‘Climate-induced’ Rural-Urban Migration in Bangladesh:

Experience of Migrants in Dhaka City

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Declaration of Authorship:

I, Neelopal Adri, hereby declare that this thesis and the work presented in it is entirely my own. Where I have consulted the work of others, this is always clearly stated.

Signed: Neelopal Adri.

Date: 23/04/2015

Dedicated to-

My Loving Parents:

Hosne Ara Begum

&

Md. Khairul Islam Khan

All my achievements in life are due to their love and sacrifices.

ABSTRACT

Climate-induced rural livelihood loss and consequent rural-urban migration is a common scenario in today's developing countries. However, little is currently known about the dynamics of the process of climate-displaced migration and the experiences of associated migrants. This is an attempt to understand how poor 'climate-induced' migrants perceive their urban conditions in hydro-geophysical and socio-economic terms. Dhaka City, the densely populated capital of Bangladesh, is highly vulnerable to the impacts of climate change. In future a sustained influx of climate-induced migrants is likely to join the ranks of the urban poor, where they will have to face new hazards of city life. Therefore this research has tried to answer questions such as to what extent have the climate-induced migrants' aspirations been fulfilled after migration and whether their vulnerability to different hazards is different than that of the non-climate-induced migrants.

The research has termed them 'climate-induced migrants' who have migrated mainly due to problems of the type climate change is expected to cause; for example flood, cyclone, riverbank erosion, waterlogging, drought and salinity intrusion. Tracer survey and snowballing process were used to identify poor climate-induced migrants in *Korail*, one of the largest slums in Asia. Questionnaire surveys, focus groups and personal interviews were the main research methods. It argues that climatic factors never affected any other group so severely at both their origin and destination as it affected the poor climate-induced migrants. They face some hazards more severely than other types of migrants due to the differences in their financial and coping capacities and educational qualification. Finally the recently arrived illiterate female climate-induced migrants from a cyclone prone area have been identified as the most vulnerable population. With the rapid rate of urbanization and climate change, this is high time to identify such migrants and bring them under separate plans.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACC	Administrative Committee on Coordination
ACCCRN	Asian Cities Climate Change Resilience Network
ADB	Asian Development Bank
BBC	British Broadcasting Corporation
BBS	Bangladesh Bureau of Statistics
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BDRCS	Bangladesh Red Crescent Society
BDT	Bangladeshi Taka
BFSCDA	Bangladesh Fire Service and Civil Defence Authority
BRAC	Bangladesh Rural Advancement Committee
BRTC	Bangladesh Road Transport Corporation
BWDB	Bangladesh Water Development Board
CCVI	Climate Change Vulnerability Index
CEGIS	Centre for Environmental and Geographic Information Services
CGC	Centre for Global Change
CIDA	Canadian International Development Agency
CUS	Centre for Urban Studies
DESCO	Dhaka Electric Supply Company Limited
DFID	Department for International Development
DMB	Disaster Management Bureau
DSK	Dushtha Shasthya Kendra
ECHO	Humanitarian Aid and Civil Protection department of the European Commission
FGD	Focus Group Discussion
GEC	Global Environmental Change

GoB	Government of Bangladesh
IASC	Inter-Agency Standing Committee
ICDDRB	International Centre for Diarrhoeal Disease Research, Bangladesh
IDPAA	Institute for Development Policy Analysis and Advocacy
IFRC	International Federation of Red Cross and Red Crescent Societies
IIED	International Institute for Environment and Development
INGO	International Non-governmental Organization
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
JDLNA	Joint Damage, Loss and Needs Assessment
LGED	Local Government Engineering Department
MSS	Manabik Shahajya Sangstha
NAPA	National Adaptation Programme of Action
NDBUS	Nagar Daridra Bastee Unnayan Sangstha
NGO	Non-governmental Organization
NIPORT	National Institute of Population Research and Training
PAR	Participatory Action Research
PRA	Participatory Rural Appraisal
PSD	Practising Sustainable Development
PUA	Participatory Urban Appraisal
RRA	Participatory Rural Appraisal
PROSHIKA	Proshikkhan, Shikkha, Karmo (Training, Education and Action)
RVCC	Reducing Vulnerability to Climate Change
SCN	Sub-Committee on Nutrition
SPSS	Statistical package for the Social Sciences
SSC	Secondary School Certificate

UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UNHCR	United Nations High Commissioner for Refugees
UPPR	Urban Partnerships for Poverty Reduction
USAID	United States Agency for International Development
WEDO	Women's Environment and Development Organization
WFP	World Food Programme
WG	Working Group
WWF	World Wide Fund For Nature

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE RESEARCH

"One of the gravest effects of climate change may be those on human migration"

(IPCC, 1990: 103).

"If disasters occur more frequently and/or with greater magnitude..... migration and displacement could become permanent and could introduce new pressures in areas of relocation"

(IPCC, 2012: 293).

Increasing evidence in the last few years has clearly established that anthropogenic climate change is a reality[1] (IPCC, 2014). It is anticipated that climate change will bring about gradual changes such as sea level rise, increases in temperature, changing precipitation patterns, increases in frequency and magnitude of extreme weather events such as floods, storms and droughts (IPCC, 2001). Though there are still uncertainties regarding the exact magnitude and rate of such changes in different regions, the impacts of climate change are already evident in many parts of the world (IPCC, 2014).

It is feared that the most severe burden of the adverse impacts of climate change will fall disproportionately on poor communities (DFID, 2004a; DFID, 2004b). The world's poor are negatively affected both by the impacts of climate change and human intervention on environment in many different ways. Amongst them the disruption of rural livelihoods and the consequent migration to cities are some major problems worldwide (Mirza and Ahmad, 2005; UNEP, 2011; Warner *et al.*, 2012). Beyond appreciation of this basic situation, little is currently known about the dynamics of 'climate-induced' migration and the experiences of the migrants associated with this process. This thesis will contribute to understanding in this field, through a critical analysis of the term 'climate-induced' and through exploring the experiences of the 'climate-induced' migrants in Dhaka, Bangladesh.

[1] Though there are considerable regional variations around global means.

It has been claimed that Bangladesh is one of the most vulnerable countries to the impacts of climate change (Maplecroft, 2011). Previously many studies investigated the causes of its vulnerability to climatic impacts (Penning-Rowsell *et al*., 2013; Huq *et al.*, 1998; Warrick and Ahmad, 1996). The highly agriculture-dependant rural areas of the country are mainly vulnerable to the extreme climatic impacts, prompting large scale rural-urban migration to the capital city, Dhaka (ADB, 1994). Dhaka City is situated in the Ganges delta and close to the Bay of Bengal, with a population of more than 14 million (BBS, 2011) and highly vulnerable to waterlogging, flooding caused by river, storm surges and extreme rainfall and lack of drainage facilities. New 'climate-induced' migrants arriving in the city occupy more flood-prone sites, which are mostly the low-lying city slums. The current research deals with the experiences of these newly arrived 'climate-induced' migrants in Dhaka City, their current living conditions and perceptions and aspirations for the future, and their special vulnerability to the new social and environmental hazards in the destination.

The inverted commas around the term 'climate-induced' indicate that the thesis will engage in a critical evaluation of the common narrative of climate change. The term- 'climate-induced'- is not only about climate change, rather it defines a broader aspect of both climatic and anthropogenic elements. In short, 'climate-induced' migration, in this thesis, has been seen as a consequence of both climatic and/or human induced events - which have been occurring in an accelerated rate for the last few years (IPCC, 2014).

1.2 BANGLADESH: GEOGRAPHICAL CONTEXT

Because of its disadvantageous geographic location, low-lying topography, high population density and poverty and climate-dependant livelihoods, Bangladesh has been considered as one of the most vulnerable countries to climate change impacts (Huq, 2001; Rahman and Alam, 2003; Huq and Ayers, 2007). Many of the anticipated adverse effects of climate change, especially sea level rise, increased temperature and changing pattern of precipitation are likely to exacerbate the current situation by reducing water and food security and damaging infrastructural facilities. These consequences are highly detrimental to the development of a country like Bangladesh which has one of the highest average population densities in the world

(2600 persons per square mile) (UN-HABITAT, 2009a). Bangladesh is the third most vulnerable country in the world to sea-level rise in terms of population size, and among the top ten countries in terms of percentage of coastal population (Pender, 2008).

The coastal areas are at great risk of sea-level rise and particularly vulnerable to tropical cyclones and associated storm surges. Human-induced events such as construction of embankments and desertification are also responsible to exacerbate the destruction of cyclonic storms (Auerbach *et al*., 2015). However, along with climatic stimuli, human interventions are always recognized throughout the thesis as major reasons for catastrophic cyclones as well as floods in Bangladesh. UNDP (2004) identified Bangladesh as the most vulnerable country in the world to tropical cyclones, and the sixth most vulnerable country to the impacts of floods. Currently almost 40 million people live in coastal areas (Akter, 2009). In 2007, the country experienced the super Cyclone *Sidr* which killed thousands of people and caused great damage to agriculture, health and infrastructure (Roy, 2011). Just two years later, Cyclone *Aila* also caused huge loss of property, socio-economic disruption and environmental degradation in coastal areas. Due to Cyclone *Aila*, hundreds of people died and almost 4.82 million people were affected in 11 coastal districts (Roy, 2011). Evidence-based research demonstrated that these two cyclones forced millions of affected people to migrate to other parts of the country in order to survive (Roy, 2011; Walsham, 2010). It is anticipated that a significant proportion of such migrants headed to Dhaka- the capital city. The present research terms such migrants as 'climate-induced' migrants and intends to understand their new context of vulnerability in the destination.

In addition to geographical location, high population density is also one of the country's major problems. Bangladesh has a population of 156.6 million and the urban population comprises 26% of its total population (Population Reference Bureau, 2013). The country is likely to have an urban population approaching 50 million by 2015 (CUS, NIPORT and MEASURE Evaluation, 2006). Rural-urban migration is likely to be a major cause of this rapid growth, particularly to metropolitan areas, of which Dhaka is the largest. On arrival, these poor migrants join the general urban poor in the slums where they lack basic amenities of life.

According to the latest national slum census, the total slum population is 5.4 million, 3.4 million of whom live in Dhaka (CUS, NIPORT and MEASURE Evaluation, 2006). Dhaka, the fastest growing megacity in the world, has an annual growth rate of 4.4% (UN-HABITAT, 2009b). Prasad *et al.* (2009) estimated that each year 400,000 migrants arrive in Dhaka from rural and coastal areas of the country and the main reason for such a huge influx has been identified to be the climate-related disasters. Therefore, 'climate-induced' migration is taking place in Dhaka on a large scale and creates problem both for the city as well as for the migrants living in the low-lying slums that are susceptible to urban flooding. The present research has tried to understand this process of 'climate-induced' migration in Bangladesh and the migrants' experiences associated with the overall process of migration. Before stating the objectives, the following section will clarify some concepts related to climate related migration.

1.3 CLIMATE AND MIGRATION

Migration is the movement of people from one place to another. Migration takes different forms such as permanent, temporary or oscillating; voluntary or forced; internal or international. Migration has also been categorized based on the types of driver such as economic, political or environmental. The present research deals with forced rural-urban migration which occurs both due to 'climatic' and 'anthropogenic' events; where anthropogenic means- 'resulting from or produced by human activities' (IPCC, 2014). However, throughout the thesis 'climate change' will actually refer to 'anthropogenic climate change'.

Climate change is generally the change in the state of the climate which is recognized by changes in the mean and/or the variability[2] of its properties which continues for an extended period, typically decades or longer (IPCC, 2007). The IPCC (2007) also stated that it refers to any types of changes over time, where the changes may be in terms of natural variability or due to human activity. This IPCC definition differs from that in the United Nations Framework Convention on Climate Change (UNFCCC), where climate change refers to the change of climate that is attributed directly or indirectly to human activity that alters the composition of the

[2] The way climate fluctuates yearly above or below a long-term average value (Dinse, 2011).

global atmosphere and that is in addition to natural climate variability observed over comparable time periods (FAO Climate Change and Bioenergy Glossary).

Due to rapid industrialization, the world is facing huge greenhouse gas emissions which are contributing to the increase of global average temperature. This phenomenon has been claimed to have bitter consequences for the world and the overall human settlement in the form of untimely precipitation, more frequent and intense weather events and sea level rise (IPCC, 2014) (see Brammer's evidence-based critique on sea level rise in Section 2.4 of Chapter Two).

Poor developing countries which are situated in coastal zones are mainly experiencing the worst impacts of climate change (UNFCCC, 2007) - sometimes exacerbated by human-induced events such as frequent construction of embankments and forest removal (Auerbach *et al*., 2015; Rahman *et al.*, 2010; Adnan, 1991). Previous research showed that the poor, who mainly depend on agriculture for survival, cannot maintain their livelihoods due to more frequent and intense climatic disasters (IPCC, 1990; Ahmed, 2013). However, Brammer (1990, 2013) rejects any links of cyclone, floods and riverbank erosion with climate change (see Section 2.4 of Chapter Two for more details). Other researchers also tried to verify such links of floods with climate change and could not come to any significant conclusion verifying the link (Hofer and Messerli, 2006; Rosenzweig *et al*., 2007; Bates *et al.*, 2008; Warrick and Ahmad, 1996). Hence academic debates are strong in terms of verifying the links of climate change and post-disaster migration.

Others also claimed that it is not only climate change, rather the politics and failure of governance system, which have significant role in inducing people to migrate (Warner, 2010). Many researchers termed migration as an adaptive strategy (McLeman and Smit, 2006), while others considered migration as a 'failure of adaptation' (IOM, 2007; Renaud *et al*., 2007; Dun and Gemenne, 2008; Stojanov and Novosak, 2008). This research attempted to conduct a critical evaluation of these different concepts and collected empirical evidences from the 'climate-induced' migrants in Dhaka City of Bangladesh as a case to understand their reasons for migration and whether the migration decision was worthy enough to live a life they wanted.

Recognizing that the effects of climate change are not yet fully manifested, I have termed them 'climate-induced' migrants in this research who have migrated due to environmental problems of the type climate change is expected to cause. For example, floods, riverbank erosion, waterlogging, drought and salinity intrusion are some cases which are likely to be exacerbated by the impacts of climate change, and therefore people induced by such events have been termed as 'climate-induced' migrants in my research. The research is also engaged in a critical evaluation of the concept of 'climate-induced' migration - where the migration has been considered as a consequence of both climatic and anthropogenic events. However, as said before, the inverted comma around the term- 'climate-induced' is an indication of its critical nature and the rest of the chapters will not use the inverted comma but will mean the same.

1.4 AIMS AND OBJECTIVES

The aim of the research is to understand the perceived challenges of 'climate-induced' migrants in Dhaka City in terms of experiencing different socio-economic and environmental hazards. The objectives of the research are explained below:

Objective 1: To understand how 'climate-induced' migrants to the city perceive their socio-economic conditions and environmental vulnerability.

Research Questions:

1. What were the reasons for their migration? Which climatic events exacerbated their livelihood conditions in their places of origin?

2. What are the new socio-economic and environmental hazards in the destination that push them to return to their places of origin?

3. What are the incentives in the city that restrict them from returning to their places of origin?

4. Do they still want to return to their villages?

5. In case of major floods in Dhaka in the future, where will they move and/or what will be their adaptation strategies?

Objective 2: To understand the differences between 'climate-induced' and 'non-climate-induced' migrants in Dhaka City.

Research Questions:

1. Do the 'climate-induced' migrants perceive the same level of vulnerability to different socio-economic and environmental hazards as perceived by 'non-climate-induced' migrants in the city?

2. Are there any major differences between 'climate-induced' and 'non-climate-induced' migrants in terms of overall expectations in the city, perceptions and aspirations for the future, and if so, what are they?

Objective 3: To explore different dimensions of vulnerability of 'climate-induced' migrants in Dhaka.

Research Questions:

1. To what extent is there any gender-based dimension to 'climate-induced' migration?

2. What is the experience of the old aged 'climate-induced' migrants in experiencing different hazards in the city?

3. How differently do the newly arrived[3] and the long-term 'climate-induced' migrants experience social and environmental hazards in the city?

4. How do their levels of formal education affect the experiences and perceptions of 'climate-induced' migrants in the city?

5. How differently do cyclone-induced and flood-induced migrants experience hazards in the city?

[3] Newly arrived migrants in this research refer to those who migrated after 2006 (in order to increase the chances of interviewing migrants induced by Cyclone *Sidr* of 2007).

1.5 RATIONALE OF THE RESEARCH

There have been several research attempts in rural areas to investigate the impact of certain climatic events on people's migration decisions (Black *et al.*, 2013; Penning-Rowsell *et al*., 2013). For example, Penning-Rowsell *et al.* (2013) found that most of the climate related migration is temporary in Bangladesh and such migrants, at some point of time, actually return to their places of origin. The authors have conducted that research at the point of five rural villages. It was necessary to investigate the destination part also in order to assess migrants' experience after migration. This particular thesis has investigated this particular phenomenon in case of the climate-induced migrants in Dhaka City, which is rarely studied so far.

Previouis research has been conducted on the topic of the vulnerability of the households in the climatic-affected regions who are left behind by the male 'climate-induced' migrants (Kolmannskog, 2009; UNFPA, 2009; Buechler, 2009). However, research that looks especially at the vulnerability of 'climate-induced' migrants to different destination-based hazards is of recent origin. There have been research initiatives into the vulnerability of Dhaka City due to climate change (Alam and Rabbani, 2007; UN-HABITAT, 2009b), but research based on experiences of this particular group, namely 'climate-induced' migrants, is relatively a new field of study in context of Bangladesh.

Moreover, in today's urbanized world, it is necessary to initiate more research to analyze the consequences of large scale rural-urban migration. As a south Asian developing country, Bangladesh is also facing rapid urbanization and under these consequences the current project is timely to analyze the vulnerability and perceptional aspirations of a special group during this urbanization process. Climate change, no doubt, is a serious research agenda and studying vulnerability analysis of migrants in a changing climate is likely to give practical solutions for the future. The current topic of the thesis is now a real research need in order to discover suitable livelihood options and policies necessary for the development of 'climate-induced' migrants.

1.6 ORGANIZATION OF THE THESIS

The thesis is organized into eight different chapters. This chapter already explained the background to the research, research objectives and research questions. The rest of the thesis contains seven chapters, the contents of which are summarised as follows:

Chapter Two

This chapter clarifies different concepts related to 'climate-induced' migration through a detailed literature review. It described environmental discourse in South Asia before the 1990s (i.e. Himalayan deforestation, Farakka barrage) and also critically analyzed the linkage of climate change with flood, cyclone and riverbank erosion. It surveys general versus environmental migration theories from the 19th century onwards. It explained when and how climatic factors became a major component of migration-related research. It also focuses on the definitional controversies related to 'climate-induced' migration and different estimates related to future scenarios of 'climate-induced' migration. Climate- related drivers of migration, concepts of vulnerability, resilience, coping capacity and adaptive capacity have been explained along with a special focus on the climate change-gender-migration nexus, vulnerability of city slums (the principal destination of 'climate-induced' migrants) and the vulnerability dimension of the old-aged population. However, the objective of this chapter is mainly to clarify different concepts relevant to the topic of this thesis and to review recent relevant literatures.

Chapter Three

This methodological chapter explains the research design of this study, sampling procedures, the process of ethical permission, rationale for selecting the study area and comparison group. In addition, it also explains the process of the recruitment of respondents and research assistants, the development process of the questionnaire and planning of focus groups and interviews. The chapter also revealed the process of data analysis.

Chapter Four

It describes both the pre-migration and post-migration scenarios of the hydro-geophysical hazards faced by the 'climate-induced' migrants. It analyzes factors that prompted the migration of the target group, environmental hazards in places of origin (such as floods, flash floods, Cyclones *Sidr* and *Aila* and riverbank erosion) and environmental hazards in the destination city (such as floods, waterlogging and heat stress) and their perceived experiences during all those climatic hazards.

Chapter Five

This describes the socio-economic condition of 'climate-induced' migrants before and after migration. The chapter explained the livelihoods and asset framework in details. It identified indicators of socio-economic conditions such as livelihoods, asset base, food security and health and each aspect has been discussed in details both in terms of before and after migration of the target group. Important national policies associated with climate-induced migration in Bangladesh have been reviewed in this chapter. Finally the dimension of politics and governance has been analyzed to see what impact they have on the socio-economic conditions of the 'climate-induced' migrants.

Chapter Six

This chapter is based on the relationships and the differences between the 'climate-induced' and 'non-climate-induced' migrants in the same slum. For comparison, it uses different indicators such as financial conditions, education and awareness, family structure and patterns of migration, access to credit, coping strategies with different hazards, relationships with the place of origin and food security. It helps to understand how differently the 'climate-induced' group is vulnerable to the various social and environmental hazards in the city from the rest of the urban poor. It also analyzed urban politics and governance and their differential impacts on 'climate-induced' migrants. The chapter also attempted to understand whether their pre-migration characteristics were a factor in shaping their current socio-economic conditions. The chapter uses some statistical tests for comparison such as the independent samples t-test and Chi-square ($\chi 2$) test.

Chapter Seven

This chapter explores different dimensions of the vulnerability of 'climate-induced' migrants. Along with the gender dimension, it also emphasises the issue of the special vulnerability of old aged 'climate-induced' migrants during the process of migration and also their particular vulnerability to the impacts of climate change. It tries to identify the most vulnerable population among the 'climate-induced' migrants based on their gendered role, age, education, duration in the city and types of climatic events that prompted their migration decisions. The chapter also analyzed the dimension of politics and governance and how this differs within the 'climate-induced' migrants. This chapter mainly attempts to deal with the diversified dimensions of the overall 'climate-induced' migration process and the challenges perceived by different categories of population among 'climate-induced' migrants.

Chapter Eight

This chapter summarises the principal findings of the thesis, identifies the original contribution of the research and its limitations. It re-visited some of the theories associated with climate-induced migration in this chapter (which was previously discussed in chapter two) in order to assess their relevance in the context of climate-induced migration in this study. It also identifies the policy gaps related to the process of 'climate-induced' migration in Bangladesh, and suggests some useful measures in order to protect and assist the target group. Fruitful directions for future research are also identified.

1.7 CONCLUSION

This research is based on the experiences of 'climate-induced' migrants themselves and is conducted in their destination slum within Dhaka. However, this is a pioneering empirical research project based on destination data about 'climate-induced' migrants in Bangladesh. So far research in this field has been biased towards data on climate-affected rural regions, but this thesis expects to reveal new experiences of 'climate-induced' urban migrants and their aspirations about the future. I have to admit that the scope of the research is broad in the sense that it covered many aspects such as experiences of 'climate-induced' migrants both at

origins (ex-post) and destinations, their comparison with other groups, and identifying the most vulnerable sub-groups. While trying to limit the discussion, these aspects were difficult to avoid because the experiences perceived by the target group were not easy to describe based on a specific theme or in few words or pages. It was an emotional journey of interviewing each respondent and all my efforts will be fruitful if my thesis can contribute to some extent to produce research-based, evidence led document helping to understand the process of rural-urban migration in Bangladesh as related to climate and associated urban experience of the migrants.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 INTRODUCTION

Rural-urban migration is a longstanding phenomenon in the context of so-called third world or developing countries. Though people have a tendency not to leave their ancestral homes, for many reasons they have to migrate to other places. These 'reasons' vary to a great extent, from voluntary to forced in nature. A substantial literature has explored different factors underlying people's migration (Prothero, 1987; Barnum and Sabot, 1977; Moench and Gyawali, 2008; Carr, 2005; IOM, 2005). Among these, over the last decade or more, one of the most commonly discussed factors is climate-induced migration (Bates, 2002; Castles, 2002; IOM, 2007; IPCC, 2012; IPCC, 2014).

Climate-induced migration is the subject of strong definitional controversies within the literature. In this thesis, climatic factors inducing migration refers to those types of environmental problems that climate change is expected to cause (e.g. floods, cyclones, riverbank erosion, salinity intrusion). Therefore, this thesis discusses literatures based on migration induced by both climatic variability and change where the reasons of such changes are often anthropogenic (see Section 2.2-v to understand the concept of climate-induced migration).

While many researchers strongly disagree with this concept of climate-induced migration (Black, 2001), others have tried to link climate and migration (Myers, 2001). This thesis will deal with climate-induced migrants and their special vulnerability in a megacity- which is also vulnerable to the impacts of climate change. Therefore, this chapter explains related concepts and theories relevant to the topic of the research. For example, it elaborates the concepts, causes and consequences of climate-induced migration based on published literature. It also explained theories related to climate change, environment and migration, reviews research based on origin and destination of climate-induced migrants, elaborates concepts such as climate-gender-migration nexus, vulnerability, adaptation and resilience.

2.2 IMPORTANT TERMINOLOGY

Studies on climate-induced migration are highly characterized by terminological controversies. Migrants induced by climatic and environmental factors have been termed differently in different literatures. Some examples are given below:

i) Refugees:

"The 1951 Convention relating to the Status of Refugees defines a refugee as a person who owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality and is unable, or, owing to such fear, is unwilling to avail himself of the protection of that country"

(IOM, 1996: 4).

ii) Environmentally Displaced Persons:

"Persons who are displaced within their country of habitual residence or who have crossed an international border and for whom environmental degradation, deterioration or destruction is a major cause of their displacement, although not necessarily the sole one"

(IOM, 1996: 4).

iii) Internally Displaced Persons:

"Persons or group of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular, as a result of, or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized state border"

(OCHA, 2004: 1).

iv) Environmental Migrants:

"Environmental migrants are persons or groups of persons who, for compelling reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad"

(IOM, 2007: 1).

Previously people involved in climate-induced migration were frequently termed as 'environmental refugees'. But the official definition of the term 'refugee' did not match with the range and extent of the climate-induced displaced persons. The term refugee is controversial because according to definition a refugee is someone who has crossed the border of their home country (see definition of refugee above in Section 2.2-i). Research found that most environmental migration occurs within their home countries (Hugo, 1996; Morton *et al.*, 2008). Therefore, this research deals with only internal migrants (who move within the country) rather than international migrants (who cross national borders).

In 2001, Richard Black identified the term 'environmental refugee' as a myth and a misleading concept which is highly politicized (Castles, 2002). Black (2001) sees the emphasis on environmental refugees as a distraction from central issues of development and conflict resolution. McGregor (1993) pointed out that as environment is a term outside politics, use of the term 'environmental refugee' may encourage receiving states to treat the environmental migrants in the same way as economic migrants to reduce their responsibility to assist and protect (McGregor, 1993). Nowadays, most research on environment-related migration uses the term environmental migrants or climate-induced migrants, while the current research adopts the latter. Recognizing that the effects of climate change are not yet fully manifested, I have termed them climate-induced migrants who have migrated due to environmental problems of the type climate change is expected to cause. For example, floods, riverbank erosion, waterlogging, drought and salinity intrusion are likely to be exacerbated by the impacts of climate change, and therefore people driven by such events are the target group of this research.

v) Climate-induced Migrants

The thesis will frequently use the term climate-induced migrants, who are the target group of this research. The climate change definition of IPCC and UNFCCC (see Section 1.3 of Chapter One) are generally considered to be the standard all over the world. However, in most of the cases there are some hidden words associated with the term "climate change". Those are 'accelerated' and 'anthropogenic'. So it is important to understand the meaning of 'accelerated' and 'anthropogenic' climate change to clearly understand the climate change discourse around the world.

'**Accelerate**' means increase in rate, amount or extent. Global GHG (greenhouse gas) emissions due to human activities have grown since pre-industrial times, with an increase of 70% between 1970 and 2004 (IPCC, 2007). This indication from IPCC clearly shows that climate is changing in an accelerated rate. Climate change is not a new phenomenon; it has been changing over millennia. But the main worry of the human community is its 'accelerated' rate (see Appendix VII) (IPCC, 2014). However, 'anthropogenic' means resulting from or produced by human activities (IPCC, 2014). By far the greatest part of the observed century-scale warming is due to human factors (Allison *et al.*, 2009). So when climate is concerned, it is not only about natural factors, rather human-induced causes are also recognized both by IPCC and UNFCCC as responsible for climate change. Therefore, in this research human-induced climatic hazards are also considered as climate-induced events.

Climate-induced events also refer to the events that are influenced/induced/caused by climate variability and change, the latter being accelerated in nature and resulted from anthropogenic or human-induced actions. It encompasses both variability which has already been observed across the globe in many systems and projected changes into the future. Therefore, climate change and variability includes past, observed and projected values all together (IPCC, 2007). These events cannot be called directly as 'climate change-induced', rather the term 'climate variability and change-induced' might be appropriate.

Climate-induced events are, therefore, the events which have started to occur globally due to anthropogenic reasons and are now understandable by variables, but in the future there will be a clearer trend with attribution. As a result, 'climate-induced' events in this research refers to the extreme climatic events like floods,

cyclones and riverbank erosion, which are the consequences of both climatic as well as human-induced causes. The following two sections will, therefore, unfold some of the old environmental discourse in South Asia and will critically analyze the linkage of "climate change" with floods, cyclone and riverbank erosion in order to understand the debates associated with their linkages with climate change and it will also help to understand the role of human intervention in influencing such hazards.

2.3 ENVIRONMENTAL DISCOURSE IN SOUTH ASIA BEFORE THE 1990s

"*From the malign influence of the Farakka Barrage or the damage done by deforestation in the Himalaya through to rising sea-levels, Bangladesh is portrayed as having one of the world's most fragile environments which is suffering both actual and potential change, with unimaginably damaging human consequences, as a direct result of human activity beyond its borders*"

(Bradnock and Saunders, 2000: 66)

In the last two decades 'climate change' has become the dominant discourse in Bangladesh. However, some significant narratives of the 1970s and 1980s in Bangladesh were the relationship between flooding and the deforestation in the Himalaya and Farakka Barrage. Human intervention was often seen as a contributing, or even dominant, factor in exacerbating flooding in the region. These issues are briefly surveyed below:

a) Himalayan Deforestation

Before the climate change agenda, deforestation of the Himalayan Mountains was a heated topic of discussion in the South Asian region (Bradnock and Saunders, 2000). The conventional wisdom was that due to huge population growth in the mountains, demand for fuel wood, fodder and timber increased and therefore the mountain people had started uncontrolled forest removal. This phenomenon resulted in intensified erosion and peak flows in the river, severe flooding and siltation on the densely populated plains of the Ganges and Brahmaputra. According to Ives and Messerli (1989), these conclusions had been adopted by the scientists and became popular among the politicians. Mountain farmers were accused of causing land degradation and flooding in the lowlands of the GBM (Ganges-Brahmaputra-

Meghna) Basin. However, this idea had been subjected to many debates. Some researchers showed the highland-lowland linkages in Himalayan ecology but they did not find any significant correlation between human activities in the mountains (e.g. deforestation) and catastrophes on the plains (e.g. floods) (Ives and Messerli, 1989; Messerli *et al*., 1993; Ives, 2004).

From 1979 to 1991, the University of Bern and the University of Boulder, Colorado, along with other institutions, were involved in research which was also focused on highland-lowland linkages and the changes in landscapes and the hazardous areas over the past 20 years (Ives and Messerli, 1981; Kienholz *et al*., 1983, 1984; Zimmermann *et al*., 1986; Vuichard and Zimmermann, 1987). Major findings showed that human activities in the highlands do not have an immediate effect on the floodplain in the lowlands. Statements on forest removal and its effects should not be generalized: in certain areas of the Himalayas, forest cover has increased over the past few decades. Forest removal does not necessarily lead to degradation of soil and water resources. If forests are replaced by well-maintained agricultural terraces or other adapted and sustainably managed land-use systems, erosion and runoff are not greater than in a forested area. In 1992, the focus shifted to the GBM Basin mainly as Bangladesh was hit by a devastating flood in 1988. The Bangladesh Action Plan for Flood Control was formulated after that. One important original objective of this plan was to control floods in Bangladesh by strengthening and expanding the embankment network along the main river courses. This approach, which today has been modified significantly, provoked vigorous debate and controversy among the various interested aid organizations and governmental institutions in the early 1990s (e.g. Adnan, 1991, 1993; Adnan *et al*., 1992). The popular practice of building embankments was, however, highly criticized in Bangladesh as, according to many researchers, embankments became responsible for increased flooding and salinity in many areas of Bangladesh. The example of Farakka Barrage below is instructive.

b) Farakka Barrage:

Farakka barrage was commissioned in April 1975. This barrage gave India the power to control water during the dry season. Mirza (1997) analyses the hydrological changes that have occurred in the Ganges system (including the Ganges River and

the Gorai offtake) in Bangladesh in the post-Farakka period (1975-1992) using relevant discharge and water level data.

The analyses set out above indicate that the diversion of water at the Farakka Barrage has caused significant hydrological changes in the dry season discharge of the Ganges system in Bangladesh. Flow regulation by the barrage has induced non-homogeneity in its annual peak flow. The statistical tests found most of the hydrological changes significant. The diversion also accelerated the siltation of the Gorai River (a major cause of waterlogging and salinity in the south-west Bangladesh) (Adri and Islam, 2012).

The reduced dry-season flow in the Ganges system has potentially wide-ranging socio-economic and environmental implications for Bangladesh. For example, in recent years, extreme low flow in the Gorai River in the dry months has appeared to exacerbate the intrusion of saline water to the most inland parts of southwest Bangladesh (Khan, 1993). The implications of the diversion of the Ganges water on various sectors in Bangladesh should be carefully examined.

Rahman *et al.* (2010) stated that India has built barrages in many rivers near the border of Bangladesh and these dams and embankments act as the main barrier to flow water towards downstream like Bangladesh. Increased salinity of soil and water, decline of soil quality and crop yields, shrinking fish populations, decline of fishing villages and loss of livelihoods, decline of mangrove forest, increased erosion rate and sedimentation, increased salt water intrusion, more severe flooding during monsoon season etc. have been identified by many researchers as the consequences of the Farakka barrage in Bangladesh (Mirza *et al.*, 2003; Rahman *et al.*, 2010).

From the above discussion, it is evident that before the climate change narratives, there were other environmental discourses regarding the South Asian region and researchers demonstrated that much of the environmental degradation was occurring due to human intervention; while others rejected the concept (Ives and Messerli, 1981; Kienholz *et al*., 1983, 1984; Zimmermann *et al*., 1986; Vuichard and Zimmermann, 1987). There always have been some conflicting debates on such regional environmental issues. However, since the last two decades, 'climate change' has become the most important environmental discourse of the South Asian region. The following sections attempt to understand the relationship of climate change with

floods, cyclones and riverbank erosion- three common hazards of South Asian countries, including Bangladesh.

2.4 FLOODS, CYCLONE AND RIVERBANK EROSION: A CRITICAL REVIEW OF THEIR LINKAGES WITH CLIMATE CHANGE

"*The physical and socio-economic environments (of Bangladesh) are complex; they are also dynamic....these factors make it extremely difficult to isolate or assess the specific consequences of any particular trend or intervention*"

(Brammer, 1993: 246).

The above statement reflects the difficulty of establishing linkages of climate change with events like floods, cyclones and riverbank erosion. However, this section explores the debate and research based on such linkages in context of South Asia, and particularly in Bangladesh. IPCC and others do present evidence of changes in prevailing conditions and in some areas there is a long enough timeframe to judge (see Appendix VII) (IPCC. 2014). However, what is proven is that climate variability is already interplaying in exacerbating hazards (Walsham, 2010; IPCC, 2014).

In fact, it is difficult to establish links between climate change and different environmental hazards such as floods, cyclone and riverbank erosion because the impacts of climate change have not yet fully manifested and there are academic debates about the validity of such links (Brammer, 1990). This section seeks to convey some of these debates.

2.4.1 Flood: Linkage with 'Climate Change'

The impacts of climate change have been projected on different flood variables such as precipitation and temperature. Researchers did not find any evidence of a systematic change through time in any of the natural variables affecting flood frequency and also no gauge-based evidence was found by the researchers for a clear climate-induced change in the magnitude and frequency of river floods during the last decade (Rosenzweig *et al.*, 2007; Bates *et al.*, 2008; Warrick and Ahmad, 1996). The IPCC's special report on extreme events (SREX report) (S12) also agreed the

above findings (IPCC, 2012). ‘Are floods getting worse in the GBM Basin?’- this was the title of research done by Mirza *et al*. (2001). They examined the claim that flood discharges, areal extent and damage costs are getting worse in the GBM Basins. The validity of such claims was examined by applying four different statistical tests to the peak discharge time series and flooded areas. The results found no conclusive changes in flooding that have occurred in the last few decades but increased flood damage has been experienced, probably due to building of human settlement in more flood prone areas and improved damage assessment techniques. The same authors, in another paper, also claimed that precipitation in the GBM Basin is by-and-large stable (Mirza *et al*., 1998).

There is a different point of view also in the broader arena of climate change research. Based on many scientific climate models, Kundzewicz *et al.* (2013) discussed the global and regional perspectives of flood risk and climate change. The authors demonstrated the globally projected increases in the intensity and frequency of heavy precipitation which should contribute to the increased rainfall generated local flooding. In other research also, human-influenced global warming has been identified as responsible for increases in heavy precipitation (Groisman *et al*., 2005; Trenberth *et al*., 2003). Scientists also predicted increases in hot extremes and decreases in cold extremes which are expected to amplify further (Allison *et al.*, 2009; IPCC, 2012; IPCC, 2014). Some researchers stated with ‘medium confidence’ that projected increased rainfall in some region might increase rainfall-generated floods (Kundzewicz *et al*., 2008; Bates *et al*., 2008). Some research, on the other hand, could not detect any consistent pattern of changes in precipitation extremes (Tank *et al.*, 2006) and mentioned the uncertainty in estimates of future precipitation in Bangladesh (Christensen *et al.*, 2007).

According to the SREX report (S12), some variables have been found which are influenced by anthropogenic climate change. Such variables have been listed as mean precipitation (Zhang *et al*., 2007), heavy precipitation and snowpack (Barnett *et al*., 2008) and the authors believe that these should contribute to the hydrological cycle in affecting floods. However, no direct statistical link between climate change and flooding trend (in magnitude/frequency) has been established (Kundzewicz *et al*., 2013). The authors also stated with ‘high confidence’ that in areas where snow storage and melting play a significant role in yearly runoff, the hydrological regime

is affected by temperature changes and also the changes in the timing of spring peak flows in snowmelt- and glacier-fed rivers (*ibid.)*. This certainly leads to the changes in the timing and intensity of floods.

Globally, Asia has experienced so far the most devastating floods (in terms of life and property loss) in the world, due to intensified convergence of water vapour flux in summer; heavy precipitation is projected to increase in the Asian region (Kamiguchi *et al.*, 2006; Hirabayashi *et al*., 2008) and significantly in Bangladesh (Kundzewicz *et al*., 2013). Bangladesh has been identified as the most at-risk country to the flood-related hazards (Bouwer *et al*., 2007; Dash *et al*., 2007; Shen *et al*., 2008; Douglas, 2009). Flooding is a frequently recurrent phenomenon. Rain floods occur due to poor drainage, monsoon floods occur in the flood plains of major rivers and flash floods are also the distinctive feature in some region in the country, originating from the overflowing of upland rivers. However, Bangladesh occupies an extremely diverse, variable and dynamic landscape which is subject to both great natural dynamism and, especially over the last century, major human influences. Brammer's paper demonstrated that it was impossible at that time to pin down such floods as the result of climate change (Brammer, 1990).

Allison *et al.* (2009) is an important document which stated that, according to satellite measurements, sea-level is rising at 3.4 millimetres globally per year since these records began in 1993. This is 80% faster than the best estimate of the IPCC Third Assessment Report (1.9 millimetres per year) for the same time period. The consequence of sea level rise in South Asia is a significant topic of discussion and researchers explain it in different ways. Some became anxious by projecting immediate impacts of sea level rise such as flooding and some tried to cool the debate by saying that there is nothing to worry at the moment.

The Bangladesh Inland Water Transport Authority has been trying to measure the sea level data for a long time but some researchers are doubtful about the accuracy of the measurement of sea level data in Bangladesh (Bradnock and Saunders, 2000). Brammer (2013) is an important source which discussed Bangladesh's dynamic coastal region and sea level rise. Though some researchers claimed that rising sea level with global warming will overwhelm Bangladesh's coastal area and will displace up to 30 million people in the 21st Century, Brammer (2013) termed these as

misconceptions. It says that the coastal areas of the country are very much dynamic and the soil and hydrological patterns within region are often complex.

Hofer and Messerli (2006) found no statistical evidence that the frequency of flooding in Bangladesh has increased during the 20th century. There is indication, however, that the inter-annual variation of floods and the areal extent of big events have increased since 1950. This trend can be related to similar trends in rainfall and discharge patterns (Hofer and Messerli, 2006).

As global warming is likely to affect the hydrology and water resources of the GBM Basin, Mirza (2001) feared more devastating floods in Bangladesh in the future. The use of climate change scenarios from four general circulation models showed significant increases in mean peak discharges in the GBM Rivers. These changes might lead to changes in the occurrence of flooding with certain magnitude.

Finally, some closely occurring flood events in Bangladesh demonstrated the trend of its increasing frequency. According to the NAPA (National Adaptation Programme of Action) document of Bangladesh, every year 20-25% of the land in the country is flooded by river overflows and drainage congestion. 10, 50 and 100 year floods are projected to inundate 37, 52 and 60 percent of the whole Bangladesh respectively. Alarmingly, Bangladesh faced three floods within a twelve-year time period (1987, 1988 and 1998) (Bradnock and Saunders, 2000), all of which inundated more than 60% of the country, demonstrating that what used to be considered a "100-year flood" may already have become more frequent (Ministry of Environment and Forest, 2005). Bangladesh, in spite of developing extensive disaster risk reduction system by constructing embankments and formulating flood action plans during late 80s and early 90s, have been suffering from big floods (in terms of areal extension and depth) within a shorter periods of time (i.e. floods of 1988, 1998, 1999, 2004, 2007). There might be some relationship with the changes in climatic variables such as peak discharge during monsoon. In a nutshell, flooding is a reality in the context of Bangladesh but claims that it has increased to date as a result of climate change are not borne out by the long-term data sets that exist.

2.4.2 Cyclone: Linkage with 'Climate Change'

"*Although future changes in tropical cyclone activity cannot yet be modeled, new analyses of observational data confirm that the intensity of tropical cyclones has increased in the past three decades in line with rising tropical ocean temperatures*''

(Allison, I. *et al.*, 2009:15).

The GBM Delta is one of the most vulnerable coastal regions due to extreme poverty, increasing rate of population growth, projected sea level rise, subsidence, increases in cyclone and storm surges, salinity intrusion, waterlogging and human-induced sedimentation. Tropical storms affect the GBM Delta every few years and recently two devastating cyclones hit the delta (Cyclone *Sidr*, 2007 and Cyclone *Aila*, 2009) which together displaced nearly 1 million people. While evidence supports that tropical cyclones are likely to be more intense (Hoyos *et al.*, 2006; IPCC, 2007; Rana *et al*., 2011) under the warmer climate as a result of higher sea surface temperature (SST) (Mann *et al.*, 2008), there is uncertainty about the changes in frequency and changes in the tracts of the storm (Christensen *et al*., 2007). IPCC (2007) found a significant upward trend in the severity of cyclones since the mid-1970s due to the rise in SST. With IPCC (2007) many other researchers also stated that the tropical sea surface temperature has a positive correlation with the duration and intensity of tropical cyclone (Emanuel, 2005; Mann and Emanuel 2006; Emanuel *et al*., 2008; Mann *et al*., 2009). Pielke Jr. *el al*. (2005) and Landsea (2005) question Emanuel's (2005) conclusions and claim that the connections between Atlantic hurricanes and global warming are premature. Anthes *et al*. (2006) challenged the findings of Pielke Jr. *et al*. (2005) and Landsea (2005) and claimed a direct and growing trend in several important aspects of tropical cyclones, such as intensity, which can be attributed to global warming. In reply, Pielke Jr. *el al*. (2006) concluded that the associated research issues are in a fluid state and are the subject of much current investigation. They claimed that the hurricane events of 2004 and 2005 in the Atlantic are yet to be scientifically assessed in future research and before that any authoritative comments will not be logical.

Hoyos *et al.* (2006) and Elsner *et al.* (2008) identified SST as the leading cause of the global increase of the number of devastating hurricanes. On the other hand Singh and Rout (1999) proved by detailed historical analysis that the annual frequency of tropical cyclones has actually decreased over the last few decades over the North

Indian Ocean. With the help of data from the Indian Meteorological Department, other researchers such as Patwardhan and Bhalme (2001) showed similar results. The tables from the latest publication by Bradnock (2015) also reject the claim of increasing frequency of tropical cyclones over the Bay of Bengal (see Appendix VIII). Therefore, there is regional diversity of the changes in cyclonic frequency.

2.4.3 Riverbank Erosion: Linkage with 'Climate Change'

Riverbank erosion mainly occurs due to the heavy flood velocity and the storm surges followed by a cyclone and also due to anthropogenic bank weakening through de-vegetation/deforestation. Sea level variation is a major concern in Bangladesh because a vast low-lying area of the country experiences large tidal range, heavy river run-off and frequent severe storm surges. Bangladesh is a dynamic delta where river courses change frequently and where erosion and deposition are some fundamental features of the system, not indicators in themselves of recent change.

Riverbank erosion has become a more frequent event in Bangladesh which, in most of the cases, occurred following floods or cyclonic storm surges. A link with climate change is not clear so far but some studies recognized this phenomenon as a consequence of climate change (Rahman *et al*., 2014). Another study conducted in Leuk Deak District of Cambodia along the Mekong River revealed that the changing water level and flooding flow direction and higher flow velocity, contributed by climate change, are main causes of bank erosion (Ratha *et al.*, 2010). Some also proved that increasing flood discharge due to climate change is likely to cause increased bank erosion in future (Aktar, 2013; ADB, 2010). The ADB study revealed that, in the past 30 years, the *Jamuna* and the *Padma* rivers in Bangladesh have widened more than three kilometres, affecting 130,000 hectares of floodplains and displacing more than one million people, and that both climatic factors and human intervention have an effect on this widening process (ADB, 2010). Some researchers showed that the delta experiences not only erosion but also land gain. Allison *et al.* (1997) showed evidence of large-scale net annual land gains in the Meghna estuary of Bangladesh by using satellite images. Brammer (2013) said that this land gain might exceed land loss resulting from the slow rates of sea level rise projected for the 21st Century.

The above discussion has tried to analyze critically the link between climate change and various hazardous climatic events which impact on people's migration decisions. There is huge debate about their clear linkage but there is no doubt that the climate variability is already interplaying in exacerbating hazards. At present we can only assume that some changes have started to occur in the extent and frequency of different climatic events. Based on this hypothesis, the research moves on and terms the target group as 'climate-induced migrants' for convenience without prejudice to the ongoing scientific uncertainties and debates about the complex and at times contradictory evidence.

2.5 MIGRATION THEORIES

So far, there is no single set of climate-induced migration theory in the world literature. The issue of environment and climate in migration is always based on differential debates of the researchers (Gemenne *et al*., 2012; Naser, 2012). This is one of the main reasons that the climate-migration field of research is still involved in searching for suitable definitions and linkages among natural and social phenomena.

Table 2.1: Migration research and theories without references to climate as an explanatory factor of migration

Migration theory	**Key ideas**
Ravenstein's laws of migration (1885 and 1889)	-Migration is undertaken mostly by innovative and active persons. -Migration mainly covers short distances. -It is a stepwise process and is mainly related to economic reasons.
The Lee model (1966)	-Migrants are positively selected, of a higher quality (more educated, ambitious and healthier). -Origins and destinations are seen as possessing a range of attributes; each potential migrant perceives

	these attributes differently, depending on their personal characteristics, such as sex, age and marital status.
Mabogunje (1970:2)	-Physical shift and changes in attitude, skills and behaviour is the most likely phenomena after migration. - It enables and facilitates the adjustment of the migrants to split completely with their rural background and accept the urban way of life. 'A permanence of transfer is thus the essence of the movement'.
The Todaro model (1976)	-Migration proceeds in response to urban-rural differences in expected rather than actual earnings. -Potential migrants are self-selected and depicted to be educated and skilled, and are informed enough to secure a job in a job-scarce situation.
Marxist theory (1980s)	-Migration becomes the only option once people are alienated from the land.
Gender Studies (1990s)	-Men and women differ in responses to migration. -There is sex discrimination in the labour market.
Massey *et al*. (1998)	-Network of migration is a location specific form of social capital that people draw upon to increase access to resources elsewhere.
Bauer *et al*. (2000)	-Once migrants' networks reach maturity and a certain size, marginal positive externalities generally start to decrease and diseconomies of scale might occur through rising competition for jobs and other resources.

Epstein (2002, 2008)	-It is argued that those without information about destinations will migrate to those places where most initial migrants have gone. -It is common for new migrants having no or limited information to follow previous migrants on the belief that they enjoyed information that the previous migrants did not have and that so many other persons cannot be wrong (Epstein 2008: 569).

In the past, most migration theories were based on economic considerations of migration (Table 2.1). Ravenstein's law of migration clearly stated that migrants are mostly active and innovative persons. The Lee model (1966) declared that migrants are selective and they are of higher quality (for example with better health and better education). The Lee model also described migrants as an ambitious group. Mabogunje (1970) admits that migration is likely to change the skill, attitude and behaviour of the migrants and most of the migrants eventually adopt the urban way of life, breaking up completely with their places of origin.

The Todaro model (1976) was a landmark in migration research where it stated that people migrate mainly for economic reasons. The model stated that migration proceeds in response to urban-rural differences in expected rather than actual earnings. Todaro's hypothesis would resemble self-selected migrants who are primarily economically motivated, endowed with attributes of information, education and skills, informed enough to secure employment in a job-scarce situation and young in age or able bodied.

The above theories rarely considered climatic factors as one of the drivers of migration; rather they were focused mainly on economic aspects of migration. It completely ignored distress migration where migrants move because their environmental and structural situation suggests that it is the only survival strategy (Begum, 1999).

Afterwards, there came 'Marxist' theories and gender studies on migration through the 1980s with a very little attention to climatic factors as a driver of migration. This

time researchers could have included climate-induced displacements in their research arena, but became focused on the political definition of refugees (Marx, 1990).

Massey *et al*. (1998) described migrants' networks as a form of social capital which helps to gather resources from elsewhere. However, Bauer *et al*. (2000) mentioned that once migrants are settled in their destination by using that social network, they become reluctant to encourage other people from their network to settle in the city with them due to higher competition for jobs in the labour market. Finally Epstein (2002, 2008) argued that migrants, who have limited information on different potential destinations, generally follow the path of the previous local migrants. This general characteristic of migrants is a constraint towards successful adaptation because uncertainty always has some risks of failure. Forced migrants generally start for an unknown and uncertain destination where sometimes they discover new challenges beyond their imagination. The present study deals especially with such phenomena.

