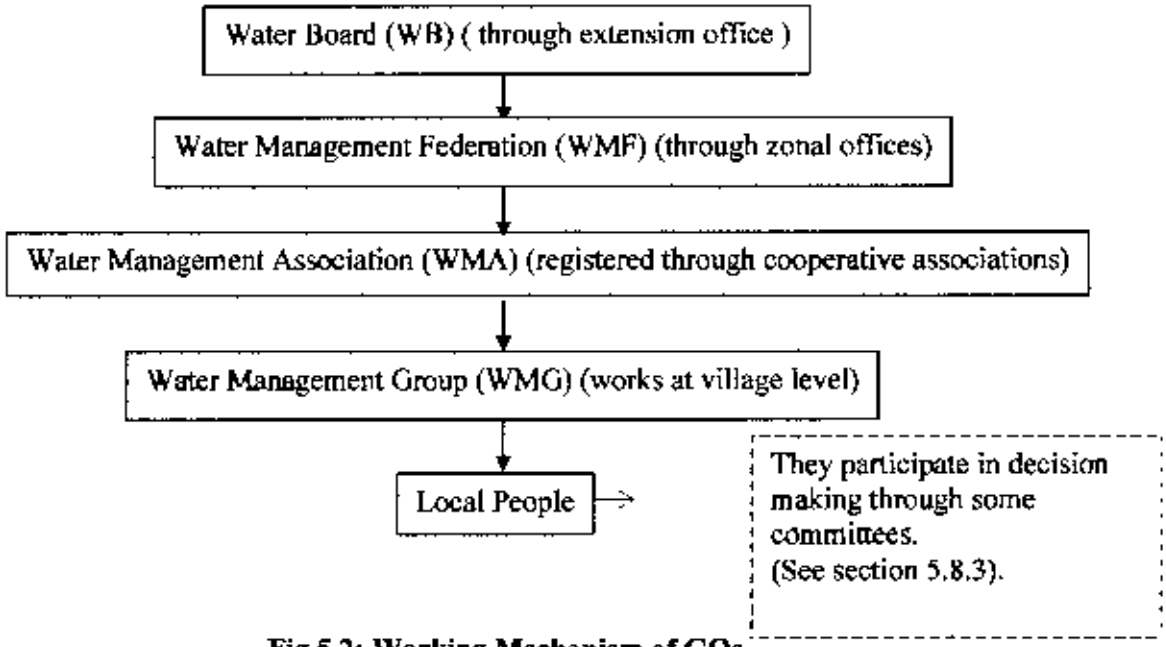


Fig 5.2: Working Mechanism of GOs

5.8.2 Working Mechanism of NGOs

Unfortunately due to limited funding, NGOs cannot take risks of big budget projects rather they expect government funding to implement their development plans. NGOs in Keshabpur have a central NGO Association. President of this committee is Md. Rezaul Karim who is also the Director of a renowned local NGO namely Samadhan.

NGO association conducts one meeting in three months with the participation of all significant NGOs along with local UP members and Chairmen. In every meeting, NGOs share their development efforts and strategies and assess their needs for government

funding. From government side, seven Chairmen and members of Union Parishads, members and representatives from some government offices are supposed to be present. Unfortunately, presence from government's side is always rare and limited to only UP members.

5.8.3 Working Mechanism of Local People

Local people participate in the development efforts willingly and spontaneously. Formally they work through several committees. Such Committees work locally in Keshabpur. These committees ensure representation from both Government and Non-Government side along with local people. These committees are:

1. Village Development Committee (25 members including UP members, local NGOs and local people)
2. Implementation Committee (local UP members, Elites, Local people); etc.
3. Pani Committee (This is a popular committee working in water logging projects)

Such committees work independently at times of disasters and in extreme waterlogged situation. They can take decision independently in case of emergency. Pani Committee is unique in its nature as they are also involved in local research and works for allover south west region.

Who are the Local people?

Here local people generally refer to that segment of population who has education up to certain level (above HSC) and also the elderly population of the society who can relate local problems with the past issues. As a matter of fact, those who have some kind of membership in NGOs or other organizations generally participate in these committees and meetings.

There are other types of institutions or 'special groups' in Keshabpur namely Landless Group (LLG, registered); Fisher folk Group (FFG, registered); and Labor Contracting Societies (LCS, not registered). The LLGs and FFGs were formed to ensure participation of landless people and fishers; covering the area of each WMAs. The LCSs were formed for the execution of specific intervention to support poor and destitute people (both

female and male). These societies mainly undertake small-scale earth works. LLGs and FFGs were registered under the Cooperative rules.

5.8.4 Coordination of GO-NGO and Local People

Coordination of different stakeholders has been found to be poor in Keshabpur. Almost 176 respondents replied that there is a poor coordination among government and non government organizations and local people (Figure 5.3).

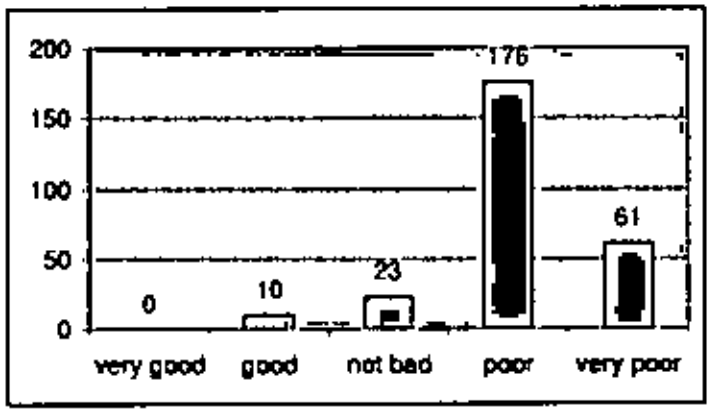


Figure 5.3: Respondents' rating regarding GO-NGO-Local people's coordination
Source: Questionnaire Survey, 2008-2009

Reasons behind such statement might be related with the failure of different organizations in reducing water logging problem in the area. People's chance to participate in the decision making process is also limited, only few people can officially participate in the decision making process through some committees. Otherwise, coordination is indeed poor in case of combined effort of development. While conducting questionnaire survey, respondents were asked about the reasons of such poor coordination. The summary of their answers is given below:

- Bangladesh Water Development Board controls all the development activities and there is little option to participate in WB's decision making process.

- WMG, which is the lowest tier of the water management institutions, does not follow concrete ethics. Rather, many complained that mostly influential of the

locality get the chance to be the member of the Group. As a result, it does not ensure people's actual participation.

- In implementation phase, coordination is good. For example, government gives fund for the implementation of projects in the area and NGOs together with local people implement the project. But, as matter of fact, coordination is poor in decision making process and in design phase.
- People's voice is hardly heard by the government. People, who complained that GO-NGO coordination is poor, are mostly unaware about the ongoing projects in their union. Therefore, people's unawareness is also responsible for the poor coordination.

5.9 People's Perspective in judging the effects of different projects relating to water logging in Keshabpur

While filling up the questionnaires, the projects were categorized to the respondents into two different groups namely:

5.9.1. Projects for improving water logging scenario:

a) TRM
b) Kabodak re excavation
c) Government's canal excavation
d) Community based embankment construction

5.9.2. Projects for coping with waterlogged situation

a) Reducing Livelihood Risk Project (RLRP)
b) Ring based gardening
c) Prodncing bamboo crafts
d) Community based open water fish cultivation
e) Water and Sanitation GO
f) Water and sanitation NGO

5.10 Scales Used in the Methodology

During household surveys, respondents have been asked to give a value against each project according to their effectiveness. They all gave scores against the before and after project completion scenario. Such scoring gives an idea about the effectiveness of each project which can be found from mean differences of before and after project scenario.

Two different scales were used for the projects. One scale was for projects directly designed to remove water logging and another scale was for the projects designed to improve coping condition under water logging. Both the scaled have drawn in the next two figures (5.4 and 5.5).

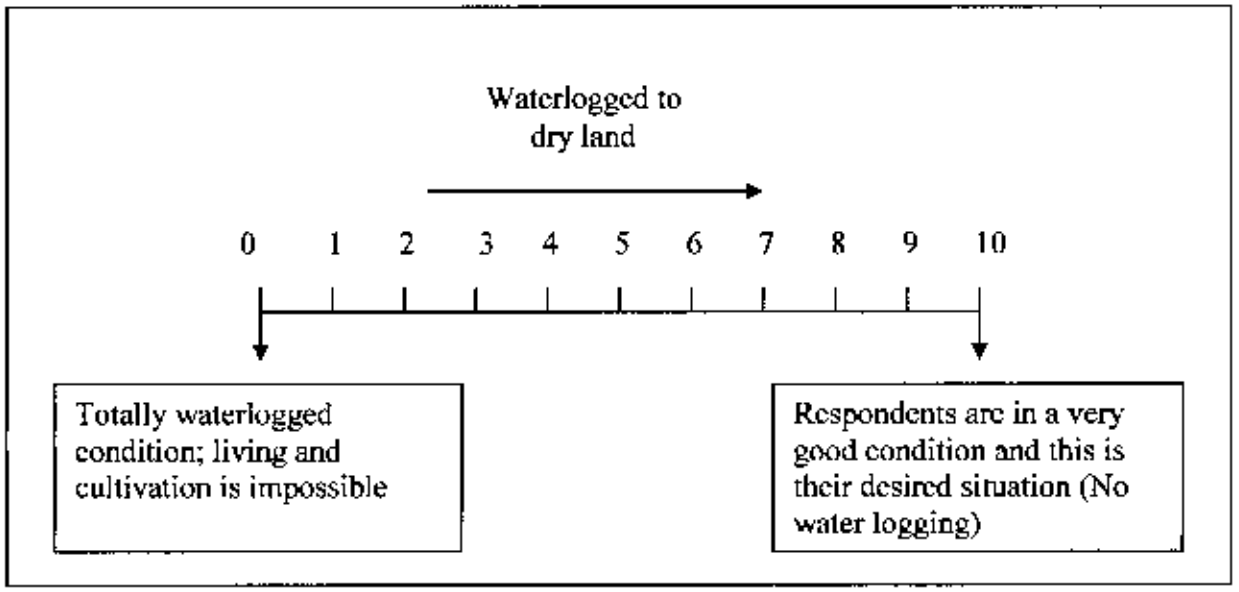


Figure 5.4: Evaluation of the projects directly designed to improve waterlogged scenario