The topic of climate-induced migration came into focus when the Inter Governmental Panel on Climate Change (IPCC, 1990) declared that the greatest effect of climate change on society could be human migration. Though the IPCC's document was an important starting point for developing an climate-migration nexus, the issue had been mentioned by many earlier researchers in the 20th century but were not taken seriously by the world community or by the geographers/researchers themselves. For example, Petersen (1958) viewed environmental migration as a primitive form of migration which, according to the author, was bound to decline as human beings gradually increase their control over their environment. Another reason for not taking environmental issues seriously in migration research was that the economic factors were given the most central role, both in Marxism-inspired and neoclassical research (Piguet *et al.*, 2010). Table 2.2 represents the key literature on migration with reference to climatic factors as a major driver:

Table 2.2: Migration research and theories with references to climate as an explanatory factor of migration

Name	**Key ideas**
Ravenstein (1889:286)	Unattractive climate can cause migration.
Semple (1911: 143)	*"The search for better land, milder climate and easier conditions of living starts many a movement of people which, in view of their purpose, necessarily leads them into an environment sharply contrasted to their original habitat".*
Petersen (1958: 259)	Primitive migration was a movement associated with man's inability to cope with natural forces.
El-Hinnawi, (1985); Jacobson (1988)	Used the term 'environmental refugee'.
IPCC (1990)	In 1990, the IPCC's First Assessment Report declared that the greatest effect of climate change on society could be human migration which will be involuntary form of displacement.
Myers (1993)	Predicted up to 150 million environmental refugees by the end of the 21st Century.
IOM (1996: 4)	Defined environmental refugees: should cross the border of national state.
Black (2001); Castles (2002)	Questioned the concept of environmental refugee.
Myers (2002); UNHCR (2002); Stern (2006); UNFCCC (2007)	Projected different numbers of environmentally induced migrants in the future.

IOM (2007)	Working definition of 'environmental migrants' was developed.
Foresight Report (2011)	-It explains how climate change is likely to influence the human migration pattern over the next 50 years. -It predicts that in the future millions of people, who are unable to move, will be 'trapped' in the vulnerable locations mainly in the low income countries. -More people will be migrating towards more environmentally vulnerable zones. -Migration can transform people's capacity to cope with the changing climate.
ADB (2012)	-uncertainties regarding the number of prospective migrants should not be an excuse for inaction. -Asia-Pacific region has been identified as the most vulnerable region to the impacts of natural disasters. -Climate-induced migration should not only be seen as a threat to human well-being but also a possible tool to encourage human adaptation to climate change.
UNESCO Publication (Piguet *et al.*, 2013)	-The book brings together the views of 26 leading experts from a range of different disciplines. They present case studies from Bangladesh, Brazil, Nepal and the islands of the Pacific, analyzing the often alarming statistics and tearing down the myths associated with the concept of climate change and migration. -Climate change is becoming an increasingly important factor in migration. -The authors recognized that heavy rains and floods,

	tropical cyclones, drought and desertification, and sea-level rise are increasingly influencing migration. -This book looks at the evidence related to the projections of future climate-induced displacements and looks at associated issues of human right.

After the IPCC's (1990) First Assessment Report, many predictions regarding the future number of environmental refugees came into the picture. Norman Myers (1993) predicted up to 150 million environmental refugees by the end of the 21st Century. Later, Myers (2002), UNHCR (2002), Stern (2006), UNFCCC (2007) and many other researchers predicted different numbers of environmental refugees (see Table 2.3). Table 2.3 reflects that there is a huge inconsistency in the projected number of future climate-induced migrants. However Saunders (2000) criticized Myers for using the term *environmental refugee*. According to Saunders, media and international organizations are popularizing the term *environmental refugee* which is likely to become an integral component of the environmental orthodoxy. This particular thesis, therefore, never term the migrants in Dhaka City as refugees.

However, the definition of climate-induced migrants still varies widely in the literature. The International Organization of Migration (IOM) defined environmental migrants in 2007 and the Foresight Report of 2011 declared that in the future more environmental migrants will be heading towards riskier places in the city. ADB (2012) is also an important document in terms of encouraging the future researchers because it stated that the uncertainties regarding the number of potential migrants should not be an excuse for inaction. Therefore, it can be hoped that far more research will be undertaken in the future to help the climate-induced migrants worldwide so that they can be recognized and be given assistance as they deserve.

Table 2.3: Some estimates of climate-induced migration in the future

People displaced by climate change by 2050: 150 million (IPCC, 1990).
People at risk of displacement due to desertification: 135 Million (Almeria Statement, 1994)
Number of total flood, famine and other natural disaster-induced people: 24 million (UNHCR, 2002)
Number of people at risk of sea-level rise by 2050: 162 million (Myers, 2002)
Number of people at risk of drought and other climatic events by 2050: 50 million (Myers, 2002)
Number of people displaced by environmental reasons by 2010: 50 million (UNFCCC, 2007)
Number of permanent climate refugees by 2015: 200 millions (Stern, 2006)

Source: Compiled from Adamo, 2008

2.6 IDENTIFYING 'CLIMATE' RELATED DRIVERS OF MIGRATION

Identifying a single driver of migration is not simple (Khuda and Alam, 2011; Christian Aid, 2007; Wood, 2001). Migration generally occurs as a result of multiple interrelated factors and tracing the most significant one among these factors is a difficult task. Worldwide, poverty-induced migration is very common, being motivated mainly by economic considerations. Therefore, there is a general consensus that every decision of migration relates somehow to economic factors (Bachofen *et al*., 2010; Hugo, 1996; Kolmannskog, 2008). In recent decades, research proved that poverty associated with environmental problems accelerated the process of migration (Hugo, 1996). However, many evidence-based research now also reveal that *"although economic and political factors are the dominant drivers of displacement and migration today, climate change is already having a detectable effect"* (Warner *et al.*, 2009: IV).

If any climatic event affects people's livelihood and if that livelihood loss is responsible for their migration, then that specific climatic event is generally seen as a climatic driver; but in most of the cases the scenarios are not so straight forward. For example, a recent study conducted in Bangladesh by Etzold *et al*. (2014) concluded that instead of climate change, social inequality and food insecurity as well as structural economic differences are the strongest drivers of migration inside Bangladesh. This research identified *Monga*[4] (seasonal hunger) as a major driver of migration from northern parts of the country. Research also supported that neither rainfall variability nor a single hazard can alone influence people's decision to migrate, but their immediate and mid-term effects such as crop loss, unemployment and rise of food price have significant influence on people's migration decision (Black *et al*., 2013; Gray & Mueller, 2012; Martin *et al.*, 2013). Therefore Etzold *et al*. (2014: 19) quoted, "*In Bangladesh, climate change cannot be considered as the major cause of migration, (though) climatic risk and environmental change have certainly altered the ways in which and the places where exposed people are pursuing their livelihoods*". Therefore, instead of a straightforward and direct relationship, climate change and migration is indirectly related and migration is always a multi-causal social process.

Food insecurity is an important driver of migration which is highly linked to climatic systems. For example, climatic events such as floods and cyclones are often proved to be destructive towards rural livelihoods (e. g. crop, shelter and other assets) (Warner and Afifi, 2014; Warner *et al*., 2009). Such impoverished conditions lead toward food insecurity (IPCC, 2012) which often forces people to migrate and leave their ancestral homes in Bangladesh (Climate Change Cell[5], 2009).

During post-disaster period temporary migration is very common in Bangladesh. When land is destroyed completely (i.e. due to riverbank erosion), given the absence of alternative livelihood, permanent displacement often becomes the ultimate choice (Penning-Rowsell *et al*., 2013; IOM, 2010; Poncelet *et al*., 2010). Bangladesh has a long history of migration for centuries mainly for good harvest and secured

[4] A famine like situation where the poor suffer acute deprivation caused by their lack of purchasing power arising from seasonal scarcity of gainful employment (RDRS, 2006).

[5] This particular reference indicates a scientific research conducted by two research organizations of the country and funded by GoB.

livelihoods. During 1960s, population started to increase and food demand also increased dramatically. With industrialization, communication became easier during 1970s and there was a rapid increase in the urbanization rate in Dhaka due to higher rate of rural-urban migration. However, climatic disasters have now become a significant reason for rural-urban migration in Bangladesh since Cyclone *Sidr* and Cyclone *Aila* (Kartiki, 2011; Mallick and Vogt, 2012). According to Rabbani *et al*. (2013), outbreak of diseases was severe after these two specific cyclones due to poor provision of sanitation and drinking water. Other researchers also revealed that the local health service providers had poor knowledge of health protection in the rural areas of coastal Bangladesh in post-*Sidr* period (Kabir *et al*., 2014). Therefore, the context of post-disaster period often becomes critical due to poor governance by local authorities and becomes a major reason for migration (post-disaster rural governance has been discussed in detail in Section 5.7 of Chapter Five).

Finally, drivers of migration are complex. IASC (2008) identified four climate-related drivers of migration and displacement: sudden-onset extreme disaster (e.g. floods and storms), slow-onset extreme disaster (e.g. drought or environmental degradation), permanent loss of land due to sea-level rise, and armed conflict over shrinking natural resources. The present research will deal with the migrants displaced mainly due to sudden-onset disasters such as floods and cyclones and due to permanent loss of land such as riverbank erosion.

2.7 VULNERABILITY

Vulnerability is the degree to which someone is susceptible to harm on being exposed to hostile factors: *"The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity"* (IPCC, 2001: 995).

Also vulnerability indicates a state which arises from complex interaction between three elements: exposure, sensitivity and resilience (Adger, 2006; Marshall *et al*., 2009; USAID, 2009; Turner *et al*., 2003). Vulnerability is a term used to describe exposure to shocks and hazards. People are more vulnerable if they are more likely to

be badly affected by those hazards. Vulnerability is also a situation when people lack the 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 people's lives, livelihoods and other assets are put at risk.

In a social context, the following terms are defined as follows:

 Exposure: The extent to which a population or community comes into contact with climatic events/impacts. For example, houses near the high-water mark may have high exposure to rising sea levels.

 Sensitivity: The degree to which a population or community is affected by climate change. Sensitivity is always determined by the relationship of the community with the resources used by that community which can be impacted by climate change and the degree of the dependency on those resources plays a major role. If the exposed reefs are the main income sources of the community, then the community is highly sensitive to the impacts of mass coral bleaching resulted from a rising sea surface temperature (Wongbusarakum and Loper, 2011).

 Adaptive Capacity: This is the ability to adjust to the impacts of climate change. The adaptive capacity depends upon many complex factors. For instance, a household with multiple sources of income is more likely to have better adaptive capacity because they can face the food shortage and other emergency situations better than others who have to rely on one income source, e.g. agriculture in rural Bangladesh, which depends on the climate.

 Hazards:

Hazard is an event or process that affects people, e.g. causing injury or loss of life, economic damage, disruption to people's lives or environmental degradation (UNISDR-RAED, 2011). This particular research deals with both environmental and social hazards. As a term environment is a very broad concept and the scope of the research is confined to the hydro-geophysical hazards of the environment which is the combination of both hydro-meteorological and geophysical hazards.

In case of hydro-meteorological hazards, the main causal agent is climatic and meteorological; for example: cyclones, droughts, floods, storm surges, thunder/hail storms, deforestation, wild land fires, temperature extremes, sand or dust storms and snow.

Geophysical hazards are those where the principal causal agent is geological and/or geomorphological (e.g. landslides, tsunamis, volcanoes and earthquakes). They do not include biological hazards.

In this research, social hazards refer to different social problems that restrict them to overcome their poverty condition and prevents them to regain their diminishing confidence level in the city. Some examples of such hazards include the threat of slum eviction, inflation, lack of privacy and security and deteriorated law and order situation.

2.7.1 Social Vulnerability

Social vulnerability is an important concept, highlighting how and why people's differential access to and control over resources are related with their ability to survive and recover from disasters (Enarson, 2002). Some groups are more prone to damage, loss and suffering to the impacts of hazards. This variation depends on several factors such as gender, health status, occupation, class, age, immigration status and extent of social networks. Power relations, social exploitation, discrimination and entitlements can play a major role in determining the degree of vulnerability (Cannon *et al*., 2003). Two types of vulnerability have been discussed widely throughout the literature. One is socio-economic vulnerability, for which indicators might be food security, housing conditions, social networks, education, displacement, agricultural production and employment security. Another type is the environmental vulnerability of a group of the population, where indicators might be the state of sanitation, water and health.

Also, vulnerability may vary according to local characteristics such as rural or urban context. Research shows that cities are especially vulnerable to climate-induced extreme weather events because of huge infrastructural investment and large

population density (UN-HABITAT, 2004). Extreme weather events by which cities are most likely to be affected are increased rainfall, flooding, cyclonic storms, increased temperature and sea-level rise. Cities in the low elevation zone are more vulnerable to climatic impacts than in any other places (Huq *et al.*, 2007; McGranahan *et al.*, 2007). There are also special social groups, who have significantly higher vulnerability than others, such as the poor with limited affordability. Due to their limited financial capacity, they generally occupy the most vulnerable lowlands of the coastal cities without proper utility services and become highly vulnerable to the adverse impacts of climate change (Christian Aid, 2007). Climate-induced migrants (target group of my research) are proper examples of such a vulnerable group, as they have limited access to resources.

Many researchers focused on 'special(ly) vulnerable groups' to climatic impacts in the past (Climate Change Cell, 2009) but very little research so far has been done to analyse climate-induced migrants' special vulnerability to climate change in the destination areas. For example, Climate Change Cell (2009) describes special vulnerable groups' condition in context of climate change. The research selected poor farmers, women, children and disabled persons as the special vulnerable groups (ibid). But few researchers have actually pointed out the special vulnerability of climate-induced migrants and most of the related research is focused on how these migrants will create additional pressure in the destination areas (Moriniere *et al*., 2009), but what about the groups' new dimension of vulnerability? No one has actually tried to explore this. Therefore, this dimension of vulnerability is a major research need in the field of urbanization and global environmental change.

However, along with the concepts above, the notion of the present research is highly relevant to the sustainable livelihoods framework developed by DFID (1999) and a model (the pressure and release model) developed by Wisner *et al*. (2004). The following are the descriptions of these:

2.7.2 Sustainable Livelihoods Framework

In 1992, Chambers and Conway defined a livelihood as a means of living which includes people's capacities, income, assets and activities required to achieve the basic needs (see Section 5.2 of Chapter Five). A livelihood is called sustainable when it allows people to cope with the shocks and stresses such as natural disasters and to

improve their wellbeing and that of future generations without undermining the natural resource base. This section explains the sustainable livelihood framework (Figure 2.1) which is an analytical tool for understanding livelihoods systems and their relationships with institutions and policies.

The diagram below has been adapted from DFID (1999). To understand it fully, one should understand its five major parts, namely- vulnerability context, livelihood assets, structures and processes, livelihood strategies and livelihood outcomes. In this research, both rural and urban livelihoods have been discussed (see Chapter Five) and therefore this framework has been explained which is applicable both for rural and urban context of livelihoods (with few exceptions; for example, the sustainable use of natural resource base, stated in the last box, is more applicable to rural contexts).

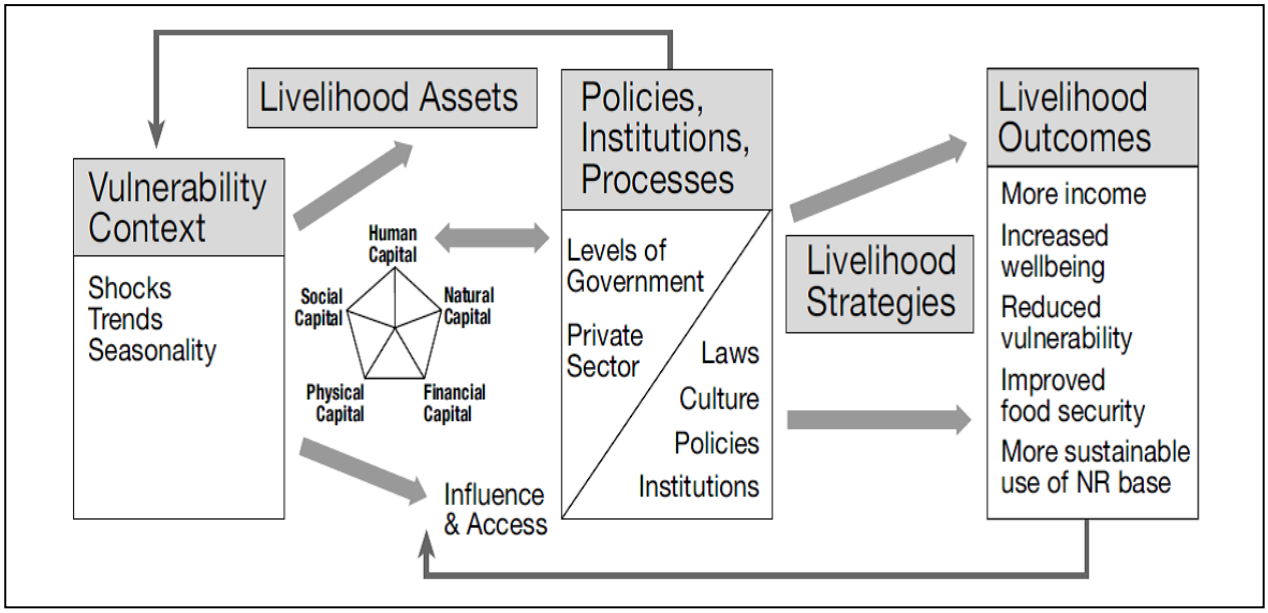


Figure 2.1: Sustainable livelihoods framework. Source: Modified from DFID, 1999.

However, this widely discussed framework among the geographical research arena is often cited while discussing livelihoods in both rural and urban context. The following is the description of the components of this framework:

Vulnerability context

The vulnerability context refers to the external environment where people exist. Shocks, trends and seasonality are the components which affect people's livelihoods and assets (with limited or no control). Shocks are related to health, economy and even nature itself. Shocks have the capacity to destroy assets directly. For example, floods, cyclone, storm surges and riverbank erosion can destroy shelter or business and even the land. Here trends might be population trend, resource trend and/or economic trend. The third element of the vulnerability context refers to the seasonality of prices, production, employment opportunities and food availability which are the major causes of hardship for the people in developing countries. Though seasonality has greater association with rural economies, it can be equally related to poor people in urban areas where they might be affected by unstable food prices due to seasonality. The DFID (1999) document also stated that:

"The inherent fragility of poor people's livelihoods makes them unable to cope with stresses, whether predictable or not. It also makes them less able to manipulate or influence their environment to reduce those stresses; as a result they become increasingly vulnerable. And even when trends move in the right direction, the poorest are often unable to benefit because they lack assets and strong institutions working in their favour" (DFID, 1999: 15).

The above statement reflects that the poorest segment of the society has limited capacity to cope with shocks and stresses and becomes more vulnerable after environmental disasters due to lack of assets and access to appropriate institutions.

Livelihood Asset:

The second part of the framework is an asset pentagon the shape of which can be used to show schematically the variation in people's access to assets. It is based on the theme that centre point of the pentagon (where the lines meet) represents zero access to assets while the outer perimeter shows maximum access. Based on this concept, different shaped pentagons can be drawn for different social groups or communities. The types of assets are generally financial, physical, social, human and natural (see Section 5.3 of Chapter Five for more details). Vulnerability is

determined by the risk that the households or communities are exposed to and their capacity to utilize assets to cope with those risks.

Transforming Structure and Processes

Institution, organization, policies, legislation, culture and power relation- all are parts of the transforming structure and processes of the livelihoods framework. These elements are also interrelated with the other components of the framework. For example, policies affect trends both directly and indirectly. Fiscal policies might have impacts on economic trend while health policies are likely to affect population trend. Organizations and institutions decide and implement policies which ultimately affect livelihoods. Culture and power relation are also two major elements of this stage where societal norms and beliefs are parts of culture; and age, gender, class and caste are the indicators of power relations. For example, gender roles and responsibilities are often determined by culturally based expectations. Women and men have different levels of both access to and control over those resources (see Section 2.8, Chapter Two).

Livelihood Strategies

The concept of livelihood strategies is not a question of people moving from one form of employment to another. Rather, it is a continuous process where people combine activities to meet their various needs. This livelihood framework reflects that the people, who have more choices and flexibility in their livelihood strategies, have greater ability to withstand the shocks and stresses of the vulnerability context. For example, people with more assets can decide to start a new occupation and are likely to have the adaptive capacity to withstand shocks.

Livelihood Outcomes

Livelihood Outcomes are the achievements or outputs of *livelihood strategies*. More income, increased well being, reduced vulnerability, improved food security and more sustainable use of natural resource base are some example of the livelihood outcomes of the framework (DFID, 1999).

2.7.3 The Pressure and Release (PAR) Model:

The Pressure and Release model (PAR model) is a simple tool which explains how disasters occur when natural hazards affect a vulnerable population. The main theme of PAR is that a disaster is the intersection of two opposing forces: those processes generating vulnerability on one side, and the natural hazard event on the other.

The model (Figure 2.2) resembles a nutcracker, with intensifying pressure on the population arising from either side – from their vulnerability and from the impact (and severity) of the hazard for the population. The 'release' idea is added to conceptualise the reduction of disaster: to relieve the pressure, vulnerability has to be reduced. Adaptation is the most appropriate way for the poor and marginalized people to reduce such vulnerability.

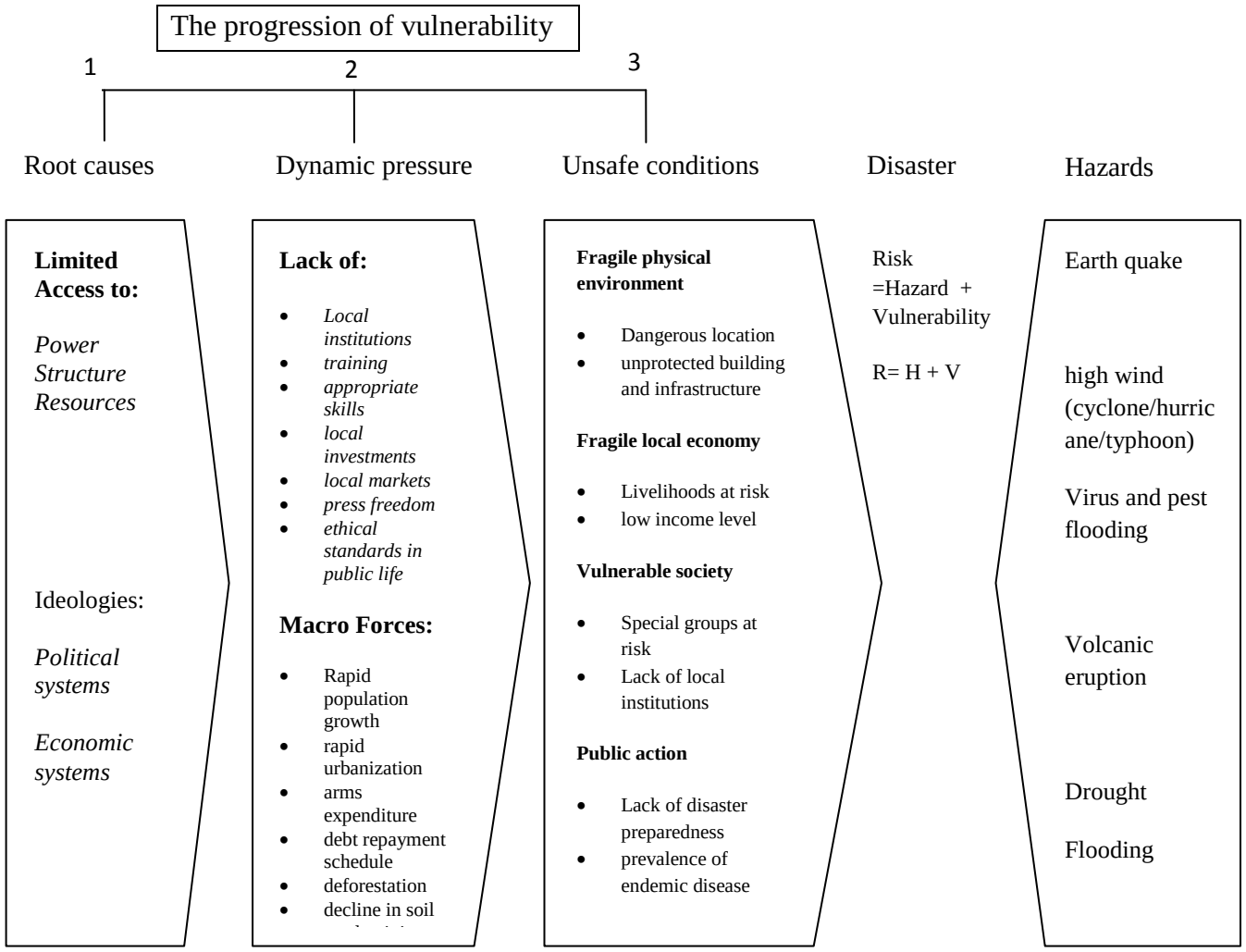


Figure 2.2: The pressure and release model. Source: Wisner *et al*. (2004)

Adaptation comprises significant changes in natural or human systems to cope with the impacts of climate change by reducing their negative impact or exploiting new opportunities (IPCC, 2007). It is said that most of the measures for adapting to climate variability will automatically contribute to climate change adaptation (Adger, 2006). For example, measures to improve drainage congestion during the monsoon season might be a good adaptation to floods in the long run. Research shows that the degree of vulnerability to climate change is different in case of different countries, religions, social and occupational groups (Bohle *et al.,* 1994). According to IPCC (2001), "even within regions… impacts, adaptive capacity and vulnerability will vary" (IPCC 2001: 15). This is due to the fact that not all countries and/or groups are situated in the same geographical context and with the same resource base to combat the impacts of climate change. This reflects that poor developing countries situated in the coastal zone will be the most affected by the adverse impacts of climate change.

2.8 CLIMATE CHANGE-GENDER-MIGRATION NEXUS

"Any dramatic and unplanned change to the environment will present practical challenges to how people make their livelihoods, and this in turn will challenge or reaffirm women's and men's roles, and power, in their families, communities, and wider society"

(Sweetman, 2009 cited in Hunter and David, 2011: 310).

'Gender and climate change' and 'gender and migration' separately are widely discussed topics in the literature. Recently the nexus among these elements has come into focus and is known as 'climate change-gender-migration' nexus (Hunter and David, 2009; Chindarkar, 2012). All three aspects are closely related and appeal for more research in this field. How climate-induced migration affects males and females differently is still a rarely discussed topic (Hunter and David, 2009). Previous research showed that the main issues faced by women in case of climate-induced migration are mainly security and emergency relief (Gururaja, 2000; Enarson, 2006; Mitchell *et al*., 2007; Brown, 2008; Brody *et al*., 2008). But most of this research focusing on women's vulnerability in the context of climate-induced migration is based on those women who are left out at their places of origin or at the

climatic affected area (Buechler, 2009; UNFPA, 2009). But very little research describes female migrants' post-migration scenario and their hydro-geophysical and socio-economic conditions in the destination.

Previously research focused on women's special vulnerability during disasters (Fothergill, 1996) and also during their stay in cyclone shelters (Enarson, 1999). Research also showed that unequal access to resources and gender relations might make women more vulnerable to the impacts of climate change than their male counterparts (Masika, 2002). Women's gender roles and care giving responsibilities make them more vulnerable in the context of climate change. For example, climate-induced scarcity of water might increase the burden on women; and also during a disastrous situation, women have to play the role of principal carer for the children and the elderly and thereby become more vulnerable to the impact of that disaster.

It is believed that the impacts of climate change on human migration are likely to disproportionately impact on the poor and the marginalized, specially the women who are dependent on resources for livelihoods (CIDA, 2002; Fothergill and Peek, 2004; Enarson, 2001; Mitchell *et al.*, 2007). Research based on the Chitwan Valley of Nepal tried to form the climate-gender-migration nexus where the objective was to study the effects of environmental degradation on out-migration and the effects were later disaggregated by gender (Mitchell *et al.*, 2007). It was found that for the women in the Chitwan Valley, an increase in the collection time for the fodder and fire wood and decrease in agricultural productivity increase the probability of out-migration. It reflected the fact that climate-induced migration for women is linked with deterioration of natural resources as women are mainly the primary collectors and users (Chindarkar, 2012).

Uneven access to relief was mentioned as a cause of women's vulnerability after a disaster. Spring (2008) showed that women are often not allowed to take relief as they are not the head of the household. Such exclusion makes them more vulnerable in a post-disaster period.

Also, there is a gender dimension to the food security issue (Emerole *et al.*, 2014). Climate-induced loss of food production is likely to affect women's nutritional levels due to their marginalization within households (Chindarkar, 2012). Climate change is

also likely to affect the availability of natural resources such as water. Research claimed that scarcity of water might increase the burden on women (Climate Change Cell, 2009).

Adaptive capacity is also gendered (Chindarkar, 2012). As adaptive capacity greatly depends on financial conditions, education, health and institutional affiliation, women are likely to have less adaptive capacity due to having poorer financial, health, institutional and educational status than men (Demetriades and Esplen, 2010). Lambrou and Piana (2006) stated that women's adaptive capacity to climate change depends on their control over money and land, access to credit and safeguard, personal mobility, good health and household entitlements. Mitchell *et al.* (2007) supported this finding with ethnographic evidence on the poor South Asian women. Many such studies have focused on how women are adapting in climatically vulnerable regions but there is still a research gap on the issue of how women are adapting to the adverse hydro-geophysical and social impacts in the new environment of their destination.

Therefore, research on the vulnerability of climate-induced female migrants in their destinations is very limited. Among them, Kakissis (2010) found that poor female migrants in Dhaka City are often forced into long working hours and low-paying jobs such as domestic servants due to their lack of skills and education. UNFPA (2009) also found women fishers from the Philippines who had to migrate locally due to adverse climatic impact on their livelihoods and eventually became domestic helpers in affluent people's houses. These findings reflect the facts that climate-induced migration is increasing poverty among women.

2.9 OLD AGED CLIMATE-INDUCED MIGRANTS: A SPECIAL VULNERABLE GROUP IN THE CITY

Old aged populations are frequently neglected in the development discourse and they are also excluded from climate change debates (Beales, 2009). There is very little literature on the special vulnerability of aged populations due to climate change impacts. This group has special health requirements (which are likely to be exacerbated by harsher climatic conditions), different nutritional needs and also

seeks special psychological support from family members, which is often not possible during the process of climate-induced migration and also during the post-migration struggle. Their special needs are almost always ignored both by family members and national policy makers. Beales (2009) urged that UN member states should include older people in the definition of 'vulnerable groups' in important documents like the Kyoto Protocol and the guidelines of adaptation funds.

Adaptation strategies are often designed as gender friendly but consideration of older people is ignored in this regard. Decreased mobility resulting from age, and restricted access to resources all limit their adaptive capacity. Also older age groups are vulnerable to the impacts of extreme temperature and they possess higher mortality rates in extreme weather events than the younger adults (Filiberto *et al*., 2010).

Social isolation and a history of chronic illness also have a positive relationship with the vulnerability of older people to impacts of climate change. Research showed that the oldest old (85 years and above) are more likely to suffer from the negative impacts of climate change (Haq *et al.,* 2008). Research also showed that older people are more likely to be exposed to natural hazards (Zimmerman *et al*., 2007). For example, during Hurricane Andrew in the USA, many older people died due to indirect causes such as heart attack during evacuation (Combs *et al*., 1996; Rosenzweig *et al.*, 2011).

Older people can be a great resource for the society as care takers of children and also as experienced leaders (Day *et al*., 2007). Their needs should be prioritized in adaptation policies and their special vulnerability aspect should be included in climate change debates.

2.10 RESEARCH RELATED TO VULNERABILITY OF MIGRANTS IN THE DESTINATION AREAS

Most environmental migration occurs within migrants' home countries and only a smaller proportion generally migrates to neighbouring countries (Morton *et al.,* 2008). In these cases, the most attractive destinations are mainly the big cities because of greater income-earning opportunities (Warner *et al.,* 2009; O'Brien *et al.,* 2008; LaFleur *et al.,* 2008). However, people do not generally migrate directly

towards cities, rather it is, in most cases, a stepwise process which generally leads finally towards big cities (Moench and Gyawali, 2008).

As already discussed in Section 2.7.1 of this chapter, impacts of climate change may vary based on location, for example by region, coastal versus inland location and even urban versus rural area (Simon, 2010; McGranahan *et al.*, 2007). In much research, cities have been identified as riskier places than rural areas in the context of global environmental change (Simon, 2010; UN-HABITAT, 2004) due to their high population densities and concentrations of large infrastructure. Sea level rise has been identified as one of the important elements of climate change scenario (Simon, 2012). Many coastal cities are likely to be adversely affected by sea-level rise and associated increase in extreme events such as catastrophic floods and/or storm surges (Simon and Fragkias, 2008). Climate change is also likely to degrade service provision as well as the living conditions of the low income people (slum inhabitants) of big cities which will be the most probable destination of climate-induced migrants (Adamo, 2008). Adamo (2010) argues that cities are exposed to climate change events which can, in future, trigger migration towards other areas. The paper also describes the impact of Hurricane Katrina on New Orleans in 2005. It found that the Hurricane impacted the black and low-income populations disproportionately, as they were concentrated in the vulnerable lower-lying zone of that area (Finch *et al.*, 2010; Fussell *et al.*, 2010; Rosenzweig *et al.*, 2011).

Impacts of climate change on cities have been discussed in many literatures (Simon, 2007), among which the most significant impacts are increased poverty and worsening food security (Davis *et al*., 2009). IPCC (2007) has also projected urban vulnerabilities in areas of hydro-geophysical hazard, housing, energy, health, functional transportation, environmental services and economic productivity. Some researchers also argued that climate-induced migration might be a good adaptation strategy (Morton *et al.*, 2008), while others said that the main impacts of mass migration are overwhelmingly negative (Simon, 2010). Increased migration may itself contribute to further degradation of the destination area in the form of rapid and unplanned urbanization and haphazard slum growth, food insecurity and other increased humanitarian crisis (WWF, 2009). The current research, therefore, attempts to deal with this new dimension of problems in the destination area of migrants.

2.10.1 Climate Vulnerable Cities

Large cities should get special attention while discussing vulnerability to climate change because of their high population density, concentration of large number of infrastructure, settlements and services (Rosenzweig *et al.*, 2011). Therefore damage due to flood or storm surges becomes more devastating, also involving huge financial losses. Also the combined effects of air and water pollution and heat stress have a detrimental impact on people's health in the city. In a changing climate, more dry conditions may reduce water availability both for drinking and sanitation which can trigger diseases like cholera and diarrhoea (Alexander *et al*., 2013). Researchers also claimed that due to warm average temperatures, tropical diseases like malaria and dengue will be increasing in the future (Hales *et al*., 2003). The worst effect will be on the urban poor who have less adaptive capacity to climate change impacts and are more likely to suffer from severe health conditions.

Many researchers claim that cities that face the highest risks from the negative effects of climate change are generally those which make negligible contributions to greenhouse gas emissions (Huq *et al.*, 2007). Research has been attempted in order to rank the vulnerable cities to climate change (Maplecroft, 2012; WWF, 2009). In many cases, Dhaka has been identified as the most vulnerable city to the impacts of climate change (WWF, 2009). A significant portion of Bangladesh's greenhouse emissions are generated from Dhaka, though the volume is negligible if compared with global emissions. Research predicted that the greenhouse gas emissions of Dhaka city will increase in the future with the rapidly rising consumption of electricity and motor vehicle use (Alam and Rabbani, 2007).

Excessive rainfall may create severe flooding in cities. Therefore in cities there is an obvious need for better drainage. In this case, poor governance often plays role in aggravating the condition and Dhaka is an example of this situation. In Dhaka, encroachment into the natural drainage system is a real problem and now climate - induced excessive rainfall is exacerbating the situation and causing frequent flooding (Adri, 2006). Dhaka is now prone to damaging and costly flooding both from the rivers around it and from rainfall runoff which is beyond the capacity of local drainage network. However, inclusion of new migrants each year is making the city

more vulnerable to flooding. However, Dhaka City is the study area of the current research.

2.10.2 Climate Resilient Cities

"A resilient city must have strong infrastructure, policy, and human resource response capacities to avert potential impacts of natural hazards"

(Prasad *et al.*, 2009: 33).

At the household scale, resilience depends on the overall financial and health status, scope for diversifying livelihoods, access to savings and credit and social network. Resilience is almost the opposite of vulnerability, where the absence of the above elements creates vulnerability of a household. Therefore, resilience is also an important element for measuring vulnerability of a system or population. Resilience indicates the capacity of a system to maintain its core function, even in case of different hazards and disruptive threats (Satterthwaite *et al*., 2009). Resilience to climate change and variability highly depends on the overall capacity of the community to face disastrous events like floods and cyclonic storms. The community will be called resilient if it can withstand shocks and even rebuild itself whenever necessary (Prasad *et al.*, 2009). A resilient city is one that can sustain itself from any events that threaten, damage or try to destroy it (Prasad *et al*., 2009; Bahadur and Tanner, 2014).

The quality of urban governance and infrastructural services greatly determines the level of resilience. City development plans should have opportunities for the disadvantaged in the society and should promote appropriate coping strategies. Greater knowledge of risks and resources available to combat those risk factors are needed for better resilience (Prasad *et al.*, 2009). Adequate disaster resistant infrastructure and community-based disaster risk management programmes can also bring desirable resilience in the urban sector (IIED, 2007).

Researchers described four elements of urban resilience, namely redundancy (when several urban systems serve the same types of functions and provide services when another system is disrupted), flexibility, capacity to recognize and capacity to learn (ACCCRN, 2009). In this document, ACCCRN partners use a few core themes as the starting point for building adaptation and learning frameworks. ACCCRN examines

the intersection of climate change, urban systems, and vulnerability to test resilience strategies by considering direct and indirect impacts of climate change. However, such a big study excluded the most vulnerable city to climate change, namely Dhaka. Kernaghan and da Silva (2014) investigated the extent to which climate-related investment from donor agencies can trigger sustained action that finally results in the integration of urban climate change resilience in future policies and plans. Based on the experiences of 10 Asian ACCCRN participant cities, this study proposed key actions to bring in resilience.

With changing global average temperatures, urban populations are increasingly exposed to resilience risk which includes inadequate food supply, flooding risks, extreme weather events and epidemiological risk (Van Zoest and Hopman, 2014). Urgent actions are required to face this situation. In order to bring in resilience at the city scale, Baker (2012) suggested actions for mainstreaming pro-poor risk reduction policies in urban planning and management such as a slum upgrading programme, an early warning system, safety net programmes and adaptation planning (Baker, 2012). Dar es Salaam, Jakarta, Mexico City and São Paulo were four case studies of this World Bank publication which provided examples of good practice at the local level to address resilience risk (ibid). Resilience, therefore, is a widely discussed topic in the field of cities and climate change.

2.10.3 Urban Slums: Destinations of Climate-induced Migrants

The UN-HABITAT definition of slum household is useful to identify slum dwellers in household level surveys and censuses (UN-HABITAT, 2009a). According to this document, a slum household lacks any one or more of the following:

- **Security of tenure** (existence of necessary documents to secure home tenure and no pressure of eviction)
- **Access to improved water** (sufficient amount of water for everyone in the family at affordable price without any extreme effort)
- **Access to improved sanitation** (public or private toilet shared with a reasonable number of persons);

- **Sufficient living area** (the same room is not shared by more than two people).
- **Durability of housing** (permanent structure in a safe location)

Many researchers urged the use of a broader definition of slums, which is beyond the household level (Jankowska *et al.*, 2011). A census-based study in Bangladesh (CUS, NIPORT and MEASURE Evaluation, 2006) defined slums as settlements with at least ten households or a mass unit of not less than 25 members with obviously very poor housing with poor environmental services (water and sanitation), high population density (and room crowding), very low socio-economic status and low security of tenure. On the other hand, squatter settlements are generally unauthorized, spontaneously erected structures on public land. They are almost similar as slums but are often temporary and always informal (Suditu and Vâlceanu, 2013).

Research shows that urban poverty will increase if climate-induced migrants keep moving to cities, while city slums will be their principal target for living (Adamo, 2008). The large numbers of urban poor then create serious pressure on limited natural resources like land and water. Also, it is seen that the poor migrants are generally compelled to live in environmentally hazardous areas such as low lying, flood-prone areas and canals. Climate-induced migrants, who are already a vulnerable group due to their already destroyed asset base, mostly occupy the low-lying flood prone slums.

2.10.4 Conflict Potential by Climate-induced Migrants

Previous research showed that the more sudden and forced the displacements, the more likely they are to trigger a deterioration in the quality of living standards of the migrants, and mostly leading to further impoverishment (Vine, 2005). Present research also deals mainly with the migrants induced by sudden-onset disasters who had to migrate to Dhaka without any proper planning and resources. Simon and Leck (2010) have stated that large-scale environmental migration to cities is likely to create threats to political stability and human security in many contexts. Other researchers also raised the issue of human security in the phase of environmental migration (Bogardi, 2004; Renaud *et al.*, 2007).

With the current trends of more pronounced climatic disasters, migration is expected to increase in the future and both climatic and non-climatic factors will create pressure on the city governance capacity and stability. Increased rates of migration will also put pressure on the natural resource base of the destination areas and then it will be more difficult for the city government authority to respond to the needs of huge numbers of urban poor (Adamo, 2008). Though this situation has a conflict potential in the city slums, according to researchers, they are not usually the violent ones (Castles, 2002; Stern, 2006; Gleditsch *et al.,* 2007).

Along with conflict over scarce resources, according to many researchers, increased migration rates can also fuel social tensions in the receiving areas (Gleditsch *et al.,* 2007). Adamo (2008) stated that the fear of violent conflict is less in case of climate induced migration than the 'classic refugees'. Gleditsch *et al.* (2007) also said that if the migrants are induced by armed conflict rather than purely economic or environmental reason, the risk of importing organized conflict will be higher. Migrants induced by sudden-onset disasters are not likely to contribute to organized violence, although there is a chance to arise sporadic violence (Adamo, 2008). Therefore, as the research will deal with climate-induced migrants, it is unlikely to find any organized issue of violence/conflict in the city. But conflicts over common resources like basic amenities and utility services are some expected area of findings.

2.11 MAKING THE LINKS BETWEEN COPING CAPACITY AND ADAPTIVE CAPACITY

"While the emphasis in adaptive capacity is on actively mitigating adverse consequences of climate change, the emphasis in coping capacity is on living with the consequences"

(Munasinghe and Swart, 2005: 176).

Adaptive strategies actively attempt to reduce the vulnerability of changing climatic conditions usually from a longer term perspective (Munasinghe and Swart, 2005; Marais, 2011). On the other hand coping is generally short term and immediate and attempts to change temporary system disruption (Leck, 2011). Some authors used the term ‘coping ability’ as shorter term ability to just survive, and applied ‘adaptive

capacity' for longer term or more sustainable adjustments (Vogel, 1998). It is assumed that both coping and adaptation overlap significantly and complement each other (Wamsler and Brink, 2014). However, people's adaptive - and coping - capacities are determined by virtually the same attributes or factors.

According to CARE's Climate Vulnerability and Capacity Analysis Handbook, coping is not a continuous process; it is motivated by crisis and often degrades resource bases. On the other hand, the same handbook stated that adaptation is a continuous and planned process with sustained results without degrading resource base (Daze *et al*., 2009). However, these highly overlapping concepts (Pelling, 2011) should be applied appropriately in academic literatures as well as in development efforts.

The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects to moderate harm or exploit beneficial opportunities (McCarthy *et al*., 2001; IPCC, 2012). Adaptation includes a set of activities, decisions and attitudes that covers different aspects of life in tune with the existing social norms and processes (Adger *et al*., 2005). Different urban centres have different adaptive capacity and cities with high adaptive capacities also need some extent of mitigation (Revi *et al*., 2014). According to Haque *et al*. (2014), to achieve meaningful and enduring resilience, adaptations at different scales (national, urban, institutional, communal, household and individual) need to be coordinated.

Local governments, in most of the cases, have budget limitations which make adaptation planning very challenging. Besides financial constraints, rapidly changing climate also puts pressure on the capacity of local government to deal with the adverse impacts of climate change, even in wealthy countries (Wamsler and Brink, 2014). However, local level capacities are very important for successful adaptation which requires the coordination not only among the institutions but also between the institutions and the community at risk who are the most vulnerable. However, research showed that adaptation plans generally exclude this most vulnerable group (Wilson *et al.*, 2014) and this trend is also prominent in case of Bangladesh. Identification and greater participation of the vulnerable and marginal group in decision making is required to achieve resilient solutions. Therefore, new and unique adaptation efforts and reconfigured local governance structure are necessary which

should have participation of the most vulnerable group, accountability and transparency (Friend *et al*., 2014).

2.12 PARTICIPATORY APPROACH STRATEGY: WHY MIGRANTS' OWN PERCEPTIONS ARE NECESSARY

In the beginning of the 20th century, research mainly used to follow top-down approach and it rarely had stakeholder participation. Participatory research later came into practice with bottom-up approach which was popularized by Robert Chambers and Gordon Conway (1992).

'Participation' attempts to bring different stakeholders together for contributing towards solution-oriented decision making through active discussion (Labonte, 1997). The participatory approach is very important in terms of identifying local contexts of vulnerability (Cowden, 2008; FAO, 2008; Ebi and Semenza, 2008; Kelman *et al*., 2012). In case of vulnerability and adaptation-related research, local coping strategies and indigenous knowledge always helped to a great extent to understand the context-specific vulnerability of the community (Ebi and Semenza, 2008; Cowden, 2008).

In the field of research which is based on an under-researched vulnerable group, preferences have mostly been given to participatory methods (Bergold and Thomas, 2012) because it helps to deeply understand the context of vulnerability. In the past, many researchers described community participation and explained participatory rapid appraisal (PRA) and rural rapid appraisal (RRA), both in terms of space and time (RVCC, 2003). They also showed the application of different tools such as social mapping, Venn diagrams, resource mapping, trend analysis and livelihood analysis (Chambers, 2007; Kumar, 2002). All these researches were mainly based on local perceptions of climate change impacts and therefore, participatory approach has been adopted as the methodology of this research.

Participatory research is a distinctive approach where science and practice meet together to develop an understanding for each other (Bergold and Thomas, 2012). The participatory research deals directly with the immediately affected person and therefore can extract first-hand data with more detailed information. There are four

main types of participatory research, namely participant observer, rapid rural appraisal (RRA), participatory rural appraisal (PRA) and participatory action research (PAR). PRA helps shared learning between local people and outsiders, but the term is somewhat misleading. Although PRA techniques were introduced to conduct research in rural contexts, they are equally applicable in urban settings (World Bank, 1996) and are often called Participatory Urban Appraisal (PUA). During PUA the research emphasizes local knowledge and enabled local people to make their own analysis of the problems they face and to identify their own solutions" (Moser and McIlwaine, 2004). Whether to call this a fifth type of participatory research or, probably more appropriately, a variant of PRA, is a moot point.

2.13 CONCLUSION

While there are several scenarios of observed and predicted changes in climate, there are gaps in the knowledge on vulnerability of disadvantaged group like climate-induced migrants in the city who are assumed to be more vulnerable compared to other groups because of their limited access to resources and limited financial ability. The above literature review reveals the current knowledge on climate-induced migration, which is mainly based on definitional controversies and vulnerability of spaces (city/region). Recognizing that the effects of climate change are not yet fully manifested, I have termed them climate-induced migrants who have migrated due to environmental problems of the type climate change is expected to cause. For example, floods, riverbank erosion, waterlogging, drought and salinity intrusion are likely to be exacerbated by the impacts of climate change, and therefore people driven by such events are the target group of this research.

The chapter also clarified the concept of 'climate-induced' events. Climate-induced events actually refer to events that are influenced/induced/caused by climate variability and change, the latter being accelerated in nature and resulted from anthropogenic actions. Therefore, climate-induced migration in this research has been considered to be resulted both from climatic and human-induced actions. This chapter also discussed about environmental discourses in South Asia before the 1990s. Bangladesh, being in South Asian region, occupies an extremely diverse,

variable and dynamic landscape which subject to both great natural dynamism and, especially over the last century, major human influences. Himalayan deforestation and Farakka barrage have been discussed in this chapter and it was found that along with climatic factors, human intervention was greatly responsible for the problems like floods in South Asian region.

The linkage of flood, cyclone and riverbank erosion with climate change has also been explored in this chapter. While there are academic debates on their linkages, Bangladesh has faced three most devastating floods in only 12 years time period (1987-1998)- which demonstrates that what used to be considered a "100-year flood" may already have become more frequent. Also, while evidence supports that tropical cyclones are likely to be more intense under the warmer climate as a result of higher sea surface temperature (SST), there is uncertainty about the changes in frequency and changes in the tracts of the storm. There is also regional diversity of the changes in cyclonic frequency. Riverbank erosion is another variable which has been discussed in order to explore its linkage with climate change. It was found that where some studies demonstrated the influence of climate change towards erosion, others proved human intervention beyond doubt to exacerbate the riverbank erosion process. Hence, there is a complex debate associated with their clear linkages with climate change.

Unfortunately assessing the vulnerability of disadvantaged groups such as climate-induced migrants in destination areas is a major research gap which needs to be filled in immediately. Research interlinking environmental change and migration has been generally more focused on the rural vulnerability issue so far. In today's urbanized world, it is necessary to undertake more research on urbanization and GEC in order to assist the poor climate-induced migrants in the city. Also recognition is an important factor for climate-induced migrants in terms of seeking their rights from the state. Currently many evidence-based studies are going on and still more are needed to be done. Besides collection of evidence, it is necessary to answer the questions such as what additional vulnerability they are facing in already vulnerable cities, what policy may assist these climate-induced migrants and under which context they might be again forced to migrate into a new place? Government, NGOs, academics as well as independent researchers should come forward to deal with these issues through careful research.

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

Methodology is the strategy for and related process of collecting essential data and information and analysis and the technique of the selection of the study area and interpretation of the survey. This chapter will highlight the methodology of this research which is mainly qualitative and which has been conducted from a social science view point.

This chapter will justify the selection of study area, selection of the specific slum, the tasks undertaken before and during fieldwork, procedure for identifying the target group, sampling strategy and data analysis technique in detail so that the research design is understandable to the readers of the thesis. In short, this chapter justifies each stages of the research from conception of research idea up to the writing stage.

3.2 LITERATURE REVIEW AND SECONDARY DATA COLLECTION

This is a very important first step where I tried to complete a comprehensive literature review on related literatures based on the climate and migration nexus as well as urban vulnerability to climate change and associated experiences of migrants. Different tools helped me to develop an understanding of the issue of global environmental change as well as climate-induced migration. Studying literature, MSc Practising Sustainable Development (PSD) modules, departmental seminars and training and lectures by the supervisor and advisor also helped.

The first year of the research was thus typically given towards developing a better understanding of the issues through extensive literature review, formulating research questions and objectives. Once I had defined my project clearly, the next crucial step was to formulate a suitable methodology (how to do) and to choose a specific study area. Again, intensive literature review helped to develop my methodological framework and select the most appropriate tools. In terms of selecting slums in which to undertake primary research, communication over emails and telephone with local researchers in Dhaka City really helped.