The first scale is for the structural measures adopted to improve water logging scenario (figure 5.4). "0" Level indicates totally waterlogged condition where living and cultivation is impossible. The Level "10" indicates that people are in a very good condition and this is their desired situation (no water logging). Respondents have been asked to point out their status on the scale when the project was started and also to point out their status after the project is complete.

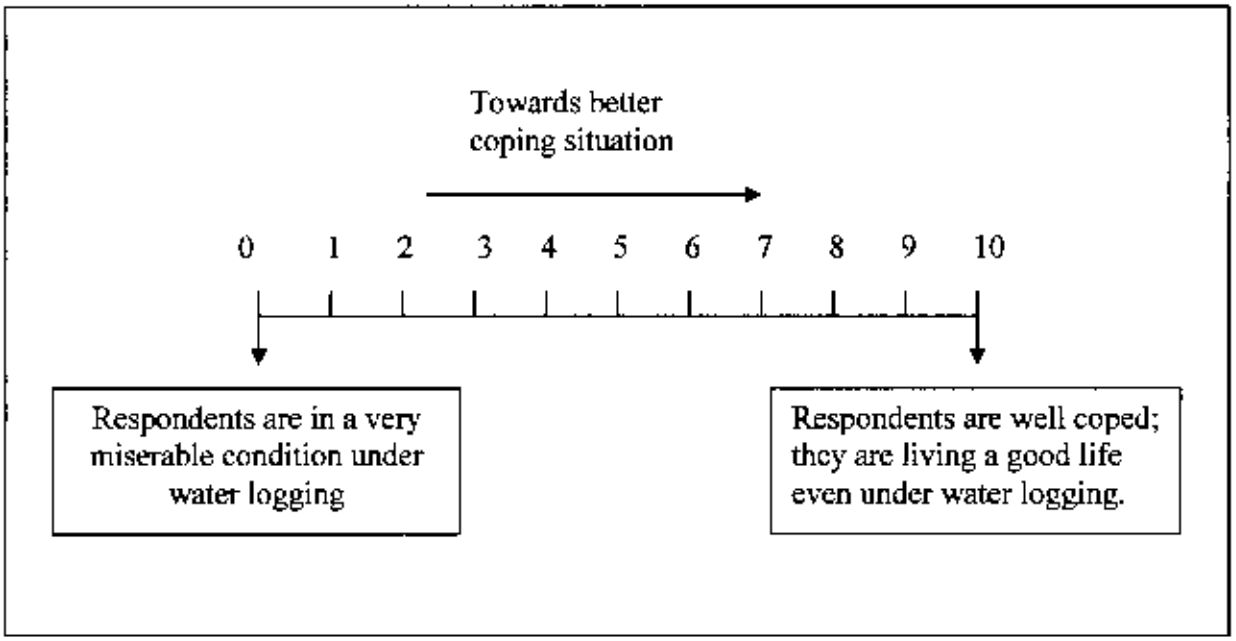


Figure 5.5: Scale for the projects designed to cope with waterlogged scenario

The second scale is for the projects designed to cope with waterlogged scenario (figure 5.5). "0" Level indicates that people are in a very miserable condition under water logging. The Level "10" indicates that people are well coped and they are living a good life even under water logging. Respondents have been asked to point out their status on the scale when the project was started and also to point out their status after the project is complete. In this way it was tried to judge people's perspective regarding the effectiveness of the projects.

Project Name	Before project completion				After project completion			
	Highest Score	Lowest Score	Mean	SD	Highest Score	Lowest Score	Mean	SD
TRM	5	2	4.1	0.3	8	3	4.9	0.2
Kabodak Reexcavation	5	3	4.1	0.3	9	7	8.7	0.1
Government's canal excavation	4	1	2.5	0.3	8	5	7.3	0.2
Embankment construction (community)	3	1	2.4	0.2	9	6	6.5	0.1

Table 5.3: People's perspective on before and after project scenario (Projects which are designed to cope with waterlogged scenario)

Project Name	Before project completion				After project completion			
	Highest Score	Lowest Score	Mean	SD	Highest Score	Lowest Score	Mean	SD
RLRP	4	2	2.7	0.2	9	6	8.3	0.2
Water and sanitation GO	4	1	2.9	0.3	5	2	2.5	0.1
Ring gardening	6	3	5.3	0.2	9	6	7.2	0.3
Community based open water fish cultivation	4	2	3.9	0.5	7	5	5.9	0.3
Producing Bamboo Crafts	4	2	3.5	0.1	6	3	3.1	0.5
Water and sanitation NGO	5	3	4.1	0.3	8	5	6.1	0.3

The above tables (5.2 and 5.3) are the final representation of this value scoring. Standard deviation has been calculated for each project so that any extreme entries can be identified. However, no big differences between mean and standard deviation were prominent, only in case of TRM project, there is little difference between mean. Probably, the project affected different part of inhabitants in a different way, because after completion of the project some people got crops while other part of Keshabpur did not get the benefit.