3.3 PREPARATION FOR FIELDWORK

I arrived in Bangladesh on the 28th June, 2012. Immediately I communicated with the research organization (Centre for Global Change), where I used to work as a research associate previously, so that I could use their office space. This base gave me a strong platform for conducting my research work. For the current research, the Centre for Global Change (CGC), a leading Bangladeshi non-profit research organization, helped me by giving space and necessary logistics. Training was also organized by CGC to assist my research assistants with the fieldwork (more details in sub-section 3.3.2 below). The following are the important steps taken before starting formal fieldwork in Dhaka:

3.3.1 Recruitment of Research Assistants

Four research assistants were selected from the existing young Masters students of the Department of Environmental Science, Jahangirnagar University, Dhaka (I undertook my undergraduate degree from this university). As this research has a significant focus on the environmental aspects, students with a background in environmental studies and with some social science experience were preferred for the fieldwork. Interviews were conducted to recruit suitable candidates (Scheyvens and Storey, 2003) and finally four were selected based on selected criteria. To maintain a gender balance in the team, I recruited two women and two men to assist me in the research. This balance helped to conduct interviews with different sex and age groups in a conservative, predominantly muslim community. All the assistants had basic knowledge related to fieldwork activities, with a recent experience of conducting interviews and FGDs.

3.3.2 Training of Research Assistants

However, before starting fieldwork, I organized a training course on 'ethics and techniques of field research' in the second week of August, 2012. There all the members were trained on different tools to be used during the actual fieldwork. I delivered my knowledge there that I had gained so far from my experiences and training from Royal Holloway. Dr. Ahsan Uddin Ahmed, executive Director of CGC, accompanied me as a trainer during the course, as promised. We explained components like the theoretical foundations of participatory research techniques,

logistics needed for participatory research, conceptual framework of climate change and migration and the overall research design. I supervised the whole session in order to make sure that the research assistants understood the objectives of my study and how I needed to find those out. However, short presentations, videos and powerpoints based on the theoretical and methodological frameworks, role play, using participatory research methods, group discussions and plenary presentations, simulations, individual and group analysis were some important parts of the training session. In this way, the training also contributed to local capacity building of the local young researchers (Scheyvens and Storey, 2003).

3.3.3 Selection of Study Area

As the research objective was to understand the overall experience of climate-induced migrants before and after migration, it was necessary to explore the possible destinations of the migrants. Previous research showed that there are various types of migration patterns from climate-affected regions. For example, some migrate alone, some with the family. Also some move to nearby towns and some to the big cities of the country (Moench and Gyawali, 2008). Also in case of city migrants, some live in the periphery and some in the inner city. So the possible destinations were too many to explore for a single PhD project. Therefore, I had to limit the scope by searching for the target group only in the capital city of the country (both periphery and inner city) where rural-urban migration is very common and literature also supported the existence of significant amount of climate-induced migrants in Dhaka (Anwer, 2012).

As I intended to deal with the new social and environmental hazards of the target group in their new destination, Dhaka City seemed to be a better study site primarily due to its high vulnerability to climate change and huge population density. Subsidence is a major source of flood-related vulnerability in Dhaka City. Researchers studying the impact of climate change on Dhaka predict that the city is likely to be affected in two major ways: flooding and drainage congestion, and heat stress. The elevation of Dhaka City ranges between 2 and 13 metres above mean sea level; hence even a small rise in sea level is likely to overwhelm large parts of the city (UN-HABITAT, 2009b). Moreover, according to the same study, a high urban growth rate and density (2600 persons per square mile) have already made Dhaka

more vulnerable to environmental disasters. As already mentioned in Chapter One, with an urban growth rate of more than 4 per cent annually and with a population of more than 14 million (BBS, 2011), Dhaka is one of the fastest growing cities in South Asia, and is projected to accommodate more than 20 million by 2025 (UN-HABITAT, 2009b). In this context of huge population size of Dhaka City, the negative consequences of climate change are likely to be felt by a large number of people, especially the urban poor who mainly live in flood-prone and waterlogged slums of the city. So exploring slums both in the inner city and in the periphery of Dhaka seemed to be a good way to trace large number of climate affected people who recently migrated due to cyclonic storms and flooding and again became vulnerable to the city based social and environmental hazards.

After securing my necessary supports from CGC, I seriously started the process of selecting suitable study areas in Dhaka. At first I explored the periphery of Dhaka City with the tracer survey questionnaire (to trace their main driver of migration). The attempt was not very successful due to several factors. First, the peripheral areas were not properly defined and comprised a vast area to explore. Second, the inhabitants were found to be reluctant to divulge information and were mostly found to be economically motivated rather than environmentally. Finally, there was a lack of existing database where I could obtain any structured demographic information about the inhabitants of the peripheries of the city.

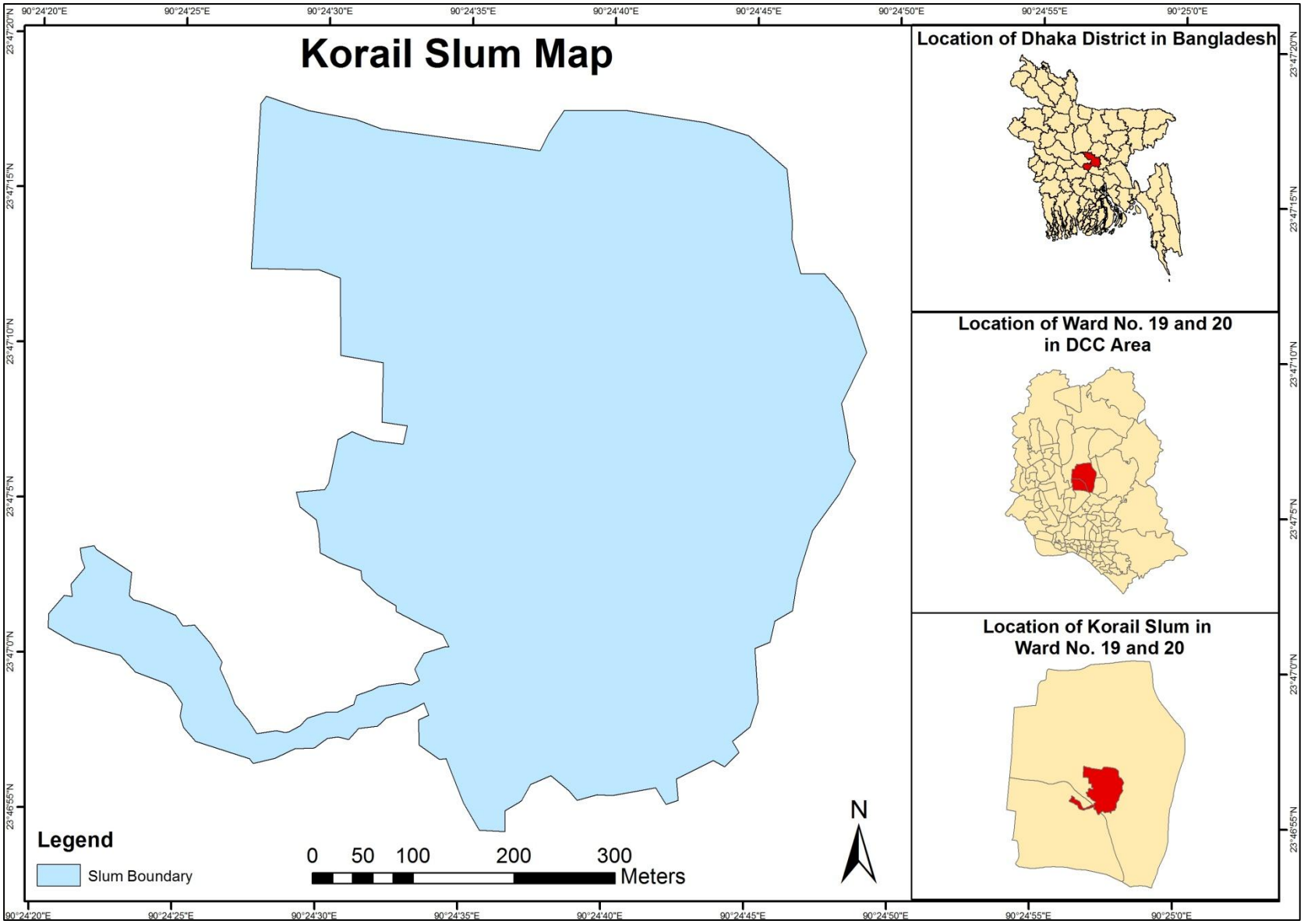
Therefore, I started visiting slums in Dhaka city and personally tried to search for climate-induced migrants, who were the target group of my research. Though slums have existed from the very early period of the history of this country, the growth accelerated after the liberation and independence from Pakistan in 1971 due to mass migration of urban poor. The latest mapping and census of slums in Bangladesh has been conducted by Centre for Urban Studies (CUS) in 2005. This slum census identified 4,966 slum clusters in Dhaka City (65% higher than the number of clusters in 1996). The slum population of Dhaka has been calculated to be 3.4 million which is double than the slum population data of 1996 census (CUS, NIPORT and MEASURE Evaluation, 2005). The population density of slums has been identified as 200 times greater than the national population density. Therefore, exploring these huge slum populations and tracing my target group from among them was the biggest challenge at that stage.

I realized that it is very difficult to find these migrants haphazardly in different slums across the city. Rather, it will be better to find a suitable part of the city where there is a greater possibility of identifying such migrants. Therefore, I started to review papers and also started to visit organizations (e. g. Centre for Urban Studies, Bangladesh Bureau of Statistics) to obtain experts' opinions and also to have some database. I found out that Korail (Photo 3.1) is the biggest and densest slum, situated on 90 acres of land area and with more than 120,000 inhabitants. CUS also helped me with a detailed database such as maps and other relevant reports on Korail.

Photo 3.1: Study area of the research: Korail slum. Source: Field Survey

After interviewing some officials who work on the slum issues of Dhaka, we were reassured that Korail might be a place where it is likely to find climate-induced migrants. CUS gave us a contact number of a family who has been already broadcasted on television as victims of Cyclone *Sidr*. This helped us greatly and finally we undertook a reconnaissance survey in Korail. Through a snowballing[6] process, we were lucky enough to find many recent climate-induced migrants, especially those who had been affected by Cyclone *Sidr*, Cyclone *Aila*, flood and riverbank erosion. This is to mention here that the initial process of selecting the study site itself took a considerable amount of time during the early stages of the fieldwork. Following is the map of Korail slum including its location in Dhaka (Map 3.1).

[6] Snowballing – also known as chain referral sampling – relies on referrals from initial subjects to generate additional subjects (Johnston and Sabin, 2010). This process is appropriate to look for hidden population and when the target group is not easily accessible.



Map 3.1: Study Area: Korail Slum in Dhaka City.

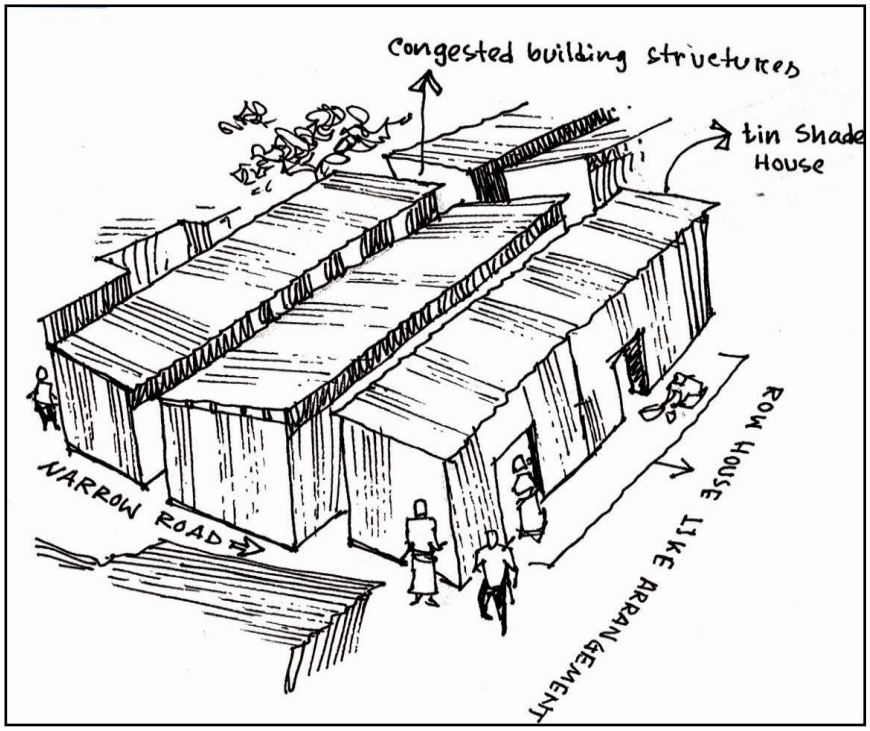
Source: Author

i) Korail Slum: An Overview

Korail is situated in Gulshan Thana of central Dhaka which is very near to 'Mohakhali Bus Terminal' and, therefore, a great concentration of urban poor. As the slum is surrounded by wealthier community of Gulshan, the slum dwellers get the opportunity to work as service providers for that community (e. g. rickshaw puller, driver, household worker, hawker). A brief overview of Korail is given below (Table 3.1).

Table 3.1: Overview of Korail slum

Location	Korail slum is situated in the central part of Dhaka City and falls under the jurisdiction of Gulshan Thana, zone no. 9, ward no.19 and 20 of Dhaka City Corporation. Korail has Banani road no. 5 to its north, Gulshan Lake to the east and BRAC centre to the south.
Total area	Total slum area 110 acres (Including lake area of 20 acres).
Year of establishment	1985
Land ownership	Bangladesh Telephone and Telegraph Board, Ministry of public works, Ministry of Science and Technology are the owners of this land.
History of slum	In 1985 some slum settlements were started by 3rd and 4th class employees of Bangladesh Telegraph and Telephone Department (T&T). In 1988/89 government allowed them to settle on the T&T land and the land of Ministry of public works and science and technology remained vacant. Floating people began to settle in the area and by 1992-95 the whole area was covered with slums.
Population	120,000 (approximately)

Population density	Korail slum is densely populated. The net population density of the slum is more than 1000 per acre (approximately).
Number of households	Total number of household is 24,000 (5 person per family)
Religion	Muslim: 99%; Hindu: 1%
Major occupation of slum dwellers	Male: Rickshaw puller, auto rickshaw driver, garments worker, day labour, wood technician, carpenter, vegetable seller, night guard, small business, others. Female: garments worker, day labour, household workers, house wife.
Common housing structure	House roofs are purely made of tin; walls are made of tins and/or bamboo and floors are both pucca and kutcha[7]. The average size of rooms is about 80 sq feet.  Figure 3.1: Sketch of typical housing structure in Korail slum

[7] *Pucca* refers to the structures that are designed to be solid and permanent. *Kutcha* is opposite of pucca.

NGOs active in the slum	1. DSK is working with health and sanitation. 2. BRAC is working with health and education. 3. MSS is working with health. 4. Intervida is working with health and education. 5. Fulki is working with education. 6. Meristops is working with heath. 7. NDBUS is working for the overall welfare of urban poor.
Education and society	• There are 10 schools (Intervida-2, REAK-1, MSS-3, BRAC-3, Fulki-1), all are primary schools and there is no secondary school in the slum. • There are four *Madrashas*. • 20% children of the slum get access to education (UPPR, 2009). • There are three mosques for Muslims but for the others no religious places exist. • Korail is away from the basic sense of community facilities. No playground-parks-open space for the children to play, they play on the streets. There is no community centre for their family-social programmes.
Water supply	Majority of people have access to water supply but they are not satisfied with the quality. Service charge is 50-500 BDT/ month.
Sanitation	Pucca, kutcha and hanging latrines are all prominent in the slum. DSK provided pucca latrines to a majority of slum dwellers (80% officially) but still many people are using kutcha and hanging latrines.

Drainage	There are some drains but they are very narrow and full of garbage. The NGO DSK made some drains by underground pipes. The drainage system is not working properly here.
Solid waste disposal	Slum dwellers mostly dump their household wastes into the lake surrounding the slum. The NGO DSK provides them some vans for collecting waste and this has a charge in monthly basis.
Gas	There is no gas supply in the slum.
Cooking	The slum dwellers use kerosene, wood, bamboo and straw for cooking.
Electricity	In 2003, Korail slum came under the coverage of electricity connection by Dhaka Electric Supply Company (DESCO) on condition that the consumers must be the civil society organizations working in the slum. Currently the electricity cost ranges from 50-500 BDT per month. Previous research showed that instead of residential rate, the slum dwellers are charged by commercial rate of electricity which is more than double the former.
Health	There are few NGOs providing health facilities or maternal healthcare. There are five delivery centres (BRAC-3, Meristops-1, Intervida-1) and three day care centres (MSS-1, Intervida-2). Intervida also provide health services to their beneficiaries (students and their families).

Source: Modified from CUS, 2009

3.3.4 Securing Space in the Slum for FGDs/Interviews

Selecting the study area was not enough. We needed a platform/space in the slum in which to conduct FGDs and interviews. I joined a team who were in the slum to record a documentary for a private TV channel. I became a part of that team as a volunteer and started to gain a sense of the slum environment, road network and people's behaviour. I also talked to a local leader so that I could use the same space afterwards for my interviews and FGDs. They assured me that they would try to

arrange it for me. I collected some slum dwellers' personal cell phone numbers and afterwards finally we succeeded in gaining access to office space in Korail (According to the BTRC website, cell phones are widely used by both rural and urban inhabitants of the country and Bangladesh now has 100 million mobile phone users). Initially we conducted some FGDs there but unfortunately that was an office of a political party and we didn't feel safe or that it was appropriate. Also we wanted to shift to another part of the slum so that we could cover a wider area. Then we started to find another suitable space in another part of the slum. From the CUS we obtained the phone numbers of a local organization NDBUS (Nagar Daridra Bastee Unnayan Sangstha), which is situated in Korail slum. NDBUS is a local organization working under a national project namely UPPR (Urban Partnerships for Poverty Reduction). While attending a participatory workshop in the BRAC centre on 'community and institutional responses to the challenges facing poor urban people in an era of global warming in Bangladesh' in September, 2012, I met the chief of the UPPR project and fixed an appointment with him in the LGED office (Local Government Engineering Department). He gave us permission to use the space of NDBUS in Korail slum, which works under their supervision. However, this time we secured a safe and suitable location for conducting FGDs/interviews in Korail. We utilized this particular office space till the end of the fieldwork.

3.4 ACTUAL FIELDWORK - STAGES OF PRIMARY DATA COLLECTION

During fieldwork, we maintained a clear schedule with divisions of labour. Among the many fieldwork tools, my research assistants were directly involved only with administering the questionnaire survey. In every other case, they were indirectly involved in the fieldwork by taking notes, maintaining recordings, organizing FGDs and exploring data sources. As there were 120 questionnaires to be filled in, research assistants played a major role in completing this task. After finishing every day's work in the field, we used to have a meeting to check and explain the notes to each other and to identify any mistakes. During analysis also, I was in touch with this group of assistants so that any confusion regarding data could be solved immediately. The fieldwork in Korail started with a tracer survey. What follows is a description of each stage of fieldwork conducted in Korail slum:

3.4.1 Tracer Survey

Recognizing that the effects of climate change are not yet fully manifested, I termed them climate-induced migrants who had migrated due to environmental problems of the type climate change is expected to cause. Identifying them in the city slums was the first necessary step to initiate the research. I, along with my local research assistants, tried to find this special group in Korail by means of different tools such as personal interviews and a socio-economic questionnaire survey (tracer survey) because local authorities and NGOs active in these sites do not hold databases of such migrants.

I started my work with the hypotheses that significant numbers of climate-induced migrants will be identified through this tracer survey as, according to recent literature, Dhaka is a popular destination for the climate victims of the country (UN-HABITAT, 2009b; Anwer, 2012). For this purpose, only those migrants were selected who had come to the study area after 2006 and it made the process of identifying victims easier because this period included two major national climatic disasters, namely Cyclone *Sidr* (2007) and Cyclone *Aila* (2009) and some major floods which caused huge displacements of coastal people to all over the country. Also the newly arrived migrants' experience of migration and displacements was relatively recent and therefore prominent in their lives and memories. Hence, recently arrived migrants were selected so that they would be more likely to recall details of the key events and decisions reliably. However, four research assistants assisted me during this survey in taking notes, recording conversations and taking photographs.

In the beginning, I intended to select some migrants randomly who informed that they came from climatic hot spots of the country and reached Dhaka following a climatic disaster. After personally interviewing those migrants, I included some selected migrants in separate group discussion involving the identified migrants together and assessed any differences in their responses from the earlier personal interviews. It helped me to cross-check data regarding their actual reasons for migration and allowed me to assess my own mistakes in applying the research tools. In some cases, I rejected respondents after the group discussion who were previously identified as climate-induced migrants because of their inconsistency of information.

After completing a few rounds of tracer survey questionnaires and group discussions with the potential target group, it was easier to understand who had actually been environmentally motivated and who had not.

Once a climate-induced migrant had been selected, we followed the snowballing process to identify other climate-induced migrants. Whenever we found climate-induced migrants, we used those contacts to find more similar cases. In this way, in the first few weeks we conducted an intensive search programme by means of the tracer survey questionnaire (see Appendix I). Finally, three major categories were prominent in the slum: migrants induced by floods, cyclone and riverbank erosion.

3.4.2 Questionnaire Survey

A questionnaire *"is a device or tool for collecting information to describe, compare, understand and/or explain knowledge, attitudes, behaviour and/or socio-demographic characteristics of a particular population (target group)"*

(Simon, 2006: 164).

In other words, a questionnaire is generally a set of carefully structured questions which is designed to obtain required information without bias (Thomas, 1999). In this particular research, a questionnaire played a major role to achieve objectives of chapters Four, Five and Six. The questionnaire was designed in a simple manner so that it would be understandable to the respondents. The Bengali translated version was used during the fieldwork. As most of the respondents were illiterate, the questionnaires were mostly filled in by me and my research assistants. Every interview started after explaining the purpose of the research. It is to mention here that, every questionnaire started with a tracer survey in order to identify the appropriate respondents for the study (Appendix I).

A questionnaire might be structured, semi-structured or unstructured. Semi-structured questionnaires are most widely used where both closed and open-ended questions are asked, and their mixed format makes them appropriate in many circumstances (Simon, 2006). I did not want to make the questionnaire purely close-ended as I wanted to know about the respondents' varied perception regarding the

objectives of the research. Therefore, a semi-structured questionnaire was used in this research.

Sampling and Design of Questionnaire

The obvious problem with fixing the sample size was that the total population (total number of climate-induced migrants in Korail slum) was unknown for this study. Also identifying the target group was a really time-consuming job. It should be mentioned here that, during the tracer survey, the rejected migrants were more numerous than the number of finally selected climate-induced migrants. As a result, when I completed surveying 80 climate-induced households, I thought it better to proceed with the next phase of interview with the comparison group (non-climate-induced migrants).

Finally the questionnaire survey targeted 80 climate-induced households and 40 non-climate-induced households (to know the reason of interviewing non-climate-induced migrants, please check the next sub-heading). During the process of identifying non-climate-induced migrants, we also returned to some of those migrants who were previously rejected during the tracer survey for the target group.

However, through the questionnaire survey, I tried to identify respondents' vulnerability and coping strategies to various social and environmental adversities. Two versions of questionnaire were designed: a household questionnaire and an institutional questionnaire. People have their own justification regarding definition of household and identifying household head (Adato *et al.*, 2007). In this research, a household was defined as a unit which cooks together. However, my team and I personally visited every study household and the interviews were not limited only to the household heads; rather we welcomed others who willingly participated through different perceptions and experiences within that household. The household questionnaire survey (Thomas, 1999; De Vaus, 2002; Bryman, 2008 and Simon, 2006) adressed issues like demographic information of respondents, information of environmental condition, livelihoods, housing, utility services, health, food security, mobility, linkage with place of origin, institutional support, coping strategies and assets. All these data have been taken both in terms of before and post-migration scenarios.

The necessity of conducting the institutional questionnaire survey was felt due to some obvious reasons. For example, the climate-induced migrants might be special to me for many reasons but might not be considered as special by the Government. Therefore the institutional version of the questionnaire (see Appendix II) searched for policies regarding protecting the rights of climate-induced migrants. This process gave an idea about how this special migrant group is treated by the government in the city and also gave an idea on existing policies related to climate-induced migration. However, after starting the fieldwork, the questionnaire was modified several times based on local circumstances and experiences. New variables were added accordingly and it was shared with my supervisor from time to time for comment.

Need to Incorporate a Comparison Group

Newly arrived climate-induced migrants are the target group for the present research. The research needs a comparison group (newly arrived non-climate-induced migrants) in order to differentiate the climate-induced migrants' experiences from those of the general urban poor in the city. Without a comparison group, the target group's experiences could have been considered as the general experience of slum dwellers in the city. To clarify any confusion, taking a comparison group was necessary. The same questionnaire which was used on the target group, was used to interview the 40 non-climate-induced households, who had migrated purely due to economic reasons and without any environmental push. In this case also migrants, arriving in the city after 2006, were selected. The same time period in the city for both the target group and comparison group was necessary to compare similar types of city-based experiences of social and environmental hazards.

3.4.2.1 Statistical test used to determine differences between the two groups

In order to assess differences between the groups of migrants, the independent samples t-test and Chi-square ($\chi 2$) test were used. The statistical package, Statistical Package for the Social Sciences (SPSS) for Windows (versions 20.0) (SPSS Inc), was used to calculate descriptive statistics. The independent samples t-test, also called the student's t-test, is an inferential statistical test that determines whether there is a statistically significant difference between the means in two unrelated groups. In this research, the independent samples t-test has been used to determine whether the ‘climate-induced migrants’ have any significantly different dimension of

vulnerability than the 'non-climate-induced migrants'. This test has been conducted in the case of quantitative variables such as differences in income, savings, year of schooling, family size, number of visits to village of origin, number of meals per day and number of food items in one meal. All the variables, which have been used in the tests, have the appropriate attributes[8].

The Chi-square ($\chi 2$) test is generally used to test an unmatched case-control study, or a cross-sectional study. In this research, the Chi-square test has been applied to see whether there is any significant relationship and/or differences between two groups in terms of qualitative variables such as health-related awareness, coping strategies with unemployment, reason of village visit, or aspiration to return to places of origin.

3.4.3 Focus Group Discussions (FGDs)

Focus Group Discussions (FGDs) are a widely used method in social research worldwide. This is an important tool for qualitative research. Focus groups are more appropriate for assessing community dynamics and group viewpoints rather than the perception of individual (Lloyd-Evans, 2006). As the current research is based on the perception of climate-induced group, FGDs proved to be major tool to achieve important data related to the target group's experiences before and after migration. The FGD is, however, a useful tool for rapid assessment where a selected set of people gather to discuss issues based on a list of key themes strained up by the researcher/facilitator (Kumar, 1987). The characteristics of FGDs conducted for this research have been summarized in the following table:

Table 3.2: Elements of focus groups conducted during the research

[8] As we know, 't-test' is basically a small-sample test, but can be used for large sample size and approaches a normal distribution for n>30. In our case, the minimum sample size is 40 for the group – non-climate-induced migrants, whereas n is 80 for the other group (climate-induced migrants). This justifies the use of 't-test' in the case of quantitative variables for the two groups in our study.

Element	Focus groups
Format	Group Session (total 16)
Size	Usually 4-6 persons per session
Length	1 to 2 hours
Participants	Selected mainly based on homogeneity in terms of age, sex, duration in the city and types of migrants. Some mixed group FGDs were also conducted.
Forms of Data	1. Conversation; including tone of voice 2. Silences; words and issues 3. Body language
Data Collection	1. Audio tape; 2.Transcribe
Formats for reporting	1. Selected quotations 2. Analysis of repeated themes

Source: Schuck *et al.* (2004) (Modified by the researcher)

Researchers generally allow a small number of people so that engaging discussion can be carried out with active participation of every respondent (Morgan, 1997; Krueger, 2000). However, in this research, FGD participants were limited to a maximum of 6 persons in each session. I was the main facilitator in every FGD session and research assistants also sometimes participated in the discussion to make the respondents feel comfortable to participate.

FGDs were conducted based on different groups among climate-induced migrants. Groups were defined according to sex, age, duration of residence in the city, places of origin and types of migrants because perceptions often vary with these characteristics (Morgan, 1993). Asking different groups the same question is a better way to cross check the validity of information as well as understand the logic behind different perceptions about their experiences associated with migration.

Table 3.3: Summary Description of FGD Sessions

FGD serial	Types of participants*	Number of participants	Date of FGD
1	Purely climate-induced migrants	6	12/07/2012
2	Purely climate-induced migrants	4	12/7/2012
3	Purely non-climate-induced migrants	4	22/7/2012
4	Purely non-climate-induced migrants	6	22/7/2012
5	Cyclone-induced migrants	6	18/09/2012
6	Flood-induced migrants	6	18/09/2012
7	Flash flood-induced migrants	4	19/09/2012
8	Male climate-induced migrants	5	22/11/2012
9	Male climate-induced migrants	5	22/11/2012
10	Female climate-induced migrants	5	22/11/2012
11	Female climate-induced migrants	5	22/11/2012
12	Climate-induced migrants who were previously fishermen and/or farmers for few generations	4	12/12/2012
13	Old aged climate-induced migrants (above 60 years of age)	5	05/05/2013
14	Old aged climate-induced migrants (above 60 years of age)	5	05/05/2013
15	Long-term climate-induced migrants (who migrated long before 2006)	4	07/05/2013
16	Long-term climate-induced migrants (who migrated long before 2006)	6	07/05/2013

** Except the respondents of FGDs 15 and 16, all respondents arrived in the city after 2006 in line with my definition of 'recent'.*

The above FGDs were very much important tools of the research methodology and helped me to understand their perception more deeply and from varied viewpoints. Different vulnerability aspects were discussed during FGDs, such as the state of their employment security, food security, seasonality mapping of livelihood aspects, problem tree, historical profiling, access to institutions (through Venn diagrams), health status including sanitation and drinking water, their future aspirations, issues like whether they have any plan to return to the village and reintegrate there. It should be mentioned here that as the term 'climate change' was not clearly understood by most of the respondents, I used 'weather' and/or 'seasonality' in place of climate change, using local language (Moser and Stein, 2010). Table 3.3 describes each FGD session, along with the characteristics and number of participants.

3.4.4 Special Case Studies Through Personal Interviews

Ten personal interviews were conducted with climate-induced migrants to generate detailed case studies. Case studies were formulated based on special experiences of climate-induced migrants. For example, those who lost their family members during climatic disasters in their village or who are now suffering from severe health problems have been selected for personal interviews. I picked respondents from the FGD sessions who had also previously participated in the questionnaire survey. This helped to gather more in-depth information and helped to better understand the context of their special vulnerability.

3.4.5 Key Informant Interviews

The key informant interview is a standard social scientific method that is widely used in social science. The term ‘key informant’ indicates anyone who is able to provide detailed information and opinion based on his or her knowledge of a particular issue. Key informant interviews generally expect qualitative information that can be cross checked with quantitative data, a method called ‘triangulation’ (Carter and Beaulieu, 1992). In this research also all key informant interviews were cross-checked afterwards with the results of the questionnaire survey.

Selection of Key Informants

The main purpose of this series of interviews was to assess the preparedness/capacity of the local governance institutions and NGOs to address climate change and the needs of the climate-induced migrants. First of all, listing of different government and non-government organizations dealing with climate related migration in Dhaka City was crucial. The list was carefully revised so that appropriate agencies could be selected. Also the key persons working in those institutions have been listed out. Finally, appointments were made for face to face interviews and the interviews were conducted in a successful manner.

The parcicipants of FGDs and questionnaire surveys were also important key informants. Suitable key informants were chosen according to the purpose of the research. They were interviewed separately to understand their perception regarding city bsed hazards and their special needs for adaptation. The following (Figure 3.2) is the methodological diagram of the study:

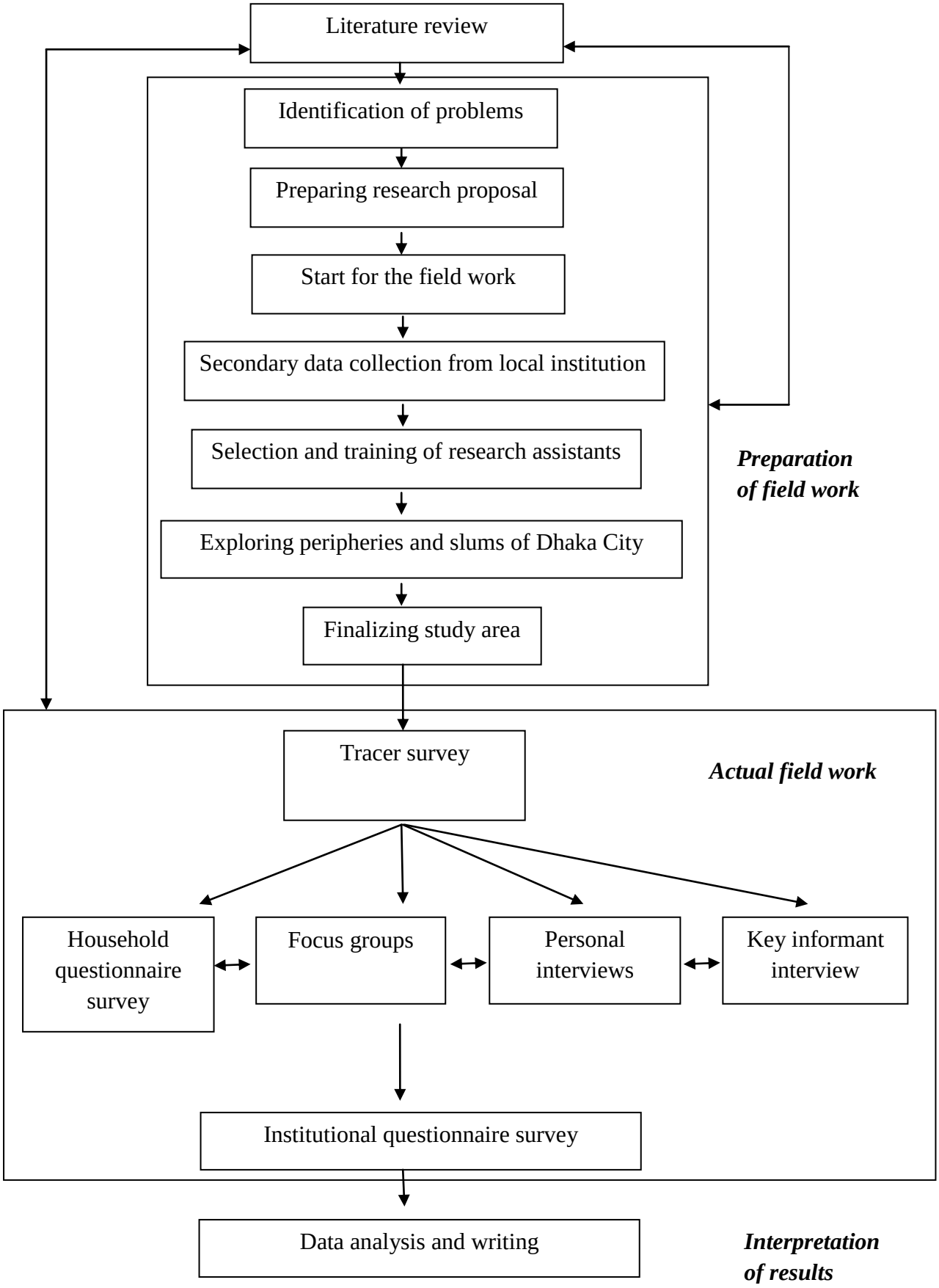


Figure 3.2: Methodological diagram of the study

3.5 DATA ANALYSIS AND INTERPRETATION

I completed data input by SPSS software during March-April, 2013. Different statistical tests were used for the data analysis such as frequency distribution, cross tabulations, Chi-square test and independent samples t-test. Chapter Six required more quantitative analysis (see section 6.3 for details) while other chapters were mainly based on qualitative analysis. Qualitative responses were coded and quantified and were presented through tabular, graphical or other statistical forms.

Analyzing qualitative data was easier with SPSS as it is software specially designed to analyze both quantitative and qualitative data. However, the information gathered from interviews and FGDs were gathered carefully by taking notes and making audio recordings at the same time. Note taking helped to point out important facial expressions such as hesitance (Kitchin and Tate, 2000). Both notes and recordings helped to gather useful insights about the summary of discussion and to analyze the information. Before starting analysis, data were rechecked by revising notes, audio transcripts and also by the means of meetings with research assistants. This phase helped to identify mistakes and inconsistencies in the data and clarify some major confusion.

3.6 PROBLEMS/LIMITATIONS

a) Both selecting the study area and tracing the migrants were very time consuming processes, as already explained above.

b) It was also difficult to identify purely climate-induced migrants. I had to place much emphasis on the main reason for their migration and that was a sensitive task. I had to be conscious while judging the principal 'cause of migration' from their statements, body language and emotions.

c) The study only explored one slum and could not explore the periphery of Dhaka due to resource and time constraints, though the urban periphery was another potential destination for the target group.

d) As most of the respondents used to work outside during the day, we often conducted the major interviews in the evening, after they had returned home. We also preferred the Friday mornings for major surveys as people are late in starting work in the morning of weekly holidays (i.e. Friday in Bangladesh).

e) In the rainy season, as the slum was waterlogged, my team and I had to cross the waterlogged area on foot. Sometimes we also used boats to collect data. However, it was rather a different but challenging experience.

f) Mosquito bites (source of malaria and dengue) were very common in Korail and we suffered a great deal.

3.7 ETHICAL CONSIDERATIONS AND RISK ASSESSMENT

Ethical issues are very important for undertaking fieldwork, and need to be considered in advance (Simon, 2006; Scheyvens and Storey, 2003). The departmental research ethics committee assessed my proposal before going to the field for any ethical issues. As expected, the proposal was passed as all relevant ethical issues and aspects related to potential associated risk factors had been taken care of. For example, I had to formally submit on the written application that there would be no major sensitive issues which might cause harm to the participants physically or socially.

In the field, all participants were recruited on the basis of their informed consent (Scheyvens and Storey, 2003; Brydon, 2006). Before conducting sessions, I briefly told the participants about myself, my research and its objectives. I need to mention here that I am also from the same country (Madge, 1997) where my field research location is, but there is always an insider-outsider dilemma if researching in one's own country or locality (Scheyvens and Storey, 2003; Mandiyanike, 2009). In most cases it seems to be advantageous to work in one's home country due to known contexts of different socio-economic, environmental and political aspects (Madge, 1997), but sometimes this is not true depending on researcher's positionality, not least relative to any societal tensions or cleavages.

During my fieldwork, for example, some respondents feared that I and my team might be a group of spies from the government to find out who are using the illegal

gas and electricity connections in the slum. Though I clarified my identity and intention before starting the interviews, most of the respondents continued to think that I was a government representative and expected that they would have something in return after the interview (Sultana, 2007). Howard (1997) noted that aid expectations by the respondents can influence the results. These problems related to positionality became clearer after working in the slum for a few weeks and then I had to be more conscious in explaining my academic position and intention before starting the interviews, in other words to manage my interviewees' expectations (Sultana, 2007).

Trust building was a challenge for this particular research but eventually when I started frequent visits to the slum, and started to mix with people, this difficulty was overcome with the passage of time. In this case, a letter from Mr. Azahar Ali (Project coordinator, UPPR project in Korail) to the UPPR officials in Korail made it easy for me to prove that I am not a government representative and my intentions are purely academic. Therefore, this is not always easy to work under local circumstances; one has to face certain challenges irrespective of the location of study site (Unwin, 2006).

However, it also happened that some people were not interested in talking about social hazards such as drug dealings and how the situation of political unrest is affecting their livelihoods. It also happened that some husbands did not allow their wives to talk with us. However, we did not force anyone, and only those who came willingly were considered as our respondents.

Power relations are an obvious factor which influences participatory field research. During FGDs I sat with the respondents on the floor and sometimes I also stood up to explain something on the black board but never sat on a chair so that they don't feel undermined. In my research, though I had the advantage of interviewing people in my mother language (Unwin, 2006) (which saved time during the actual fieldwork and analysis and avoided the inevitable translation problems), my dialect is purely urban rather than rural. My dialect did not match with that of the respondents, who came from different parts of the country with different dialects of the Bengali language. Here the insider-outsider duality had been merged (Mandiyanike, 2009) and it was obvious that they were, at some point in time, considering me to be an outsider because of my different linguistic dialect, more educated background as well as more affluent get up than those of a typical slum dweller.

However, like all other research, this particular work also involved some risk factors. For example, working in a conservative, predominantly Muslim society was not easy for me as a female researcher. Therefore, I was always accompanied by male research assistants who were familiar with the local environment. For my research team's safety, we did not go to the slum areas during night time. Other risk factors included the unstable political situation in the country, traffic congestion on the roads of Dhaka City and working in crime-prone slum areas (Habib *et al.*, 2005; Alam *et al*., 2013). In January, 2014, Bangladesh held a national election and that is why in 2013 there were frequent strikes by the opposition parties. Therefore during my fieldwork (2012-2013) there was political unrest all over the country, especially in the capital city. Working during the political unrest was not easy (Mandiyanike, 2009). For example, primarily I found an office space in Korail to conduct my interviews (see Section 3.3.4 of Chapter Three) but later on, that was found to be an office where the members of a specific political party occasionally sit for meetings. Knowing this fact, we stopped working there in order to avoid political colouring and associated risks. Eventually we found office space which was beyond any political exposure. Finally, positionality and power relations in the field are two important aspects which should be addressed with care during ethical and participatory research.

3.8 CONCLUSION

This chapter has presented the research design in detail and the multiple methods applied to answer the research questions. Questionnaire survey, focus groups, key informant interviews and personal interviews were some main tools to achieve the objectives of the research. This chapter also described the main study area – Korail slum – in detail and gave an idea about its demographic, socio-economic and environmental conditions. The next four chapters will address the objectives of the research directly by presenting and analysing the results of my empirical research. The coordination schema for the research below (Table 3.4) is formulated to facilitate understanding of the research design and its variables:

Table 3.4: Coordination Schema

Objectives	**Research questions**	**Parameter/complex variables**	**Simple variables**	**Data source**
The first objective is to understand how climate-induced migrants to the city perceive their socio-economic conditions and environmental vulnerability.	1. What were the reasons of their migration?	The main push factor of migration	• Impact of climate variability on their livelihoods in places of origin.	Tracer survey questionnaire + secondary information
	2. Which climatic events exacerbated their livelihood condition in places of origin?	Climatic condition of the places of origin	Characteristics of different environmental hazards in Bangladesh: -Floods -Flash Floods _Cyclone -Riverbank erosion	Tracer Survey Questionnaire + secondary information
	3. Did they migrate if the specific climatic event, which affected their livelihoods, would never occurred?	Tracing the root causes of migration	• Exploring other socio-economic and political problems in their places of origin which could push them anyhow towards cities irrespective of climatic problems.	Tracer Survey Questionnaire
	4. What are the new socio-economic hazards in the destination that pushes them to go back?	Socio-economic hazards in Dhaka City	• Livelihoods • Asset base • Food security • Health	Questionnaire + FGD

	5. What are the new environmental hazards in the destination that pushes them to go back?	Environmental hazards in Dhaka City	• Dhaka's vulnerability to climate change. • Floods • Waterlogging • Heat stress	Questionnaire + FGD
	6. Do they still want to return to their villages?	Aspiration to go back	• Perceived Problems in the city • Perceived Advantages in the city • Relatives and assets left in their village	Questionnaire + FGD
	7. What are the incentives in the City that restricts them to go back?	• Socio-economic incentives • environmental incentives • Psychological incentives	Perceived advantages in the city such as employment opportunities and income.	FGD
	8. In case of a major flood in Dhaka in the future, where will they move and/or what will be their adaptation strategies?	Future adaptation with urban flooding	• City government's plan/policy to protect the urban poor from adverse environmental condition in the future. • Respondents' personal Aspiration.	Questionnaire + FGD+ KII + Secondary sources

The second objective is to understand the differences between climate-induced and non-climate-induced migrants in Dhaka City.	1. Do they perceive same level of vulnerability to different socio-economic and environmental hazards as perceived by the non-climate-induced migrants in the city?	Differences of vulnerability to socio-economic and environmental hazards in the city between the target group and comparison group.	• Both group's current socio-economic condition • Both group's experiences related to socio-economic hazards in the city. • Both group's experiences related to environmental hazards in the city	Questionnaire + FGD
	2. Are there any major differences between climate-induced and non-climate-induced migrants in terms of overall expectation in the city, perception and aspirations for the future?	Differences in the overall expectation, perception and aspiration for the future between the target group and comparison group.	• Differences in the experience of future plan. • Differences in the aspiration to stay and/or return to places of origin.	Questionnaire + FGD
The third objective is to explore different dimensions of vulnerability of climate-induced migrants in Dhaka.	1. Is there any gender dimension of climate-induced migration?	Gender dimension of climate-induced migration	• Experiences of male and female climate-induced migrants associated with the overall migration process and their differentiated experience in the city.	FGD + Personal Interview

	2. What is the experience of the old aged climate-induced migrants in experiencing different hazards in the city?	Old age dimension of climate-induced migrants.	• Experiences of young/active and old aged/inactive climate-induced migrants associated with the overall migration process and their differentiated experience in the city.	FGD + Personal Interview
	3. How differently the newly arrived and long-term climate-induced migrants experience social and environmental hazards in the city?	How duration in the city influences the perception of individual	• Differences in experience/aspiration between newly arrived and long-term climate-induced migrants in the city.	FGD
	4. How their levels of formal education affect the experiences and perceptions of climate-induced migrants in the city?	How level of education influences the perception of individual	• Contrast experiences/aspirations in the city of educated and non-educated climate-induced migrants.	Personal Interview

	5. Cyclone-induced migrants and flood-induced migrants – how differently they experience hazards in the city?	Identification of the most vulnerable group among climate-induced migrants	• Differences in experience/aspiration between flood-induced and cyclone-induced migrants in the city.	Questionnaire + FGD

CHAPTER FOUR

ENVIRONMENTAL HAZARDS EXPERIENCED BY CLIMATE-INDUCED MIGRANTS BEFORE AND AFTER MIGRATION

4.1 INTRODUCTION

With the process of migration, the climate-induced migrants aspired to a future in the city where there would be no environmental hazards as before. To what extent have their aspirations been met? Along with discussing the factors that were responsible for influencing the migration decision, this chapter will argue that climate and environmental factors affected the climate-induced migrants severely at both their origins and destinations. In effect, therefore, such migrants have moved from one vulnerable situation to another, and it is important to understand how and why.

Rural Bangladeshis are mainly dependent on agricultural livelihoods which are always under the threat of destruction by climate-induced hazards like floods, drought, salinity intrusion, cyclone and storm surge (Rahman, 2011). Following extreme environmental events, some decided to migrate and others to remain in their villages. The chapter will try to determine the factors which actually forced the target group of the research to migrate. The chapter will then describe the environmental conditions in the climate-induced migrants' districts of origin and their own experience regarding the specific environmental events which triggered their migration decisions. Finally it will examine recent (i.e. since 2007) climate-induced migrants' experience regarding the environmental hazards in Dhaka City.

According to the available literature, most environmental migrants settle in the urban centres of their own countries rather than the neighbouring countries (Morton *et al*., 2008). Research shows that big cities are the most attractive destinations for the migrants as they give them more diverse and potentially better income-earning opportunities (Warner *et al.*, 2009; O'Brien *et al.*, 2008; LaFleur *et al*., 2008; Adamo, 2010). My research found many climate-induced migrants (for definition, see Section 2.2 of Chapter Two) in Dhaka City from different parts of the country who migrated following extreme environmental events. However, cities have been identified as potentially riskier places than rural areas in the context of global environmental change (GEC) (Simon, 2010; UN-HABITAT, 2004). Cities are

generally built up with large infrastructure and therefore increased rainfall due to the changes in the pattern of climatic variability may create severe flooding (World Bank, 2010). Therefore a functional drainage system in the city is very important. Dhaka city, which acts as a magnet for migrants from all over the country (see Map 4.1), is characterized by high population density and a poor drainage system that has inadequate capacity, doesn't cover all parts of the metropolitan area and is impeded by the low-lying location of much of the city. Under these circumstances, absorption of more migrants each year is making the city more vulnerable to flooding by slum expansion on more low-lying lands (OCHA/IRIN and UN-HABITAT, 2007). The obvious questions here are that if the city is flooded heavily in the future, would these poor migrants be able to cope and/or where would they move? The following diagram has been made to represent the conceptual framework of the arguments of this chapter (Figure 4.1).