Effects of different projects have been summarized in table 5.4. The result has been calculated both from people's value scoring task and Key Informants' Interviews:

Table 5.4: Effectiveness of different projects in response to water logging

Name of Project	Organization	Goal	outcome	Comment
TRM	GO	To increase crop production by removing water logging	✗	Failed; implementation is socially difficult; though it is probably the best suitable option for removing water logging.
Kabodak Re-excavation	GO	To remove silts from the river bed of kabodak and to ensure flow of water into the drainage channels	✓✓	Proved very effective at the point of excavation; Limited to only one point of Patharghata, need to be implemented different other points.
Canal Excavation	GO	To rehabilitate the small canals along the river channel; to reduce local water logging; to increase crop production	✓✓	Very effective; People got crop after seven years; but only for one season
Water and Sanitation Dev.	GO	to serve at least 80% of the population with healthy water and sanitation facilities	✗	Failed. Could not reach the target.
Ring based vegetable gardening	NGOs	To create employment opportunity, maintain nutrition even in waterlogged condition	✓✓	Very effective. Proved effective where implemented.
Water supply and sanitation	NGOs	To ensure safe water and sanitation for the people of Sufolakathi,	✓	Moderately effective; Most of the implementation was

		Trimohini and Sagardari.		limited to Sufolakathi, did not cover other two unions according to its expectation.
Establish bamboo crafts for vulnerable community	NGOs	To create alternative livelihood for water logging affected farmers	✗	Failed; The training offered by the NGOs was limited to few households, did not really cover mass population
Reducing Livelihood Risk Project	Multi donor project, executed by NGOs	To establish a complete system of household based livelihood. (to maintain nutritional status by producing vegetables, to raise the land level of household, to ensure safe latrine and sanitation etc.)	✓✓	Very effective; Implementation was good at household level, but it did not cover most of the affected population in community level.
community embankment cons	Local People	To remove local water logging from Trimohini and Sagardari Union.	✓✓	It protected 15 bighas of land from water logging.
community based open water fish cultivation	Multi donor project, NGO executed	To create employment opportunity, to maintain the flow of nutrition	✓	Ownership problem raised; didn't carry expected output.

✓✓ → Very effective
✓ → Moderately effective
✗ → Failed

Source: Field Survey, 2008

From above table, it is evident that there are some projects namely Kabodak re excavation, canal excavation, community based embankment construction, RLRP and ring based gardening, where means have been increased dramatically after project completion. It can be said that these projects really proved effective for the inhabitants. Some projects, according to people's perspective, failed due to their inability to serve people such as Government's water and sanitation projects and bamboo crafts projects.

However, TRM is probably the best option for removing water logging from Keshabpur. But implementation of TRM is very much difficult because of social reason. TRM needs to be implemented year after year in different pieces of land or beel. Here people's consent to use their own land or homestead area for implementing the project is very much tough. in most cases impossible Nobody wants to leave their land for the project though all know that TRM may be the optimum solution of water logging. There were elite groups in the society who always took the advantage of such situation. Generally elite group provoked the local people to protest against TRM. People became busy with protest activities and in the mean time these rich/elite people started fish cultivation in the water bodies where TRM project was going on. Therefore, implementation of TRM became a social problem where few riches became winner over the poor people of Keshabpur.

5.11 Conclusion

Water logging is a pressing problem in Keshabpur since many years. So far efforts to develop well GO and NGO collaboration were not that much successful. Main problem from NGOs' side was limited funding and main problem from Government's side was lack of willingness and lack of skilled and passionate government officers. In most of the Water Board's projects, Government do not encourage people's participation. From Decision to Implementation process, they maintain Up-bottom approach. On the other hand, there is a good number of local NGOs devoted to solve the water logging problem in Keshabpur but they are also not very much organized and that is why people are not getting fruitful outcomes.

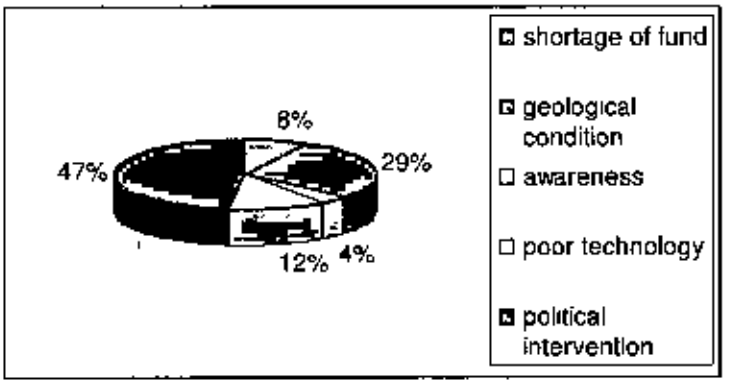


Figure 5.6: Respondents' perception about the constraints in effective implementation of projects; source: Questionnaire Survey, 2009

Political Intervention is one of the main constraints in effective implementation of projects relating to water logging in the area (Figure 5.6). Government's unwillingness and corruption in undertaking development process are some factors which work to form political intervention. Under these circumstances, People need some collaborative working relation among all the stakeholders and development partners so that local people get the maximum benefit.