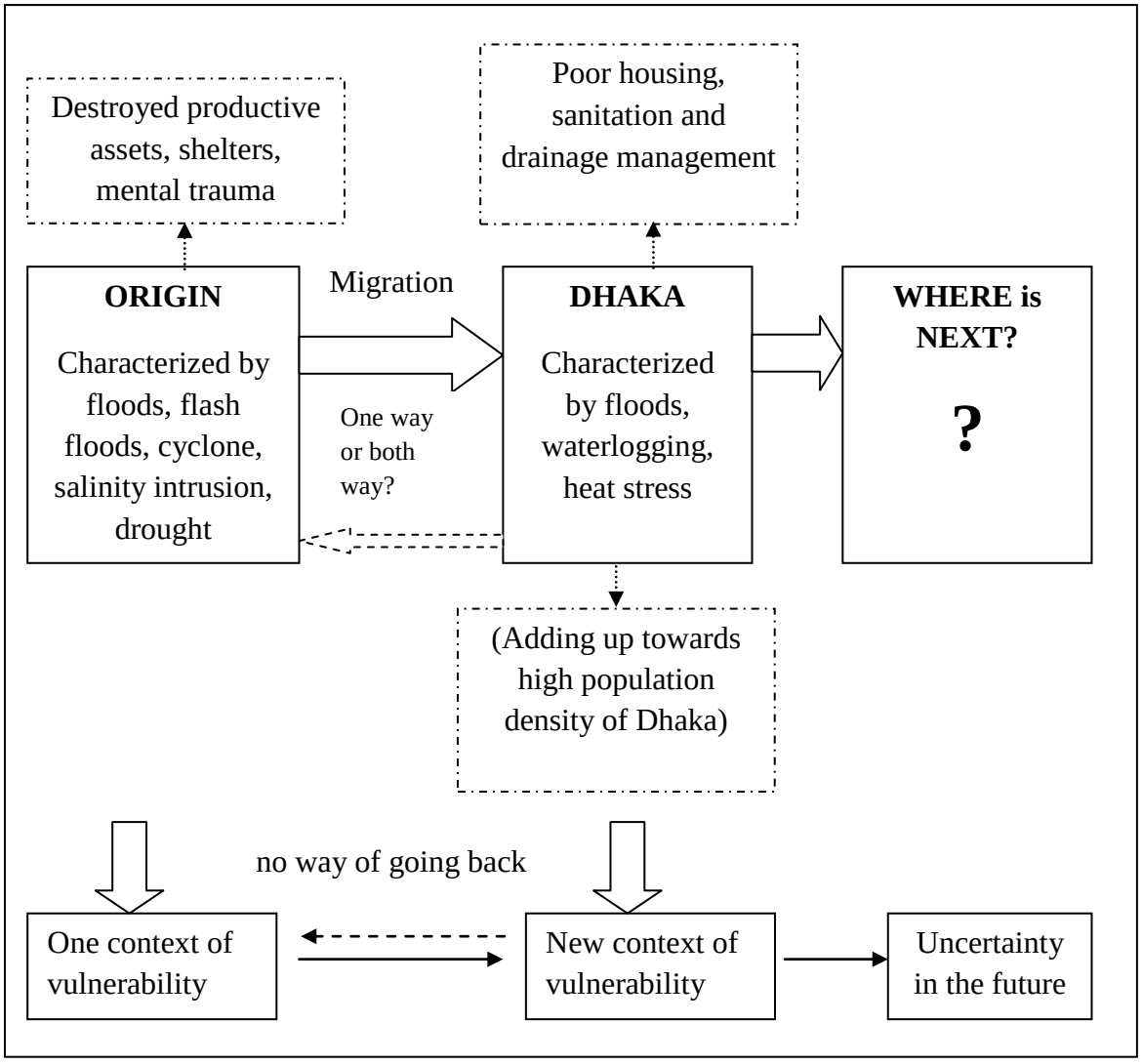


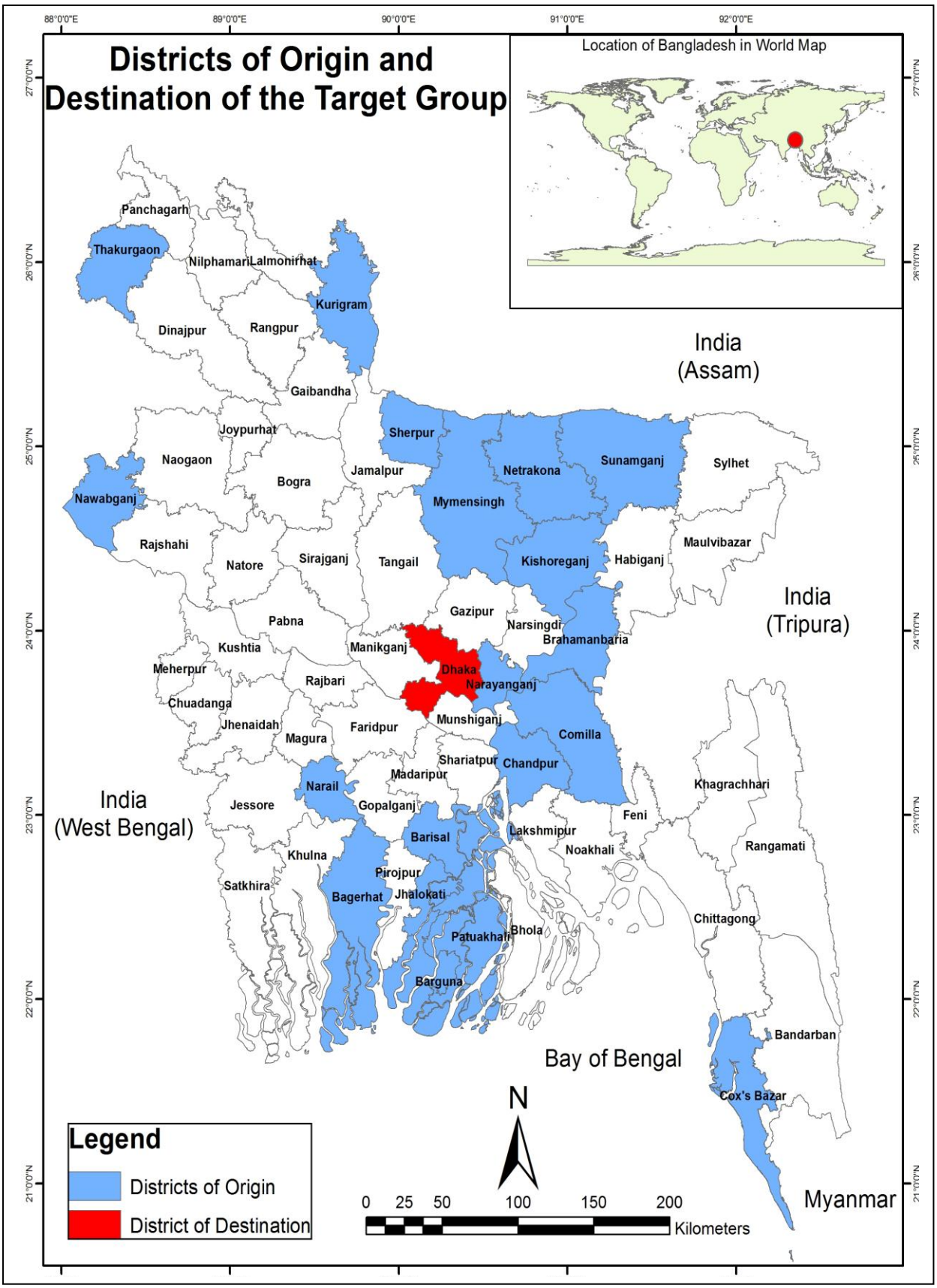
Figure 4.1: The conceptual framework of the arguments of this chapter

The above figure (Figure 4.1) represents the poor climate-induced migrants' environmental conditions before and after migration where they have to move from one vulnerable situation to another with many uncertainties. For example, in most of the cases, such migrants are unaware of their types of migration (permanent or temporary), new environmental threats of destination and most importantly their next destination after any major urban floods in the future. Along with discussing climate-related drivers of migration, this chapter will, therefore, compare climate-induced migrants' before and after scenario of environmental hazards.

4.2 FACTORS PROMPTING MIGRATION

People migrate for a variety of reasons. Some migrations are voluntary, some are forced. Researchers have explored the many different factors prompting migration (Prothero, 1987; Barnum and Sabot, 1977; Moench and Gyawali, 2008; Carr, 2005; IOM, 2005). Among the most widely discussed topics in recent years has been climate-induced migration (Bates, 2002; Castles, 2002; IOM, 2007).

It is generally difficult to identify one main cause of migration since the causes are usually complex and interrelated. The Foresight Report (2011) revealed that the migrants migrate due to a variety of reasons and it is not wise to consider any of them in isolation as the effects are closely intertwined. For example, if a poor person migrates after an extreme environmental event, the main driver might be the poverty of that person which weakens his/her coping capacity but that extreme environmental event acts as the trigger to push him/her over the tipping point of the migration decision. This environmental push can help to cross the tipping point also in case of social, political, demographic and economic drivers of migration (Foresight, 2011). This section, however, attempts to explore that 'tipping point' in case of the climate-induced migrants of Korail slum- which is a settlement of migrants from different parts of the country (Map 4.1).



Map 4.1: Districts of origin of the target group found in Korail, Dhaka.

Source: prepared by the author

It is clear from Map 4.1 above that the capital city, and especially Korail slum, worked as a magnet for the climate-induced migrants from all over the country, though the environmental contexts were different through the regions. In other words, there were differences in the types of environmental events those triggered their migration decision. Climate-induced migrants, found in Korail slum, came mainly from 18 districts of the country, namely Barguna, Sherpur, Bhola, Kishoreganj, Mymensingh, Patuakhali, Chandpur, Sunamganj, Netrokona, Barishal, Chapainababganj, Thakurgaon, Comilla, Brahmanbaria, Kurigram, Jhalokathi, Cox's Bazar and Bagerhat.

The literature provides evidence that these districts are prone to floods, flash floods, cyclone and associated storm surge, salinity intrusion, drought, and riverbank erosion (Climate Change Cell, 2009; Bangladesh Bureau of Statistics, 2011). Therefore, it was clear that different people came from different environmental contexts.

However, the factors driving migration stated in Table 4.1 are most commonly reported by the target group irrespective of location. They are ranked according to the frequency of responses during my questionnaire survey and these of course played as the most important factors for taking decision to migrate (Table 4.1).

Destruction of agricultural livelihoods was the most important underlying reason that forced them to leave their ancestral homes. 97% of the climate-induced migrants mentioned their destroyed agricultural livelihoods (either crop, fish or livestock agriculture) as the main reason for migration. However, 'destroyed livelihoods by climatic events' was the major criterion for identifying the target group of the research – the climate-induced migrants in the city (see Chapter Two for more details).

As previously reported by other researchers, after the specific disastrous environmental events, people started living in cyclone shelters, in embankments or in their relatives' homes (Sarker and Hossain, 2012). Those who lived in cyclone shelters reported unsatisfactory living conditions (see Section 7.2.2 (ii) of Chapter Seven for more details) and those who used to live in embankments reported their fear of children falling into the river. However, those, who lived in their relatives' homes, had tried to find alternative livelihoods in their areas but failed.

Table 4.1: Factors underlying migration

Ranking	**Factors**
1	Destroyed agricultural land
2	Destroyed shelter by the specific climatic events
3	Destroyed livelihood assets: equipment, livestock, fishing boat, net)
4	Limited opportunity of earning alternative livelihoods
5	Death of close relatives and associated trauma
6	Death of main earning member of the family
7	Unsanitary condition, polluted drinking water and threat of life through disease outbreak
8	Consequent poverty and landlessness
9	Limited cyclone shelters in the area and the associated unsatisfactory living condition
10	Having friends and/or families who migrated to Dhaka City

Source: Questionnaire survey

Many said that they received relief while in their places of origin but those were related to food items only. Relief came from the government, INGOs (international non-government organizations) and local NGOs (non-government organizations), Red Cross and also from community-based organizations. However, they did not receive any training which could develop their coping capacities. One of the cyclone-induced respondents said,

"Local government officers promised me to rebuild my house and that is why I gave them all the savings of my life which was 25000 BDT (£250). Finally I was cheated. I waited for few months on the embankment, and when I realized that I have been cheated, it was too late. I had no other option than to migrate"

(Jaheda Begum; FGD: 2; 12/07/2012).

Such instances of ineffective institutional effort, mismanagement during relief operation and government's lack of effectiveness in helping the most vulnerable have been cited in many literatures (Warner, 2010; Mahmood, 2012). Strong intervention in this area can play a major role to prevent unplanned and forced climate-induced migration.

Along with this type of mismanagement of relief operations, many other factors also triggered their migration decision, one of the most important being the death of a close relative. There are many respondents like *Liton* and *Shahenur* in Korail, who lost their family members in a cyclone or floods and eventually escaped from their villages to minimize the associated mental trauma. About 28% of the respondents said that they experienced death of their own family members during the specific environmental disasters in their villages. However, important factors underlying migration are listed in Table 4.1.

In a nutshell, the factors behind migration were clearly linked to specific climate-induced events and their struggle not to leave the ancestral home was also prominent in their stories. Therefore, there was a highly significant role of the climatic factors and variability in influencing their drivers of migration (Warner and Afifi, 2014; Warner *et al*., 2009; Climate Change Cell, 2009). Finally they had to cross the 'tipping point' of migration when they lost all hope of maintaining their livelihoods.

The following sections (section 4.3 and 4.4) will describe the climate-induced migrants' experience regarding different environmental hazards faced both before and after migration (i.e. in place of origin and in the city). It should be mentioned here that environment is a broad concept but this particular research deals only with the geophysical and hydro-meteorological hazard of the environment (see Chapter Three for more details).

4.3 ENVIRONMENTAL HAZARDS IN PLACES OF ORIGIN

As a low-lying deltaic country, Bangladesh experiences a wide variety of environmental disasters, which have recently occurred more frequently (Raillon, 2010) (see Chapter Two for more details). Table 4.2 sets out the variation of hazards based on location.

Table 4.2: Variation of hazards based on interviewee's districts of origin

Environmental events experienced by respondents	**Districts of origin of the respondents**
Flood	Sherpur, Kishorganj, Mymensingh, Chandpur, Netrokona, Barishal, Chapainababganj, Thakurgaon, Comilla, Brahmanbaria, Kurigram, Patuakhali, Jhalokathi, Cox's Bazar
Flash flood	Sunamganj, Netrokona
Salinity intrusion	Barguna
Cyclone and storm surge	Barguna, Sherpur, Patuakhali, Barishal, Thakurgaon, Bagerhat
Flood and riverbank erosion	Sherpur, Jamalpur, Barishal, Kurigram, Mymensingh, Jhalokathi

Source: Questionnaire Survey

This gives an idea about the origins of the climate-induced migrants in the study and the environmental events which triggered their migration decisions. As previously mentioned, it was evident that people from the target group migrated from different parts of the country and from different environmental contexts. More than 98% of the climate-induced migrants mentioned flood, cyclone and associated storm surge and riverbank erosion as their main reasons for migration (Figure 4.2).

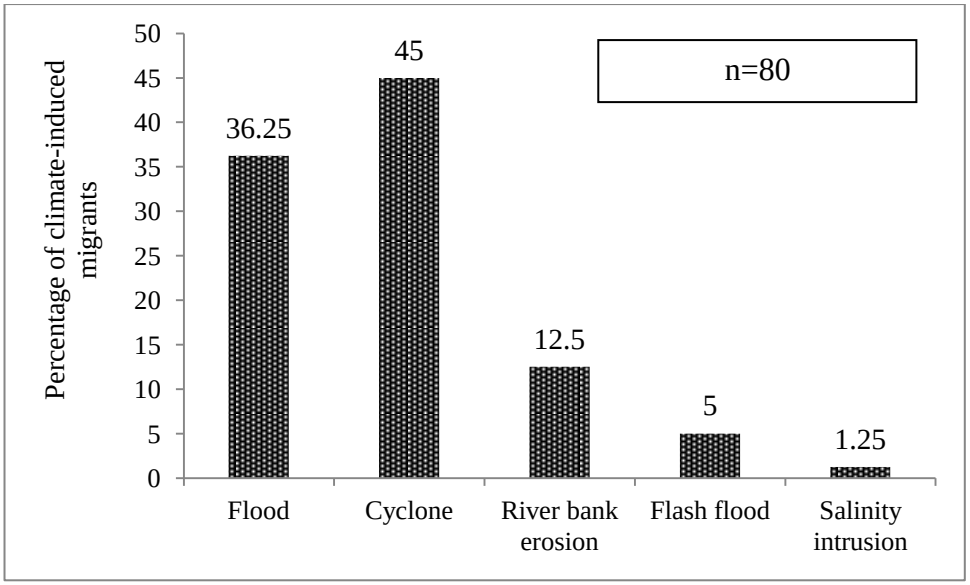


Figure 4.2: Percentage of climate-induced migrants in the study by category of environmental events. Source: Questionnaire Survey

This study has been conducted purely in the destination area (Dhaka City) and therefore, the description of the climate-related events in the areas of origin was based entirely on respondents' reported experiences. In order to have the most accurate data possible with this research design, I chose to select recent (since 2007) climate-induced migrants in the city (see Section 3.4.1 of Chapter Three) so that they can easily recall the details of the devastating events that pushed them to migrate. Attempts were also made during interviews and focus group discussions to triangulate in order to minimise gaps and ex-post rationalization.

The following section will describe the target group's experiences during the environmental events which forced them to migrate to the city. This description is based on both primary and secondary data. However, as said before, descriptions are all based on the geophysical and hydro-meteorological hazards (see Section 2.7 of Chapter Two for definition of hazards).

4.3.1 Floods

Bangladesh is one of the most populous delta regions of the world and situated in a low elevation coastal zone (McGranahan *et al.*, 2007). About 80% of the total area of Bangladesh comprises floodplains. During the 1988 and 1998 floods, almost 45 and 30 million people were displaced respectively (Siddiqui, 2011).

Table 4.3: Total areas affected and number of homeless people by floods in Bangladesh

Year	**Inundated area**	**Estimated damage**	**Comments**
1987	50,000 sq. km	US $ 1 billion	2055 deaths
1988	61% of the country (n=147570 sq. km.)	US $ 1.2 billion	45 million people homeless
1998	100,000 sq. km	500,000 homes	30 million people homeless
2004	38% of the country (n=147570 sq. km.)	US $ 2 million	3.8 million people affected
2007	32,000 sq. Km	US $ 1 million	85000 houses destroyed

Source: Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2008

Table 4.3 describes the impacts of different flood events in the country. The literature also reveals that the floods of 1988, 1998 and 2004 were the most devastating in recent years (Alam and Rabbani, 2007). There are regional diversity and complex debates associated with the linkage between climate change and such floods which have been discussed in Section 2.4.1 of Chapter Two. However, since 1954, Bangladesh experienced 48 floods of different scales (Figure 4.3). The recent flood of 2007 affected 16 million people, damaged 85,000 households and 1.12 million hectares of the cropland (Khatun, 2013).

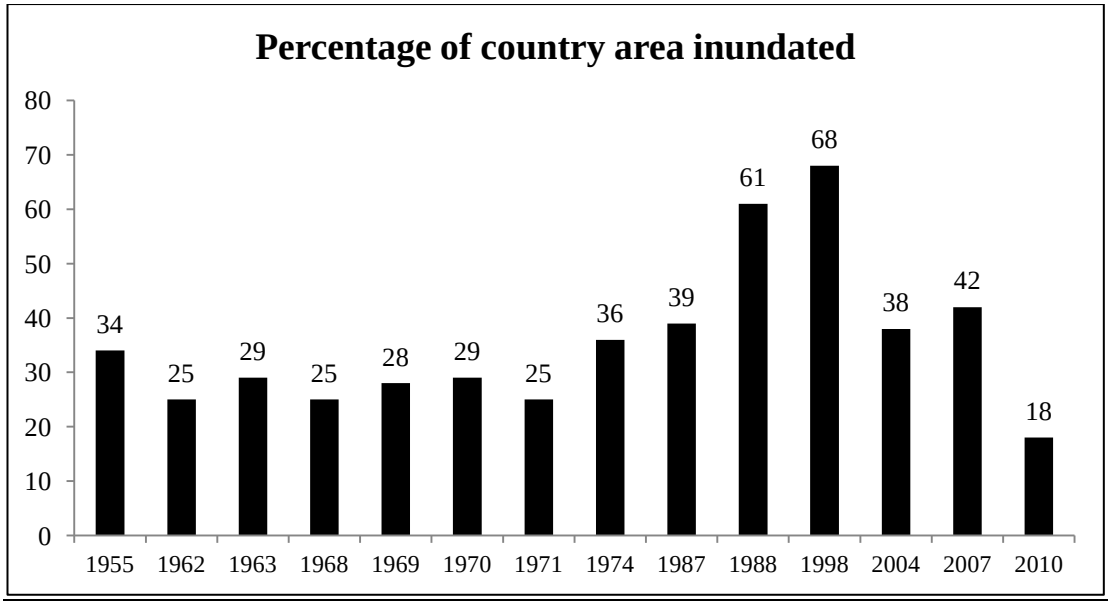
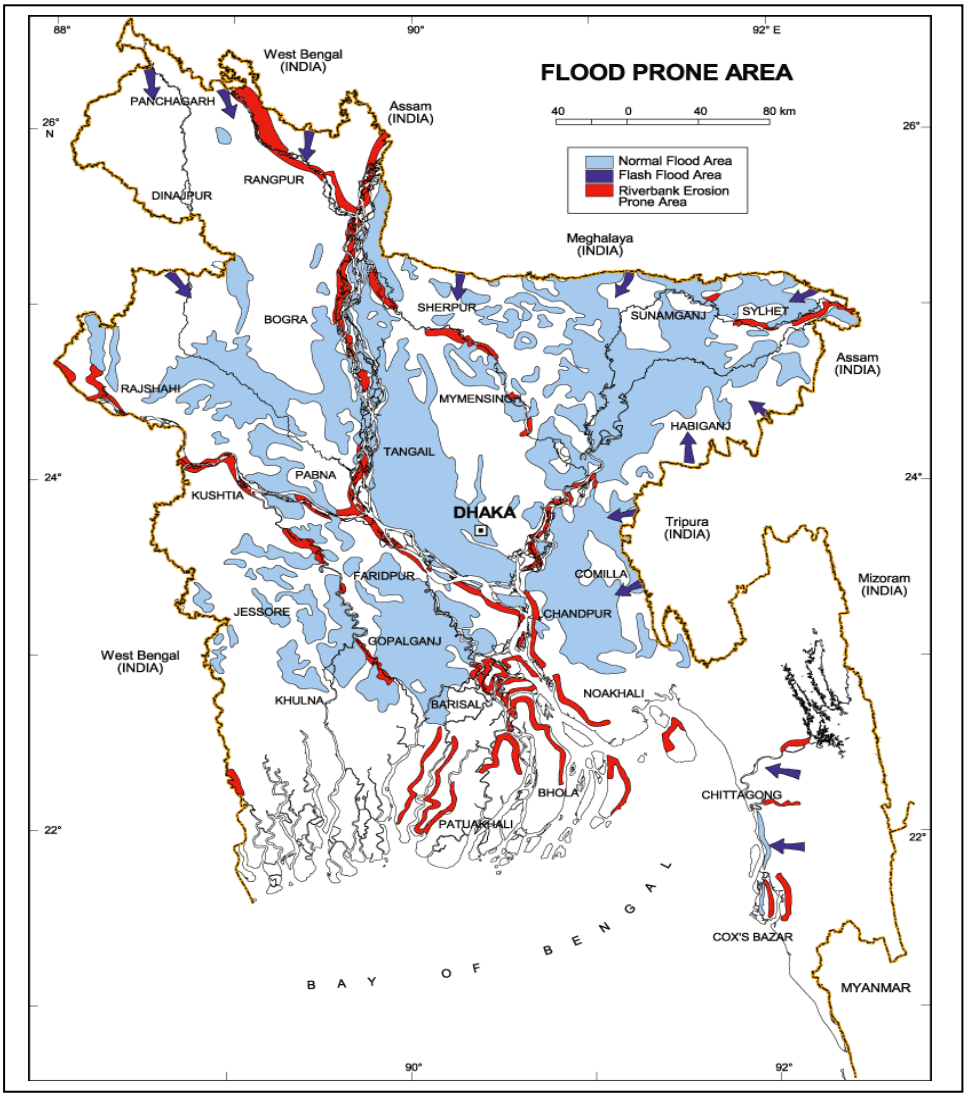


Figure 4.3: Major floods and area inundated, 1954-2010. Source: Bangladesh Water Development Board (BWDB), 2010.

I found people in my study area from Sherpur, Kishorganj, Mymensingh, Chandpur, Netrokona, Barishal, Chapainababganj, Thakurgaon, Comilla, Brahmanbaria, Kurigram, Patuakhali, Jhalokathi and Cox's Bazar Districts who came to Dhaka mainly as a result of floods in their places of origins. A questionnaire survey and focus group discussions (number of FGD participants: 6; 18/09/2012) were conducted to understand their experiences during the specific floods in their places of origins which forced them to migrate. However, experiences of flood-induced people from different parts of the country were not very different as all of them were victims of a common hazard.

Flood-related migration is not new in Bangladesh. Moreover, most of the seasonal migration in the country occurs when migrants' productive assets (for example, ancestral homes and agricultural lands) are submerged under flood water (Ahamad *et al*., 2011; McLeman, 2014). In that situation people generally migrate to cope with the disastrous situation and return to their villages when the situation comes under control again (Dun, 2009). However, this research experienced a different trend. During the tracer survey, I found many permanent flood-induced migrants who migrated to the capital with their entire families and they have no way of return due to their destroyed asset base (i.e. housing and agricultural land) in the village.

Farmers from Sherepur, Barishal, Mymensingh and Comilla reported that frequent floods in their areas destroyed their agricultural lands. Van pullers from Thakurgaon also reported that frequent flooding in their local area damaged crops, houses and road infrastructure. Most of them had to take shelter in their relatives' houses several times in their life during flooded conditions but last time they couldn't even manage their relatives' homes as flooding covered a wider area in the region. In case of other previous floods, instead of van pulling and/or farming they used to work at other people's houses as day labourers. But this time those wealthy houses were also flooded and this group actually lost all their means of livelihoods and finally decided to migrate (FGD:6; 18/09/2012).



Map 4.2: Flood, flash flood and riverbank erosion prone areas in Bangladesh.
Source: Centre for Environmental and Geographic Information Services (CEGIS)

Case Study 4.1: Maruf Mia (Interviewed on 20/09/2012)

Maruf Mia (60), who was previously a farmer in Thakurgaon District, migrated to Dhaka after the flood of 2010. According to Maruf, there was unusually heavy monsoon rain in Thakurgaon District that year. Heavy downpours continued from mid-July till mid-September and it also inundated the area where Maruf and his family used to live. *''Everything went under the muddy water of the flood. The flood water continued for almost three weeks. All the paddy fields were covered with mud. When the water receded finally, the whole area turned into a mud field''*- said Maruf Mia, who is now a rickshaw puller in Dhaka City.

He and the other four members of his family tried to stay at the place of origin but due to inadequate relief services and poor employment opportunities they migrated to the capital city during January, 2011. His wife now works as a maid servant and his sons are working as hawkers in the streets of Dhaka. He identified 'excessive temperature' as the main environmental hazard which is deteriorating his health condition. *''Only a rickshaw puller knows how it feels like during pulling a rickshaw under the scorching sun in the city''*, said Maruf. Finally he said that there is no way of going back and he must pull rickshaw in the city even during adverse weather condition because otherwise they will not be able to cope with the increasing cost of living in Dhaka.

4.3.2 Flash Floods

Flash flood is generally caused by heavy or excessive rainfall in a short period of time over a relatively small area. In case of flash flood, water level rises and falls quite rapidly with little or no advance warning. Generally, flash floods occur in areas where the upstream basin topography is relatively steep and the concentration time of the basin is relatively short. In case of Bangladesh, flash floods generally occur in the north-east, south-east and Chittagong region (Map 4.2) (Climate Change Cell, 2009).

The extreme flashy character of the rivers and sudden excessive rainfall in the region causes frequent flash floods in the north-eastern *Haor*[9] areas, originating in the very steep uplands adjacent to the region in Asam and Meghalaya hills range in India, and causing immense damage to the standing *Boro*[10] crops, lives and properties every year (BWDB website).

This floodwater not only carries the water but also a huge amount of sediment. Over time this sediment has deposited on the river and canal beds, reducing the capacity of almost all the water courses within the *Haor* area. As a result, flash floods easily overtop the banks and create breaches at several locations on the submersible embankment. This floodwater usually comes into the *Haor* very early in the monsoon season and farmers do not have sufficient time to harvest their standing *Boro* crop (BWDB website).

Northeastern Bangladesh, especially Sunamganj, Sylhet and Netrokona Districts, is one of the most economically depressed regions of the country. In my study area, I also found people from Sunamganj and Netrokona Districts who could not grow their principal '*Boro* Crop' due to flash floods and eventually migrated.

A Focus Group Discussion (FGD) was organized with four flash flood-induced migrants. Those who migrated due to flash floods were mainly from Sunamganj and Netrokona Districts. Literatures also support that these areas are prone to sudden flash floods (IFRC-BDRCS, 2010). Flash-flood induced migrants described their vulnerable condition during the devastating flash floods in their places of origin. All of them were farmers before migration. They used to produce *Boro* crops but sudden flash floods destroyed their agricultural land. They experienced the death of their neighbour, who slipped under the flood water and drowned. The event that pushed them to migrate was not new; for many years those areas were prone to flash floods but the frequency increased in last few years before they left, said the respondents

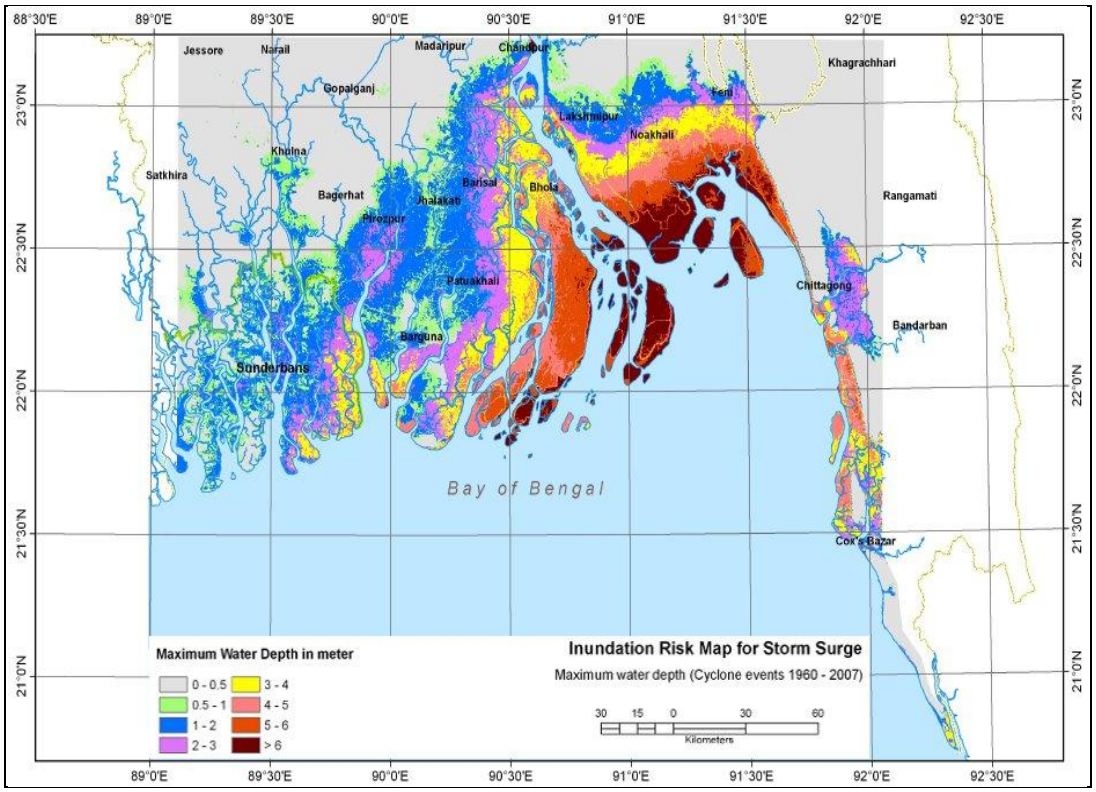
[9]*Haors,* derived from Bengali word for 'sea', and large semi-permanent lakes formed in the actively sinking tectonic bowl-shaped depression commonly known as the Sylhet Basin, in part of the north-east quadrant of the country, which experience deep flooding in the monsoon rains every year (GoB, 2012).

[10] *Boro* is a winter-season, photo-insensitive, transplanted rice cultivated under low-lying residual soil moisture conditions with supplementary irrigation. This gives the farmers a chance to grow a winter season crop which normally they could not grow. This practice is emerging as a new cropping system by its spreading even to those non-traditional areas where irrigation is available (Lal *et al*., 2013).

(FGD:7; 19/09/2012). Continuous flash floods in north-east Bangladesh depressed the farmers and many started trying diversifying livelihoods. According to them, migration was 'the most necessary step' at that time in order to survive.

4.3.3 Cyclone and Storm Surges

In Bangladesh, cyclones and storm surges are two major causes of migration (Khatun, 2013; Dasgupta *et al.*, 2009). In spite of developing a good warning system over the years, Bangladesh faces cyclonic disasters on a regular basis in some hot spots which are concentrated mainly in the southern part of the country (Map 4.3).



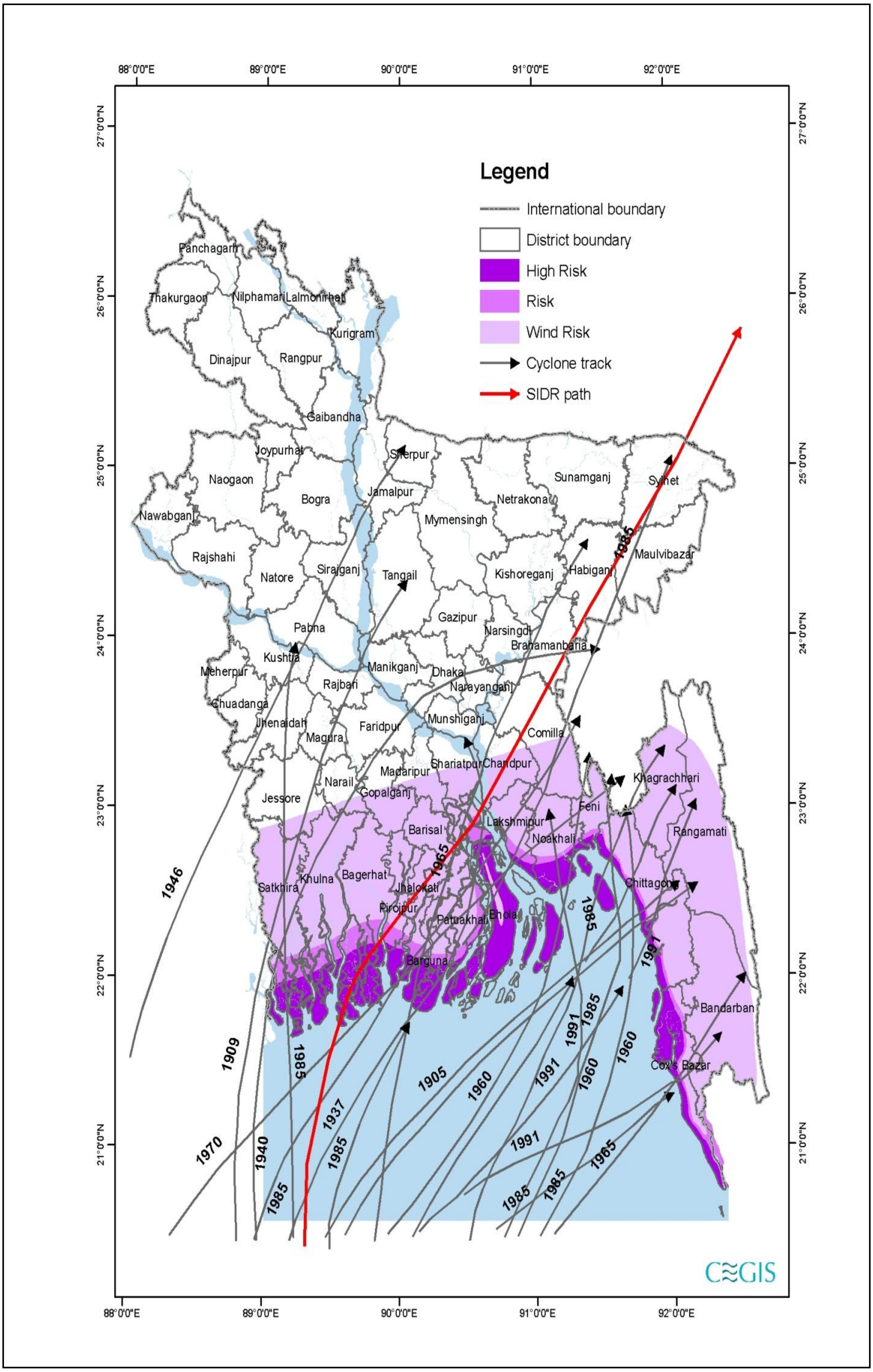
Map 4.3: Areas under the risks of storm surge in Bangladesh. Source: Disaster Management Bureau (DMB) Website.

There are 19 coastal districts in Bangladesh, of which 12 are directly exposed to cyclones and tidal surges (Siddiqui, 2011). Among the 26 major cyclones since 1970, 18 occurred in the last 20 years. About 19 million people were affected by these cyclonic storms. In the five years prior to commencing my research, there were two high intensity cyclones in the country. One was Cyclone *Sidr* of 2007 and another was Cyclone *Aila* of 2009. There is empirical research showing large scale displacements of people after these two cyclonic events (Gain and Ray, 2010; Roy *et*

al., 2013; Penning-Rowsell, 2013). However, literature also says that seasonal migration from cyclone-affected areas increased many times over (Akter, 2009; Gain and Ray, 2010). Descriptions of these two major cyclones of the country and associated experience of migrants are below:

i) Cyclone Sidr

On November 15, 2007, Cyclone *Sidr* struck the highly vulnerable low-lying coastal areas of Bangladesh with heavy rain, winds of up to 223 km/hr with a tidal surge of 6.1-7.6 m high, and a storm surge (Haq *et al*., 2012). Cyclone *Sidr* was rated as category 5 (the highest cyclone rating in Bangladesh), causing a storm surge of up to 5m across the low-lying coastal zones of the Southern parts of Bangladesh. It was one of the most devastating environmental disasters recorded in Bangladesh, with a death toll of 10,000 people (Hossain *et al*., 2008). The path of Cyclone *Sidr* has been shown in the following map (Map 4.4). The Joint Damage, Loss, and Needs Assessment (JDLNA) estimated the total damage and losses caused by the cyclone to be 115.6 billion Bangladeshi Taka (BDT) (US$ 1.5 billion) (GoB, 2008).



Map 4.4: Cyclonic paths in Bangladesh in different years. Source: CEGIS

Case Study 4.2: Shahenur Akter (Interviewed on 25/09/2012)

Shahenur Akter, 35, came from a wealthy family in Barguna District, whose migration was induced by Cyclone *Sidr*. She described what happened during the night of the cyclone. According to Shahenur, it was like the 'end of the world' situation when she lost her youngest daughter. Shahenur was holding the hands of her two daughters and the youngest one was in her lap. They were trying to float somehow in the water of a storm surge. Suddenly the baby slipped from her lap and she could not catch her as Shahenur was also holding her other two daughters' hands at that time. She cried out loud but no-one even heard her voice due to the disastrous cyclonic storms. Next morning, her youngest daughter Purnima (2) was found dead in a nearby garden.

Shahenur was a housewife and her husband used to be a farmer in the village. Shahenur used to rear chickens, ducks, goats and cows and she also used to sell eggs and milk regularly in the market. She knew handicrafts and on some occasions she also used to sell her hand made handicrafts in the market in order to buy more ducks and chickens. Livestock farming was her own business which she used to enjoy. However, after Cyclone *Sidr* in 2007, she lost her dearest daughter and all her livestock assets. Their house was totally destroyed by the cyclone. Eventually they took shelter in their relatives' home but her husband failed to re-establish an alternative livelihood in their village as agricultural lands were also destroyed. She also started suffering from mental trauma arising from her daughter's death (probably a form of post-traumatic stress disorder). Finally her husband decided that *''no more in Barguna, we need to move on''*. They had an uncle in Korail, Dhaka, where they finally migrated six months after Cyclone *Sidr*. Shahenur now works as a maid servant and her husband is a rickshaw puller and occasional day labourer in the city. Her children are also not attending schools. They have frequently suffered from jaundice and diarrhoea since coming to the city. According to Shahenur, she never thought that she would end up in urban slums. She declared her strong aspiration to return to her village.

This case study is typical of the target group of the research. Twenty five *Sidr*-induced migrants were found in the study area. They did not want to leave their ancestral homes but were forced to do so due to their inability to re-establish rural livelihoods and inability to repair their destroyed homesteads. More institutional efforts were necessary just after the disaster (Warner, 2010). It seems that, rather

than just giving them relief, more training was necessary to establish any alternative rural livelihoods and thereby increase their adaptive capacity (Turnbull *et al*., 2013; Mahmood, 2012). Lack of such institutional efforts along with their sudden poverty situation pushed them to the national capital, where their friends/relatives had migrated previously.

ii) Cyclone Aila

On the 27th May, 2009 almost 330 people were killed by Cyclone *Aila*, and at least 8,208 more were missing, while about 1 million people lost their shelters (Memon, 2012). The Government of Bangladesh confirmed a deadly outbreak of diarrhoea on the 29th May that year, with more than 7,000 people being infected and 4 dying. In Bangladesh, an estimated 20 million people were at risk of outbreak of diseases due to *Aila* (Wikipedia, 2013).

"Most latrines have been washed away, and there is serious pollution from sewage and dead animals. The threat of water-borne epidemics is very high, including cholera, which is endemic throughout this area. The supply of safe drinking water is reaching crisis levels. Hundreds of thousands of people are homeless, clustered into municipal buildings and schools, or are camping outside on higher ground"

- Website of Oxfam International, after Cyclone *Aila* (2009).

The above quote clearly reflects the hydro-geophysical condition of the post-*Aila* periods. There is empirical research documenting that large numbers of people migrated out after Cyclone *Aila* (Roy *et al.*, 2013; ECHO, 2009; Mallick and Vogt, 2012; Gain and Ray, 2010). Cyclone *Aila* displaced 76,478 families (UNDP, 2010). Nine months after *Aila*, almost 200,000 people were still reported to be without shelter (ECHO, 2009). The vast majority of such migrants became seasonal migrants as tidal surge covered agricultural land with saline water and employment opportunities became scarce in the local areas. However, people undertook long-distance migration between rural and urban areas. In most cases, Dhaka and Chittagong became the primary choices as destination of migrants because of better employment opportunities (UNDP, 2010; Wikipedia, 2013). Eleven *Aila*-induced migrants were found in the study area of this research. In a FGD session, the after

effects of Cyclones *Sidr* and Cyclone *Aila* were discussed in detail (FGD:5; 18/09/2012). Findings from FGD showed that their livelihoods, shelter and health conditions were the most affected aspects of their lives after the cyclones. Questionnaire survey also revealed the similar results (Figure 4.4).

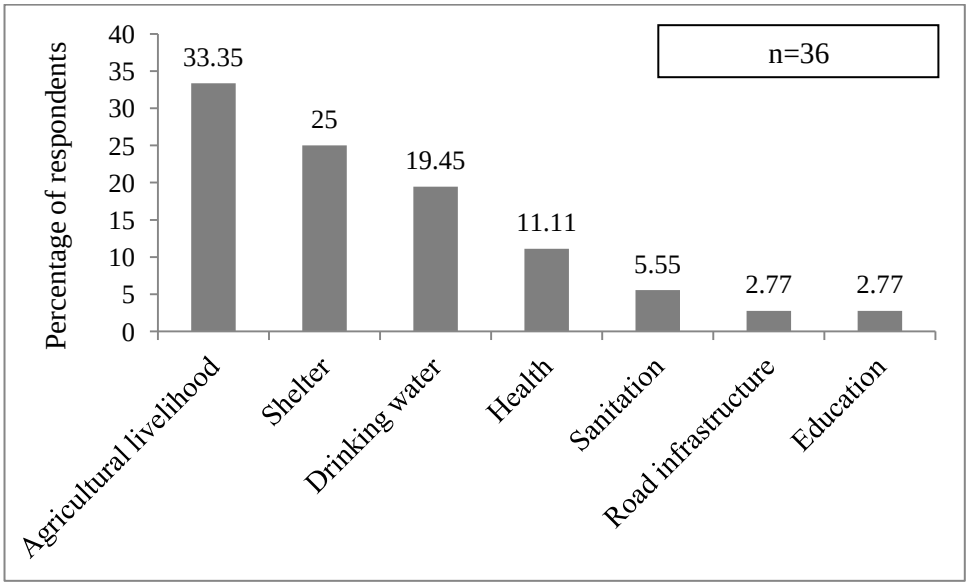


Figure 4.4: Respondents' perception about the most affected sector in place of origin after the cyclones. Source: Questionnaire Survey

Figure 4.4 is based on the perception of the respondents during the questionnaire survey who selected the most severely affected aspect after Cyclone *Sidr* and/or Cyclone *Aila*. The major problem after cyclonic disasters was identified as the destroyed agricultural livelihoods by 33% of the respondents. However, respondents also mentioned destroyed shelter (25%), pollution of drinking water (19%), disease outbreaks and/or malnutrition (11%) and poor or no sanitation system (5.5%) in their places of origin as the most severe problems in the post-disaster period.

The questionnaire survey also found that 65% of the cyclone-induced migrants suffered from waterborne diseases while staying in the cyclone shelters/ embankments. One respondent described how her nephew died from diarrhoea just after Cyclone *Sidr*. These factors together forced them to leave their ancestral villages and finally to move to big cities.

Respondents also described their experience of their stay at the cyclone shelters. 36% of the respondents took shelter at the cyclone centres, 50% took shelter on the

embankments and the remaining 14% were living in their relatives' homes before migration. School buildings were used as cyclone centres after the cyclones, though the floor area was not sufficient to serve the whole affected population.

According to the focus group participants, cyclone shelters were densely populated, without electricity and proper sanitation facility (Dasgupta *et al*., 2010). Families took shelters with their domestic animals and the smell was unbearable. Women specially reported their inhuman conditions while staying in the cyclone centres. They experienced birth of a child in the crowded cyclone shelters and also several miscarriages (see Section 7.2.2 (ii) of Chapter Seven for more details). However, the above discussion shows that the cyclone-affected people mainly moved to Dhaka as a result of their destroyed shelters and the ineffective institutional efforts to assist the victims.

4.3.4 Riverbank Erosion

Northwestern Bangladesh is particularly prone to riverbank erosion (Photo 4.1) and this part is also one of the most economically depressed regions of the country (Abrar and Azad, 2004) (Map 4.2). Reduced income opportunities, lack of adequate productive land, and inadequate food production are some common and immediate consequences of riverbank erosion.

Photo 4.1: Illustrative picture of typical riverbank erosion in Bangladesh.

Source: The Daily Star, 2014.

In Bangladesh, riverbank erosion-induced migration is very common and the rate of erosion is expected to increase in the coming years (Akter, 2013). On average, while 10,000 people annually become internally displaced due to riverbank erosion (Abrar and Azad, 2004), about 1 million people become directly affected by this event in forms of destruction of property and livelihoods (Siddiqui, 2011).

Among the total sample of climate-induced migrants in Korail, 12.5% had migrated mainly due to riverbank erosion. It is important to mention here that almost all the riverbank erosion occurred following local floods. Therefore, flood also worked together along with erosion as a cause of migration. The type of erosion-induced migration is generally permanent as the particular event destroys people's productive assets. In this research also the impact of riverbank erosion was disastrous and all the affected migrants lost their homesteads and migrated to Dhaka.

Case Study 4.3: Rashid Alam (Interviewed on 07/12/2012)

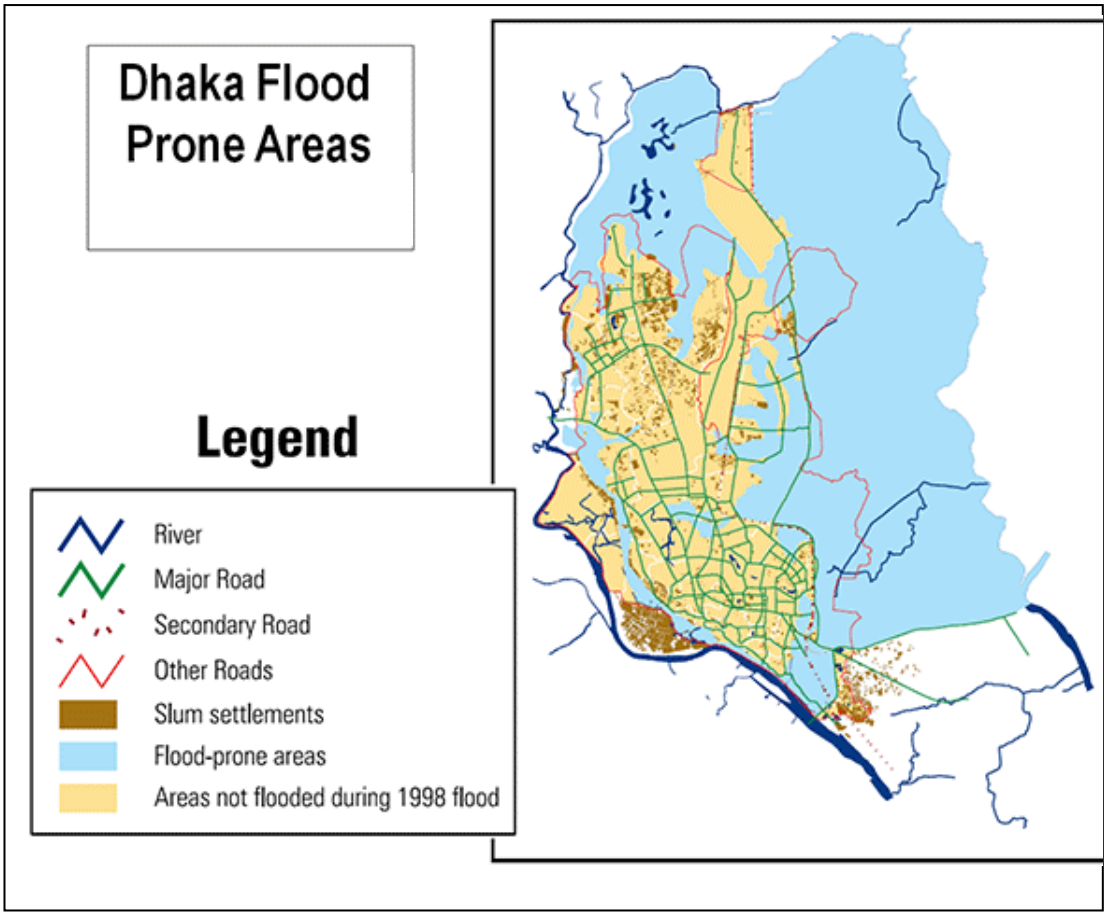
Rashid Alam was a farmer in Barisal district and used to live in his own house. His wife Rowshan-Ara used to be an egg seller in the local market. Rowshan used to maintain a small household-scale poultry enclosure where she had chicken, ducks and pigeons. According to Rashid, they were previously a 'happy family' with four children. Their situation changed when in 2009 Rashid lost his own agricultural land due to river bank erosion. After the event, he started working as a wage labourer on other people's land. Recently in 2011, erosion engulfed their house along with all the fruit trees and poultry infrastructure they had. Overnight they became destitute with four little children. They started living in their relatives' homes but could not continue living in other's house as they had already a big family. *"I knew that one day my ancestral house will be under water, but I never realized that this could displace us from our village"*- said Rashid. Rashid and his family tried to secure alternative livelihood in their village and nearby areas but most infrastructure were destroyed due to recent floods and river bank erosion. Finally they migrated to Dhaka in 2012. Both he and his wife are now day labourers in the city.

The above case study (Case Study 4.3) stated some common features of the riverbank erosion-induced migrants in the study. However, so far the sections in this chapter highlighted the experience of climate-induced migrants before migration. Now the following sections will describe their experiences regarding environmental hazards after migration.

4.4 ENVIRONMENTAL HAZARDS EXPERIENCED BY CLIMATE-INDUCED MIGRANTS IN DHAKA CITY

Research shows that, because of large population density and huge infrastructural investment, cities are especially vulnerable to climate-induced extreme weather events (UN-HABITAT, 2004; Balica *et al*., 2012) (see Section 2.7.1 and 2.10 of Chapter Two). Low Elevation Coastal Zones are more vulnerable to climatic impacts such as increased rainfall, flooding and cyclonic storms than to any other places (Huq *et al.*, 2007; McGranahan *et al.*, 2007). As already mentioned in Chapter Three (Section 3.3.3), with an urban growth rate of 4% annually and with a population of 14 million, Dhaka is one of the fastest growing cities in South Asia. Dhaka City is also the major destination of the target group of the research and is also one of the most vulnerable cities in the world to the impacts of climate change (WWF, 2009). According to the literature, Dhaka City is highly vulnerable to flooding, waterlogging and heat stress (Map 4.5) (Alam and Rabbani, 2007; UN-HABITAT, 2009b).

The following map (Map 4.5) shows the flood proneness of Dhaka and also shows the slum settlements throughout the city. As slums are considered to be the ultimate destination of the poor migrants (Awumbila *et al*., 2014), this research chose the slum areas of the city to be the study site of the research. Slums in the city are generally situated along canals or lakes and therefore more vulnerable to flooding, waterlogging and other health-related hazards (Jankowska *et al.*, 2011). According to the literature, 60% slums of Dhaka City have no drainage system (CUS, NIPORT and MEASURE Evaluation, 2006). This condition easily creates drainage congestion which ultimately causes waterlogging throughout the low-lying areas of the city (Adri, 2006). However, adding up more migrants each year due to climatic disasters is making the slums more susceptible to urban flooding and waterlogging due to encroachment into the natural canals.