CHAPTER *SIX*

SUMMARY OF FINDINGS, RECOMMENDATION & CONCLUSION

Chapter Six

SUMMARY OF FINDINGS, RECOMMENDATION & CONCLUSION

6.1 Summary of Findings

Exposure, sensitivity and resilience were three important criteria based upon which vulnerability of different unions has been assessed. Trimohini has been found as the most vulnerable union under water logged condition. Other vulnerable unions can be ranked as Sagardari, Bidyanandakathi and Sufolakathi respectively.

Agricultural livelihood, housing, food security and education are some socially vulnerable areas in Keshabpur under water logging. Environmentally the area is also vulnerable due to the poor performance of drinking water, sanitation and health care facilities.

People use indigenous coping measures to survive in water logging. They increase plinth height of houses and latrines, Farmers change the variety of seeds, increase seedbed height etc. and often change their occupation. There is a tendency to shift to refugee shelter in case of prolonged water logging. Migration, unfortunately, is a new phenomenon in the Thana due to water logging induced livelihood loss.

Ring based vegetable gardening is a popular example of NGO's initiative towards achieving the goal of sustained livelihood. Kabodak re excavation and Reducing Livelihood Risk Project are other big budget programs which has been very effective where implemented. However, an example of effective local initiative was community based embankment construction.

However, Climate change is the major constraints towards reducing vulnerability in Keshabpur Thana. Climate change induced aggravated water logging condition is affecting agricultural production and thereby employment and food security of people. Health is also threatened due to unavailability of safe drinking water and poor sanitation facilities. Climate change, no doubt, is increasing the risk of water borne diseases. Therefore, climate change can be treated as one of the main constraints towards reducing vulnerability of people in Keshabpur Thana. Other constraints may be listed as poor coordination between stakeholders, limited institutional initiative of coping, lack of prioritization of problem area, lack of gender sensitive initiative etc.

Figure 6.1 shows the summary of findings and the policy recommendation of the research:

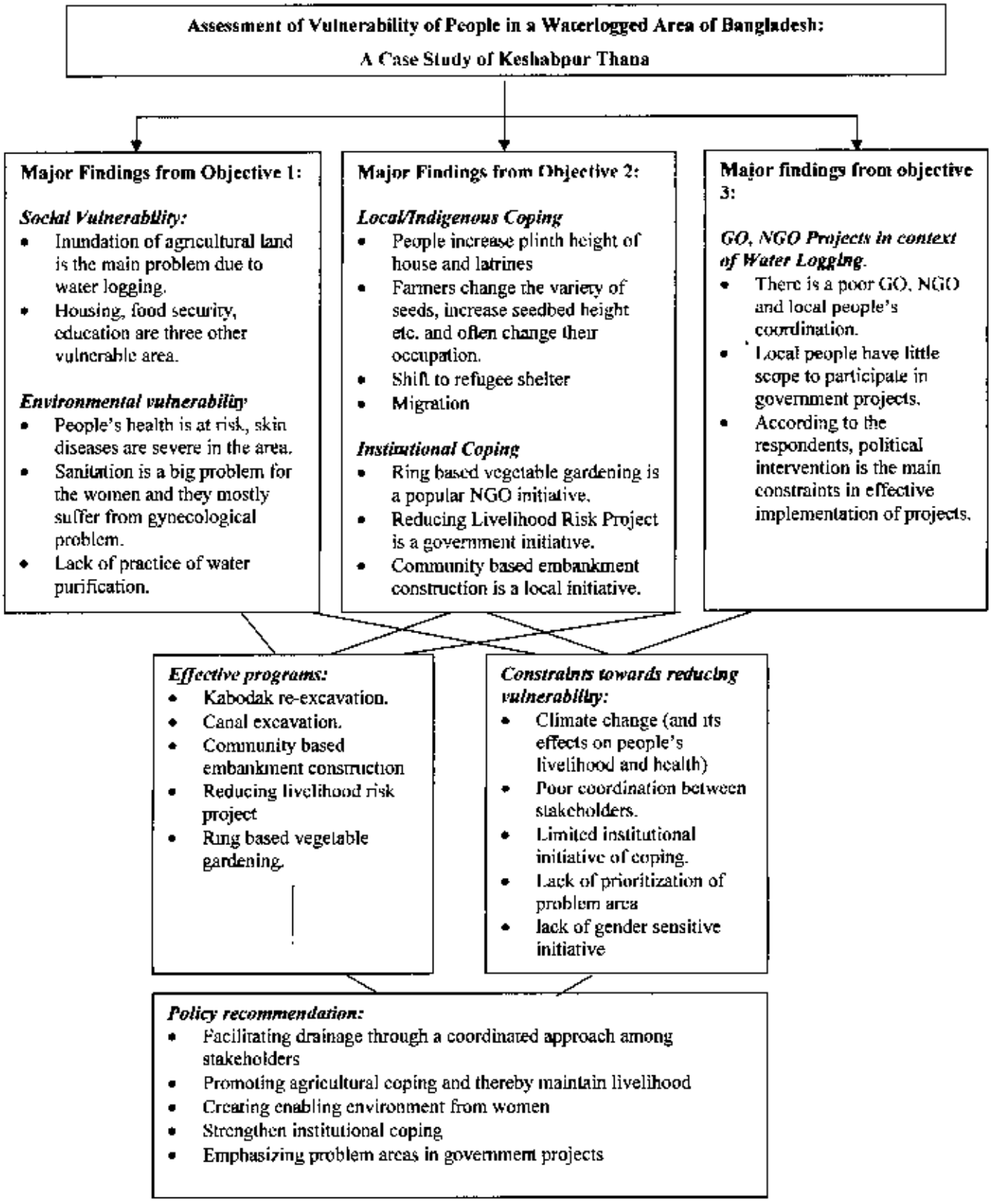


Figure 6.1: Summary of findings and the policy recommendation of the research

6.2 Policy Recommendation

The problem of water logging in Keshabpur is a local manifestation of a national level problem. The problem cannot be completely solved locally without national and policy level implementation. However, some recommendations have been suggested below in order to control the water logged situation which requires effort from both the local and national level institutions:

6.2.1 Facilitating drainage through a coordinated approach among stakeholders

Facilitating drainage of water is the greatest perceivable adaptation, which is far beyond the capacity of individual woman or a small water logged community. Only the authority can plan and execute an emergency water removal/drainage programme, much to the benefit of the helpless people. However, little has actually been done so far.

In order to get the actual benefit of drainage program, there should be improved coordination between different Government Organizations (GO) and Non Government Organizations (NGO) working in the study area. All these organizations should design their projects so that participation of local people is ensured and thereby local uninterrupted drainage is ensured.

Implementation strategy

- An effort has been made to remove sediments from the Gorai River under the Gorai River Restoration Plan (GRRP), which could be of little help towards removing silts from the river bed. The project concluded by indicating that the river bed must be brought under maintenance dredging in a bid to enhance its drainage efficiency (KJDRP, 2002). Based on such inference, the National Water Management Plan has created provision for resuscitating major rivers including the Gorai River, with a further provision of maintaining a sustained flow regime throughout the dry season, by virtue of building a barrage on the Ganges River and by linking distributaries of the Ganges River flowing through the south west region. However, due to lack of political commitment, no significant stride has so far been taken to implement these programs. These efforts should be initiated immediately.

- People opine that, excavation of Kobadak river system as a whole could have been greatly facilitated local drainage of standing waters. Unfortunately, the project has not so far been approved / implemented in their full capacities to effectively solve the problems. Excavation is going on at only Patharghata point. Excavation must be implemented at various other different points to get the full and actual benefit.

- Different options of OGDA (Options for Ganges Dependent Area) report should be taken into consideration. One of the most suitable options for the removal of water logging from this portion of south west part is pumping water from specific point of river system at a specific speed so that the silt of Gorai and other branches like kabodak is removed because of extreme speed of high volume water and the adjoining canals also achieve their flow. It should be done in order to maintain a sustain flow regime throughout (during) the dry season. However, careful integrated planning is necessary to initiate the program.

- NGOs in Keshabpur have a central NGO Association. This association consists of different local NGOs and UP members and chairmans. There must be participation of some representatives from local people's side in this association. Otherwise the decisions will ignore local people's voice.

- No personal level coping can further improve the situation. Bangladesh Water Development Board (BWDB) must come forward to initiate the whole hydrological planning in a participatory method. This may require involvement of local Union Parishad (UP) members to involve the local peoples' representatives in this matter. BWDB can initiate re excavation of adjoining flooding rivers, where local people can participate. Attention must be given so that the flow of the rivers sustains and BWDB can initiate the process to prevent the choking of the rivers, in addition to flow augmentation in the Gorai River, dredging is one of the options to do. Much research, surveillance and monitoring are needed into the whole planning and implementation phase. However, bottom up approach of the projects might also bring up desired results.

- Local committees such as Village Development Committee, Implementation Committee, Pani Committee etc. are active in the study area at times of disaster. There should be strong recognition of these committees so that together they can implement their activities in Keshabpur all the year round.

6.2.2 Promoting agricultural coping and thereby maintain livelihood

Agricultural coping requires special skills as well as ability to invest in input-based cropping. Seedbeds are by choice prepared in raised lands; however such a well practiced measure is generally out of reach of poor farmers. Coping in such a case is synonymous with ability to either purchase high lands or paying more to purchase seedlings from highland areas, which may be located in other districts.

Implementation Strategy

- If water could have been drained off, farmers could easily utilize the *Aman* season and maintained their food security. Such an obvious adaptation however depends on how and when the water management condition will be improved throughout the affected areas.