Map 4.5: Flood-prone area of Dhaka City. Source: BCAS, 2007

Study Area: Korail Slum

As already mentioned in the Section 3.3.3 (i) of Chapter Three, Korail is the biggest slum in Dhaka City (Photo 4.2) (Angeles *et al.*, 2009) and surrounded by the wealthiest part of the capital- Banani and Gulshan. The slum is situated on approximately 110 acres of land, adjacent to the Gulshan Lake. The land on which Korail stands is owned by three government agencies. The population is more than 120,000 in Korail with almost 24,000 families living there (DSK, 2010).

Korail slum has been developed with thousands of tin shade houses along the Gulshan Lake (Photo 4.2). The pollution and encroachment of the Gulshan Lake by the slum dwellers is a major cause of several eviction attempts by the government (see Section 7.2.2-x of Chapter Seven). The following photo clearly shows the slum's housing density and its proximity towards Gulshan Lake.

Photo 4.2: Korail slum in Dhaka City, Bangladesh. Source: Field Survey

After coming to Dhaka City, most of the climate-induced migrants followed their friends or relatives into Korail. 43% of the climate-induced migrants reported that they were previously in other slums in Dhaka but eventually relocated to Korail following evictions.

The following sections will discuss how environmental hazards in Dhaka City affect the climate-induced migrants. However, this research deals only with the poor climate-induced migrants as it did not consider wealthier people in the city and as it worked only in slum areas. Therefore, when climate-induced migrants will be mentioned, it will mainly refer to poor climate-induced migrants.

The impacts of urban floods, waterlogging and heat stress (the most common hazards in Dhaka City) on this specific group have been discussed below in detail. However, these city based hazards have not been identified only from the secondary sources (Alam and Rabbani, 2007; UN-HABITAT, 2009b) but also, during FGDs, respondents identified these three hazards currently as the most severe.

4.4.1 Floods in Dhaka City

Dhaka city experienced exceptionally heavy floods in 1988, 1998, 2004 (Reid and Sims, 2007) and also more recently in 2007. Apart from these extreme events, the low-lying areas of Dhaka (especially the slums) are flooded each year during the monsoon period. The duration of flood in 1998 was nearly two months, making it the longest flood in the history of Dhaka City up to that time (Nishat *et al.*, 2000). According to the respondents of this study, this particular flood affected the Korail slum as well in a devastating way submerging most of the houses. The flood started on 22 July and continued for 65 days. The city's piped water supply was found to be contaminated by coliform bacteria (Haque *et al.*, 2010).

There was a catastrophic storm water flood in 2004 in Dhaka City. The flooded area was smaller than during the previous floods but it severely affected urban infrastructure. All government offices were declared closed in Dhaka for the peak period of the flood. Nearly all main roads were under water (BBC News, 2004). Electricity disruption also occurred due to inundation of power grids. The urban poor suffered greatly as most of the city slums were under water. A large number of houses were damaged. Due to the poor sanitation system flood water had been mixed with congested sewage which gave rise to waterborne diseases (Rahman *et al.* 2005). During the flood of 2004, the prevalence of diseases increased greatly. These diseases included diarrhoea, dysentery, acute respiratory infection, fever, skin diseases and eye infections (Alam and Rabbani, 2007).

The 2007 flood occurred mainly due to rainfall in the upper catchments of the Ganges, the Brahmaputra and the Meghna rivers. The average rainfall plot for the month of July showed that the rainfall was higher in 2007 than the two previous years (Islam *et al.*, 2008). This excessive rainfall was accumulated and carried downstream. The flood of 2007 had an adverse impact on the city dwellers' health. Due to inundated and contaminated drinking water supply, waterborne diseases spread quickly in Dhaka City. During August 2007, the cholera hospital received and treated about 21,500 patients with cholera, rotavirus and typhoid- sometimes at a rate of more than 1,000 per 24 hours, which was the highest number of patient-admission in the 40-year history of ICDDRB (International Centre for Diarrhoeal Diseases Research Bangladesh) (ICDDRB, 2007).

All the above statistics demonstrate Dhaka City's vulnerability to flood hazards, which was, in most of the cases, unknown to the newly arrived climate-induced migrants when they arrived in the city. Thirty seven respondents among the eighty climate-induced migrants in my research migrated before 2008 and they described their experiences of floods in the city (because after 2007, Dhaka did not face any major floods). Separate focus group discussions (six participants) have been conducted with the flood victims in the city. Respondents mentioned that floods in the city were very much unexpected to them. '*Flood again!'* was the common reaction of the migrants who had already been affected by floods in the past in their villages. This group had some previous experience of coping with floods, but this time they had no idea where to go next:

"Everything we brought in the city was immediately washed away by the floods of 2007. It affected our level of confidence and lead to a greater extent of uncertainty"

- said Abu Motaleb, one of the climate-induced migrants from Barishal District (FGD: 6; 18/09/2012). 'Where to go next?' was the common question in the mind of almost all the climate-induced migrants in the city during the flood periods in Dhaka. A questionnaire survey was also used to understand their experiences during floods in the city. Respondents were asked about the main problems they faced during urban floods and 37 climate-induced migrants were found who had the experience of floods sufferings in Dhaka. the results are given in Figure 4.5.

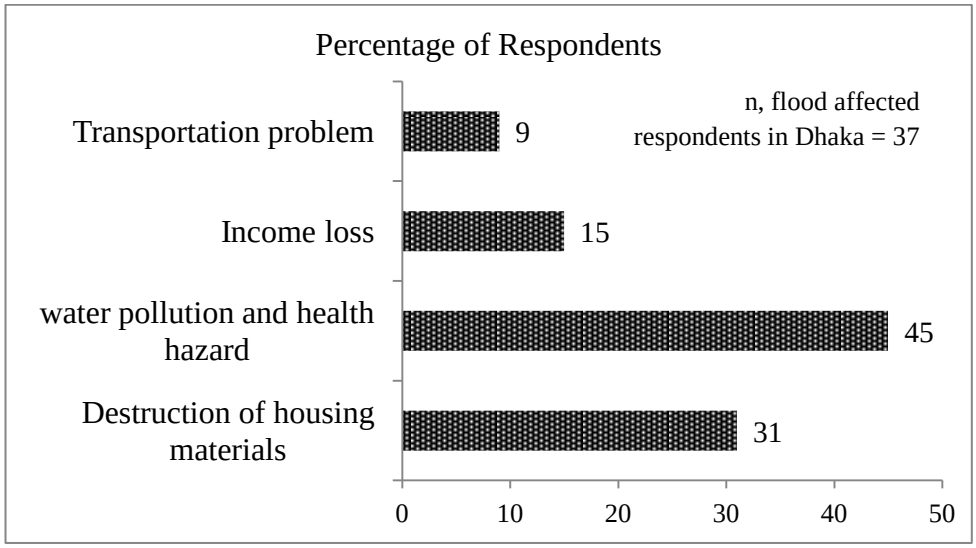


Figure 4.5: Main problems experienced by the climate-induced migrants during recent floods in Dhaka City. Source: Questionnaire Survey

Figure 4.5 shows how floods in the city affected climate-induced migrants' wellbeing. Flood affected climate-induced migrants (n=37) complained mainly about health problems (45%) and house destruction (31%) at times of major floods in the city. Consequent income loss (15%) and transportation problems (9%) were also reported by the respondents as the major problems faced during floods in Dhaka. Respondents also complained about gender-specific problems which did not emerge very clearly from the questionnaire survey but focus groups helped to understand this dimension to some extent. Women in the FGD described their sufferings regarding their inability to attend to personal hygiene in private in a culture with very strong norms of modesty. They also reported the incidence of increased miscarriage in the slum during the flood period (FGD: 10; 22/11/2012).

After the flood, what few possessions the respondents had were in the form of house structure, such as pieces of roofing iron and scrap timber; furniture such as beds and tables. As most slum-dwellers used to work locally, they also lost the ability to earn income for extended periods.

BRAC and the Grameen Bank were two major NGOs which provided relief to the affected slum dwellers during the floods of 1998, 2004 and 2007. Other social welfare and volunteer organizations also came forward. However, the government's role was criticized by the respondents. Most of them think that the government has better relief coverage in the rural areas than in the city. The reason behind this statement was that they at least received some food items from government as climate victims while staying in the climatic affected area, but once they entered the city, no one helped even with a taka.

However, as most of the climate-induced migrants in this study migrated after 2007, the major environmental hazard they face in the city is 'waterlogging'. Waterlogging is a regular phenomenon in the city slums mainly due to drainage congestion. Sufferings related to waterlogging are described below.

4.4.2 Waterlogging in Dhaka City

As said before, Dhaka City is a popular destination for migrants from all over the country (see Map 4.1). Therefore the built-up areas are increasing day by day and the retention ponds and lakes are being filled up by the building development agencies. At times of extreme rainfall, the limited number of lakes cannot contain all the excess water and overflows create regular waterlogging (stagnation of water) in the city during monsoon periods (Adri, 2006).

Photo 4.3: Waterlogging in Korail after a ten minute rain storm.

Source: Field Survey

The low-lying slums are more prone to the problem of waterlogging as the drainage systems are relatively poor there. Even modest rainfall now creates waterlogging in the slums of Dhaka City (Photo 4.3). Waterlogging due to heavy rainfall is recognized as a major city-based hazard by the respondents. Almost 26% of respondents said that waterlogging is the main environmental problem in the city. During rainy seasons, they suffer the most as water cannot drain out from the area and stays for up to four days, on average. Interestingly, they termed waterlogging as 'floods' during FGDs.

"If we could afford a better place in the city, probably we could avoid this urban flooding (waterlogging). But unfortunately we always have to deal with floods, irrespective of our location"

- said one of the climate-induced migrants from Mymensingh District (Hasina Begum; FGD: 2; 12/07/2012). It reflects the fact that this group generally takes shelter in the most vulnerable low lying places in big cities which again makes them

vulnerable to different types of environmental events like 'small floods' or 'waterlogging'.

The impact of waterlogging on the slum dwellers is huge. *"The water of drainage congestion is not clean"*- said the respondents (FGD: 2; 12/07/2012). This dirty water is the breeding ground of mosquitoes. Mosquitoes and the garbage flowing with the clogged water are the major causes of disease outbreaks in Korail slum. Respondents in the FGDs complained about increased waterborne diseases during the extreme waterlogged period, especially in rainy seasons. Literature also supports this statement as hospital admissions of people with diarrhoeal disease increase during both high and low extremes of rainfall in Dhaka City (Dodman, 2008).

Finally respondents reported the sanitation problem during waterlogged period in the slum. It is evident from Figure 4.6 that climate-induced migrants have to cope with sanitation problems both before and after migration and their situation has not changed much in the city.

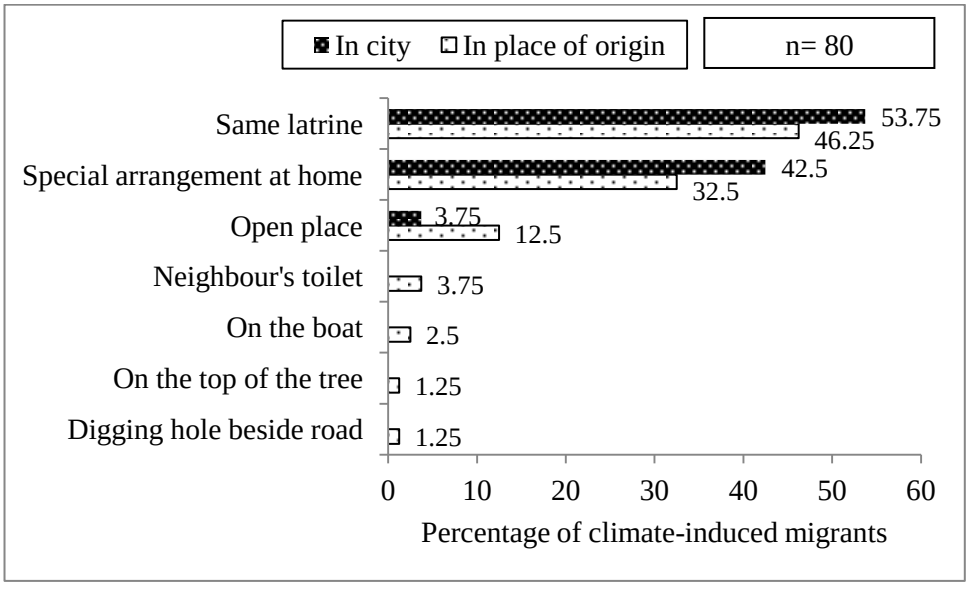


Figure 4.6: Sanitation practices during waterlogging/floods.

Source: Questionnaire Survey

From my questionnaire survey, it was found that residents still have to make special arrangements before defecation during extreme environmental events (42.5%). Such special arrangements include defecating inside home on a big piece of leaf/paper/polythene. Around 4% of the climate-induced migrants said they defecate

in an open place at times of extreme environmental events in the city (Figure 4.6). However, the largest proportion of respondents (53.75%) said that during waterlogged conditions they use the same latrine that they use during dry season, though in most of the cases the pit remains full of water which eventually overflows and makes the community more vulnerable by spreading water- and vector-borne diseases. No respondents mentioned any innovative technology which could help them to cope with the stagnant water such as heightening the ground of the latrine. According to them, DSK (Dushtha Shasthya Kendra) is an organization which helps its members to improve their latrines in Korail. The research found that 16% of the target group are the members of DSK and 80% of those members are now having pucca latrines.

4.4.3 Heat Stress in Dhaka City

The temperature of an urban area is generally more than that of the surrounding peri-urban and rural areas. One of the fundamental components that distinguishes a city from the rural areas is the urban climate. In urban areas, the paved surfaces have generally replaced previously natural landscapes. Therefore, solar energy is absorbed into roads and rooftops, making the surface temperature of urban structures to become 50-70°F higher than ambient air temperatures (Taha *et al.*, 1992).

According to the IPCC (2012), the heat waves will increase in length, frequency and/or intensity over most land areas in the future. According to IPCC's Fourth Assessment Report (2007), the whole Asia is likely to warm this century and the warming in South Asia is likely to be above the global average, up to 3.3ºC. Literature says that overall the temperature is increasing over the whole of Bangladesh (the rate of max temp is +0.028°C/year) concurrent with the global temperature increase (Sarker, 2009). Dhaka may also face 'heat island' problems, because temperatures in the city are a few degrees higher than in surrounding areas (UN-HABITAT, 2009a). On 26th July 2009 Dhaka also faced the highest temperatures in 14 years with a 'blistering' 38.7º Celsius (Khan, 2010); this was exceeded only on 24th April 2014, when the thermometer recorded 40.2º Celsius, the hottest day in 54 years (Bangladesh Meteorological Department, 2014).

Altogether 59 respondents (73.75%) in Korail said that excessive heat is the main environmental problem they now face. In contrast, only 2.5% of the respondents mentioned it to have been the main problem in their places of origin. All of the respondents reported that Dhaka City has a relatively higher temperature than that of their places of origin. While asking about the main problems they face due to high temperature in the city, almost 45% reported "becoming faint" as the major problem. Decreasing working efficiency was the next most severe problem due to high temperature (20%), according to the respondents. Major problems faced by the respondents due to high temperature in the city are given below (Figure 4.7).

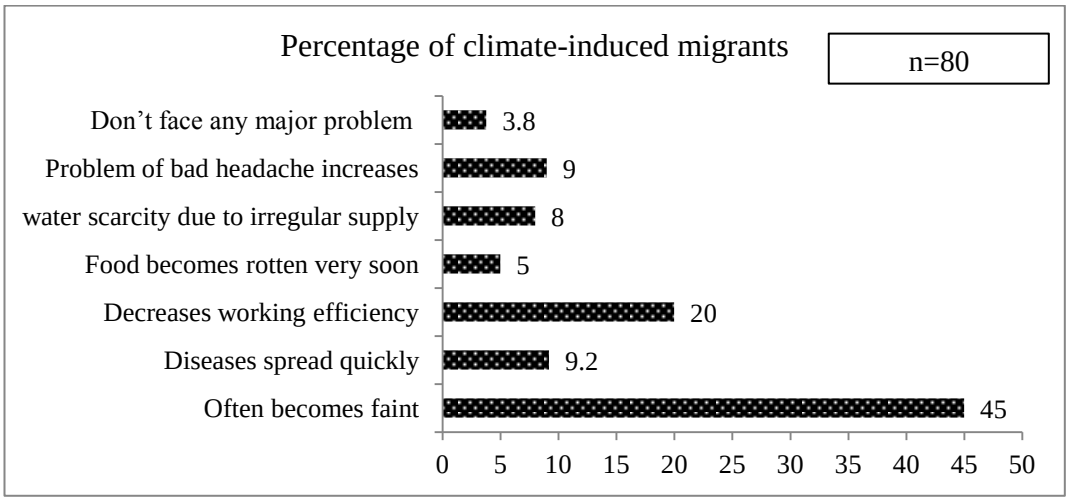


Figure 4.7: Problems faced due to high temperature in the city.

Source: Questionnaire survey

The questionnaire survey also revealed that the respondents lose 2.47 hours of working time on average at times of extreme summer heat. Respondents were also asked about the utility-related problems in the extreme summer. Responses were similar from everyone that they face increased load shedding during hot summer days. Some also said that water supply is irregular in the summer (28.7%), some complained about having hot water supply and others said they have to spend more money in order to purchase water due to irregular supply in the summer (see Figure 4.8).

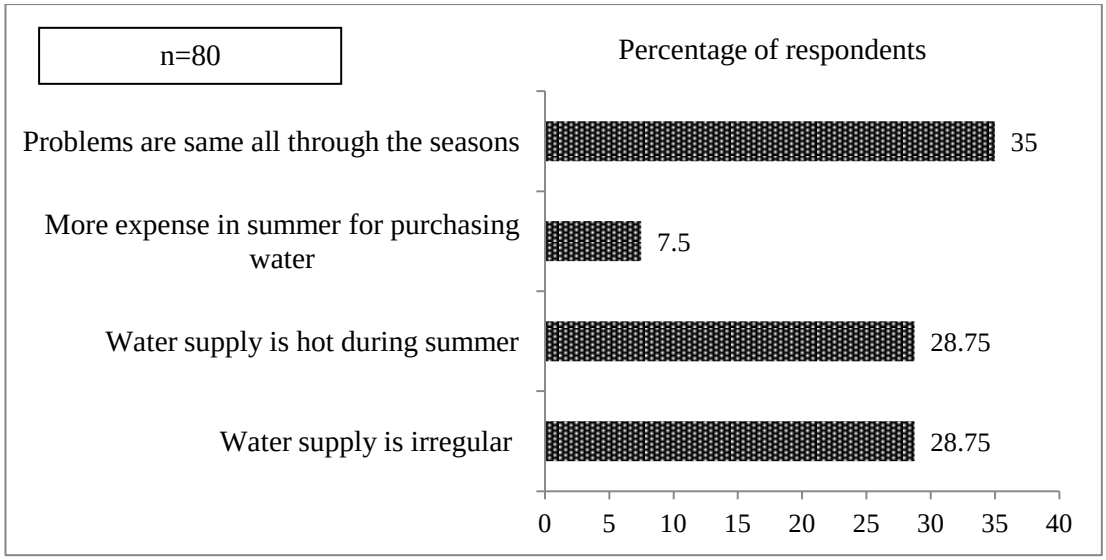


Figure 4.8: Problems faced regarding drinking water in extreme summer days.

Source: Questionnaire Survey

Heat stress is a particularly major problem for the Korail slum dwellers as they mostly live in tin shed houses (77%). The tin sheds make the dwellings hotter during hot summer days. It becomes very uncomfortable inside the houses and people generally cope with the heat stress by taking rest under the shade of a tree or sitting at a roadside tea stall. However, 46% of climate-induced migrants have said that they get out of their house during very hot summer days in search of comfort as it becomes impossible to stay inside due to scorching sunlight induced temperature (see Section 7.2.2 (iv) of Chapter Seven for more details on the problem of extreme temperature in the city).

4.5 EXPLORING ADAPTATION STRATEGIES BY CLIMATE-INDUCED MIGRANTS

Though Myers (2011) said that slum dwellers often show significant adaptive capacity, the target group was less likely to have such strength. As the target group of the research was exposed to new environmental problems in the city, their preparation to face those new hazards was not enough. During the household questionnaire survey, their houses were found to be in a dilapidated condition with either broken windows or defective roofs (see Section 5.2.5 of Chapter Five). 96.2% of the climate-induced migrants reported that they regularly face rain water intrusion

into their homes but rarely took any steps other than covering the roofs with polythene. Their lower income and limited contacts in the city also prevent them to make necessary repair of their houses and therefore they suffer in the rainy season to a great extent.

Along with their lower income (see Section 5.2.2 of Chapter Five), their non-owner status (97.5%) was also a constraint for building resilience in structural adaptation. Previous research also shows that individuals are less likely to invest in long term adaptation measures if they are not house owners (Roy *et al.*, 2013). Housing adaptation strategies of the Korail slum dwellers have been mentioned in IPCC AR5 WGII report (IPCC, 2014), but as climate-induced migrants are very poor and mostly non-owners, they have been unable to make such adaptations themselves.

Also, migrants are less likely to invest in long-term adaptation measures when threats of eviction loom over them (Moser *et al*., 2010). Fear of eviction is a major problem in Bangladeshi urban slums and the eviction of 2012 forcibly removed around 2000 families from Korail (DSK, 2012). For 33% of climate-induced migrants, Korail was not the first slum in which they had lived and they had been previously evicted from other slums in the city. Therefore, they don't feel able to build any substantial assets in the slum which can strengthen their adaptive capacity.

Community-based adaptations in urban areas have been studied by many researchers (Dodman and Mitlin, 2011; Satterthwaite and Dodman, 2009) which requires collective action through local skills and knowledge in order to build locally appropriate technology and collective participation in decision making. However, the newly arrived climate-induced migrants, having limited institutional affiliation (discussed in Chapter Five) and inadequate local knowledge/skills, cannot be easily linked with that process.

The lack of access to services is also an important factor in undermining their adaptive capacity. As the newly arrived target group cannot properly get access to potable drinking water, electricity and proper sanitation, they cannot easily adapt to the city-based health related hazards. They also lack knowledge and capacity required to cope with the new and unexpected environmental hazards in the city such as heat stress and drainage congestion. Therefore, their action to reduce the adverse environmental impacts is not always enough. A research project on Korail slum

(Jabeen *et al*., 2010), which is also cited by IPCC (2014), showed that the slum dwellers in Korail generally respond to flood risks in unique ways such as building barriers across door fronts, increasing height of furniture, building floors/shelves above the flood level, constructing false ceilings to reduce home temperature and having advantage of portable cookers. This research did not find any personal attempt from the target group to renovate their housing structure in an environmentally friendly manner like the above example. Rather the present study found some personal level initiatives or coping strategies such as increased use of fans to have comfort during hot summer days (limited to the 12.5% of the climate-induced migrants) and using buckets and polythene to protect their walls and roofs (see Section 6.3.5 of Chapter Six). Therefore, this research only found some coping strategies practised by the respondents which rarely fit into the broader context of adaptation.

4.6 CONCLUSION

The research found climate-induced migrants from various locations around the country and Korail proved to be a major destination for such migrants. The chapter has highlighted the environmental events that triggered the target group's migration decisions and also their environmental conditions after migration. Some of the environmental hazards were found to be comparable in both their places of origin and destination. Flood, cyclone and riverbank erosion were three major climatic events those were responsible for their migration. They did not migrate due to a single event; rather these climatic events occurred repeatedly in their localities and weakened their socio-economic condition in the society. These events destroyed their assets and made them poorer than ever before. Finally a big flood or cyclone pushed them to cross the tipping point of migration decisions and they eventually migrated to survive.

In the city, in addition to floods, they also became exposed to drainage congestion, extreme temperature and associated heat stress. About 98% of the climate-induced migrants said that they don't know where to go if another catastrophic flood affects the city again in the future. This is probably due to the fact that most of the respondents (89%) have no way of going back to their villages as they don't even

have the land or the shelter to live in their place of origin (their destroyed and current assets have been discussed in details in the next chapter).

One of the important findings of the chapter was that the climate-induced migrants received better relief support while in their places of origin than in Dhaka City. Once they entered the city, they have been considered as the general urban poor in the slum. Government never recognized their special vulnerability to the impacts of environmental hazards. No doubt, this group needs special assistance in order to build adaptive capacity in adverse environmental conditions. For this, both government and NGOs should come forward.

From the FGDs and questionnaire surveys it was clear that the environmental hazards in the city were unexpected for the newly arrived climate-induced migrants. Their livelihoods in the city are also constrained by the extreme rainfall, heat stress and prolonged waterlogged conditions. Their health is also at stake due to increased water- and vector-borne diseases. As this group never aspired to leave their ancestral village, but was compelled to do so, they were unaware about the way (and the hazards) of city life and that became the major problem for them to adapt to the new environment. These new hazards like heat stress, increased mosquitoes, extreme rainfall and associated waterlogging lowered their confidence level. It can be said that no other groups of migrants have been affected so severely by climate and environmental factors at both their origin and destination. Hence this group needs to be treated differently and should be brought under separate institutional plans.

CHAPTER FIVE

SOCIO-ECONOMIC CONDITIONS OF CLIMATE-INDUCED MIGRANTS BEFORE AND AFTER MIGRATION

5.1 INTRODUCTION

This chapter focuses on the socio-economic conditions of the climate-induced migrants in Korail slum both before[11] and after migration. Socio-economic status refers here to the condition of livelihoods, asset base, food security and health condition of the selected climate-induced migrants. All four elements will be discussed and will be compared in the pre- and post-migration contexts. This chapter is based principally on primary data from interviews with the respondents in their destination, supplemented by secondary information as appropriate.

The main argument of this chapter is that the livelihood, asset, food security and health conditions of the target group of the research have changed to a great extent since migrating to Dhaka City. These changes will be discussed in relation to the respective indicators. The chapter will also explain how the climate-induced migrants cope with their changed conditions.

Indicators have been selected for all four categories. However, although asset, food security and health ultimately form parts of livelihoods, they will be discussed separately in this chapter in order to provide a more disaggregated and nuanced analysis. This chapter analyzes people's conditions of livelihoods, assets, food security and health both before and after migration and also understands how they are coping with the changing situation in an urban context. Finally the governance structure and national policies have been analyzed in order to understand their impacts on the socio-economic conditions of the target group of the study. The indicator-wise analysis is given below.

[11] 'Before migration period' in this chapter mainly refers to the period before the specific disastrous climatic event that pushed them to migrate.

Table 5.1: Indicators of socio-economic conditions of the climate-induced migrants in Korail slum

Categories of socio-economic condition	**Indicators**
Livelihoods	Types of occupation Income Expenditure Savings Unemployment Energy security Housing condition Recreational and spiritual facilities
Asset base	Education Networks Contacts Skills Access to credit Physical and financial asset
Food security	Availability of food Access to food Utilization of food
Health	Types of diseases Frequency of diseases Access to health care services Treatment cost Coping with medical emergencies Quality of treatment Sanitation system Waste disposal system
National Policies and Governance: Discussed in detail to understand their impact on the socio-economic conditions of the poor climate-induced migrants	

5.2 LIVELIHOODS OF CLIMATE-INDUCED MIGRANTS

As discussed in Chapter Two, the concept of livelihoods is an effective tool to understand the lifestyle and the well-being of people, especially in developing countries (Bernstein *et al*., 1992; Carney, 1998; Davies, 1996; Rennie and Singh, 1996). Livelihood usually refers to a person's or household's means of securing the basic necessities such as food, clothing, shelter, education and health care (see Section 2.7.2 of Chapter Two). A livelihood is sustainable when it can cope with and recover from stress and shocks (Chambers and Conway, 1992), a characteristic now often termed resilience, especially with reference to climate change impacts. There are many different definitions of livelihoods, but Carney's comprehensive definition based on the work of Robert Chambers and Gordon Conway (1992) is widely used:

"A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base"

(Carney, 1998: 4).

In this section both rural and urban livelihoods of climate-induced migrants are examined. Generally the poor depend to a large extent on natural resources for earning their livelihoods through cultivation, collection or hunting and therefore rural livelihoods have been defined differently by the researchers. One such definition is given below:

"Predominantly the poor of the world depend directly on natural resources, through cultivation, herding, collecting or hunting for their livelihoods. Therefore, for the livelihoods to be sustainable, the natural resources must be sustained"

(Rennie and Singh, 1996: 16).

Since migrating to Dhaka, the climate-induced migrants have changed their livelihoods to a great extent and mainly joined the informal sector. Their livelihoods have been examined based on the indicators such as types of occupation, income, expenditure, savings, unemployment, energy security, housing condition, and

recreational facilities. These livelihood categories are not all-embracing, i.e. not the sum total of what livelihoods comprise but merely useful indicators. Each indicator has been analyzed based on the condition both before and after migration.

5.2.1 Types of Occupations

"*While urban and rural areas are distinct geographical categorizations in Bangladesh, there is less distinction between the rural and urban poor*"

(Banks *et al.*, 2011).

Before discussing occupations and income levels before and after migration, it is important to understand the characteristics of rural and urban poverty in the global South. Worldwide as many as 1 billion people live in informal settlements in urban areas and most of them lack infrastructure, services and official identity documents confirming their address and their right to live there (Mitlin and Satterthwaite, 2013). Bangladesh always has a rural-oriented national model of development and therefore, urban areas are neglected by the state itself. As a matter of fact, the respondents claimed that they had received better institutional support in their villages before migrating. This is again due to the fact that the national policies are mainly rural biased and both government and NGOs are active in eradicating rural poverty, with little attention towards urban poverty (Banks *et al.*, 2011).

Urban poverty is a distinctive feature of cities in Bangladesh and is characterized by poor living conditions with higher costs. This is different from the rural poverty in a sense that it is associated with many new and complex challenges. Such urban-based challenges are associated with the cost of non-food items such as house rent, payment of utility services such as water, sanitation, electricity bill. It also includes transport cost. In rural areas also, people have to bear such costs but the expenses are relatively lower than the urban areas (Mitlin and Satterthwaite, 2013).

However, occupational characteristics and income levels both before and after migration are important agenda of this research because it would help to compare their nature of poverty situation before and after migration.

Table 5.2: Types of major occupations before and after migration

Types of occupation	**Percentage of climate-induced migrants before migration (n=80)**	**Percentage of climate-induced migrants after migration (n=80)**
Rickshaw puller	2.5	23.75
Unemployed	0	21.25
Day labourer	12.5	20
Maid servant	3.75	18.75
Housewife	20	5
Garment worker	0	2.5
Shop keeper	0	2.5
Businessman	1.25	1.25
Office peon	0	1.25
Security guard	0	1.25
Hawker	0	1.25
Scavenger	0	1.25
Farmer	48.75	0
Fisherman	10	0
Student	1.25	0

Source: Questionnaire Survey

In the places of origin, the climate-induced migrants had been mostly farmers (48.7%), housewives (20%), day labourers (12.5%), fishermen (10%), maid servants (3.75%) and rickshaw pullers (2.5%) (Table 5.2). These were reported as their main but not their only occupations. Respondents used to farm in one season, and also

tried to adopt different occupations such as rickshaw pulling and daily labouring when farming was not possible during the agricultural off-season and/or when fishes were not available. Most of the respondents (84%) also said that they had their own livestock, which was also a major livelihood source.

According to the research findings, 58.8% were mainly involved in natural resource-based activities such as agriculture and fishing. This dependency on natural resources and seasonality made them more vulnerable to the impacts of climatic variability such as frequent flooding and cyclones, heavy and untimely rainfall. During the FGDs, the respondents were asked to list the probable causes of their livelihood loss. They identified frequent flooding as the most important factor, followed by frequent cyclones, loss of land through riverbank erosion, salinity intrusion into agricultural land, untimely rainfall and changes in temperature.

The data in Table 5.2 and Figure 5.1 also demonstrate how differently the climate-induced migrants have chosen their occupations in the city. Actually they did not have any choices; they had to do something to live and that's why they had been forced to do the low-paid jobs in the urban sector. As farming is not a viable option in Dhaka[12], most of them are now working as rickshaw pullers (23.75%), maid servants (18.75%) and day labourers (20%) in the city while a significant proportion (21.25%) remains unemployed.

[12] Dhaka is a densely built up city and urban agriculture is very rare due to unavailability of cultivable land. Only recently rooftop gardening has been started in the city, but that is also very limited in scale. Moreover, the urban agriculture of Dhaka cannot even meet the need of vegetable supply and Dhaka dwellers mainly depend on peri-urban and/or rural areas for the supply of vegetables as well as other food grains (Islam, 2004).

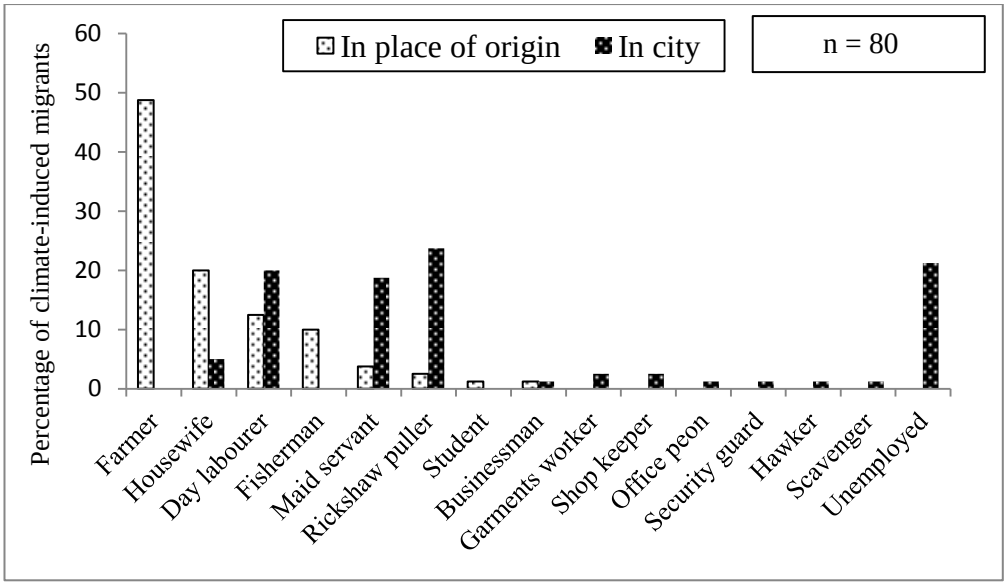


Figure 5.1: Changes in occupation before and after migration.

Source: Questionnaire Survey

However, in the city they also try to diversify their livelihoods in order to reduce vulnerability and spread the risk of income loss, since most of the jobs are insecure and incomes are variable. For example, during the rainy season it is difficult for day labourers to find work, so they start working as rickshaw pullers, maid servants or urban scavengers. As a matter of fact, their current occupations are still dependent on seasonality and in the city it is actually more difficult to diversify livelihoods as they have fewer contacts and assets to start a new occupation.

My questionnaire survey revealed that the climate-induced migrants are now mainly involved in low-paid urban jobs and that participation in relatively better-paid jobs like garments worker, office peon or security guard is minimal (5%).

In Bangladesh, the urban garment industry serves as a major pull factor for rural-urban migrants because more than 80% of the garments industries of the country are located in Dhaka (Jahan, 2012) and they employ large numbers of un- and semi-skilled workers. But only 2.5% of the target group in this research were involved in this much-desired garments sector. However, the poor climate-induced group is mainly involved in very menial and low-paid urban jobs which are the reflection of their low level of contacts, commitment to the way of urban life, skill as well as inadequate formal education.

The proportion of housewives among the climate-induced migrants is also lower in the city (5%) compared to the village (20%). The research distinguished unemployed people and housewives on the basis of their aspirations to become involved in the job sector. Housewives were considered to be those who wanted to take a break from work due to taking care of young children. However, after an interval, most such housewives also join mainly in the informal sector (FGD: 11; 22/11/12).

Finally, it can be said that, among the household members in the city, the females are generally working as day labourers, garment workers, maid servants and housewives. On the other hand, male members are generally day labourers and rickshaw pullers. According to the available literature, 19.1% of slum children (aged 5-14) are engaged in child labour in Bangladesh (BBS-UNICEF, 2007). However, in this research also several families (around 10%) of climate-induced migrants were found where children under the age of sixteen are rickshaw pullers in the city and also some reported that their children are working as hawkers, scavengers and/or day labourers in Dhaka.

5.2.2 Income, Expenditure and Savings

In their places of origin, it was not easy to calculate the incomes of the farmers. Apart from possible inaccuracies in their recollections, the income was estimated based on the total amount of crop they used to produce each year. Also some livestock assets used to give them a monetary return. All those factors were taken into account while calculating their rural income. The average household income was found to be 4000 BDT (US$[13]51.50) per month, which is less than their current income but expenditure in the village was negligible by comparison because they did not have to pay for house rent and utility services.

The target group had a mean household income of 5711.25 BDT (US$73.50) per month in the city at the time of my research. Their mean household expenditure in the city was found to be 5518.75 BDT (US$71) per month. Mean household savings in the city are 192.50 BDT (US$2.5) per month. Forty eight respondents out of 80 mentioned that they cannot save anything at the end of the month. Forty four respondents said that they have to take loans at the end of the month on a regular

[13] 1 US$ = 77.65 BDT on 23/05/2014

basis from friends and relatives. This amount of such loans varies from 500 to 1500 BDT (US$6.5-US$19). *Jaheda* and *Amena*, two of the climate-induced migrants, said that they have to choose begging occasionally when expenditure exceeds their income (see Section 6.3.1 of Chapter Six for more details on financial conditions).

5.2.3 Unemployment

In Bangladesh, many strategies have been taken so far to reduce unemployment. Micro-credit activities have been functional in many villages of Bangladesh and worked as a strategy to start a new livelihood and thereby reduce poverty (Saha and Rahman, 2006; Satterthwaite and Mitlin, 2014). However, the associated success was limited because of limited coverage and in some cases, misuse of the credit and lack of monitoring.

Underemployment is related to a situation when the employment of a person is inadequate to earn a livelihood in terms of hours of work, use of skills, income and productivity (Bangladesh Bank, 2008). After a disastrous cyclone, floods and/or riverbank erosion, disguised rural underemployment served as a major factor for many people taking migration decisions across the coastal areas of Bangladesh. But unemployment was never a problem in their places of origin before the disastrous climatic events as most of the climate-induced migrants in this study were self-employed. In contrast, unemployment was reported as one of the major problems in their destination: 62 respondents (77.5%) informed that they have the experience of remaining unemployed in the city. Day labourers informed that they have the record of consequent twenty days of unemployment on average in the rainy season. Reasons stated for being unemployed in Dhaka are shown in Figure 5.2.

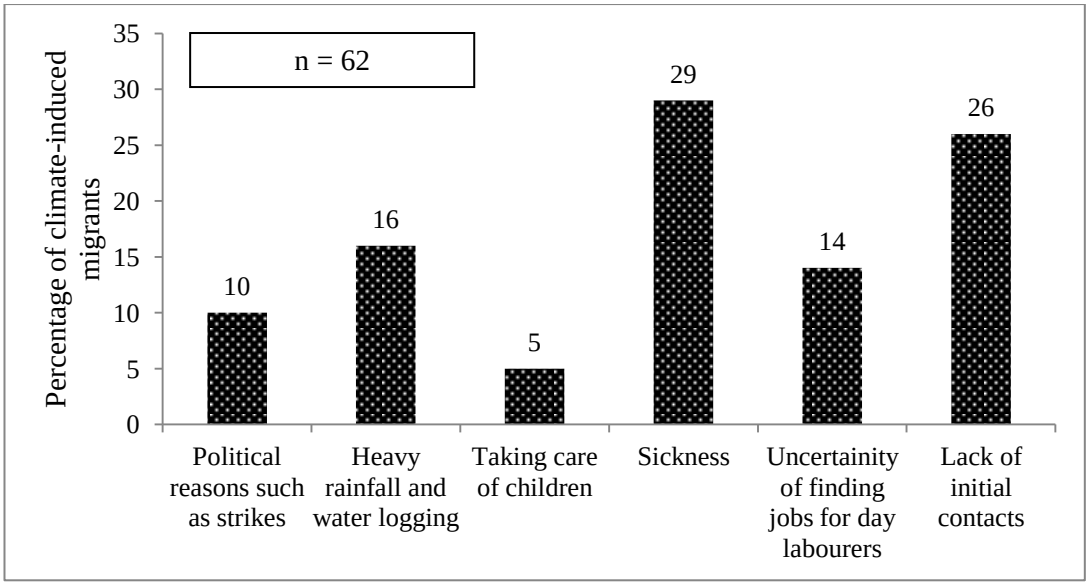


Figure 5.2: Reasons for unemployment in the city. Source: Questionnaire Survey

Sickness was accounted to be the major reason for unemployment in the city (29%) followed by lack of initial contacts just after migration (26%), heavy rainfall and waterlogging (16%), uncertainty of finding works for day labourers (14%), political reasons such as strikes (10%) and taking care of young children (5%) (Figure 5.2). However, during the fieldwork, almost 21.2% of the climate-induced migrants were found to be unemployed in Korail. As mentioned before, here unemployment was calculated excluding those who took a temporary break from work for taking care of children.

5.2.4 Energy Security

Two types of energy sources were necessary while the target group used to live in their villages: cooking fuel and the power to run irrigation pumps. "*We didn't have to worry about the cost of energy services; we used to get the service from nature''*, said one of the climate-induced migrants in Korail (Rahima Khatun; FGD:1; 12/07/12). The cooking fuels were generally obtained from their own livestock and trees. Some were also using irrigation pumps to provide water for agricultural lands, but not very regularly. 17% of the respondents had electricity in their villages but the cost was negligible because each household was limited to the connection of a bulb and a fan. They didn't have any cost for water supply as all of them had their own manually operated tube wells.

Photo 5.1: Cooking in Korail. Source: Field Survey

"Energy is one of the most costly services in the city"- said most of the climate-induced migrants. Energy services in the city are mainly related to cooking fuel and lighting. Result shows that 29% of the respondents have access to an illegal electricity connection, which offers very irregular and unreliable service. The charge is more than double the normal electricity bill for legally connected households due to the syndicate of some influential people who are involved in this illegal business. Also fewer electricity meters than required have been provided in the slum, often without the relevant accessories such as electric posts and cable connections (IDPAA, 2007). Those who are receiving illegal electricity reported frequent power cuts. This group informed that they used to enjoy more comfort in their villages in the summer time even without electricity.

There is no legal gas supply in Korail. Hence people use kerosene, wood, bamboo or straw for cooking. There are some points where people make illegal gas connections and those points are used as community kitchens. Most slum dwellers generally purify drinking water by boiling and not by any other means such as tablets or filtration. This is probably because of their lack of information and training related to health and safety. About 42.5% of the respondents said that they don't purify their drinking water as the fuel cost is high in Dhaka and it is difficult to have timely access in the community kitchens due to long queues. Respondents said that they spend BDT 800 (US$10) per month on average for energy services (gas, electricity and water bill), which is almost 14% of their average monthly household income and 6% of non-climate-induced migrants' average monthly household income. This is because the non-climate-induced migrants generally earn more (see Chapter Six for more details about non-climate-induced migrants).

5.2.5 Housing Conditions

Respondents reported having lived in a variety of housing types in their places of origin such as tin sheds, straw-built, mud-built and even concrete-built dwellings. Almost 93% of respondents said that their shelters were destroyed completely during the specific disastrous environmental events. However, prior to that, 95% of the respondents had their own houses. By contrast, in the city, house ownership is negligible (2.5%). Figure 5.3 shows the house ownership status of these migrants both in the origin (before specific environmental events) and in the destination.

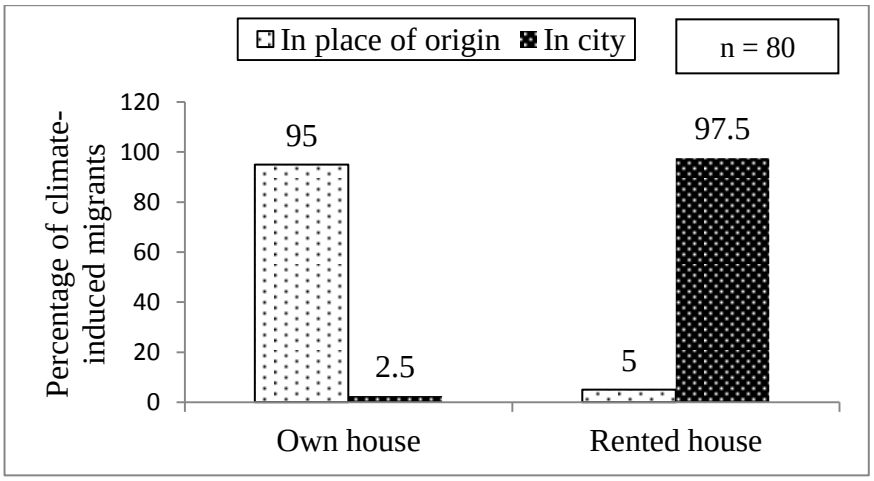


Figure 5.3: House ownership both in origin and destination.

Source: Questionnaire Survey

Literature showed that house ownership is an important factor in differentiating adaptive behaviour of households (e.g. Roy *et al.*, 2013). Climate-induced migrants' lower rate of ownership in the housing sector also weakens their adaptive capacity. They cannot easily take decisions targeting any innovative changes in housing structure which might have helped them to reduce the impacts of adverse environmental events. For example, one respondent informed that he cannot modify his housing structure (for example, increasing the height of the floor in case of flooding or replacing the tin shade) as his landlord is unwilling to allow this (FGD 2: 12/07/2012).

"I requested my landowner to fix it (the hole in the tin shade roof) in the last rainy season, but he was reluctant in taking any action. Currently we are trying to cope with polythene shades but that's not enough during heavy rains and stormy cyclones. Probably this time we will have to replace the tin shade by our own cost, although last year he (the landowner) didn't even allow us to do so"

(Al Amin, FGD 2: 12/07/2012).

Climate-induced migrants in Korail live in very poor conditions. Thirty-five percent live in the *Jhupri*s (dwellings made of bamboo, straw and polythene) along the bank of Gulshan Lake. Others generally live in tin shed houses with tin or bamboo walls. More than 33% of the climate-induced migrants use unhygienic hanging latrines in the city. Respondents have an average family size of five, who live in single-roomed houses in the slum. The average size of the rooms is 80 square feet. The arrangement of dwellings has no proper orientation and they are constructed in an unplanned manner (Sinthia, 2013). Korail lacks open spaces, and has a chaotic road network, with very little connection to the nearby main road (CUS, NIPORT and MEASURE Evaluation, 2006).

Photo 5.2: Typical housing with hanging latrine (left) in Korail. Source: Field Survey

In Dhaka, this group still experiences extreme weather events. Therefore, 43% claimed that their slum houses were destroyed due to cyclonic storms and/or excessive rainfall at least once. Again their limited power and capacity to repair the housing makes them more vulnerable to the impacts of social and environmental hazards.

5.2.6 Recreational and Spiritual Facilities

Recreational and spiritual facilities are an integral part of daily life. Respondents were asked to describe their leisure time before and after migration. Before migration they used to have more leisure time than now. Respondents said that in places of origin, they used to go to watch theatre dramas in groups and also used to organize events where local singers used to perform.

In contrast, most of the climate-induced migrants in Korail said that watching television in the roadside shops is their major source of recreation. Children generally play in the narrow streets and near Gulshan Lake, where the risk of drowning is very high.

According to the female respondents, leisure time decreased considerably after migrating to the city. *''We work all day like a machine, what will we feed our children if we enjoy leisure time*?''- said one of the female respondents (FGD:11; 22/11/2012). Lack of time for religious practices was another worry of this group. One female respondent cried out because she cannot maintain what she called ‘spiritual modesty' as before in Dhaka City. This modesty is related to social and religious norms.

5.2.7 Livelihood Coping Strategies

The respondents regularly have to cope with changing financial conditions in the city. As explained above, diversification of livelihoods is one of the most common strategies to face seasonal unemployment. Climate-induced migrants such as rickshaw pullers, day labourers and hawkers are generally involved in many jobs at a time in order to meet the high expenses of city life. This also helps them to face financial crises in case of any income loss from one source as long as they have another source of income – the principles of risk spreading and vulnerability reduction referred to earlier. But when all the income sources are closed simultaneously, people have to choose different strategies to manage their living expenses.

Almost 41% informed that they take personal loans during periods of urban unemployment (Figure 5.4). 'Eating less' is the next most common coping strategy during their days of unemployment. A female respondent said-

"We (5 members of the family) had to survive a whole week with only 1 kg rice. We cannot go to streets for begging also because our self dignity restricts us to do so"

(Aleya Banu; FGD: 2; 12/07/2012).

Other commonly used coping strategies during periods of unemployment were found to be buying on credit (13.24%), selling assets such as old jewellery (8.82%), getting help from others (8.82%), spending from savings (7.35%) and begging (1.47%). Only two respondents stated begging as their coping strategy. Begging is not favoured by most of the climate-induced migrants, probably due to their better socio-economic status before migrating to the city. They cannot easily become involved in any type of jobs which might undermine their self-dignity.

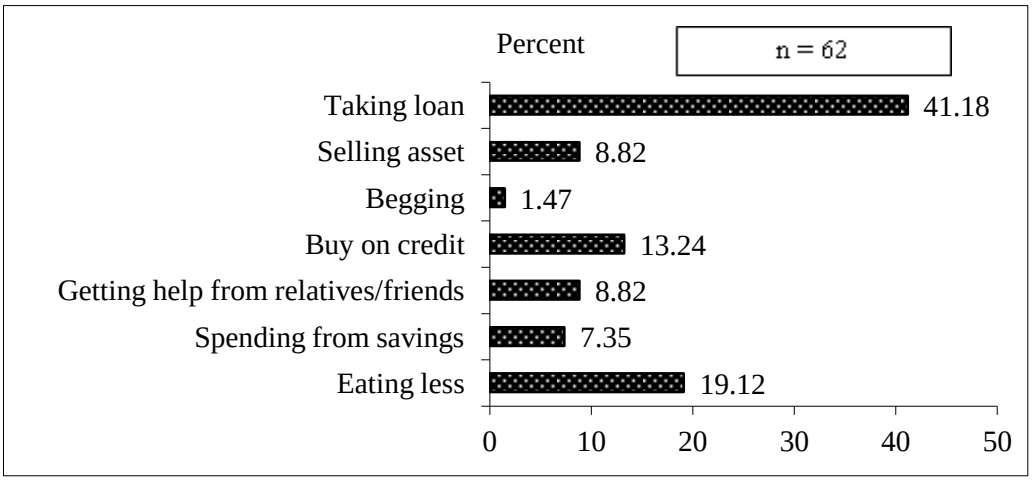


Figure 5.4: Adapted coping strategies while unemployed in the city.

Source: Questionnaire Survey

Unemployment in the city becomes especially difficult for the climate-induced migrants as they cannot easily depend on their rural source of income which is, however, possible for non-climate-induced migrants (see Chapter Six for more details on non-climate-induced migrants). The questionnaire survey found that 90% of the non-climate-induced migrants regularly visit their villages at least once in a year. A major reason for their village visit has been identified as taking care of village property and administering income from agricultural production (45%). When unemployed in the city, this income helps them to cope with the financial constraints. Strikingly, the climate-induced migrants, due to their destroyed asset base in the village, cannot depend on this rural source of income during unemployment (see Section 6.3.6 of Chapter Six for more details).