- Unless the local water management situation improves drastically, much to the delight of the poor farmers, efforts need to be made to help farmers utilize the remainder of the *Aman* (*Kharif*) season to grow cash crops such as vegetables.

- National Agriculture Research System must initiate research for inventing suitable crop species and cultivation pattern, high value crops suitable for this region.

- The government should strengthen the existing extension network to provide agricultural services up to the grass roots stakeholders through the Department of Agricultural Extension (DAE).
- As agricultural land is limited, government should train the young unemployed people at Keshabpur in other trade and business activities. Here NGOs can also come up with credits and training facilities.

- Special groups like Landless Group, Fisher folk Group etc. should be active all the year round in Keshabpur. They can participate in small scale earth works and thereby can take benefit from combined effort.

- Since food security is severely constrained in the absence of land based productive system, food relief generally helps maintain nutrition and contain hunger. NGOs have been generous enough to provide food assistance. However, the regular safety net programmes of the government (i.e., the Food for Works programme, the Vulnerable Group Feeding programme etc.) could not be initiated in the affected areas as yet. The local people and their representative, the *Pani Committee* (i.e., Water Committee), have been requesting the Government to declare the affected region as designated 'vulnerable zone' (*Durgato Elaka*) so that these people could be brought under such safety net programmes. However, their requests have so far been ignored. Meanwhile, more and more new areas are being inundated every year, especially in the SW region.

6.2.3 Creating enabling environment for Women

The gender issue must be taken on board while seeking for broad-based solution to address various relevant issues. Therefore, ensuring standard health and transportation service is a dire need of the locality.

Implementation Strategy

- DPHE should establish tube wells placed in high lands in each of the Unions of the affected region. Similar community based solutions in relation to public toilets should be implemented and the approach roads to both the tube wells and toilets for women should be raised above standing water.

- People want to have health care services. The KII involving local NGOs clearly suggested that qualified health care practitioners were not interested to stay in marooned conditions and employments offered to them in this regard were not accepted. No wonder, the government's effort to keep doctors in their respective stations in the affected areas has so far been failed. The local health practitioners,

mostly village doctors (i.e., *Palli Chikitshaks*) cannot treat the ailing people properly. Simultaneously, they consider the poverty status of the people and refrain themselves from prescribing costly but effective medicines. Consequently, the poor continue to suffer with ailments. Efforts must be made to increase public health care facilities and coverages, especially targeting at adolescent girls and young women for improved productive health care.

- Regular health awareness related NGO activities can continue their activities in a regular pace.

- Special safety net social security programs must be initiated for this community people through the Ministry of women and social welfare.

- However, water related vulnerability to human health can be reduced significantly if community representatives are trained to prepare and use low cost water purifying techniques. To train community people, Department of Health and Engineering (DPHE) and local NGOs can come forward and initiate training programs.

- In a bid to enhance living condition of women in affected areas, the state must consider gender specific response and coping measures having two objectives in perspective: a) to reduce women's overall vulnerability by draining off stagnant water from the area, even if the solutions are expensive, and b) to build resilience of women by various social-engineering means. While the former demands a harmonization of planning at various tiers at governance system, which can only be approached at government level, then latter is better suited for the NGOs to intervene. In the later case, local government institutions at their lowest tier can play a complementary role for the benefit of the local women.

- In devising plans and programs, costs of women's sufferings and vulnerability must be weighted against the potential cost of implementing such activities. It is believed that community based coping measures can facilitate women's well being in a major way in the affected areas.

- A number of low cost glass fibre made fabricated boats with engines can be provided to each of the local government institutions, solely to facilitate transfer of pregnant women at advanced stage to nearest hospitals for safe motherhood. If the lackluster women could receive reproductive as well as neonatal health care on time, it could have drastically reduced infant mortality rates.

6.2.4 Strengthen Institutional Coping

Personal level coping alone cannot bring desired result in Keshabpur. Institutional coping is necessary with adequate training and credit facilities by GOs and NGOs.

Implementation Strategy

- At household level, plinth height of houses and toilets need to be raised. However, it is easier said than done given the prevailing poverty situation and poor financial ability of the poor households. NGOs can come up with credit facilities.

- Unless the schools are rebuilt at higher grounds, or raised (applicable only for shanty structures) adequately, the academic activities have to be curtailed during the peak water logging season. As because the problem is caused by a new phenomenon, there have been no effort to adapt in this respect. In dilapidated dwellings, however, studying is often seen as a strange activity to those who have been just surviving amidst water and despair. Many of the school building are dilapidated structures and special arrangement must be made by Facilities Department of Ministry of Education and Local Government Engineering Department (LGED) to reconstruct the school buildings and uplift the approach roads to the schools.

- Agricultural Extension Office should also come up with training and workshops for poor farmers in order to introduce them with water logging adaptive technology.