5.3 ASSET BASE OF CLIMATE-INDUCED MIGRANTS

Assets are an integral part of people's livelihoods. They may be tangible or intangible. Tangible assets have a physical form such as income, savings, land, trees, livestock and food store. Intangible assets are the claims one can make for food, work and access to different services such as employment, health care, education and information. According to Moser (1998), people are less vulnerable when they have more assets and more vulnerable when there are fewer assets or they experience 'asset erosion'. Asset erosion will also be discussed in this chapter as the respondents experienced it during the extreme climatic event in their places of origin. However, in the sustainable livelihoods approach defined in Section 5.2 above, Carney (1998) identified five types of capital assets - natural, social, human, physical and financial.

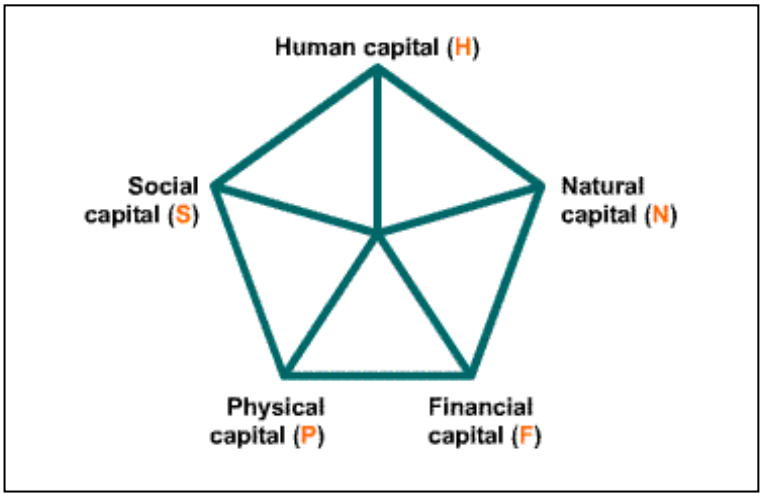


Figure 5.5: Asset pentagon. Source: Carney, 1998

Figure 5.5 is an asset pentagon developed by Diana Carney in 1998. Based on this, I tried to develop a group of assets which are necessary to understand climate-induced migrants' socio-economic conditions both before and after migration. Therefore, assets have been grouped into the five major categories, as shown in Table 5.3:

Table 5.3: Types of capital assets

Category	**Example**
Natural capital	forest, agricultural land, trees, canals.
Social capital	network and connectedness, membership of more formalized groups, informal safety nets, relationship of trusts.
Human capital	education, training, skill, good health.
Physical capital	basic infrastructure such as shelter, water supply, sanitation, transport.
Financial capital	income, savings, regularity of income, access to credit.

Source: adapted from Carney, 1998

The following sections will discuss in detail what assets the climate-induced migrants had before migration, what assets they lost during the process of migration and what assets they have now. Education, networks, contacts, skills, access to different services and material assets have been considered while discussing asset base.

5.3.1 Education

Climate-induced migrants in Korail slum have been found to be poorly educated. Only 28% of the respondents were sending their children to school at the time of my interviews. Children under the age of 16 have been found to be employed in informal urban jobs (e.g. rickshaw pulling, scavenging, hawker) in 53% of the households of the climate-induced migrants in Korail.

Forty five percent of the sample of climate-induced migrants was found to be illiterate. It is evident from Figure 5.6 that only 30% have the experience of school attendance and only 2.5% of them have passed the Secondary School Certificate (SSC) exam. Almost 70% of respondents never attended school and 45% of those cannot even sign their names (see Section 6.3.2 of Chapter Six for more details on education).

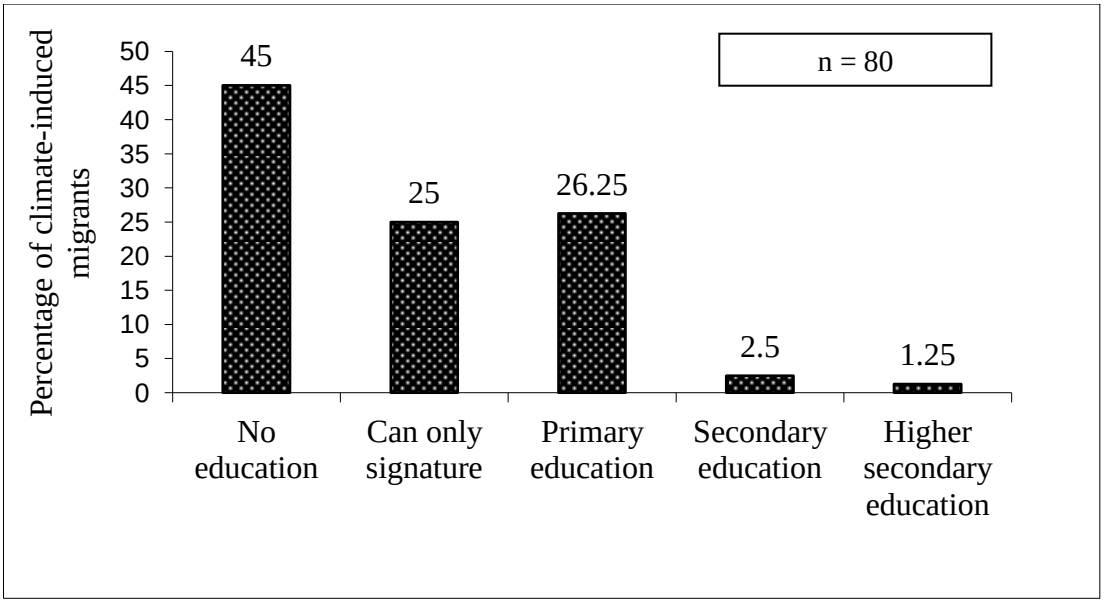


Figure 5.6: Educational status of climate-induced migrants.

Source: Questionnaire Survey

5.3.2 Networks, Contacts and Skills

During the focus group discussions, respondents were asked to list their skills. In most cases, these were not appropriate for generating a monetary return in the city. For example, they listed fishing, ploughing, constructing and repairing boats and nets, constructing houses, rearing livestock, handicrafts and also singing as their major skills. However, they are not able to apply most of these skills in Dhaka as the city does not offer farming opportunities. Most of their skills don't have any exchange value in the city and therefore have no demand. After coming to the city, they learned some new skills such as rickshaw pulling and building construction. But as they are new in the city, they are still relatively inexperienced in these urban-based occupations.

Newly arrived climate-induced migrants generally have poor contact with other people in the city due to their short stay in this unfamiliar environment. However, almost 66% of respondents claimed that they use a cell phone in the city, but that is mostly limited to receiving calls from their relatives in their home village.

5.3.3 Access to Credit

Is there any relationship between income and the tendency to seek loans? It has been found that those who earn less than 5000 BDT per month are more likely to take a loan at the end of the month. Result showed that 55% of respondents have to take loans regularly in the city from friends and relatives while 70% said they had never taken any loan while in their places of origin. However, these loans are generally taken at a personal level and not from any institutional sources. No climate-induced migrants were found who had their own bank account. On the other hand, the research found that more non-climate-induced migrants have their bank accounts in the city (see Section 6.3.4 of Chapter Six for more details).

However, only 16.3% (13 out of 80 respondents) of climate-induced migrants have at least one institutional affiliation in the city and their affiliation is mainly limited to the membership of DSK (Dushtha Shasthya Kendra), a leading NGO working to improve sanitation in Korail. DSK also gave cash to very few of my respondents (3 out of 80) but in every case they didn't do anything productive with that money; rather they spent it to repay their previous personal loans. In this way, their debt condition does not allow them to utilize any credit support.

5.3.4 Physical and Financial Assets

Land, house, pond, tube well, agricultural equipment, tree, livestock, rickshaw, van, jewellery and furniture were reported to be the common assets in the place of origin. However, most of these assets were destroyed during the specific cyclone or flood or riverbank erosion that triggered their move to Dhaka. During the process of migration also, most of them could not bring any assets with them (see Section 7.2.4 of Chapter Seven). Now in the city, their material assets are limited to cell phones (66%), furniture (36%) and the like (Figure 5.7).

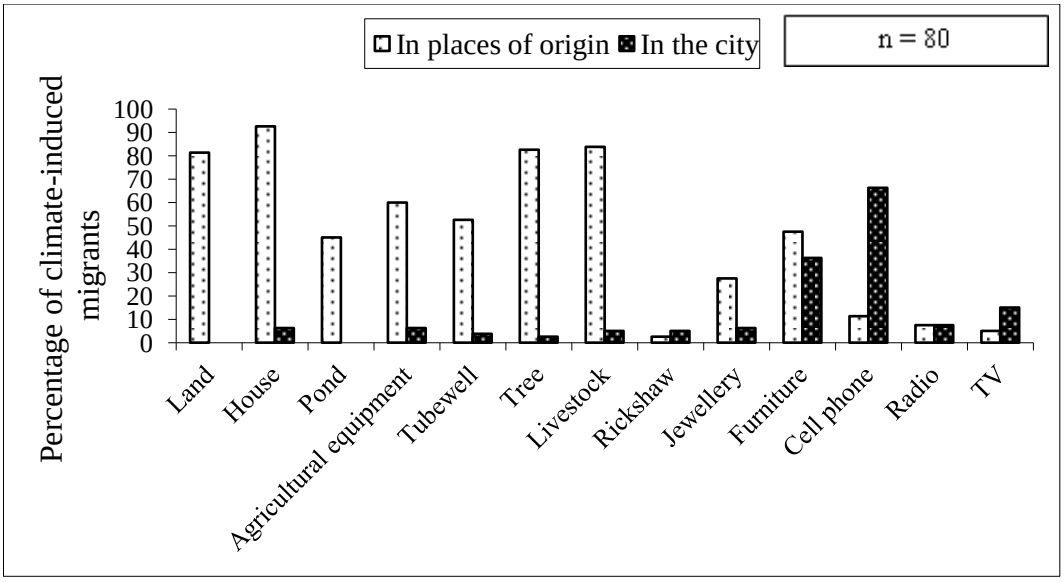


Figure 5.7: Percentage of having different assets of climate-induced migrants before and after migration. Source: Questionnaire Survey

From Figure 5.7, it is evident that climate-induced migrants lost significant lifetime assets during the specific environmental events which pushed them to migrate. It destroyed their shelters, livelihood assets, energy services, livestock, trees, and made them more vulnerable to the impacts of further environmental disaster. Only the use of cell phone has increased to a great extent (and use of television to some extent) after migrating to the city.

5.4 FOOD SECURITY OF CLIMATE-INDUCED MIGRANTS

"*Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life"*

(FAO, 2003: 28).

Food security has been discussed based on the three major elements (Hadley, 2011):

1. Availability of food

2. Access to food

3. Utilization of Food

Availability depends on the demand and supply of food to satisfy domestic needs. Food availability is necessary but not always enough for a household to be food secure. In other words, people can be food insecure even when food is available in the market (Maxwell and Smith, 1992). Therefore, access to food is very important. Access here generally means people's purchasing power to buy food. Purchasing power is generally affected to a large extent by their poverty situation.

Even having access to food is inadequate on its own: it is important to utilize the food properly. Utilization of food refers to a person's capacity to absorb and utilize nutrients in food that is consumed. Utilization of food is generally assessed through eating habits, caring practices, hygiene, access to health services and sanitary facilities (WFP, 2002).

Food security also has a temporal aspect. If the household faces any income loss or shortfall in direct food production, they must have some coping strategies to overcome the emergency situation. According to Corbett (1988), some adopt coping strategies such as consuming less while others adopt strategies such as withdrawing children from school to make them involved in income generating work. Both have some effect but dropping out of school has a long-term detrimental effect on the household. Therefore, it is necessary to remember that one should not sacrifice the long-term ability to acquire food in order to meet short-term food needs (Benson, 2004).

It is very relevant here to analyze the concept of food insecurity. Food insecurity occurs when people do not have enough food to satisfy their hunger, have an inadequate and limited diet, are anxious about having enough food or need coping strategies such as begging, scavenging, or depending on emergency assistance programmes (Cook and Frank, 2008). According to the literature, food insecurity is closely related to poor socio-economic status (Cook and Frank, 2008; Else, 1999; Press, 2004; Rush and Rusk, 2009; Rychetnik *et al*., 2003; Parnell and Smith, 2008). This particular research adopts the definition of household food security that a household is food secure if it can gain access to reliable and nutrient food in adequate quantity and quality for all members of the household all the year round. The next section will, therefore, discuss mainly the last two elements of food security - access and utilization (Hadley, 2011).

5.4.1 Access to Food

Before the specific climatic event (e.g. cyclone/flood/riverbank erosion.), climate-induced migrants used to have their own sources of livelihood and shelter at their places of origin. They generally used to eat their own produce such as rice, fruits, milk, eggs and vegetables. On an average, 55% of the respondents said that while in the village, they had their own production unit in the home yard. They used to obtain plenty of vegetables all the year round.

Scavenging was also an attractive option to 90% of the respondents, which enabled them to find food without spending money. They used to collect spinach and other types of vegetables and fruits by scavenging in their village either from roadside green spaces or open fields, which is rare in city life. *''One has to buy everything in the city*''- was the most common comment during the focus groups. While in the village, this scavenging helped them to prepare meals at least four days per week. However, bins and roadside waste dumping sites in the city do not give them a good source of food scavenging because in a hot and humid city like Dhaka, food become rotten very soon.

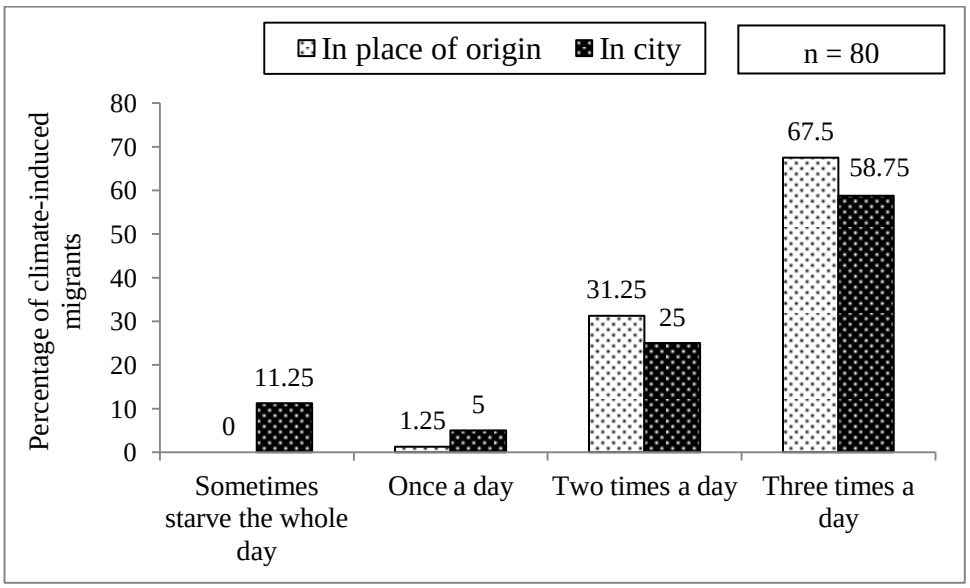


Figure 5.8: Number of meals taken in a day (both in city and in village).

Source: Questionnaire Survey

Figure 5.8 shows that more people are starving after coming to the city. At least 9 out of 80 respondents (11.25%) said that they have to starve for a whole day during unemployed periods in the city. This is very common for day labourers. On the other

hand, no-one said that they had to starve in their villages before the devastating environmental events. The event of having one meal per day is also more common in the city than in their places of origin. However, about 59% (47 out of 80) of the respondents in the city informed that they take meals three times a day but that there is less variety in each meal than in their place of origin. The number of items in each meal has also decreased after migration.

Access to pure/safe drinking water is a problem in the slums of Dhaka City. In Korail, there is no proper access to potable water supply as it is mainly illegal and often the water pipes bring muddy water due to lack of maintenance.

5.4.2 Utilization of Food

It is not enough to have access only if there is no healthy utilization of food. Food security and health are closely related concepts (Cook and Frank, 2008; Hampton, 2007). A person cannot be food secure without a healthy diet and proper health care facilities. Food insecurity has an impact on the overall physical, mental and psychological health and is a major cause of low birth weight, maternal depression and other conditions (Cook and Frank, 2008; Kristjansson *et al*., 2007).

While discussing the quality of food, all interviewees agreed that they used to eat more fresh and good quality food in their villages. *"Foods in the city are processed and are often added with Formalin*[14]*"*- complained many climate-induced migrants of the focus groups (FGD: 1& 2; 12/07/2012).

As already mentioned in the previous section, Korail slum dwellers generally drink the supply water, which is dirty and often mixed with mud. However, people were asked about their water purification process and 42.5% of climate-induced migrants said that they boil water before drinking (see section 5.2.4 above). Others do not follow any purification process as fuel cost is high in Dhaka City.

According to Figure 5.9, more respondents were satisfied with the quality of water they had used in their places of origin (92.5%). In contrast, only 11.25% said that the quality of water is good in the city.

[14] A harmful chemical, usually used to stop dead bodies from rotting, is now being used to preserve edible items. The scientific name is Formaldehyde (see SIDS, 2002; Ali, 2013).

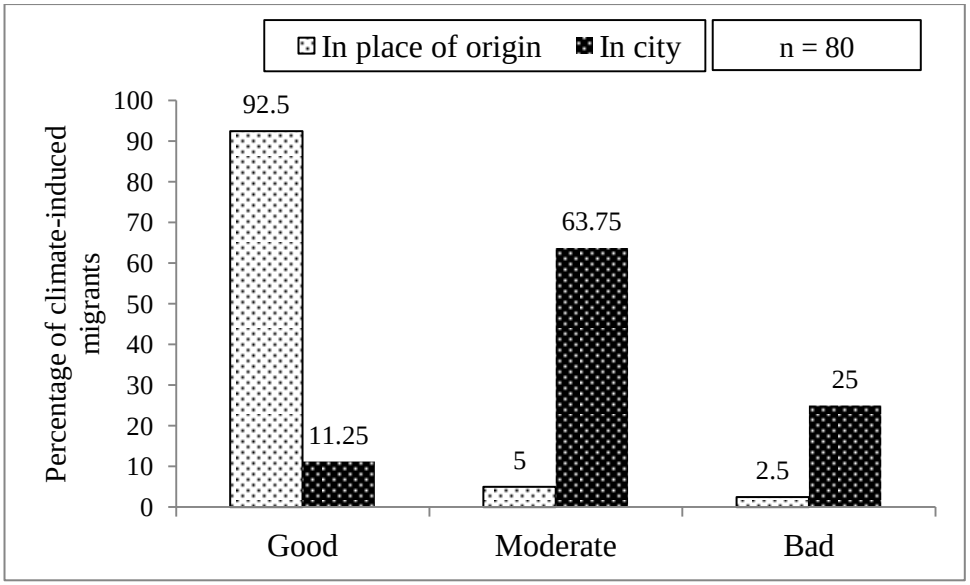


Figure 5.9: People's perception about the quality of drinking water before and after migration; Source: Questionnaire Survey

Women in the focus groups informed that most of them used to be livestock farmers in their villages. Some used to rear ducks, hens, chickens, pigeons, goats, sheep and cows and used to sell the eggs and milk in the market. With the profit, they used to buy more livestock. Therefore, they had plenty of eggs, meat and milk supply all the year round in their villages which were the sources of their protein intake. Events like Cyclone *Sidr* and floods destroyed these important productive assets.

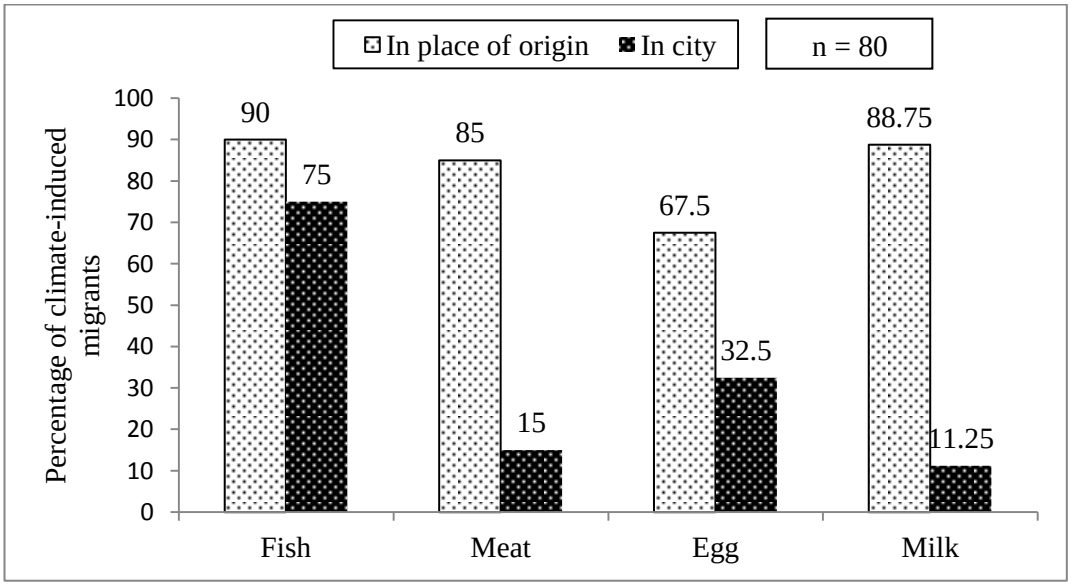


Figure 5.10: Percentage of climate-induced migrants having different types of protein, at least once per week, before and after migration. Source: Questionnaire Survey

Figure 5.10 shows that they now have considerably lower levels of weekly protein intake compared to that of their places of origin. Milk, egg and meat are occasionally consumed by the respondents in the city while these were frequently consumed by them while in their villages.

Also events like invitations and exchanges of food items with neighbours decreased significantly in the city. On an average, 87% of respondents said that they never get any food help from anyone, unlike previously in the villages, where they used to exchange foods regularly (20%). In Dhaka this rate is now only 3.75%, while 51.2% said that they were never in that position of luxury in the city that they could afford sending foods to other people's house (Table 5.4).

Table 5.4: Practice of exchanging foods with neighbours, friends and/or relatives before and after migration

Exchange of Food (n=80)		***Frequency of Food Exchange* (%)**			
		Never	Once a week	Once a month	Once a year
	In place of origin	20	20	36.25	23.75
	In city	51.25	3.75	26.25	18.75

Source: Questionnaire Survey

Food security has also been assessed based on the rate of personal invitation each year. 72.5% of respondents never have any experience of inviting people or having any invitation for lunch or dinner in the city. By contrast, 75% of climate-induced migrants said that they had this experience in their places of origin (Table 5.5).

Table 5.5: Practice of invitation before and after migration

Invitation (%) (n=80)		Never	Once a Week	Once a Month	Once a Year	Several Times in a Year
	In place of origin	25	10	21.25	25	18.75
	In city	72.5	1.25	13.75	7.5	5

Source: Questionnaire Survey

My results also show that climate-induced migrants used to eat those meals, with food produced in their garden or from their livestock, at least 4 days in a week while in the origin (43%), which is not possible in the city (see Section 6.3.7 of Chapter Six also for more detail discussion on food security).

5.4.3 Gender Dimension of Food Security

There is also a gender dimension to the issue of food security. In this research, it has been found that male members generally buy dry foods such as bread/biscuit and/or banana as their lunch while working outside. Conversely, women generally never spend money to eat outside. They naturally want to save more in order to face any emergency situation. Relevant literature shows that in food insecure households, the male heads and the children are often given the food first and this may then compromise the availability of food for other household members, particularly women (Cook and Frank, 2008). There will be more detailed discussion on the gender dimension of food security in Section 7.2.2 (vii) of Chapter Seven.

5.5 HEALTH CONDITIONS OF CLIMATE-INDUCED MIGRANTS

The research reveals that the health conditions in their places of origin were better than their current health conditions. Respondents reported incidences of diarrhoea, normal cough and fever while in the villages, but otherwise their health condition was good. Except heart disease and diabetes (5%), they did not have any type of serious health condition.

Health conditions have deteriorated substantially since migration. The unhealthy slum environment and lack of hygiene education made them more vulnerable to the impacts of vector and water-borne diseases. Jaundice was found to be a common health condition (62.5%). Almost 100% of the jaundice patients agreed that they suffered from this condition for the first time after coming to the slum and 66% of them have the experience of jaundice more than once.

Diarrhoeal disease is another problem faced by almost 92.5% of the respondents in Dhaka. This indicates the poor quality of drinking water and sanitation system in the slum. Typhoid (21.2%), malaria (28.7%) and dengue (48.7%) are some other common diseases experienced by the target group in the city (Figure 5.11).

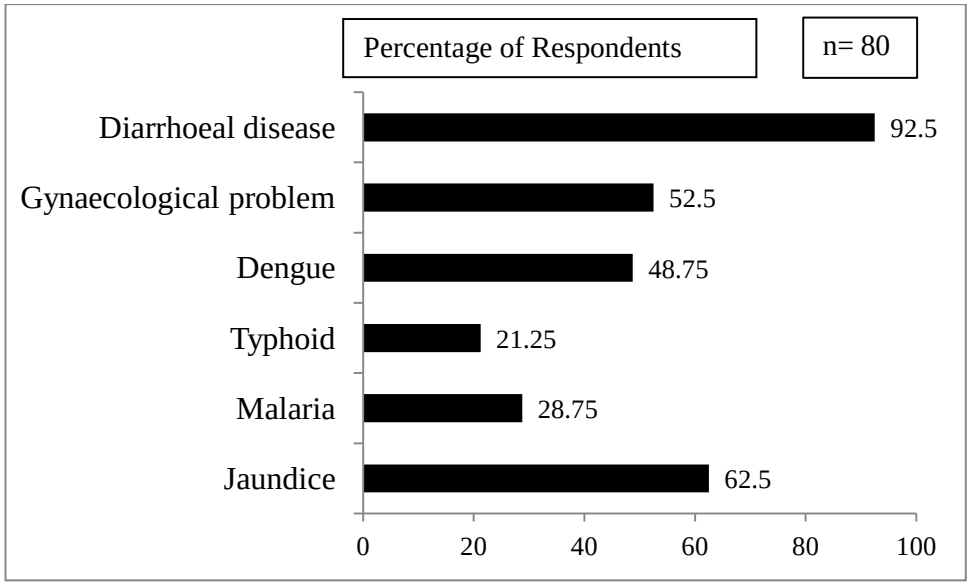


Figure 5.11: Experience of disease at least once in the city among the climate-induced migrants. Source: Questionnaire Survey

52.5% of the climate-induced migrants said that they suffered from severe gynaecological problems after coming to the city[15]. While discussing this issue, the female respondents identified that the dirty canal water is responsible for this problem as they often have to take baths in the canal due to the unavailability and irregularity of water supply. However, gastric, cough, joint pain, bad headache, pneumonia, hookworm, asthma, heart and kidney diseases were also reported by the climate-induced migrants during the field survey.

Children's health in the slums of developing countries is another important research agenda (e.g. Fink *et al*., 2014; Agarwal and Taneja, 2005). During FGDs with female climate-induced migrants, all the mothers said that their children's health deteriorated to a great extent after migration. Diarrhoea, pneumonia, dengue and jaundice were the most commonly reported health problems of their children. One respondent also mentioned her own daughter's death in the slum due to diarrhoeal diseases (see case study 7.1 of Chapter Seven).

Access to treatment is also limited for the poor respondents due to their limited financial ability. In case of medical emergency, people generally go to the local pharmacy in the slum in order to get health services at cheap price (65%). Almost 25% of respondents have the experience of going to public hospitals in the city, where treatments are generally cheaper than that of the private hospitals. Very few of them have the experience to get admitted to private clinics (2.5%). Moreover, 1.25% of the respondents go for homeopathic treatment and the rest of the respondents (6.25%) do not go anywhere because they cannot afford the treatment cost.

Table 5.6: Reasons behind bad experience regarding quality of treatment in Dhaka

Reasons	**Percentage of respondents (n=32)**
It cannot cure diseases	43.75
Treatment is very costly	34.37
Doctors' ignorance towards poor	21.87

Source: Questionnaire survey

[15] About 56% of climate-induced migrants were female in the study

62.5% think that quality of health treatment in the city is good and the rest of the respondents think that it is either moderate or bad, revealed the questionnaire survey. There are various reasons behind this statement. The majority of those who think that treatment quality in Dhaka is not good identified the reasons behind this as being doctors' inefficiency to cure their diseases (43.7%), the high treatment cost (34.3%) followed by doctors' ignorance due to their poverty-stricken conditions (21.8%) (Table 5.6).

Photo 5.3: Solid waste dumping directly into the Gulshan Lake.

Source: Field Survey

The availability and quality of the sanitation system and solid waste management are important indicators for assessing people's health condition. In spite of DSK's sanitation improvement project in Korail, 33% of climate-induced migrants are still using unhygienic hanging latrines in the slum which are situated overhanging Gulshan Lake (see section 5.2.5 above). 72.5% of the respondents said that they throw their everyday household waste directly to the lake (Photo 5.3). Only 17.5% of the respondents throw their household waste into a specific place in the community, which was 42.5% in case of their places of origin (see Section 7.2.2 (iii) of Chapter Seven for more details on gender dimension of vulnerability to health problems in the city).

5.5.1 Coping with Medical Costs

Annual medical costs have increased significantly in the destination. Mean annual household medical cost before migration was 974 BDT which is now 8190 BDT on an average. 77.5% of the respondents think that they are not capable enough to bear the current cost of health treatment.

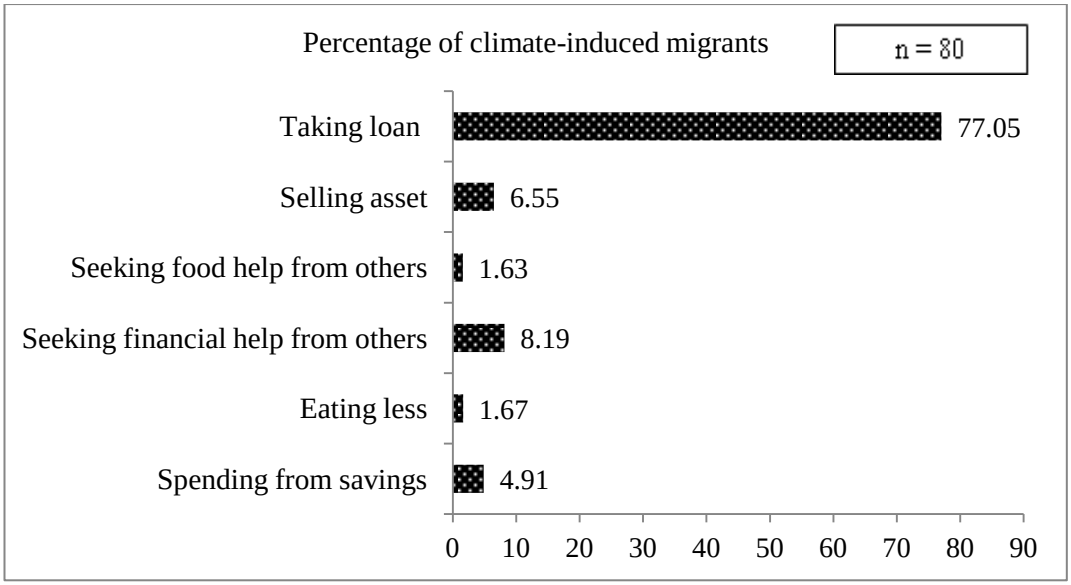


Figure 5.12: Coping strategies adapted during a medical emergency.

Source: Questionnaire Survey

Coping strategies vary from household to household (Figure 5.12). 58.7% of the respondents took personal loan in case of medical emergencies after coming to Korail. Others said that they generally sell assets (5%), seek food and/or financial helps from neighbours (7.5%), eat less (1.25%) and/or spend from savings (3.75%) in order to bear medical emergency costs.

Such a struggling situation generally restricts the climate-induced migrants to accumulate adequate savings needed to reconstruct their destroyed homesteads in their villages and always pulls them back towards more poverty conditions.

5.6 EXISTING POLICIES ASSOCIATED WITH CLIMATE-INDUCED MIGRATION

Government programmes related to Disaster Risk Reduction (DRR) and adaptation obviously influence decisions regarding migration (Foresight Report, 2011). Therefore, while reviewing the policies on climate-induced migration, it is also important to review the relevant policies on broader development, emergency preparedness, poverty reduction, urban and rural planning and so on (Walsham, 2010). Existing laws and policies in Bangladesh are mostly sectoral and are characterized by a lack of intersectoral integration. Most such policies are not attuned to address the real challenges posed by climate change in Bangladesh (Naser, 2014). Issues related to migration should be integrated into existing laws and policies concerning other relevant areas.

In some cases, the official policy discourse identified migration as the 'failure of adaptation' and thereby tried to restrict the migration from environmentally affected regions of the country. For example, the National Adaptation Programme of Action (NAPA) portrayed migration as a less desired option during the post-disaster struggle period and never recognized the adaptation potential of migration. Such an approach delayed the process of developing useful policy measures to increase adaptive capacity of vulnerable people and communities who could become potential migrants.

5.6.1 Climate-related Policies

The most important legislation adopted to deal with environmental protection include the Environmental Policy (1992), Bangladesh Environment Conservation Act (1995) and Environmental Conservation Rule (1997). Sectoral policies are the Forest Policy (1994), Fisheries Policy (1998), Water Policy (1998), New Agriculture Extension Policy (1995), Energy Policy (1995). Other Important documents are National Conservation Strategy (NCS), National Capacity Self-Assessment (NCSA) for Global Environmental Management (2007) and National Environmental Management Action Plan (NEMAP) (1995). Although these documents deal with the environmental threats facing the country, only a few make specific reference to migration as an effect of environmental change and degradation (Naser, 2014; Biswas and Chowdhury, 2012).

The Coastal Zone Policy (2005) deals with the adverse effects of disasters and environmental problems and also addresses the susceptibilities of coastal communities who are dependent on natural resources for their livelihoods. This policy did not make enough reference to the migration issue. In the policy, there was no effective land distribution strategy for those who lost their lands or live in erosion prone areas.

The Bangladesh Government formulated the National Adaptation Programme of Action (NAPA) in 2005 to guide and manage all the local and global responses to integrate climate risks into development plans and processes (NAPA, 2005). The NAPA describes the main effects of climate change in Bangladesh and offers a number of adaptation strategies to face the challenges of climate change impacts. In the NAPA document, the links between climate change and migration were not expressed in concrete terms. NAPA (2005) identified high depth of standing water as a reason for preventing crop cultivation during the *kharif* season. NAPA also recognized that such situation is creating unemployment in coastal areas, leaving limited food sources, leading to migration to cities for jobs and livelihoods. NAPA identified climate-induced migration as a negative impact of environmental change. For example, it portrayed the gender vulnerability of the families left in the villages by the male migrants and it never recognized the adaptation potential of migration.

The BCCSAP (Bangladesh Climate Change Strategy and Action Plan) is a 10-year programme (2009-2018) developed to address long-term planning for adaptation and mitigation, as well as management and information sharing on climate change (MoEF, 2009). This was designed for resilience and capacity building of the country to climate change (MoEF, 2009). Importantly, and in contrast with the 2005 NAPA, the 2009 BCCSAP draws direct links between climate change and displacement in Bangladesh. BCCSAP recognized that the most severe impacts of climate change will be upon the poor segments of society. Therefore, needs-based programmes have been suggested in this document to ensure basic human rights. It stated that the process of migration of climate change affected people needs to be monitored closely and adequate institutional support should be provided for their proper resettlement. The Ministry of Environment and Forests, the Ministry of Home Affairs and the Ministry of Local Government, Rural Development and Cooperative are responsible for taking care of the residents living in vulnerable coastal zones.

5.6.2 Climate-induced Migration and Poverty Reduction Related Policies

Bangladesh's development strategies are developed in the documents like the revised second National Strategy for Accelerated Poverty Reduction Financial Years 2009 to 2011 (NSAPR-II), the five-year development plan (2011-2016) and Vision 2021. Though all of these policies have developed mainly with the intention of poverty reduction, mainstreaming and strengthening climate change adaptation were a common focus of these policies. NSAPR-II includes a specific section on foreign employment which suggested long-term strategies to have better access to overseas labour markets. This strategy paper considered environmental issues in fixing goals on international migration. One such measure includes exporting labourers from *Monga*-affected and ecologically vulnerable areas of Bangladesh.

5.6.3 Climate-induced Migration and Disaster Management Policies

According to the declaration of the World Conference on Disaster Reduction in 2005, states have the primary responsibility of protecting their citizens and their assets and property from natural disasters (ISDR, 2005). While some countries adopted constitutional provisions of governmental obligations for supporting displaced people or migrants following a disaster, the government of Bangladesh does not have any such obligations (Naser, 2014). The National Plan for Disaster Management (2010-2015) is the most relevant policy document for disaster management in Bangladesh. This plan makes specific reference to disaster-induced migration and also mentioned about the vulnerabilities of families left behind. However, no practical measures were suggested which could guide and facilitate planned migration from disaster prone areas.

Bangladesh also has 'Standing Orders on Disaster Management'. According to McAdam and Saul (2010), the orders are flexible in nature and lack specificity. For example, the standing order mentioned the provision of *Khas* land, the *Adarsha Gram* and the *Abashon* Projects for rehabilitating displaced persons after disasters but it did not clarify the time frame of this service and did not mention specific rights of the migrants in these projects. There is one section (stated below) where the standing order discussed about the disaster induced displaced persons:

"Ensure that people displaced from hazard can return to their previous places; in this case, dispute (if any) regarding the land of the displaced people should not be an obstacle to them returning after disaster"

(MoFDM, 2010: 33).

In this document, the government also tried to make provisions so that displaced persons can return to their places of origin. It greatly lacks the guidance for the climate-induced migrants who have no ways to return to their places of origin due to unavailability of rural land, livelihood and/or savings. In 2012, the Disaster Management Act (DMA) (XXXIV Act of 2012) was passed in Bangladesh to enforce standing orders which also lacks concerns for climate-induced migrants.

The above mentioned policies highly lacks the consideration of climatic affected people who have already migrated. The National Adaptation Programme of Action (NAPA) of Government has mentioned the term 'migration' only once in the entire document. This is one example of how the migration agenda has been ignored in the national environmental policy documents. Gender is another issue which lacks the focus in national policies. Very recently the government has passed a policy named the 'Bangladesh Climate Change and Gender Action Plan' in 2013 (BccGAP, 2013). Though this document portrayed migration as the cause of vulnerability of women left out in the villages, there are scope to enhance the document by including adaptation potential of migration and introducing gender-specific measures to increase overall resilience both at the point of origin as well as destination.

Besides the national level policies, the local level governance is also an important element which has impacts on the overall socio-economic conditions of the climate-induced migrants. This dimension of politics and governance has been discussed in the next section.

5.7 POLITICS AND GOVERNANCE AND HOW THEY RELATE TO THE SOCIO-ECONOMIC CONDITIONS OF THE CLIMATE-INDUCED MIGRANTS

"*Urban governance is the sum of the many ways individuals and institutions, public and private, plan and manage the common affairs of the city. It is a continuing process through which conflicting or diverse interests may be accommodated and cooperative action can be taken. It includes formal institutions as well as informal arrangements and the social capital of citizens*"

(UN-HABITAT, 2002: 14).

The term governance refers to the coexistence of all collective regulations from government as well as from different layers of civil society organizations (Mayntz, 2004). Good governance ensures an open and legitimate relationship between civil society and the state (McCarney *et al.*, 1995). Existing policies and governance have a significant impact on the status of socio-economic conditions of the urban poor (Moses, 2014). This section will analyze how governance mechanisms shape the socio-economic conditions of my research subjects.

5.7.1 Rural Local Governance Structure

The rural/regional local government bodies in Bangladesh consist of three tiers: Union Parishad, Upazila/Thana Parishad and Zila Parishad (Panday and Panday, 2008; Islam and Fujita, 2012). The rural local government bodies are generally highly controlled by the central government in Bangladesh (Habibullah, 1996). At times of disaster, their performance is greatly influenced by national policies which have been discussed by many sources (Walsham, 2010; Naser, 2014; Biswas and Chowdhury, 2012).

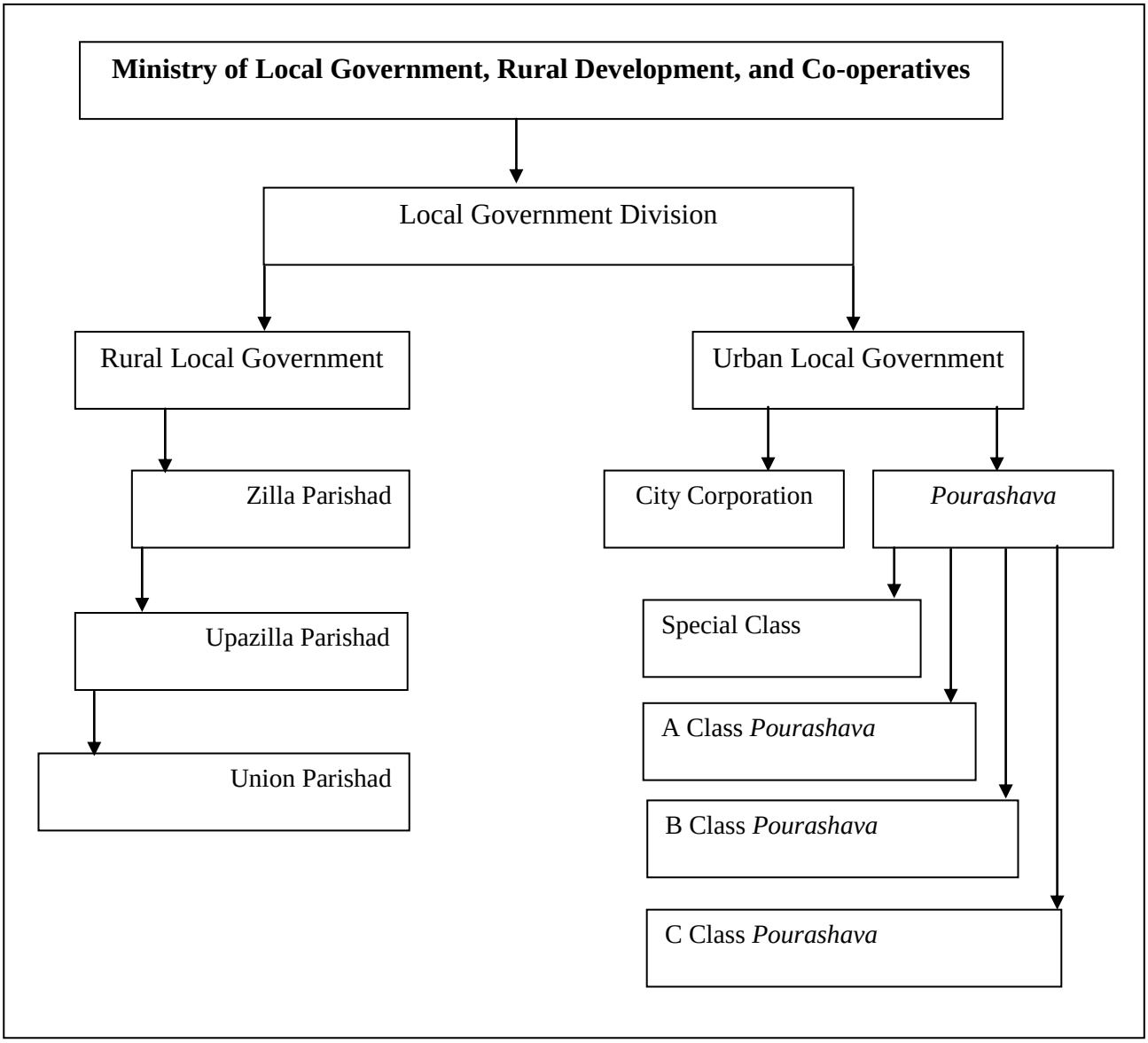


Figure 5.13: Rural and Urban Local Government Structure in Bangladesh.

Source: Modified from DS & YPSA, 2014

Figure 5.13 demonstrates the institutional structure of local government in both rural and urban contexts. The Ministry of Local Government, Rural Development and Co-operatives is responsible for local government and rural development institutions. These rural institutions, namely *Union Parishad* and *Upazilla Parishad*, are key bodies for climate adaptation activities. These rural institutes are operated under the supervision of Local Government Division (LGD), which has the responsibility to ensure all pre-disaster preparedness and post-disaster response. LGD also works to mobilize local resources, establish good local governance and to ensure safe utility

services at times of disasters. Urban local government, on the other hand, consists of City Corporations and *Pourashavas* (municipalities).

The Ministry of Food and Disaster Management is the focal ministry for disaster management and, therefore, has a major role to play for climate-induced migrants. Under this ministry is the Disaster Management Bureau (DMB), which is responsible for coordinating major disaster management interventions all over the country. The DMB is, therefore, responsible for establishing coordination among the key local government institutes such as the City Corporation, Municipality, *Upazila* and Union level Disaster Management Committees.

The institutional framework for disaster management consists of numbers of councils and committees from local level to the national level involving government, NGOs, CBOs and other relevant stakeholders. The National Disaster Management Council (NDMC) is the highest-level platform for formulating and reviewing policies related to disaster management. NDMC is headed by the Prime Minister. The Inter-Ministerial Disaster Management Co-ordination Committee (IMDMCC) (headed by government ministers) is responsible for implementing disaster management policies and also implementing the decisions taken by NDMC. To assist IMDMCC, National Disaster Management Advisory Committee (NDMAC) has been formulated. NDMAC gives advice on technical matters, socio-economic aspects of disaster risk reduction and emergency response management (Biswas and Chowdhury, 2012).

5.7.2 Pre-Migration Scenario: Rural Politics and Governance

My findings (Section 5.1-5.5 of Chapter Five) suggest that the climate-induced migrants had better socio-economic conditions before the specific climatic events which eventually made them vulnerable and pushed them towards rural poverty. Rural poverty is an important agenda in the national policy of Bangladesh. In spite of many national efforts to eradicate poverty in the rural areas, policy implementation has become difficult due to weak and under-resourced institutions.

5.7.2.1 Governance Gap in Rural Administration

The national policies have failed to address the needs of the most vulnerable and that is why large numbers of Bangladeshis become displacees every year due to environmental disasters. A profound governance gap exists in this respect (Sabates-Wheeler *et al*., 2008). There is no policy to guide the potential migrants in order to better integrate with the livelihoods available in their destination. There are some international soft-law provisions regarding the protection of IDPs (Kalin, 2000), but few systematic approaches are in place in Bangladesh and this is often an overlooked policy area (Kolmannskogg, 2008; Oliver-Smith, 2009).

Vulnerability is always context-specific and it is important to understand the rights of the poor, related policy and the policy deprivation which created some losers and some winners in the system. After Cyclone *Sidr*, for example, one of my respondents, Jaheda Begum (FGD 2: 12/07/2012), received a promise from people claiming to be local government officials that if she deposited 25,000 BDT then she would be given a new house. She followed their instruction, deposited money and was cheated because this was a scam. Here the problem was definitely rooted with corruption and at the same time with her lack of knowledge regarding the governance structure. Poor people are ignorant about what institutional programmes exist, about their rights and the way to establish them; and therefore they easily become victims (losers) in crisis situations. On the other hand, political influence always exists in both rural and urban arenas in Bangladesh when it comes to the matter of resource distribution and/or relief operations. Influential local leaders (winners) try to maximize their profit at times of crisis, especially following disasters.

However, in spite of extensive governmental rural policy to eradicate rural poverty, the climate-induced migrants had to leave their ancestral home and that is somehow related to the weaker governance system which could not serve the people most in need. The following case describes the flaws in the governance structure after Cyclone *Aila* which was, to a great extent, responsible for large out-migration of people from affected villages.

Case of Cyclone *Aila*

Cyclone *Aila* affected almost 11 coastal villages in Bangladesh in 2009 where previously the communities were mostly protected by embankments. The *Aila*-induced migrants in my study reported that shrimp farming-related activities such as frequent opening of embankments to move saline water into shrimp ponds made the old earthen embankments weak which were breached more severely during the tidal surge of Cyclone *Aila* and inundated numbers of villages over the coastal districts. Embankments were built during 1960s. The government's Bangladesh Water Development Board (BWDB) was responsible for the maintenance of the embankments but failed to do so; rather they were influenced by the shrimp farmers (by illegal means such as bribes) and illegally installed pipes, tube wells and gates on the embankments.

"These permanent pipes, tube wells and gates, thousands in number and arranged closely one after another, weakened the protective embankments from the base and vulnerable spots have been breached during Aila. Moreover, these pipes, tube wells and gates make parallel reserve tanks with saline water, speeding up the process of soil erosion"

(Oxfam, 2009: 2).

According to research by Oxfam (2009), the inevitability of cyclone *Aila* could not be escaped but much of the disastrous aftermath could have been prevented if there had been proper maintenance of the embankments through effective governance. Good governance is always a problem in a country like Bangladesh. Lack of proper governance mechanisms meant that there was no intervention to control the silting up of river beds and rapid coastal subsidence which were major contributors to the high tidal surge during the recent coastal cyclones (see Section 2.4.2 of Chapter Two and Section 4.3.3 of Chapter Four for more details). Similarly, over the years the protective buffer zone (with mangrove vegetation) had slowly vanished due to leasing out of forest, lands and water bodies. The coastal community, therefore, had lack of protection to face the strong wind during the cyclones.

Moreover, during Cyclone *Aila* the surface energy of waves was stronger than ever before, which accelerated the breaching process of the embankments. Soil erosion

was also an important factor contributing to the weakness of the embankment structure. The combination of both compaction and erosion leaded toward loss of height of the embankment and the high tide of the cyclone easily entered the community over the top of that embankment. This was a major cause of the suffering of people after Cyclone *Aila*, and as a consequence the poor people crossed the threshold limit, lost shelter and livelihoods and decided to migrate. There were also outbreak of diseases after Cyclone *Aila*, but people didn't receive any standard health assistance from local health providers (Rabbani *et al*., 2013). This is surely a failure of rural environmental governance which played a major role in making up their mind to migrate. They didn't know about different national policies and acts which could be in favour of reducing their vulnerability (see Section 5.6.1 for different national policies on climate change, migration and poverty reduction). All they stated was that they had been cheated and neglected after the disaster. The *Aila*-induced migrants said that their voice did not reach the chairman of their union councils as they could not manage appointments and also were ignored by the officials. The powerful elites of their villages had easier access and that made a difference in their socio-economic conditions in post-disaster period.

5.7.3 Urban Local Governance Structure

Urban governance for poor people has a strange and informal arrangement in Bangladesh (Roy *et al.*, 2011; Hossain, 2012; Satterthwaite and Mitlin, 2014). A very common misconception in Bangladesh is that the rural areas are the legitimate place for the poor people to live in and the urban areas are the places for the rich. Though the urban poor in Dhaka comprise 40% of its total population, their rights are ignored by the policy makers partly because further incentives for this group in urban areas might encourage more migration in the future towards already vulnerable big cities. Rural officials are subject to some level of accountability because they generally have to deal with small localities and by ensuring a certain degree of participation of the rural people. In contrast, the urban poor face a lack of accountability from government (Kamal, 2000) as direct contact is almost impossible. Therefore, the urban context of governance is always different from the rural context (Mitlin and Satterthwaite, 2013; Satterthwaite *et al*., 2009).

As stated before, the LGRD Ministry of Bangladesh Government is the focal ministry responsible for urban governance (see Figure 5.13 under Section 5.7.1). It oversees the City Corporation, which has the responsibility for providing services to Dhaka City dwellers. The City Corporation has two divisions: DCC North and DCC South. The study area of this research falls within DCC North. In DCC, the Mayor (currently called the Administrator) has the highest administrative power. Under the Administrator's supervision the Chief Executive Officer (CEO) works as the chief of 14 divisions of DCC. One of such division is called the Social Welfare and Slum Development (SWSD) Wing. One Deputy Secretary of the Government is the chief of this wing, under whose supervision the Social Welfare Officer and Slum Development Officer work (DCC, 2014).

The City Corporation Law, 2009, is the basis of all plans and programmes taken by the City Corporations of the country (Bangladesh Gazette, 2009). This law has no separate component for slum dwellers; rather, all the measures are designed for urban dwellers in general. According to Md. Anowar Hossain Bhuyan, Slum Development Officer of DCC (North), *"DCC collects tax from the city dwellers and services are provided targeting the tax payers only*" (Institutional Key Informant Interview No. 11: 15/12/2014). As slum dwellers are not taxpayers, the DCC does not inclusively target slum areas to undertake government financed programmes.

The current programmes in the slums of Dhaka City are mainly donor funded. For example, The Government of Bangladesh has a programme called UPPR (Urban Partnerships for Poverty Reduction) which is jointly funded by DFID and UNDP. UPPR does not provide support to any of the climate-induced migrants of the research and which is evidence of how institutional services and supports exclude the most vulnerable segment of population (i.e. newly arrived climate-induced migrants).

This SWSD Wing operates the UPPR project in the slums of Dhaka City. The UPPR project starts with the formation of Primary Groups (PG) (consists of 15-20 families). The group members are selected from ultra-poor families. The selection criterion is not as specific as the UPPR project book of 2011 stated that the families, who have to skip one meal per day due to lack of money, comprise the ultra-poor (LGED, 2011). Surprisingly, according to the slum development officer of DCC (North), this selection criterion is assisted by local leaders (or, *Mastaans*) of Korail Slum. While

government officers enter the slum area, the *Mastaans* work as local guides and they become the main source of identifying ultra poor families. This is the main weakness of UPPR project and due to this reason many ultra poor climate-induced families have been excluded from the list of beneficiaries.

5.7.4 Post-Migration Scenario: Urban Politics and Governance

Urbanization, if carefully handled, can be a strong tool for development. It is evident from past trends that the economic successes depend on purposefully and efficiently used urbanisation to achieve economic goals (McGranahan *et al*., 2014). In Bangladesh, while urbanization is a powerful tool for earning and sending remittances to rural relatives, it is also a growing problem for the overpopulated megacity of Dhaka. Poor migrants immediately become urban poor once they enter the city. Their status becomes illegal as they occupy so called illegal places like 'slums' (Hossain, 2012). Therefore, the urban poor in Bangladesh always have to deal with urban politics for survival. This urban politics and governance is characterized by informality (Hossain, 2012). The informal actors are the leaders of the system. Those who have power and political connections are always the winners. The political systems and bureaucratic structures in Bangladesh were never in favour of the urban poor. This section has discussed such informal settings of urban governance, lack of urban bias in policy making and how they relate to the socio-economic conditions of the climate-induced migrants living as the urban poor in the city.

This section has explored urban governance with special attention towards environmental aspects. While considering the environmental and health issues of the urban dwellers, urban environmental governance is important. Satterthwaite and Mitlin (2014) attempted to review urban environmental governance and stated that the urban poor of the global South generally cannot afford the costly utility services. Their experiences showed that the local authorities provide public utility services with a vision to generate more income rather than to improve household wellbeing (Satterthwaite and Mitlin, 2014). Due to the increased cost of utility services, the lowest-income households (i.e. newly arrived climate-induced migrants) continue to use surface water, practice open defecation in absence of any affordable alternative

and thereby put their health at risk, just as the climate-induced migrants of this study (see Section 5.5 of Chapter Five).

As Bangladesh is not a 'welfare state[16]', the government is not able to deal with the urban challenges alone. Collaborative and multi-level governance, therefore, plays an important role in the overall functioning of urban services (Bulkeley and Betsill, 2005; Bulkeley and Newell, 2010; Leck and Simon, 2013). Hence, the urban environmental risk is highly influenced by the capacity and quality of local government (Satterthwaite *et al*., 2009).

The Government of Bangladesh has urban-based service delivery programmes for urban dwellers in general. As the poor migrants living in slums are not considered legal by the government actors and are generally excluded from the mainstream urban population, they are usually also excluded from government-supported grants and programmes. The following section will explore other important gaps in urban governance process.

5.7.4.1 Governance Gaps and Informal Actors in Urban Administration

A city with a higher rate of urbanization cannot sustain itself without inclusive urban policies (McGranahan *et al*., 2014). The major weakness of the urban governance system for the poor in Bangladesh is that there is no separate urban policy or even a ministry to address the needs of the urban poor and there is no social assistance programme for this group. Social safety net programmes are purely rural-based (only the old age allowance or pension is accessible to the urban poor among the total 27 social safety net programmes running in the country). There is a government housing fund for homeless people which rarely addresses the needs of the urban poor. The donor-funded Slum Improvement Project (SIP) was also stopped during 1996 due to the end of the contract period and has not yet restarted.

Bangladesh's Poverty Reduction Strategy Paper (PRSP) identified the reasons for this neglect of the urban poor. Poor people's image in the urban areas of Bangladesh is generally portrayed negatively as an illegal segment of population who are

[16] Universal access to health care and schools is a characteristic of welfare-states (Satterthwaite *et al.*, 2009).

involved in crime and cause environmental pollution by throwing waste into the city canals (Bashir *el al*., 2014). The threat of slum eviction is another distinctive component of urban poverty in Bangladesh and the threat is highly determined by the governance structure (Hossain, 2012). The eviction-related brutality and its consequences are well documented (Rahman, 2001; Hackenbroch *et al*., 2008). Where government contributes negligibly towards the improvement of slum life, NGOs active in this field also do not take the risk of heavy investment as eviction might destroy everything (Hossain, 2012). Unless NGOs are transformed from advocates to service providers, the situation of urban poverty is not likely to change significantly. As a matter of fact, there are some informal actors involved in urban governance in Bangladesh. The roles of some of these actors are given below:

(i) Influential Local Leaders (*Mastaans*)

Power relations in the urban society are important factors where the urban poor have limited voice and limited scope to participate in decision-making process in the community. The governance mechanism in urban slums is highly motivated by political power and operated by the intermediaries or the musclemen (*Mastaans*) (Jahan *et al*., 2011; Bashir *et al*., 2014). These *Mastaans* work as the connection between the local slum residents and the political leaders/government officials and provide utility services for the poor at higher rate (Hossain, 2012). Political parties highly depend on the *Mastaans* during the election period as they arrange the so called ‘vote banks’ for them where the voters are generally the poor slum residents (Rashid and Hossain, 2005). Power relations determine differential access to urban utilities:

> *“The power relations structures in the bosti are relatively well "formalized", despite their designation as informal. There is little scope for most inhabitants to enter into the contestation and negotiation of their interests within this system- it is a closed system, coercive and discriminatory, and will continue as long as the bosti settlement remains "illegal" and the perception of state authorities regarding bosti inhabitants remains unchanged”*
>
> (Hossain, 2012: 223).

Hossain (2012) stated that in the contestation and negotiation process, powerful and relatively well-off people always win and there is little scope for others to enter into the process. Here *Mastaans* are the strong members of this powerful group. The same paper also revealed that the poor slum dwellers in Bangladesh are highly dependent on these powerful and well connected *Mastaans* and this dependency limits their resilience as well. Due to their illegal status, they cannot claim services directly from government. Under these circumstances, conflicts between inhabitants are settled locally by means of a *Salish*[17] involving local *Mastaans* and political leaders (Hossain, 2012).

Not only in Korail, *Mastaans* are active local leaders in most Bangladeshi slums. These so-called local leaders are well connected to the ruling political party as well as the DWASA (Dhaka Water Supply and Sewerage Authority) and legalize the illegal connections of utility services in the slum. For example, *Mastaans* have become the largest water vendors in Bangladesh and they sell water at very high prices to poor slum dwellers (Hackenbroch, 2010). Due to the illegal status of the slum, the slum dwellers cannot protest against this higher charge but have accepted this informal practice as the main mechanism of utility distribution.

As said before, *Mastaans* are also employed in the slums for electoral mobilization by the political parties, where direct communication is difficult. *Mastaans* are the agents of the political parties to collect money from the urban poor in exchange of their use of public land such as street business.

However, *Mastaans* are the active informal actors of urban environmental governance. Maintaining a good relationship with them is always a plus point for the poor urban dwellers. However, the newly arrived disaster-stricken poor climate-induced migrants often don't understand this informal regulation of urban governance and therefore they are often deprived from the adequate utility facilities due to their poor contacts with the powerful groups like *Mastaans*. This result was extracted from the FGDs in Korail where the newly arrived climate-induced migrants were mostly found to be completely unaware about the role of *Mastaans* in the slum. This is a

[17] A local meeting involving local leaders to resolve local problems; mainly practised in the Indian subcontinent.

reflection of their lack of knowledge about the urban way of life which makes them less resilient than other.

(ii) Home Owners

There is another stakeholder group active in urban governance in the slum, namely the home owners. The poor renters don't hold any copy of entitlement. Absence of documents showing their rights to the piece of land and houses they are living in is one of the major constraints against building resilience (Patel and Baptist, 2012; Appadurai, 2012). The new climate-induced migrants in the slum reported that they have not given permission to undertake house repairs or to use the courtyard of the house. Therefore, they cannot productively utilize their space.

"I don't have any relatives in the city. If the homeowner evicts us from this house, I will have to live under open sky with my young daughters. So I don't usually argue with the homeowner. I had managed this accommodation via a Mastaan and I had to pay extra money for this"

Mr. Rashid Alam (7/12/2012).

FGD respondents also reported that homeowners constructed extra dwellings for climate-induced migrants but did not provide extra utility services such as extra latrines or water collection point. This created pressure on limited resources when a large number of migrants entered the slum following Cyclone *Sidr*.

Homeowners are generally well connected with the political leaders and are mostly involved in the process of water vending. The home owners are the connection between the renters and the water vendors in the slum. In Korail, it was found that the extra benefits from this illegal utility business in the slum are shared by both the home owners and *Mastaans*. The newly arrived climate-induced migrants, being unaware about the market rate, always pay higher charges and thereby regularly face financial obstacles.

(iii) Police Force

Though a formal organization, the police force is informally involved in the governance process. The police play an important role in the lives of slum dwellers. The FGD findings showed that the respondents generally fear police force as, according to them, police are the agent of corruption. "*I have to give bribe to traffic police every alternative day sometimes even without any fault*"- said one of the climate-induced migrants (FGD 1: 12/07/2012). Frequent rickshaw bans also constitute a constraint against integrating into urban livelihoods, as rickshaw pulling is one of the major sources of income for the urban poor in Bangladesh (Sadekin *et al*., 2014). Police also threaten the slum dwellers that they will be evicted from their locality if they don't pay regular bribes.

In a nutshell, the urban environmental governance is different from its rural context. It involves many informal actors mainly to legalize its strange informality. Urban areas offer many added challenges such as fear of *Mastaans*, higher utility cost and eviction threat. To deal with all these new challenges new migrants have to struggle in their new destination and are often cannot cope with the changed situation. The next chapter will discuss, in one of its section, to what extent the existing structure of urban governance affects all the slum dwellers in the same way or not.

5.8 CONCLUSION

Finally, the following table (Table 5.7) presents the major findings of this chapter:

Table 5.7: Differences between the socio-economic condition of climate-induced migrants before and after migration

Indicators	Before Migration	After Migration
Livelihoods	• Everyone had their own rural-based livelihoods • High dependency on natural resource and seasonality • Exposed to natural hazards	• More involvement in relatively low paid jobs in the urban informal sector • Mean household savings in the city is 192.50 BDT (US$2.5) per month. This amount is not enough even for the fare of their return journey to their villages • High rate of unemployment (21.25%)

	• Negligible energy cost • Nearly 90% of the respondents had their own houses	• Negative savings (pressure of loan): 55% of respondents take loans regularly at the end of the month • Very low access in the popular garments sector and other better paid jobs (5%). • Still some migrants such as day labours and hawkers are dependent on seasonality for their livelihoods. 16% of the respondents said that heavy rainfall and waterlogging are the main reasons for unemployment • Still exposed to natural hazards • High cost of poor housing (mostly rented) and energy services • Begging is not a common coping strategy because of their self dignity.
Asset base	• Strong social network in village. • Rich material asset, such as land, house, trees, livestock and jewellery. 70% of the respondents never attended school.	• Lower social network in the city. • Almost no institutional affiliation except DSK-a slum based NGO (16%). • Poor material asset.
Food security	• Migrants never had to starve before the extreme climatic event • 55% of the respondents, while in the village, had their own production unit in the home yard	• More people are starving after coming to the city. • Less variation of food item

	• Most of the respondents (92.5%) were satisfied with the quality of drinking water. • Higher level of protein intake.	• Lack of access to pure drinking water; (only 11.25% of the respondents are satisfied with the quality of drinking water) • Lower level of protein intake.
Health	• People used to enjoy relatively good health condition. • Mean annual household medical cost before migration was 974 BDT.	• Health condition is severely deteriorated. • Poor sanitation and solid waste management in the city. • Mean annual household medical cost is now 8190 BDT on an average in the city.

**Refers to the period before the specific devastating climatic event in place of origin*

This chapter has focused on the differences between the climate-induced migrants' past and present socio-economic conditions. Significant differences have been found in terms of types of occupation, living cost, access to food and its quality, and health conditions (Table 5.7).

From a relatively better socio-economic status in their places of origin, climate-induced migrants in Dhaka City are now struggling with lack of food security, poor health conditions and unemployment. This group also reported some added socio-economic threats in the city, such as decreased level of privacy and dignity, lower scope of religious practice and associated worry, constrained livelihood during political unrest situation and waterlogging and continuous threat of slum eviction. These are discussed in detail in Chapter Seven.

This chapter also discussed about the national policies related to climate change and migration and identified gaps which are working as the constraints against building effective resilience of the target group. For example, ignorance of migration and gender issue in climate change and disaster management related policies have been identified as gaps in policy level. Climate-induced migration is still considered to be the consequence of 'failed livelihood' following a disaster where policy level transformation is needed if migration is to be seen as adaptation. As the chapter

discussed, the informal actors like *Mastaans* and home owners in the city play vital role in shaping target group's vulnerability.

In a nutshell, the new context of social and economic threats and risks were unexpected for the climate-induced migrants. As most of them are uneducated, they cannot easily improve their conditions. They have few contacts in the city and therefore cannot easily obtain access to essential services. Most importantly, as they are environmentally forced migrants, they didn't have the time to plan their future in the destination. This made them unaware about the urban way of life. Once they had their own identity, property and establishment in their villages, but now they have nothing but their destroyed rural property and diminishing confidence levels, coupled with increased insecurity and vulnerability – precisely the opposite of what they anticipated in deciding to migrate to Dhaka. This group has gone through a drastic change in their life in terms of livelihoods, assets, food security, health condition and the overall lifestyle. Therefore, it is important to identify them and give them special assistance so that they can cope in a better way and can have access to essential services which are necessary to lead a good life.

CHAPTER SIX

DIFFERENCES BETWEEN CLIMATE-INDUCED AND NON-CLIMATE-INDUCED MIGRANTS IN DHAKA CITY

6.1 INTRODUCTION

"(Degree of) expectations and realisation in the urban areas, would vary among migrant types"

(Begum, 1999: xiv).

The two previous chapters compared the climate-induced migrants' past and current hydro-geophysical contexts and also examined their socio-economic conditions in the city. This chapter will answer the most important question of the research: '*Are the climate-induced migrants differently vulnerable than the other types of migrants in the destination*?'

There is limited previous research comparing migrants and non-migrants (Butterworth, 1972) and also permanent and temporary migrants (Bell and Ward, 2000). However, this chapter will compare two different groups of migrants - climate-induced migrants and non-climate-induced migrants, who are living in the same slum in Dhaka City. Comparison has been made in terms of their characteristics, experience in the city, and future aspirations.

Migrants to Dhaka, who are not climate-induced but live in the same slum, have been termed 'non-climate-induced migrants'. They form the 'comparison group' in this chapter. On the other hand, the climate-induced migrants will be called the 'target group'. Both the target group and the comparison group were selected as having arrived in the city after 2006 (see Section 3.4.1 of Chapter Three).

6.2 CLIMATE-INDUCED MIGRATION VERSUS NON-CLIMATE-INDUCED MIGRATION

"Migration proceeds in response to urban-rural differences in expected rather than actual earnings. The fundamental premise is that migrants as decision makers consider the various labour market opportunities available to them as between, say,

the rural and the urban sectors, and choose the one which maximizes their 'expected' gain from migration. Expected gains are measured by (a) the differences in real incomes between rural and urban job opportunities and (b) the probability of a new migrant obtaining an urban job"

(Todaro, 1976: 28-29).

Todaro's migrants expect higher incomes and migrate mainly because of rural-urban wage differentials. Lee's migrants also migrate mainly to achieve better employment in the city (Lee, 1966). Hope and Ruefli (1981) also identified 'expectation of social and cultural amenities' as the factors driving migration. The expectations of such migrants generally match with those of the non-climate-induced migrants. Most of such common migration theories (see Section 2.5 of Chapter Two) apply to all migrants in general. However, in reality, not all migrants relocate due to the expectation of wage differentials, if we focus mainly on third world cities (Begum, 1999; Prothero, 1987).

According to Akin Mabogunje (1970), this is the non-conducive structural milieu which motivates people to migrate. The target group of my research matches with Mabogunje's migrants because they are the distressed migrants and their environmental and structural situation suggests that migration is the only survival strategy (Begum, 1999).

For climate-induced migrants, migration is not a distinct choice of aspirations to higher income levels but the emergency need for safe shelter and ready cash through any forms of employment (Begum, 1999). This is the group who become the part of the unemployed population of the city. Coping during unemployment is very difficult for them because they cannot depend on the rural income and also cannot depend on their inadequate savings.

In the destination urban area, migration has led to the scaling up of economic activities and optimization has been achieved through economies of scale. If that is the case, there must be a balance between the number of migrants who are productively joining the urban labour force and the availability of jobs in the labour market. However, in last few decades, climate change has altered the migration scenario (Black *et al.*, 2008). When there is an influx of climate-induced migrants,

who are less committed to the way of life in urban regions but who are seeking a survival strategy, then the management of such migrants in an already overpopulated city might be a concern for the city authorities. For example, in Dhaka, arrival of more migrants will occupy more low-lying lands and eventually create severe drainage congestion problem for the city. Therefore, it is necessary to identify the climate-induced migrants who are already in the city and to understand their different context of vulnerability by comparing them with other types of migrants.

6.3 DIFFERENCES BETWEEN THE CLIMATE-INDUCED MIGRANTS AND NON-CLIMATE-INDUCED MIGRANTS IN KORAIL SLUM

Both the target group and the comparison group were asked to respond to the same questionnaire and similar agenda were discussed in the FGDs as well. The result shows significant differences in most of the following areas (results have been generated from statistical tests described in Section 3.4.2.1 of Chapter Three):

6.3.1 Financial Conditions

Occupations, income, savings, asset base, transportation mode used for going to work and home ownership have been considered in case of determining differences in financial condition of the two groups - climate-induced and non-climate-induced migrants. In comparing the occupational profiles of the two groups, the Chi-square ($\chi 2$) test could not be used because more than 73% of the cells have counts less than 5 (the minimum threshold for the test to be valid). Therefore, Table 6.1 compares data between two groups.

It is evident from the following table (Table 6.1) that a substantial proportion of the climate-induced migrants are still unemployed in the city (21.2%). Conversely, no-one among the comparison group, strikingly, was found to be unemployed at the time of the survey. The table also reveals much higher participation of climate-induced migrants in the lowest-paid menial jobs such as day labourers (20%) and maid servants (18.8%). In contrast, the comparison group has higher participation in better paid jobs such as garments factory workers (15%), shop keepers (15%), business (15%) and office peon (7.5%).

Table 6.1: Major occupations of climate-induced and non-climate-induced migrants

Types of occupation	**Percentage of climate-induced migrants (n=80)**	**Percentage of non-climate-induced migrants (n=40)**
Unemployed*	**21.2**	**0**
Rickshaw puller	23.8	22.5
Day labourer	**20**	**5**
Garment worker	**2.5**	**15**
Shopkeeper	**2.5**	**15**
Driver	0	2.5
Hawker	1.2	0
Housewife	5	2.5
Maid servant	**18.8**	**2.5**
Scavenger	1.2	0
Office peon	1.2	7.5
Businessman	**1.2**	**15**
Security guard	1.2	2.5
Construction worker	0	2.5
Carpenter	0	2.5
Contractor	0	2.5
House caretaker	0	2.5

**Bold sections indicate areas of major difference.* Source: Questionnaire Survey

Table 6.2 demonstrates the differences in the financial conditions between the two groups (see Section 5.2.2 of Chapter Five for more discussion on the financial condition of climate-induced migrants). An independent samples t-test was conducted to examine whether there was a significant difference between the two groups in relation to their current income in the city. The test revealed a statistically significant difference between them ($t = -9.748$, $df = 45.241$, $p < 0.001$). Non-climate-induced migrants reported higher income, on the average, in the city (M, Mean = 13325, SD, Standard Deviation = 4756.305) than did climate-induced migrants (M = 5711.25, SD= 1886.86).

Monthly mean savings of the comparison group are also almost 27 times higher than those of the target group and the difference is significant at the 1% level (see Table 6.2). The mean monthly savings of the climate-induced migrants is only 192.50 BDT (SD=797.27) which is not enough even for purchasing a return ticket to their places of origin. On the contrary, the comparison group stated about higher mean savings at the end of the month (Mean, M=5125; Standard Deviation, SD=2603.62). This mean savings of comparison group also includes remittances to their villages.

For other categorical variables such as transportation modes used every day, house ownership and asset base, Chi-square ($\chi 2$) tests were conducted. It has been found that more climate-induced migrants (77.5%) go to work on foot than the respondents in the comparison group (37.5%). A negligible proportion (1.2%) of the climate-induced migrants catches a bus to work, while 32% of the comparison group selected this as their main mode of transport. Therefore, it can be said that there is a significant difference ($P<0.001$) in the choice of transportation based on types of migrants, where more climate-induced migrants travel on foot as compared to the non-climate-induced migrants. In other words, these findings showed that the comparison group can afford better transportation modes for going to work, when compared with the target group. This modal choice scenario is clearly linked to their differential financial conditions. Given the significantly higher average monthly income, the non-climate-induced migrants have more flexibility in transportation choice, especially for mechanized mode of transportation, which their climate-induced counterparts can hardly avail.

Table 6.2: Differences in the financial conditions of the climate-induced and non-climate-induced migrants in Korail slum of Dhaka City

Variables	**Climate-induced migrants (n=80)**	**Non-climate-induced migrants (n=40)**	**Test statistic ** (P-value)**
Financial conditions[18]:			
Average monthly household income (BDT)	5711.25 (US$ 73.50)	13325 (US$ 172)	t= -9.748; (**p<0.001)**
Average monthly household expenditure (BDT)	5518.75 (US$ 71)	8200 (US$ 106)	t= -5.044; (**p<0.001)**
Average monthly household savings (BDT)	192.50 (US$ 2.5)	5125 (US$ 66)	t= -11.710; (**p<0.001)**
Transportation mode used every day:			
-*On foot*	77.5%	37.5%	$\chi2$ = 18.556;
-*Not on foot*	22.5%	62.5%	**(p<0.001)**
House ownership in the slum:			
-*Rented*	97.5%	87.5%	$\chi2$ = 4.855;
-*Own house*	2.5%	12.5%	**(p=0.040)**
Asset:			
-*Own shop/business*	3.75%	40%	$\chi2$= 26.295; (**p<0.001)**
-*Rickshaw*	5%	20%	$\chi2$= 6.667; (**p=0.020)**
-*Jewellery*	6.2%	37.5%	$\chi2$= 18.75; (**p<0.001)**
-*Furniture*	36.2%	82.5%	$\chi2$= 22.842; (**p<0.001)**
-*Cell phone*	66.2%	92.5%	$\chi2$= 9.800; (**p<0.001)**
-*TV*	15%	50%	$\chi2$= 16.705; (**P<0.001)**

Source: Questionnaire Survey

[18] Statistical results are provided from the independent samples t- test and Chi-square test.

A significant difference has also been found with respect to house ownership ($p=.028$) and asset base ($p<0.001$) between the two groups (see Table 6.2). 12.5% of the respondents in the comparison group have their own houses in the slum compared to 2.5% of the respondents from the target group. FGD sessions revealed differences in terms of what they brought with them during the process of migration. Almost all the respondents from the target group said that they could not bring anything during the migration process, except their clothes. On the other hand, non-climate-induced migrants were found to have brought more money and other assets when relocating to the city. Also, in the FGD sessions, the comparison group reported that during the process of migration they brought clothes, furniture, sewing machine and sufficient money to meet the initial needs and confront the struggle in the city. Currently 12.5% of the non-climate-induced migrants are house owners in Korail (which does not include ownership of land). As a striking instance, one FGD participant from the comparison group also revealed that he was planning to buy a piece of land on the fringe of Dhaka City. This is an indication of the differences in financial conditions, purchasing power and in priorities between the two groups.

6.3.2 Education and Awareness

According to previous research, the tendency to migrate increases with the level of educational qualification achieved (Byerlee, 1972, 1974; Caldwell, 1969; Rempel, 1970; Sabot, 1972; Sahota, 1968; Adepoju, 1995, 2002; de Haas 2008). Therefore, it can be said that the potential migrants were previously assumed to be well educated. But recent research argued that migrants from environmentally fragile regions might come from varied educational backgrounds and levels but there are differences in their motives for migration (Tacoli, 2011). According to recent literature, those who are poorly educated generally migrate with a view to finding an alternative livelihood strategy and those who have higher education (at least up to secondary level) migrate with different objectives such as better education and better lifestyle (Van der Land, 2013). The results of the present research (Table 6.3) are in agreement with these recent findings and I argue that the climate-induced migrants' motives for migration are significantly different from those of the non-climate-induced migrants.

An independent samples t-test was conducted to examine whether there was a significant difference between climate-induced and non-climate-induced migrants in relation to the years of schooling completed (Table 6.3). The test revealed a statistically significant difference between the two groups ($t = -2.121$, $df = 118$, $p=.036$), where the comparison group ($M = 3.98$, $SD = 2.702$) reported significantly higher levels of education than did the target group ($M = 1.96$, $SD= 2.712$).

The study also assessed the level of health-related awareness of the two groups. Both climate-induced and non-climate-induced migrants were asked whether they know the reasons for the incidence of diarrhoea, malaria and/or dengue. A Pearson Chi-square ($\chi 2$) test was conducted to examine whether there were any remarkable differences in health-related awareness between the two types of migrants. The results revealed that the level of health-related awareness is significantly different between the two groups of people. A significantly larger proportion of non-climate-induced migrants (85%) reported that they were aware of the reason for at least one disease among diarrhoea, malaria and dengue compared with only 61.2% of climate-induced migrants (see Table 6.3).

People's water purification habit is another important indicator for assessing their awareness related to health. The results showed that there was statistically significant difference between the two groups of participants in terms of water purification practice. A significantly larger proportion of non-climate-induced migrants (70%) reported that they purify water before drinking compared with only 42.5% of climate-induced migrants (Table 6.3).

Table 6.3: Education and health-related awareness of climate-induced and non-climate-induced migrants

Variables	**Climate-induced migrants (n=80)**	**Non-climate-induced migrants (n=40)**	**Test statistic ** (P-value)**
Years of schooling (mean value)	1.96	3.98	t=-2.121; p=0.036
Awareness about reason for diarrhoea, malaria and/or dengue	61.2%	85%	$\chi 2$= 7.053; p=.008
Habit of water purification	42.5%	70%	$\chi 2$= 8.076; p=.004

*****Statistical results are provided from the independent samples t- test and Chi-square test. Source: Questionnaire Survey.

Therefore, unlike Todaro's profit maximizing migrants (Todaro, 1976), the climate-induced migrants of this research are not very educated and not aware of the ways of urban life. For example, they are unaware of the fact that water needs to be purified in the city and also are ignorant of the causes of the likely diseases in the urban slum. In this case, however, there exist a clear difference with the comparison group who are more aware of the different types of health-related hazards and have better educational qualification that provide them a better standing in the city than that of the target group. Therefore, it can be easily said that there are differences in the educational qualifications as well as in the levels of awareness of the two groups, which also indicate differences in the goals and expectations of migrants based on their educational level (Connell *et al.*, 1976).

6.3.3 Family Structure and Pattern of Migration

Family size and composition are important indicators to understand a household's socio-economic condition. The family size of the target group (M=4.20; SD=1.326) in the research was found to be significantly larger (t=3.37; p<0.01) than that of the comparison group (M=3.25; SD=1.515). Nearly 79% of climate-induced migrants are living with their parents whereas less than 2% of non-climate-induced migrants brought their parents in the city with them during the process of migration. This information clearly links with the fact that climate-induced migrants were helpless during the process of migration and there was no other way than to bring the whole family with them. FGD respondents from the target group also claimed that one of the main reasons for migration was that they did not have the shelter to live in. Then how could they leave their parents in the village?

Literature suggests that migration is characterized by age, education and skill selectivity (Caldwell, 1969; Rempel, 1970; Schultz, 1971; Barnum and Sabot, 1976; Byerlee, 1972 and 1974; Chaudhury, 1978; Clark, 1986; Lipton, 1977; Todaro, 1976; Rienzo, 2013; Kaestner and Malamud, 2011). But climate-induced migration in this research is not characterized by these variables. Families came as a whole: with both economically active and inactive members. For example, Setara Begum (65) came to Dhaka after Cyclone *Sidr* in 2007 and since then she has been living in Korail with her husband, two sons and two daughters-in-law in one room with a partition wall. The room size is almost 80 square metres and 6 persons are really too many for the area. "*Sometimes I prefer to sleep under the bed of my sons*"-said Setara with tear in her eyes. Her self-dignity thus deteriorated to a great extent after coming to the city. Currently she is sick and cannot work and, according to her, she is now considered to be a burden for her family. "*Why don't you go back then*?"-The answer was simple-*"no way to go back, nothing left in there!"* (Personal interview: 5; 23/08/2012).

However, Table 6.4 shows some different trends in the patterns of migration between the two groups. Almost 56% of non-climate-induced migrants initially migrated alone and brought family afterwards but the research found very few climate-induced migrants (1.2%) who migrated alone. Hence there is a basic difference in terms of the whole migration pattern between purely climate-induced and non-climate-induced migrants, which reflects the profoundly different circumstances under which

they left. Koubi *et al.* (2013) stated that if people migrate alone from climatic-affected areas leaving their families there, then this is likely to weaken the relationship between climate change and migration and rather reflects only a form of livelihood diversification. However, as previously stated, 98.8% of the climate-induced migrants in this study moved to Dhaka with their families. Considering Koubi's findings, the pattern of migration found in my research is likely to be linked with climate change.

Table 6.4: Differences in migration pattern between the target group and comparison group

Category	**Climate-induced migrants (%) (n = 80)**	**Non-climate-induced migrants (%) (n = 40)**
Migrated with the whole family	98.8	26.5
Initially migrated alone and brought family afterwards	0	56
Living alone in the city	1.2	17.5

Source: Questionnaire Survey

FGDs also revealed that the comparison group generally had some time to plan for the migration and had scope to leave their relatives in the village. Still 17.5% of the comparison group are living alone in the city because they have the option to keep their families in villages and send money from the city, something which is not possible for the climate-induced people who actually don't have anything in their villages due to their destroyed asset base. Therefore, family size was found to be significantly different ($t=3.37$; $df=118$; $p=.001$) in case of climate and non-climate-induced migrants.

6.3.4 Access to Credit

Many institutions based in Korail provide micro-credit facilities to the slum dwellers. The NGOs involved in this programme are BRAC (20 groups), PROSHIKA (143 groups) and others (15 groups) (Mridha *et al*., 2009).

Attempts have been made to understand whether there are any differences between the two groups in terms of access to credit. For this, they have been asked regarding their practices of taking loans, sources of loan (whether personal or institutional), affiliation with institutions, credit facilities of those institutions and use of bank account. Table 6.5 is the summary of the questionnaire findings regarding access to credit of the respective groups.

Table 6.5: Differences in access to credit between target group and comparison group.

Access to Credit[19]	**Climate-induced migrants (%) (n=80)**		**Non-climate-induced migrants (%) (n=40)**		**Test statistic*** $\chi 2$**; p-value**
	Yes	No	Yes	No	
Loan taken since came to the city	**55**	45	**17.5**	82.5	$\chi 2$=15.345; **p<0.001**
Having any bank account	**0**	100	**30**	70	$\chi 2$=26.667; **p<0.001**
Having any institutional affiliation?	**16.2**	83.8	**30**	70	$\chi 2$=3.057; p=.080

Source: Questionnaire Survey

[19] In this study, the variable 'access to credit', for example, is a nominal variable, for which the response was 'qualitative response' (i.e. yes or no) for various categories of the variable. Chi square test is the appropriate test in such a case.

Significant differences were found between the two groups in terms of use of bank account and tendency to take loans ($p<0.001$). It was already mentioned in Section 5.3.3 of Chapter Five that no climate-induced migrants were found who had a bank account. In contrast, 30% of the non-climate-induced migrants said that they regularly operate a bank account in the city.

Moreover, more migrants from the target group (55%) take personal loans regularly than migrants from the comparison group (17.5%). Here personal loans refer to the loan taken at personal level (e.g. from friends and/or neighbours). Though there are 178 groups working based in Korail slum to give credit support, the target group rarely have access to this institutional source (Mridha *et al*., 2009; Sinthia, 2013).

As stated in Chapter Five already, only 16.3% of climate-induced migrants have institutional affiliations in the city (compared to 30% in case of comparison group) and their affiliation is mainly limited to the membership of DSK, a leading NGO working in the slum (DSK, 2010). DSK also gave cash (not loan) to very few respondents in the target group (3 out of 80) but in every case they didn't do anything productive with that money; rather they spent it to repay their previous personal loans.

"DSK gave me BDT 10,000 to construct a grocery shop; but I used that money to repay my previous loans"

Lipi Begum, a climate-induced migrant (Personal Interview: 2; 12/12/2012).

It proves that climate-induced migrants of the research cannot even utilize institutional credit support due to their already pressurized debt condition in the city (see section 5.2.2 of Chapter Five to understand debt conditions of climate-induced migrants). The annual progress report of Urban Partnerships for Poverty Reduction (UPPR) mentioned this behaviour of misusing credits among some Korail slum dwellers and identified this as a major challenge for poverty reduction (UPPR, 2009).

On the other hand, the migrants from the comparison group reported a higher rate of membership (30%) in the credit giving organizations such as BRAC and PROSHIKA (leading national NGOs), co-operative organizations and formal banks in the city (Mridha *et al*., 2009). As this group can save money at the end of the month, they don’t have to seek loans regularly. This makes them free from any debt pressure and

therefore, they can utilize the credit facilities in a better way unlike the climate-induced migrants.

6.3.5 Coping Strategies

Coping strategies can take different forms. It can be coping with unemployment, health-related hazards and/or environmental hazards. As poor slum dwellers, almost every inhabitant of Korail needs to develop coping strategies to combat the negative social and environmental hazards. The research tried to understand whether there are any differences in the coping strategies of these two different groups. The following table (Table 6.6) represents different types of coping strategies during unemployed periods in respect of the different groups of migrants.

Table 6.6: Coping strategies in situations under unemployment

Coping strategies	**Target group (n) (n=62)**	**Comparison group (n) (n=37)**
Taking Loan	41.2%	27%
Selling Asset	8.8%	5.4%
Taking help from govt/NGO	-	2.7%
Begging	2.94%	-
Shopping in local shop and paying later	11.76%	-
Getting help from relatives or friends	8.8%	5.4%
Spending from savings	**7.4%**	**59.5%**
Eating less	19.1%	-

Source: Questionnaire Survey

The above table shows that nearly 78% from the target group have the experience of being unemployed in the city at least once after joining labour force in Dhaka, where 92% from the comparison group have the same experience. The comparison group's greater experience of unemployment is probably related to their greater participation in the garment sector where they are often fired due to strict rules and regulations. FGD findings revealed that many migrants from the comparison group also take breaks from jobs in order to improve their skills through income generating training (e.g. car driving). In contrast, the migrants from the target group can rarely plan such 'break from work' situations. Their lower savings also do not allow them to explore for suitable jobs and they have to take low paid menial jobs anyway in order to survive in the city. Jaheda Begum, a climate-induced migrant, said that, "unemployment is starvation, we cannot afford it" (FGD: 2; 12/07/2012). Strikingly, the research found 21% of the climate-induced migrants to be unemployed during the fieldwork.

Hence, both groups have the experience to be unemployed in the city but the ways of coping with unemployment is different for these two groups. As already discussed in Section 5.2.7 of Chapter Five, taking loans during periods of unemployment is very common among the target group (41.2%) followed by eating less (19.1%). Strikingly, eating less was not mentioned as a coping strategy by anyone from the comparison group. On the contrary, spending from savings was reported as the main coping strategy of the comparison group (59.5%), where very few (7.4%) from the target group mentioned this as an option. The more capability of spending from savings reflects the more savings they have and their better socio-economic condition. This category has been shown in bold in the table due to their noticeably higher differences (Table 6.6).

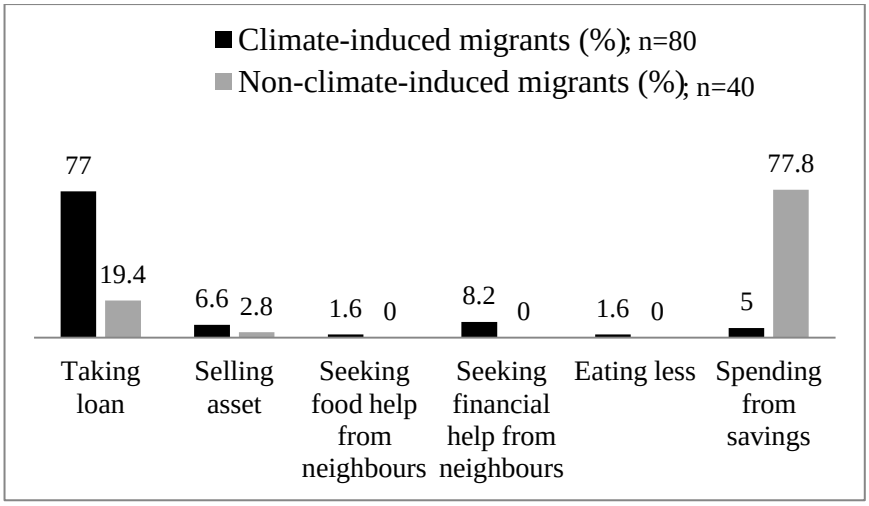


Figure 6.1**:** Coping strategies adapted to meet medical emergencies in the city. Source: Questionnaire Survey

Slum dwellers have to cope with other emergency situations when they have to bear significant and sudden health-related costs. The research also focused on the types of coping they pursue in this particular condition, as shown in Figure 6.1. It can be seen clearly that during medical emergencies also, more non-climate-induced migrants (77.8%) can use their savings to overcome the difficult situation which is not possible for most of the climate-induced migrants. Rather, an almost identical proportion of the climate-induced migrants have to seek personal loans (77%) to deal with health-related emergencies. The similarity of these percentages is quite remarkable and demonstrates how loans become the most common source of essential funds in the absence of personal savings.

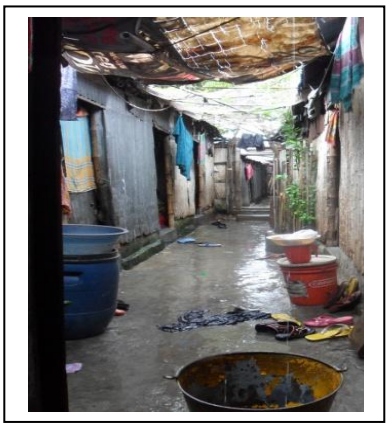


Photo 6.1: Climate-induced migrants trying to cope with rainfall with bucket and polythene in Korail. Source: Field Survey

A different type of coping is related to extreme environmental events. Respondents from both groups were asked about their coping strategies during heavy storms and rainfall in the city. Almost 50% of the non-climate-induced migrants reported that they do not need any coping during rainfall because they do not experience rainwater intrusion into their houses, compared to only 3.8% of the climate-induced migrants. This information also reflects the fact that the climate-induced migrants live in more dilapidated housing conditions than the non-climate-induced migrants. Those who have to take precautions while it rains commonly use polythene to cover the roof and use a bucket to protect the floor.

Respondents were also asked about their most common coping strategies for combating high temperatures (Figure 6.2). 3.8% from the target group informed that use of traditional *Hatpakha*[20] is their only form of comfort in summer. Walking outside the house was reported as the most common coping strategy by the climate-induced migrants (46.2%), but not a regular coping option for the other group (2.5%). However, compared to the 12.5% of climate-induced migrants, almost 77.5% of non-climate-induced migrants use fans during hot summer days and thereby consume more electricity. Their ability to do so, of course, reflects their higher money income and stronger asset bases.

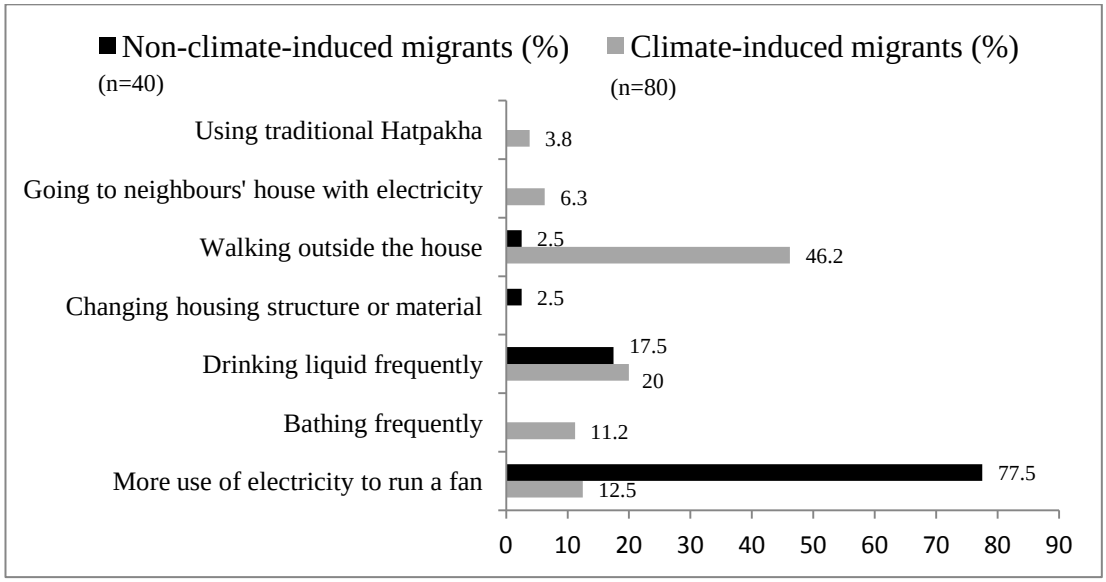


Figure 6.2: Coping strategies for combating high temperature in Dhaka.

Source: Questionnaire Survey

[20] *Hatpakha* is a traditional hand-driven fan, widely used in rural areas where there is no electricity.

It should be mentioned here that almost 79% of non-climate-induced migrants have access to electricity connections in the slum in comparison with only 23% of climate-induced migrants. It establishes that the comparison group actually have better access to utility services than the target group and therefore can adopt better coping strategies during hot summer days. As just indicated, this is principally a reflection of their different economic situations.

6.3.6 Relationship with the Place of Origin

The research focused on the relationship of the two different groups of migrants with the places of origin. From Table 6.7 it is clear that the number of visits to places of origin in a year is significantly higher ($p<0.001$) among non-climate-induced migrants than among the climate-induced migrants.

Table 6.7: Number of visits to the places of origin in a year

Type of migrant	**N**	**Mean no. of visits/year**	**Standard deviation**	**Test statistic*; p-value**
Climate-induced migrant	80	0.39	0.562	t= -5.212; df= 118; p < 0.001;
Non-climate-induced migrant	40	4.00	5.505	

*****Statistical results are provided from the independent samples t- test. Source: Questionnaire Survey.

Results in Table 6.7 indicate that most climate-induced migrants cannot manage to visit their places of origin even once a year (mean number of visits is 0.39/year), whereas the non-climate-induced migrants are making visits 4 times a year. Though not presented in the table, the research also found that 38.7% of the climate-induced migrants visit their places of origin at least once a year, whereas the rate is 90% for the non-climate-induced migrants. The results also revealed that 3.7% of the climate-induced migrants visit their villages more than once annually, which is 70% in case of non-climate-induced migrants. Therefore, by conducting an independent samples t-test, it can be easily said that the yearly visit to the places of origin is significantly higher for the comparison group than that of the target group ($p <0.001$).

However, reasons for visiting places of origin are also very different between the two groups. 98% of the climate-induced migrants who visit their villages every year, stated 'visiting relatives' as their main purpose of visit. On the other hand, the non-climate-induced migrants who visit their villages every year stated their reasons for visiting as taking care of village property (30.6%), buying new land (8.3%), administering income from agricultural production (13.9%) and meeting own family members (16.7%). However, no climate-induced migrants mentioned these reasons for their visit to village. Other than visiting relatives, the target group's reasons were limited to only meeting sick parents (2%) in the village (Figure 6.3).

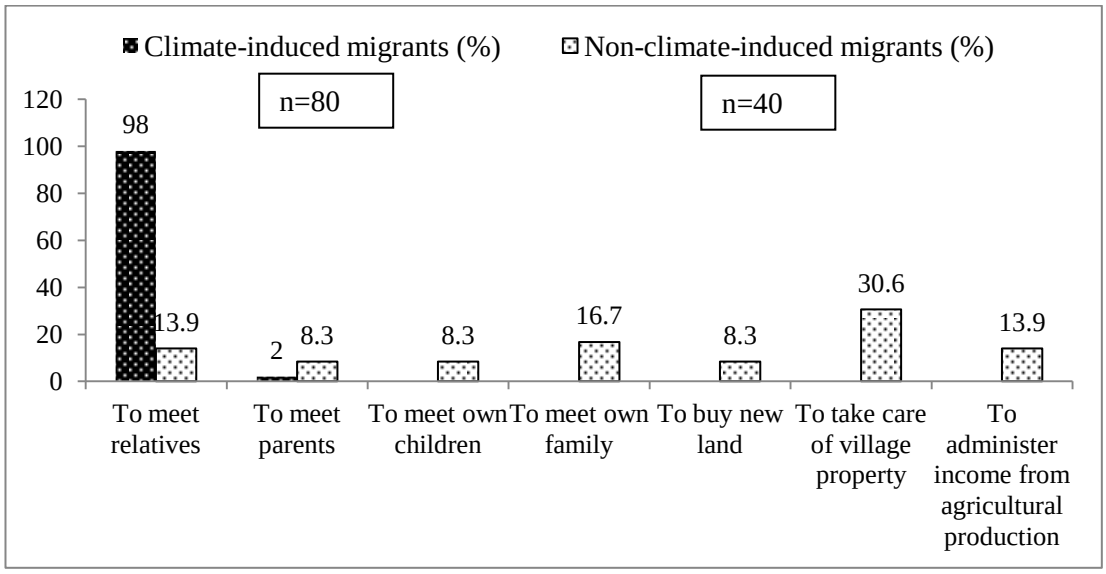


Figure 6.3: Reasons for visit to places of origin. Source: Questionnaire Survey

Such contrasting reasons reflect the very different socio-economic conditions of the two groups. It is clearly seen from the findings that the respondents from the comparison group frequently visit their villages to administer rural-based income generating activities (mainly agriculture) and property which is not possible for the target group due to their destroyed asset base.

While exploring such relationships with villagers, it is inadequate to discuss only their frequency of travel. Cell phones provide a very easy way to communicate with their relatives in the village. The proportion using a mobile phone is 66% among the climate-induced migrants and 97% among the non-climate-induced migrants. In Bangladesh, a cell phone is a very cheap commodity and widely used by the people

from almost all the classes in the society. The call rate (air time) is also very cheap and therefore it gives the climate-induced migrants a certain degree of freedom in maintaining communication with their relatives in the village. However, as mentioned in Chapter Five, the use of cell phones by the target group is mainly limited to receiving phone calls as they cannot top up their phone balance regularly (FGD: 1; 12/07/12).

Finally, their level of aspiration to return to villages was discussed with both groups through FGDs, personal interviews and the questionnaire survey. It gives an idea about how they are linked with their places of origin emotionally. A significant difference has been found in the reaction of the two groups after conducting the Chi-square test ($p<0.001$).

Table 6.8: Aspiration to return permanently to the place of origin

Types of migrants	***Having aspiration to permanently return to village***		**Total**
	No	Yes	
Climate-induced migrants (n=80)	0%	100%	80
Non-climate-induced migrants (n=40)	60%	40%	40

Source: Questionnaire Survey

From Table 6.8 it is evident that 100% of the climate-induced migrants aspired to return permanently to their own villages. In contrast, only 40% from the comparison group have a similar aspiration. From FGDs it was clearly found that the target group perceive very strong aspirations to go back to their places of origin. Surprisingly, in every focus group with the target migrants at least one person cried out expressing his/her craving to return to their places of origin.

"*Living in the city slum is like a curse on me. I strongly believe God pushed me into this city due to my previous bad conducts"*

Milton Khan, a climate-induced migrant in Korail; FGD: 2; 12/07/2012.

By contrast, the majority of the non-climate-induced migrants came to the city with the aspiration to settle permanently (60%). In the FGDs also, it was clear that they migrated with a vision and planned accordingly, unlike the climate-induced migrants.

"*I cannot stay for a long time during my visit to village, because the rural atmosphere is very uncomfortable for my family members. There is no electricity connection and also there is no good school in the village"*

Fazlur Huq (45), a non-climate-induced migrant, FGD: 4; 22/07/2012.

The above-mentioned statement clearly conflicts with the target group's aspirations. The research found many families from the target group who are struggling in Dhaka only to save the money which is necessary for their return trip to villages and the repair of the broken rural houses.

6.3.7 Food Security

As discussed in Chapter Five (Section 5.4), food security is a very broad and multifaceted concept. Inhabiting in the same slum, people are generally more or less at the same level of food (in)security if we consider all of its aspects – availability, access and utilization of food. With this assumption, the research assessed their household conditions based on some indicators such as number of meals consumed each day, number of food items in one meal, variation of meal, opportunity to have food-related institutional/personal help, custom of food exchange and capacity of inviting people in dinner. These indicators were used to judge whether there is any difference in the status of food (in)security of the respective groups.