6.2.5 Emphasizing problem areas in government projects

Government is interested to undertake big budget development projects in the eastern side of Keshabpur because of its easy communication facilities with national highways. Unfortunately the newly waterlogged areas of western Keshabpur are still neglected in this regard because communicating all part of it is very much difficult due to water logging. Government should concentrate on the Kabodak affected areas immediately with integrated program of drainage rehabilitation.

6.3 Conclusion

Water logging is a reality now and likely to be aggravated under climate change. Since there is a strong possibility that water logging would spread over a larger area in the south western region than that being observed today, efforts must be made to address the issue with proper planning, complemented with adequate financing. Addressing poor people's vulnerability alone by ignoring the hydro-geophysical aspects of the problem might not yield sustainable solution. Projects should be designed by considering both hydro-geophysical and social context of the study area. Coping strategies should be implemented at the household level supported by local institutions. Therefore, adequate macro political blessing is needed in the whole process, because resource allocation to implement all the planning and implementation phase is extremely important where political parties can intervene with their administrative hats. Local people should be actively involved in the overall process of planning and implementation of local projects. Local people must have some strong and recognized platform to delivery their point of view to other institutions. Therefore, coordinated development actions from the part of GOs and NGOs are necessary which must reflect local people's voice.

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QUESTIONNAIRE

Questionnaire

ASSESSMENT OF VULNERABILITY OF PEOPLE IN A WATERLOGGED AREA OF BANGLADESH: A CASE STUDY OF KESHABPUR THANA

A: Demographic and Socio-economic Information

1. General Information about Respondent

Name: Sex: Address. Occupation: Type of housing

2. Information regarding family members

Name	Age (year)	M/F	Relation with respondent	Education	occupation

3. Information on Monthly Income of the family:

a) less than 1500 b) more than 1500 c) More than 2500 d) more than 4000 e) other

4. Information on monthly Expenditure of the family:

a) less than 1500 b) more than 1500 c) More than 2500 d) more than 4000 e) other

B: Livelihood Information

5. Which sector is the most vulnerable under waterlogged condition? (Identify five vulnerable sectors according to importance)

6. What are the major problems you face in waterlogged condition? (Identify five issues according to importance)

7. Which productive works can be possible even in the state of water logging? (List according to priority)

8. Did you change your occupation in the past because of water logging? a) Yes b) No

Explain. . . . . . .

9. Which alternative occupation did you take after loosing your livelihood?

a) Day labourer b) Pulling Rickshaw/van in a nearby dry land c) Fish business d) shop keeping d) Other

C: Information on Health

10. What kind of health problems do you face due to water logging? (List according to severity)

11. How many months in a year do people face problem of drinking water?
a) 12 months b) more than 10 month c) more than 8 months d) more than 6 months e) Less than 6 months

12. When the tube well is under water, what is the source of drinking water?
a) Nearby open pond/canal b) river water c) well d) by purchase e) other

13. Please fill up the table:

Element	Before water logging condition	After water logging condition
Quality of drinking water	Score out of 10	Score out of 10
Source of drinking water		

14. What is the process of your water purification?
a) Boil water b) filter c) No, I directly drink d) other

15. What is your monthly medical cost? . . . . . taka (Compare with past)

16. Is this medical cost more than before water logging period? Yes/No

17. If yes, then how much the cost has been increased?
a) 0-500 b) 500-1000 c) 1000-2000 d) more than 2000

18. Where do you defecate when designated defecation places/toilets are not available due to water logging?
a) Nearby open pond b) long distance open pond c) secret dry land d) others

D: Information on Coping

19. Detail information on structural coping mechanism:

20. Please fill up the table:

Concerned sector	Your way of coping
Drinking water	
Sanitation	
Housing	
Livelihood	
Agriculture	
Energy	
Others	

21. How did you learn these coping mechanisms?
a) From my family b) from GO c) from NGO d) my own strategy e) from the local practice f) other
Explain.....

22. Do any institutions help in adopting coping mechanism? Yes/ NO

23. If yes, then what are some coping strategies you are presently practicing learned from GO/NGO?
.....
24. Information on that particular GO/NGO: Name: type:
Learning procedure: .....
.....

E: Institutional Information about Water Logging

25. Are you a member of any NGO/GO? Yes / No

26. Give information about some ongoing project regarding water logging in your area

Name of the Project regarding water logging	Type of Organization	Important Activities	Your Benefits	Condition of concerned sector before the project initiative (out of 10)	Condition of concerned sector after project initiative (out of 10)
1.					
2					
3.					
4.					
5					

27. What constraints are there in effective implementation of some programs?
a) Fund b) Geological Condition c) Awareness d) Technology e) Political Intervention f) Others.....

28. Which sector, according to you, has been improved as a result of some GO/NGO programs?
a) Education b) health c) food d) employment security e) others (please specify)
Specify Reason.....

29. How do you rate the GO-NGO and local people's coordination in Keshabpur?
a) Very good b) good c) not bad d) poor e) very poor

30. Please explain the causes of good or bad performance of the project:
.....
.....

31. What do you aspire from the ongoing projects in context of water logging in keshabpur:
.....
.....
.....
.....
.....

Thank you, Neelopal Adri, MURP Student, BUET