Non-climate-induced migrants reported a higher number of meals a day (i.e. number of times meal is taken) on an average in the city than did climate-induced migrants. Table 6.9 shows that climate-induced migrants are starving to a higher proportion as compared with the other group of migrants. More than 11% of the climate-induced migrants said that sometimes they have to starve for the whole day but no-one from the comparison group complained about starvation in the city. Starvation is a clear indicator of food insecurity which made the target group more vulnerable to the impacts of malnutrition and diseases.

Table 6.9: Number of food portions consumed each day in the city

How many times a day your household members have meal in the city?	Types of migrants	
	Proportion of climate-induced migrants (%) (n=80)	**Proportion of non-climate-induced migrants (%) (n=40)**
Sometimes starve the whole day	11.25	0
Once a day	5	2.5
Two times a day	25	0
Three times a day	58.75	97.5

Source: Questionnaire Survey

More than 97% of the non-climate-induced migrants said that they usually eat three times a day, compared to only 58.75% of the target group. Results from an independent samples t-test show that there is significant difference between the two groups in terms of the number of portions consumed each day in the city ($t=-5.200$; $df=105.188$; $p<0.001$).

The respondents from both groups were also asked to report the number of food items consumed in an average meal. The results were similar. Vegetables and lentils are widely taken by all of them but there are differences in terms of other protein consumed such as fish, meat and milk. Results suggest that climate-induced migrants are highly likely to have lower protein consumption than that of the climate-induced migrants (Figure 6.4). Figure 6.4 clearly reveals the differences in protein items consumed by the two groups in spite of living in the same slum. Results show that most of the respondents from the comparison group consume fish, meat, egg and milk regularly whereas the target group is mainly dependent on fish and lentil. Meat, egg and milk are luxury products for the climate-induced migrants (FGD: 2; 12/07/12) and they said that they eat meat only in the season of religious festivals when rich people distribute meat among the poor in the name of God.

The research also found differences in terms of variation of food among the two groups. For example, the comparison group are capable of choosing a variety of protein sources (fish, meat or egg), unlike the climate-induced migrants. In recent literature (Akter, 2012), a similar result was found where climate-induced migrants in Korail were described as the group with lower protein intake and a high rate of exposure to diseases. However, Akter (2012) did not consider any comparison group rather only described the food security status of the climate-induced migrants.

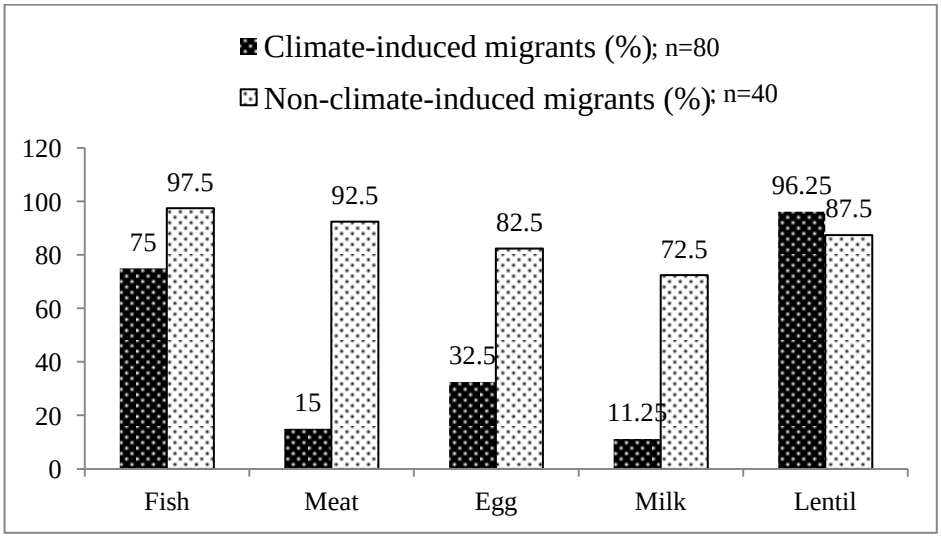


Figure 6.4: Percentage of people having different types of protein in the last week. Source: Questionnaire Survey

However, inter-household food exchange and societal food help are two important components to measure the access to food, though not very commonly used in literature. For example, Smith and Subandoro (2007) surveyed household expenditure on food but did not collect data on food given to the guests. In contrast, Maxwell and Smith (1992) discussed food help from society and also about inter-household food exchange.

This research also accounted these dimensions to understand the food (in)security status of respondents. The opportunity to obtain food help from the society has been accessed in the current research but the result was almost similar for both groups. 87.5% of climate-induced migrants said that they never received any food help from the society (such as from institutions, neighbours, friends and/or relatives), where 80% of the non-climate-induced migrants said the same.

Table 6.10 reveals the practice of food exchange among the climate and non-climate-induced migrants in Korail. Food exchange or sending special food dishes to neighbours is a traditional custom in South Asian families, mainly during religious festivals (Subhan, 2013). In traditional villages when something special is cooked, families generally share it with the close neighbours. The research tries to explore whether after coming to the city they are still maintaining this custom or not.

Table 6.10: Practice of food exchange in the city

Exchange of Food		**Frequency of food exchange (%)**			
		never	Once a week	Once a month	Once a year
	Target group (n=80)	51.25	3.75	26.25	18.75
	Comparison group (n=40)	37.5	17.5	22.5	22.5

Source: Questionnaire Survey

51.2% of the climate-induced migrants and 37.5% of the non-climate-induced migrants had never experienced food exchange in the city. However, it was found that 17.5% of the non-climate-induced migrants still exchange food with their neighbours regularly (at least once in a week), compared with that of the 3.8% of climate-induced migrants (Table 6.10). However, the frequency of exchanging food items gives an idea of the frequency of cooking special dishes and the rate is lower in case of the target group than the comparison group.

Inviting people at home or getting food as a gift is another indicator of understanding the food (in)security status in the research (Gibson and Rozelle, 2002). After conducting an independent samples t-test, it was found that the annual rate of inviting people is significantly higher ($p=0.007$) in case of families from the comparison group ($M=6.43$; $SD=8.791$) than that of the target group ($M=2.16$; $SD=5.504$). It means that, on an average, the non-climate-induced migrants generally invite guests into their house for dinner/lunch 6 times per year, where the climate-induced migrants do the same only twice a year. This clearly reflects the target group's lower financial ability to invite others.

6.3.8 Pre-migration Characteristics

This chapter is mainly based on the differences in the current conditions of both the climate-induced and non-climate-induced migrants. However, the study also attempted to understand whether their pre-migration characteristics were a factor in shaping their current socio-economic conditions. Previously their differences in educational status were discussed in Section 6.3.2 and the comparison group were found to be more educated than the target group. Therefore, pre migration income and assets were identified as other important categories at this stage of research.

In their places of origin (before the particular event which induced their migration decision), the average household income of the climate-induced migrants were found to be 4000 BDT (US$ 51.50) per month (see Section 5.2.2 of Chapter Five for the way of calculating income) and the average household income of the non-climate-induced migrants were found to be 5000 BDT (US$ 63.75) per month. Only 20% of them were found to be farmers previously and their income was estimated based on the total amount of crop they used to produce each year. Others had some monetary income from shopkeeping (25%), truck driving (15%), rural business (18%), rickshaw/van pulling (10%) and day labour (12%). Finally the value of income from livestock was calculated as livestock rearing is a common practice in rural Bangladesh.

This difference in pre-migration income was not found to be statistically significant, which indicates that in the pre-migration period (before the extreme event inducing migration), both the target and comparison group had similar financial ability. However, this chapter already revealed the differences in their financial ability in the city. This is easily understandable that the differences were shaped during the devastating floods, cyclones and riverbank erosions which made the target group more vulnerable than the migrants from the other group.

It is also found that 80% of the non-climate-induced migrants were not farmers in their villages and therefore their livelihood was not very much under threat of extreme weather events. These differences in pre-occupational characteristics might be due to their differences in educational status or vice-versa.

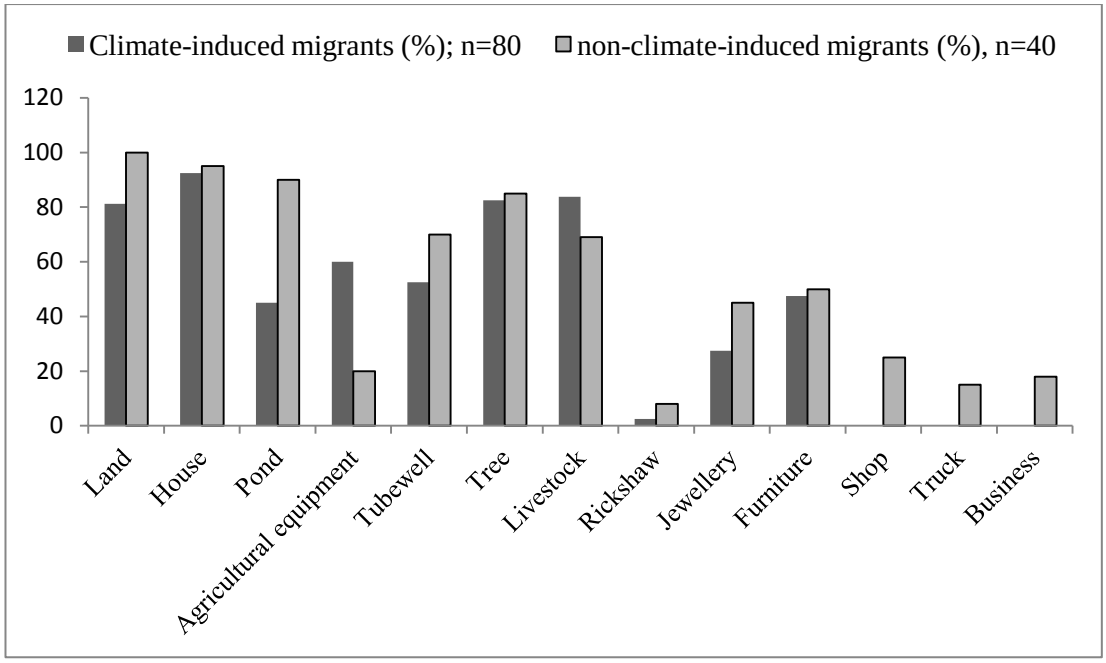


Figure 6.5: Pre-migration asset differences between the target and comparison group. Source: Questionnaire Survey

The above figure (Figure 6.5) is a demonstration of their pre-migration asset status. If examined carefully, it is evident that their asset levels were fairly similar at that time. The target group used to hold more livestock and agricultural equipment than the other group. This indicates the target group's dependency on agricultural livelihoods. Some categories were solely dominated by the comparison group such as shops, trucks and business. These assets were less sensitive to extreme weather and therefore most of those assets are still working as their sources of rural income. The comparison group still consider these shops, vehicles, businesses, land and houses as their rural property and 30.6% of them regularly visit their villages to take care of these properties (see Section 6.3.6 of Chapter Six).

During the pre-migration period, access to institutions was greater for non-climate-induced migrants (30%), where almost no institutional membership was found among the climate-induced migrants. This is probably due to their poor educational status which clearly made differences in their past and present conditions.

However, from a relatively similar socio-economic background, these two groups now have differentiated vulnerabilities in the slum, and the study found two main reasons behind this differentiated conditions. The principal reason is probably the

asset destruction during the floods, cyclone and/or riverbank erosion which made them helpless and destitute within hours (FGD: 2, 12/07/2012). Another reason was lack of education and institutional access which did not allow them to develop the confidence necessary to build their adaptive capacity. However, the next section will explore whether urban politics and governance have any differentiated impacts on climate-induced migrants.

6.3.9 Urban Politics and Governance and their Differential Impacts on Climate-induced Migrants

Section 5.7 of Chapter Five discussed how politics and governance structure affected the socio-economic conditions of the urban poor in Dhaka City. It was found that urban environmental governance has a strange informality in which many informal but active actors are involved (Hackenbroach, 2010). Corruption was found to be a root level problem of this system.

Now it is valid to ask how the impacts of urban governance structures and procedures differ between climate-induced and non-climate-induced migrants? The answer is simple in a way that it affects all the slum dwellers in general. Exceptions are the *Mastaans*, homeowners and influential political leaders who hold power in the society (Hossain, 2012) (see Section 5.7.4.1 of Chapter Five for more details). But in the research these actors were mostly found to be non-climate-induced migrants. The new climate-induced migrants, due to their shorter stay in the city, were not found to be aware about these informal actors. Also lack of education and assets made them more vulnerable to the social challenges posed by local *Mastaans*. Climate-induced migrants in Korail are found to be worried about the safety of their young daughters. As they are the least educated group in the slum, it is very easy to exploit them in the nasty political games with exchange of money. Due to lack of contacts in the city, they are always insecure and try to avoid any conflicts with the local *Mastaans*.

During the final stage of the fieldwork, the research found that a climate-induced migrant, Marjina Khatun (a divorced mother with three children, who was previously present in the FGDs of this study), has left the slum with her children. Investigation and information from her neighbours revealed that she did not feel safe in the slum because of *Mastaans*' threats over repayment of previous loans. This pressure of loan

repayment is a common story among the climate-induced migrants in Korail but Marjina's was an extreme case where *Mastaans* had direct involvement and it reflects the deteriorated law and order conditions in the slum. Marjina had no other relatives in the city and it forced her to go back to her village. Therefore, urban governance in Bangladesh does not favour the poorest, who include the climate-induced migrants in this study.

6.4 CONCLUSION

This chapter has found some major areas of differences between the two groups in Korail, which are summarized in Table 6.11 below.

Table 6.11: Major areas of difference between climate-induced migrants and non-climate-induced migrants in Korail

Indicators	**Target group**	**Comparison group**
Financial conditions	• Mostly unemployed, rickshaw pullers, day labourers, and maid servants. • Average monthly household income is 5711.25 BDT. • Low rate of house ownership (2.5%); Inability to afford common public transport such as bus; poor asset base.	• Mostly rickshaw pullers, garments workers, shop keepers and businessmen. • Average monthly household income is 13325 BDT. • Comparatively better rate of house ownership (12.5%), can generally afford public transport such as bus; better asset base.

Education and awareness	• Mean years of schooling is 1.96 • 42.5% of the respondents knows the necessity of water purification in the city. • 61.2% of the respondents knows the causes of likely diseases in the slum.	• Mean years of schooling is 3.98 • Most of the respondents (70%) know that water needs to be purified in the city. • 85% of the respondents knows the causes of likely diseases in the slum.
Family structure and pattern of migration	• Mean family size is 4.20 • 79% of the migrants brought their parents to the city with them. • 98.8% migrated with the whole family. • 1.2% are living alone in the city.	• Mean family size is 3.25 • Less the 2% of the respondents brought their parents to the city with them. • 26.5% of migrants migrated with the whole family. • 17.5% are living alone in the city.
Access to credit	• Higher rate of taking personal loans at the end of the month (55%). • Lower rate of having a bank account (0%) and institutional affiliation (16.2%).	• Lower rate of taking personal loans at the end of the month (17.5%). • Higher rate of having a bank account (30%) and institutional affiliation (30%).

Coping strategies	• On an average, 93% of climate-induced migrants cannot depend on their personal savings during emergency situation • Taking personal loan at the end of the month from neighbours (41%) and eating less (19%) are some popular coping strategies during periods of unemployment • Most of the migrants (77%) cannot afford electricity and therefore the hot summer days become difficult for this group.	• Most of the migrants (60%) can depend on personal savings during emergency situation such as periods of unemployment, diseases and/or disasters. • No one reported 'eating less' as a coping strategy. • Most of the migrants can afford electricity (79%) and can somehow cope during the hot summer days, though power failure is a regular phenomenon.
Relationship with place of origin	• Mean number of visit to the place of origin in a year is 0.39. • Reasons for visiting places of origins are mainly 'visiting relatives'. • 100% of the climate-induced migrants aspired to permanently return to their own villages	• Mean number of visit to the place of origin in a year is 4.00. • Reasons for visiting places of origins are mainly taking care of village property, buying new land and administering income from agricultural production. • 60% of the non-climate-induced migrants aspired to permanently settle in the city.

Food security	• More than 11% of the respondents reported about their history of day long starvation in the city. • Mostly eat three meals per day (58.75%), with low variation in food item. • Only 3.8% of the migrants exchange food with their neighbours regularly. • Rate of inviting people for dinner or lunch is twice a year. • Migrants have lower level of protein intake.	• No one from this group reported starvation history. • Mostly eat three meals per day (97%) with better variety of food items. • Almost 17.5% of the migrants still exchange food with their neighbours regularly. • Rate of inviting people for dinner or lunch is 6 times per year. • Migrants have better level of protein intake if compared with the target group.

The present chapter has focused mainly on the relationships and the differences between the climate-induced and non-climate-induced migrants in the same slum based on different indicators (Table 6.11). It has helped to understand the differential vulnerability of the climate-induced group to the various social and environmental hazards such as unemployment, illiteracy, lack of credit facilities and contacts in the city, food insecurity, and extreme environmental events.

The chapter revealed better income, savings, educational levels, access to credit, contacts and nutritional status among the non-climate-induced migrants compared with the climate-induced migrants. The chapter also revealed their contacts and connections with places of origin and much better connections were found in the comparison group. Reasons for visiting their places of origin are also very different in case of the two different groups. Finally, aspirations to return permanently to their places of origin are an important factor which was found to be very much higher among climate-induced migrants than in the other group.

The research also found bigger family sizes of the target group with both economically active and inactive members, where the comparison group mainly migrated with the active persons and now live with small families. The experience related to the process of migration was totally different for the climate-induced migrants: sudden and unplanned. They had no other way than to bring all the family members to the city because of their destroyed asset base in rural areas. By contrast, the non-climate-induced migrants migrated due to other types of reasons but had more time to plan their migration process than had the target group. And most importantly, the non-climate-induced migrants had the option to settle initially in the city themselves, leaving their families back home and bringing them afterwards, which was not possible for any of the climate-induced migrants of the research. This made the actual difference between the two groups – differences in types of occupations, income level and contacts; and the consequent differential coping capacity to various social and environmental hazards in the city.

Pre-migration characteristics of both groups have been analyzed mainly to assess whether their pre-migration conditions have any impact upon the current conditions in Dhaka. However, insignificant difference has been found in terms of pre-migration income but types of their pre-migration occupation highly varied. More that 80% of the non-climate-induced migrants were involved in the non-agricultural occupation whereas the rate was around 40% for the climate-induced migrants. This reflects the fact that more dependency on nature made the target group more vulnerable than others during extreme weather conditions. The target group's lower educational level also worked as a constraint against building necessary resilience during disastrous conditions. The target group experienced asset erosion during the specific floods, cyclones and/or riverbank erosion (which the comparison group never had to face) and therefore, during the process of migration they had less assets and resources in hand than those of the comparison group- which made differences in the current conditions of the both groups in Dhaka city, the research revealed.

This research also investigated whether the urban politics and governance have any differential impacts on the socio-economic conditions of the both groups. It was found that the informal actors such as *Mastaans*, homeowners and influential local leaders, who are mainly non-climate-induced migrants, generally hold the power in every aspect in the slum. Due to the target group's poor educational background,

they are often exploited and deceived from their basic rights. The comparatively educated comparison group can at least protest against any discrimination in distributing common resources such as gas and water services. Comparison group's better awareness placed them in a comparatively stronger position than the target group in terms of negotiating with the informal local actors.

From Table 6.11, it is evident that in many aspects there are clear differences between the climate-induced and non-climate-induced migrants in Dhaka. The research findings showed that, in most of the areas listed in Table 6.11, the climate-induced group is comparatively in a more disadvantageous position than the non-climate-induced group.

With the accelerated process of climate change and the higher rate of urbanization, Bangladeshi cities are expected to receive more climate-induced migrants in the future and therefore it is high time to identify them and bring them under separate national and international plans because of their differential vulnerability to social and environmental hazards.

CHAPTER SEVEN

INTRA-GROUP DIFFERENCES AMONG CLIMATE-INDUCED MIGRANTS IN EXPERIENCING HAZARDS

7.1 INTRODUCTION

According to the IPCC, climate change will exact the heaviest toll among the most socio-economically disadvantaged, the poor, the children, and the elderly (IPCC, 2007; Paavola and Adger, 2006). In previous chapters, climate-induced migrants have already been identified as one of the most vulnerable groups to the impacts of different socio-environmental hazards in Dhaka City. However, this chapter identifies intra-group differences among climate-induced migrants in experiencing hazards. The groups have been constructed based on their duration of residence in the city, their sex and gender roles, place of origin, level of education and ability to work/age of migrants. It was hypothesised that experiences might differ according to these variables. Therefore, intra-group analysis has been done to unlock any different but important dimension and to enable more in-depth analysis related to target group's experience in the city.

Findings are mainly based on qualitative data derived from focus groups (FGDs) and in-depth personal interviews. The total number of FGDs in the research was 16, of which this specific chapter draws on 11. These comprised long-term and new, cyclone and flood-induced, male and female, young and the aged climate-induced migrants respectively (see Table 3.3 of Chapter Three for more details). Most of the FGDs had 5-6 participants each.

7.2 DIFFERENT GROUPS AMONG CLIMATE-INDUCED MIGRANTS

In an initial ice-breaking session during the fieldwork, climate-induced respondents were asked to group themselves into different categories. With the help of the researcher, they identified five categories as follows:

1. Duration in the city: How differently the newly arrived and the long-term climate-induced migrants experience social and environmental hazards in the city?

2. Gender: Male and female – how differently they experience hazards?

3. Level of education of migrants: How their levels of formal education affect the experiences and perceptions of climate-induced migrants in the city?

4. Types of climatic problems in place of origin: Cyclone-induced migrants and flood-induced migrants[21] – how differently they experience hazards in the city?

5. Workability/age of migrants: What is the different dimension of the experiences of climate-induced migrants who are above the age of 60 in the city?

Similar research was conducted by Begum (1999), who looked into the experiences of different groups of the low-income urban population based on age, gender, education, (dis)ability and types of migration. The study found lower overall expectations and lower aspirations to return to places of origin among the environmentally-induced migrants in the city who have been living there for years (Begum, 1999).

"Once committed to the urban way of life, convinced of benefits in the long-term, having little to return to, they then, opt for the poverty of the city rather than the poverty of the village"

(Begum, 1999: 21).

A long duration in the city might be important to be convinced of long-term benefits of city life (i.e. better child education, diversified opportunities of income and so on) and therefore, might have an impact on the aspirations of migrants. This aspect has been discussed in detail below along with other categories of climate-induced migrants mentioned above.

[21] This phase of research considered only two categories of migrants who were the majority among the respondents: cyclone-induced (45%) and flood-induced migrants (36.25%).

7.2.1 DURATION IN THE CITY

My research deals mainly with newly arrived climate-induced migrants in the city. But the inevitable question always in mind is whether there are any differences/similarities in the socio-economic conditions and overall experiences of the climate-induced migrants based on their duration of residence in the city? Although no specific *a priori* time period or date of a major policy change suggested itself, I was concerned to establish whether climate-induced migrants from earlier extreme events had gradually managed to become more established and secure within Dhaka over a longer period of time or whether they still experience the deprivations, insecurities and vulnerabilities reported by my recent migrant informants. While conscious that the past cannot be 'read' simplistically as a guide to the future, understanding the longer term trajectory of earlier climate-induced migrants does provide an invaluable insight into the likely future prospects of more recent arrivals in the absence of a dramatic change in their circumstances. This, in turn, becomes an important factor feeding into the policy-relevant conclusions that can be drawn from my work, and which are discussed in the concluding chapter.

As reported in the previous chapters, the bulk of my research comprised FGDs and interviews with newly arrived climate-induced migrants (defined as having arrived after 2006). To answer the above question, two additional FGDs were conducted with the climate-induced migrants who came to the city before 2006 (mainly after the cyclone of 1991 and floods of 1988, 1998 and 2004 which struck Bangladesh in a devastating way)(Table 7.1).

Table 7.1: Focus groups with long-term climate-induced migrants

Type of participant	Number of FGDs	Number of participants
Long-term climate-induced migrants (migrated before 2006); mixed group	2	(4+6)=10

Source: FGD: 15 & 16; 07/05/2013

From the discussions with these long-term migrants, it was clear that they are now somehow settled in Dhaka. Nevertheless, despite many positive points, it was also

found that in spite of their long efforts, they could not move out of this slum. Their duration in the city made them more aware of possible dangers of city life than the newer arrivals. Particular examples they cited about urban hazards included child trafficking and fire and road accidents. However, they could not build up enough of an asset base to afford to live in a better and less insecure area. As a result, they are still living in the slum. In fact, both recent and long-term climate-induced migrants are occupying the same space above and around Gulshan Lake (see Section 5.2.5 of Chapter Five).

That said, many of the latter group receive some additional services such as pucca sanitation from DSK, membership of local co-operatives or other groups. Two respondents from my FGD session with long-term climate-induced migrants built their own houses in the slum. During the FGD session with long-term climate-induced migrants, all the participants also said that they drink boiled water regularly. This truly indicates that, unlike the more recent arrivals, they had learned to adapt to the changing urban environment through being in the city for a long time (see Section 6.3.2 of Chapter Six for more details of health related awareness of newly arrived climate-induced migrants in the city).

Having been in the city a long time, the respondents had suffered from water- and vector-borne diseases. Typhoid, jaundice, diarrhoea and dengue fever are the most common severe diseases they have experienced. All of the respondents from the specific FGD session suffered from jaundice at least once during their slum life. Half of the respondents suffered from it more than three times during their stay in the city. One of the respondents lost her daughter within one year after migration due to prolonged fever and jaundice in Dhaka City.

In terms of experience, long-term climate-induced migrants shared greater aspects of their city life during FGD sessions. For example, according to this group, a fire accident is one of their biggest fears in the city. Literature supports that anxiety: from 2000-2003, 122 slums were evicted by means of deliberately started fires (DSK, 2012). They described the fire accident in Korail in 2004, which affected more than 5000 inhabitants (*The Daily Observer*, 4 March, 2004), though no FGD participant was affected at that time. They also shared greater fear of floods in the city.

Unlike the newly arrived migrants, they experienced urban floods in 1988, 1998, 2004 and 2007. In consequence, this group of migrants now knows where to seek refuge during a big flood (cyclone centre), where the cyclone centres is situated, and so forth (see Section 8.5 of Chapter Eight as part of the discussion of policy implications). They also have experience of living amongst flood waters and therefore they are better prepared to face such events in the future than the newly arrived migrants, who are, in most cases, unaware about the flooding vulnerability of Dhaka City.

In terms of education, long-term migrant families are a step ahead of the newer migrants. The long-term climate-induced migrants are mostly illiterate but having been in the city for a long time, these respondents understand the value of education and therefore their children attend schools and colleges regularly. On the other hand, The FGDs with newly arrived climate-induced migrants revealed that most of the newly arrived families are not sending children to school at the moment[22] (FGD: 5, 22/11/2012) (Reasons for lower school-attendance have been discussed in Section 7.2.2 (vi) of this chapter). This difference in educational level at the household scale is prominent between the new and the long-term climate-induced migrants.

Half of the long-term climate-induced migrants in the FGDs (FGD:15 & 16; 07/05/2013; n=10) have developed personal assets such as their own house in the slum, personal transport or a personal bank account. A bank account is indicative of better financial capability and better access to institutions. However, these migrants have limited interest to go back to their villages because, firstly, they have nothing left in their villages and secondly, they now feel Dhaka to be their own place, where they have many friends and relatives. They now have their own city-based livelihoods, know how to commute in the crowded city and, most importantly, they have learned from experience how to adjust to the adversities of city life.

Finally it can be said that the longer duration in the city helped the long-term climate-induced migrants to gather experiences regarding the adaptation strategies to

[22] Among the newly arrived climate-induced households, only 28% were sending their children to school (Questionnaire survey). Questionnaire survey was conducted only among the newly arrived climate-induced migrants (see Section 5.3.1 of Chapter Five).

combat some social and environmental hazards in a better way than the newly arrived. For example, as said before, the long-term migrants know where to seek refuge during an environmental disaster (cyclone shelter) unlike the newly arrived. It can be said that both the old and new climate-induced migrants have to deal with similar environmental hazards due to being residents of the same slum; but there are some differences in the overall preparedness to face city-based hazards and urban experiences of these two groups due to the differences in their length of stay, which made the long-term climate-induced migrants more aware about the possible hazards in the city and thereby more resilient.

7.2.2 GENDER

"Migration is inherently gendered and climate change will, therefore, yield different migratory experiences and impacts for the world's women and men"

(Hunter and David, 2009: 1).

Certainly the issue of climate-induced migration is not gender neutral (WEDO, 2008). Much research has been done on the issue of gender and climate change (Chew and Ramdas, 2005; Denton, 2004; Enarson, 2002; GTZ, 2005; IUCN, 2007; UN, 2004) and also on gender and migration (Arya and Roy, 2006; Macklin, 2008; Sweetman, 1998; UNDP, 2007). The climate-gender-migration nexus is therefore very significant and requires further attention. Previously some research has been conducted on the issue of how male members' migration after a disaster creates new vulnerability for female household members who have been left in their places of origin (Kolmannskog, 2009; UNFPA, 2009; Buechler, 2009). However, very little research has been done regarding the gender specific experiences of climate-induced migrants in destination areas.

"A gender analysis is not a special focus on women, but rather, an understanding on how discrimination against women and gender roles interact to shape men and women's enjoyment of human dignity, rights, as well as quality of living"

(Climate Change Cell, 2009: i).

Gender can be defined as the distinct social roles assigned to men and women which is a critical part of all development initiatives. The roles and responsibilities of people in the society are always 'gendered' (Alston, 2011). These gendered roles demand differential responses from different sex groups. For example, the men and women in a society are treated differently in terms of culturally determined expectations all over the world. It is widely accepted and has commonly been socially taken for granted that women are mainly responsible for managing the household work such as collecting drinking water and cooking fuel, taking care of children and managing the home as a whole. On the other hand, men have a socially constructed role of 'earning livelihoods' and are treated as the heads of the households. This differential power relation shapes the differential pattern of vulnerability of men and women in the society.

The socially constructed household responsibilities put additional burdens on Bangladeshi women, hampering their ability to work outside their homes. Women are often not allowed to work in the public sphere and are therefore less likely to receive information on emergency preparedness (Swai *et al.*, 2012; Enarson, 2002). Society has a male-biased attitude in terms of participation in decision-making processes and the governance process in Bangladesh also could not establish useful participation from women. Moreover, national policies and programmes are not gender neutral. Social behaviour and strict gender codes restrict women from being mobile (Chindarkar, 2012; Chew and Ramdas, 2004) and therefore areas like 'gender and migration' under changing environmental conditions need the attention of society and policy makers.

Food security is another important agenda where the gender dimension has been widely discussed (Hunter and David, 2009; Climate Change Cell, 2009). Under the prevailing social and economic circumstances, Bangladeshi women are lagging far behind their male counterparts (ibid). Their differential response during a crisis situation set their different status, roles and responsibilities in the society (UN, 2004). The current research therefore focuses on this specific agenda and will try to explore differential experiences of male and female climate-induced migrants living in Korail slum.

Table 7.2: Methodology to explore gender dimension

Method	Total	Number of participants
FGD (female only)	2	(5+5) = 10
FGD (male only)	2	(5+5) = 10
Personal interviews with newly arrived female climate-induced migrants	5	-

Source: Field Survey

Separate focus groups were organized with the recently-arrived female and male climate-induced migrants in Korail (two focus groups with the female and two focus groups with the male climate-induced migrants). Also five case studies with recently arrived female climate-induced migrants have been generated from in-depth personal interviews (Table 7.2). The female group shared experiences differently from their male counterparts and in this way the research extracted some gender dimensions of the issue. The female group emphasized the following areas:

i) Experience of Specific Climatic Event(s) at Places of Origin

"Women are more vulnerable than men to climate change/variability and especially in time of disasters through their socially constructed roles and responsibilities, and because they lack adequate power and assets"

(Neelormi and Ahmed, 2012: 6).

The lower social power and control over assets and decision making make the women more vulnerable during an extreme climatic event. As the overall effects of a climate-related disaster is a function of the availability of and access to different capitals (human, natural, financial, physical and social) to deal with that hazard, women's relatively lower control over such capitals increases their vulnerability compared to men from the same hazard (Climate Change Cell, 2009).

Female climate-induced migrants discussed how the tidal surge of Cyclone *Sidr*, floods and riverbank erosion changed their lives and compelled them to leave their place of origin in a short period of time. On the night of Cyclone *Sidr*, one of the respondents, named Jahanara, lost her daughter and found the dead body after two days. Jahanara said that she had five children at the time of the cyclone and she alone had to cope with all of them when the cyclone hit their village. According to her:

"My husband (a shopkeeper) went to the cyclone shelter directly from his shop, leaving all other responsibilities upon me and I still blame him for the death of my youngest daughter who died at the age of 3 years during the night of the cyclone"

(Jahanara Begum; FGD:10; 22/11/2012).

Thus the traditional social values often assume that the household, including the children, should always be managed by the women (Pinnawala, 2008). These gendered norms are often the main cause of increasing vulnerability of women and children to the extreme climatic impacts (Climate Change Cell, 2009).

ii) Stay at Cyclone Shelter and Decision of Migration

Cyclone shelters are not always designed according to the needs of women and children (Enarson, 1999). As already mentioned in Chapter Four (Section 4.2), female climate-induced migrants described their experiences staying at a cyclone shelter immediately after the cyclone. They had to stay in a crowded room with other male members at night and also shared the toilet with them, which affected their privacy and dignity. Many informed that they did not go to toilets during their whole stay at the cyclone shelters as it was either unhealthy or had a long queue. That put extreme pressure on their gynaecological health; especially pregnant women suffered the most. Sexual abuse was also commonly reported. However, problems of staying in cyclone shelter were not raised by any of the male climate-induced migrants in other FGDs.

These migrants stayed at their villages for few more months by taking shelter in their close relatives' homes. They could not re-establish their agriculture- and livestock-based livelihood in their villages and eventually migrated to Dhaka. One of the

flood-induced migrants from Sherpur District said that her husband previously came to Dhaka three or four times as a seasonal migrant during the flooding season. However, the recent flood in Sherpur destroyed everything and there was no way other than to migrate with the whole family. *"We didn't want to die and that is why we came here"*- said another female respondent (FGD:11; 22/11/2012). They also shared their emotional attachment to their village and how they miss their place of origin. However, all of them agreed that both they and their husbands took the migration decision together.

iii) Health and Sanitation

Urban socio-economic structure is characterized by rapid transformation which is different to the rural social structure. Household maintenance costs are higher in the city and women are often forced to work as cheap labour, which has a negative health impact on them (Neelormi, 2009).

"We always remain sick in the city!"- said one female respondent in the focus group (FGD:10; 22/11/2012). During the earlier focus groups with male climate-induced migrants, respondents reported that their female counterparts generally suffer more from diseases than themselves in the city. *"They always complain about health problems"* - the comment was agreed by all the male members of the focus group (FGD: 8; 22/11/2012). This statement is a reflection of the fact that the new health hazards in the city have already severely affected the female migrants and at the same time this issue has been ignored by their husbands taking it for granted.

The current research shows that the climate-induced migrants are not satisfied with the quality of sanitation in Korail (IDPAA, 2007). However, women in the focus group shared their experience regarding sanitation facilities. Most of the respondents use hanging toilets in the slum and they cannot sit comfortably in the toilet due to increased mosquito attacks on exposed parts of their bodies. At night, they have to use the toilets over Gulshan Lake, where there is no lighting provision. This information reflects their poor utility facilities as well as lower level of security in the city.

As already mentioned in Chapter Five (Section 5.5), Dhaka slums are prone to diseases like diarrhoea, typhoid, cholera, malaria, skin diseases, pneumonia and cold/coughs (Dana, 2011). According to the female respondents, treatment of these diseases in the city is very costly. Women in the FGD also reported that some of them previously used to bathe in Gulshan Lake and now they are suffering from urinary tract infections and severe gynaecological problems like genital infections. It is hampering their conjugal life as well as destroying their physical and mental health. Three of the respondents reported that they took antibiotic medicines to cure genital infection but it could not cure the disease as they did not complete the course of medicine due to its costly market price. Unfortunately two of them stopped their menstrual period by taking traditional medicines. Besides the most common diseases like diarrhoea, jaundice, dengue and typhoid, this group also mentioned some additional health problems such as skin disease, anaemia, liver problems, tumour, kidney problems, increased menstrual bleeding as their other major health-related problems.

iv) Rainwater Intrusion, High Temperature and Associated Problems

Rainwater intrusion into their dwellings creates a different dimension of problems for women. Interrupted cooking and water collection during heavy rainfall in the city are the major concerns for the women as traditionally these domestic reproductive tasks are regarded as women's work (Climate Change Cell, 2009). And therefore, by any means they try to complete their cooking, even by getting wet. As toilet and kitchen are situated in close proximity to each other, they have to cook in an unhygienic environment. If toilets overflow as a result of rainwater, the sewage enters the kitchens as well. Long queues in the kitchen are another factor mentioned by several respondents who take the option of using a community kitchen. Not only cooking is affected; rain water intrusion destroys their personal life as well. Their beds and belongings get wet and this is very common during the rainy season. Experiencing snakes and mice in their houses is also very common in this specific season.

"Keeping cooked food fresh is very difficult in the city; it is rotten very soon due to high temperature in the hot summer. In our village, we didn't have to face the problem", said one of the female respondents (FGD:11; 22/11/2012). The female climate-induced migrants are sensitive to the hot weather in the city, which is

sometimes nearly 40°C in summer (GoB, 2014). Halima, one of the respondents, complained that she had a heat stroke last summer following a miscarriage in the same week (FGD: 11; 22/11/2012) (More discussion on heat stress in Section 4.4.3 of Chapter Four). They concluded that the city is probably exposed to less extreme environmental hazards than they faced in their places of origin, but it has many new environmental threats for which they were not prepared, especially hot summers, extreme rainfall and waterlogging.

v) Privacy and Dignity

Female respondents mainly complained about their decreased level of privacy and dignity in the city. Sharing common toilets with other families was a major concern for every female participant in the focus group. Instead of sanitary pads they use unhygienic cloths during their menstrual periods. Women said that they have to wash those cloths in open places where other people might see what they are doing. They have no other way as their laundry areas do not have sufficient walls. They also reported that their toilets do not have any permanent doors; hence they made temporary arrangements in order to create privacy. All these phenomena are in stark contrast to their previous lives in their places of origin. All of them agreed that they had a better level of dignity and privacy in their villages. According to them, their villages had better toilets - separate for male and females. Bathing areas were also different. Another major issue which was mainly emphasized by the female migrants was the decreased level of religious practices in the city and the associated worry which is already discussed in Section 5.2.6 of Chapter Five.

Case Study 7.1: Salma Begum (Interviewed on 12/09/2013)

Salma Begum (20) migrated to Dhaka City with her husband four years prior to my interview (September, 2013) due to floods in Sherpur District. She was four months pregnant during the interview and was working as a part-time maid servant in the city. Neither she nor her husband had ever attended school. While in the village, she used to live with her husband and father. They experienced prolonged floods which destroyed their livestock business. She used to rear cows, goats, chickens and ducks and used to trade the produced eggs and milk in the local market.

They also had a small fish pond which helped them to generate extra income as well as nutrition. The flood destroyed everything. They lost their home and livestock. Finally they decided to move to the city when Salma's father died from an asthma attack after falling into the flood-water. Initially in the city she worked as a garment factory worker. Within a few months after coming to the city, she experienced waterborne diseases like jaundice. Also due to heavy work pressure, she gradually became sick and had been dismissed from her job. After that she started working as a maid servant. But again she became sick and was diagnosed with kidney stones. She became pregnant in 2011 but her newborn died at the age of seven months due to diarrhoeal diseases. Salma cried out and said that she used to give her daughter untreated water which was the main reason for her untimely death.

"I did not know how loving she was until her death. Now I feel that I did not take care of her properly. I did not even know that water needs to be treated in the city and she might need a vaccination."

Unfortunately, Salma is still drinking untreated water during her second pregnancy. According to her, she cannot afford fuel to boil water. She doesn't have any latrine but uses a public latrine near the Gulshan Lake which is some distance from her house. She and her husband eat twice a day.

"Meat? I wish I could have it! I don't remember having meat or chicken in the last one year. We can't afford fish also. We generally eat lentils, spinach and potato."

After asking about the frequency of drinking milk, she just smiled as if someone was joking. The skinny pregnant young woman then seemed to be really like a representative of all poor female climate-induced migrants in the city who needs institutional intervention to be able to live like a human being and regain their dignity.

vi) Education

Women were found to be more conscious than their male counterparts about the future of their children. Women reported that their children used to go to schools in their places of origin but now they are not attending schools in Dhaka due to high school admission fees. They claimed that schools generally ask for a guarantor who is settled in Dhaka and who will take responsibility for the child. Also, they must be

known by one of the school committee members. Unfortunately climate-induced families lack such contacts (see Section 5.3.2 of Chapter Five). While discussing education, some of the respondents said that they don't send their children to school due to the fear of child trafficking in the city. Rather they prefer their children to be at home so that the older ones can take care of the younger children while both husband and wife are outside at work.

vii) Food Security

As already mentioned in Chapter Five (Section 5.4.3), there is always a gender dimension to food security. The intra-household food distribution in Bangladesh is generally unequal and based on gender. Due to having lower nutritional intakes, the poor women also have lower capability to face a disaster and to sustain themselves in post-disaster periods (Neelormi and Ahmed, 2012).

The male climate-induced migrants reported eating a higher number of portions each day in the city (M=2.74; SD= 0.505) than did the females (M=1.98; SD= 1.158). After conducting an 'independent samples t-test' it was evident that significantly more male respondents than the females eat three times a day in the city ($p<0.001$) (result derived from questionnaire survey consisting of 35 male and 45 female respondents). On an average, 20% of the female climate-induced migrants informed that sometimes they have to starve the whole day but no male migrants mentioned such a starving history (Table 7.3).

Table 7.3: Gender-based differences in the number of portions eaten each day in city

	Number of Portions per Day				
	Sometimes day-long starvation	**Once**	**Two times**	**Three times**	**Total (N)**
Male adults	0	1	7	27	35
Female adults	9	3	13	20	45
Total	9	4	20	47	80

Source: Questionnaire Survey

Women in the focus group reported that they were directly involved in the process of production in their villages by producing milk, egg, meat, fish and fresh fruits. But now they depend entirely on their daily earnings, which therefore determine the quality and quantity of their daily food allocation. At times of shortage, they generally sacrifice the good and nutritious food for their husbands and children and take as little food as possible to better serve the others.

viii) Risk During and After Child Birth

Primary healthcare, community midwives and local NGOs active in maternity care are available in the slum but hardly cover all the slum dwellers. First preference is always given to the members of local NGOs (FGD: 10; 22/11/2012). Often the climate-induced migrants lack communication with the appropriate medical staff during emergency situation as 34% of them do not use cell phones (see Section 5.3.4 of Chapter Five). While discussing the option of hospitalization during child birth, they said that they cannot afford the cost even in a public hospital where services can be achieved at a lower cost.

No-one came to help when their children were born in Korail. All of them who became a mother in the city experienced a home birth in an unhygienic environment. A new mother said that the large number of mosquitoes in the slum is the main threat to her newborn son. *"Many of my neighbours go to their villages, to their parents' home, just after the delivery, but where will I go? I have nothing left in the village. My parents' home is also washed away by floods"*-said the mother (FGD: 10; 22/11/2012).

All the female respondents then seemed to be very helpless, with no place of their own and they also don't know where to go next if a big flood occurs in Dhaka. They were worried and confused about their children's future. However, amongst the long-term climate-induced migrants also, no-one mentioned hospitalization during child birth.

ix) Lack of Ability to Afford Transportation

Women in the focus group are mostly working as maid servants in rich people's houses in the city. Every day these women walk for up to two hours to reach their employers' houses. As a matter of fact, they go everywhere in the city on foot, unless any emergency occurs. This reflects their inability to afford any means of transport. Narrow lanes of the slum also create security problems at night.

x) Threat of Slum Eviction

People in the slums of Dhaka live with the constant fear of slum eviction (DSK, 2012). According to recent research, eviction displaced at least 60,000 people from 27 slums in Dhaka between 2006 and 2008 (Baten, *et al.,* 2011). In 2012, the largest forceful attempt at Korail slum eviction in Bangladesh's history was undertaken and removed around 2000 families (DSK, 2012). The respondents said that they often receive announcements of eviction but most of the time that proves to be fake. But in April 2012, they experienced a sudden, unexpected and the most violent eviction process in their life. The female respondents said that they received notice of slum eviction on the 3rd April 2012 and the process started immediately the next morning.

"I was working as a maid servant in Banani area on the day of eviction; I was allowed to return to Korail only in the evening when everything, including our house, was destroyed. I and my family lived under open sky for one more month. I was dismissed because I could not go to work during that period due to the fear of losing my children. We again moved to other part of Korail slum within a month and rented another house"- said one of the female climate-induced migrants (Shafia Khatun; FGD: 11; 22/11/2012).

The group later informed that government order for changing the land use was cancelled afterwards and inhabitants started to return to Korail within one month. During that month, the evicted slum dwellers mostly spent the nights on the footpaths of Dhaka and under the open sky. According to my questionnaire survey, approximately 45% of the climate-induced migrants in this study were affected by that eviction process in the forms of either destruction of shelter or of business.

The fear of eviction was significantly higher among the female respondents than the male climate-induced migrants. The socially constructed gendered roles of managing

household and children made clear differences in their response of experiencing the hazards. For example, spending the night or cooking under the open sky was not as big a concern for the male respondents as it was for the females in the FGDs.

7.2.2.1 Final Remarks on Gender-based Differences

From the above discussions it was evident that female climate-induced migrants have some different dimensions of experience in the city from those of their male counterparts. The areas where female climate-induced migrants are generally more vulnerable than the male climate-induced migrants are: poor sanitation, gynaecological health, poor cooking and bathing facilities, hampered privacy and dignity, lack of food security, absent maternity health care and poor access to transportation. Also during the female focus groups, women raised some special issues upon which the male respondents in other FGDs didn't give much emphasis. Some of these issues include: experience at cyclone shelter, inability to admit their children to school, fear of child trafficking, threat of slum eviction and risk during child birth. Therefore, there are gender-based differences also in their selection of priority topic.

7.2.3 LEVEL OF EDUCATION OF MIGRANTS

"People who are poorer, less educated, less connected to transportation, and who have smaller social networks will be at greater risk for negative outcomes in natural disasters"

(Filiberto *et al*., 2010: 2).

As already mentioned in Chapter Six (Section 6.3.2), there are differences in migrants' goals and expectations based on education level (Connell *et al.*, 1976). Education is always a decisive factor in shaping one's future. As mentioned in Chapter Five, the climate-induced migrants in this research were mostly formally uneducated. Since 45% of the climate-induced migrants are illiterate and 25% of climate-induced migrants can only sign their names, it can easily be inferred that the level of education is very poor among the target group and it was not easy to find many educated migrants from the target group in the slum. The questionnaire survey found only 3.75% of the climate-induced migrants who had completed SSC (Secondary School Certificate) level. This chapter, therefore, tried to assess the differences in the current conditions of the target group based on education. Holding a focus group with migrants, who had passed their SSC level, was not possible because they were very few in Korail. Therefore, two in-depth personal interviews were conducted with SSC passed climate-induced migrants. The summary is given below:

Case Study 7.2: Hawa Begum (interviewed on 29.10.2012)

Hawa Begum (26) is a mother of one daughter who lives with her family in Korail. She passed the SSC exam in her village just before her marriage. She was planning to enrol into the next level of education when Cyclone *Sidr* struck their village in Barguna District. Their house washed away and they migrated in late 2008, mainly in order to earn enough money so that they could build a new house on their own rural land.

''Despite being an educated person, I had to work as a day labourer in the city! It was difficult to accept''- said Hawa Begum. The salary of a day labourer was given on daily work basis (100 BDT per day on average) and Hawa could not earn anything during times of sickness, the rainy season and/or political unrest situation. One day, members of an NGO, BRAC, came to Korail for a visit and they found Hawa Begum to be educated and offered her a job in their NGO. Now she earns 2500 BDT (£25) per month.

While discussing livelihood, she mentioned that her husband was an educated farmer (passed SSC) in the village. Initially in the city he used to be a rickshaw puller. *''My husband's dignity was affected to a great extent and he started searching for a better livelihood''*. Unfortunately, Hawa had to sell the tea stall which she constructed in the slum by taking loans from her office, in order to manage the cost for her husband's driving training. Her husband is now working as a driver for the renowned development agency 'DOM-INNO' in Dhaka. It was probably the power of education and their special skills which helped both of them to acquire alternative livelihoods in the city in a short period of time. Dignity achieved by education also helped them to overcome their physical vulnerability because at the end Hawa said *''we are now planning to move from this slum to other low cost housing in the city''*.

However, the above example is a very unusual story of upward mobility among the climate-induced migrants. The research did not find any other cases where anyone mentioned about their planning to move to locations better than the slum. This indicates how differently education motivates people towards a better life.

Case Study 7.3: Md. Liton Mia (Interviewed on 29.10.2012)

Md. Liton Mia (30), an SSC-passed young migrant, migrated to Dhaka from Patuakhali District after Cyclone *Sidr* in 2008. Both his mother and sister died on the night of Cyclone *Sidr*. Everything was destroyed by the cyclone, including their homestead, trees, livestock and crop fields. *"My sister was holding my hand but suddenly she slipped away from me and I never found her alive"*, said Liton.

Eventually he, along with his father and two surviving sisters, migrated to Dhaka to earn alternative livelihoods. *"We want to go back as we left our mother and sister in the village graveyard, but our agricultural land has been destroyed due to the breach of the embankment caused by Cyclone Sidr. How will we maintain our livelihood there?"* said Liton. Initially Liton started a co-operative society in the slum that became very popular. He now has a stationery shop in Korail which is his main source of income. His two sisters also passed their SSC level of education and now they are garment workers.

Liton said, *"My sisters suffered a lot while living in the dirty environment of the slum but we had no other way than living here because it is cheaper than other places."* His sisters were initially offered work as maid servants in wealthier people's houses in the city but their self-dignity restrained them from doing so. Therefore, they were unemployed for a long time. However, it was Liton's idea that they should seek jobs in the garment sector since they are educated. Finally, unlike most of the poor climate-induced migrants, his two sisters secured jobs in urban garments industries.

The above examples demonstrate that education not only gives people certificates but also the determination and ability to secure a better life. In case of Liton and Hawa also, educational qualifications played a major role in securing better livelihoods in the city. The above discussion establishes the power of educational qualifications, which is unfortunately inadequate among most of the target group of the research (newly arrived climate-induced migrants) (see Section 5.3.1 of Chapter Five). Education is a factor which clearly made a difference in respect of their social and financial conditions, coping capacities as well as their future aspiration.

7.2.4 THE INFLUENCE OF THE TYPE OF CLIMATIC PROBLEM TRIGGERING MIGRATION

While exploring different groups among the climate-induced migrants, the type of climatic problem that triggered their migration decision was identified as an important category by the respondents during the initial ice-breaking session before starting the actual fieldwork.

Table 7.4: Separate focus groups with cyclone and flood-induced migrants

Type of participant	Number of FGDs	Number of participants
Cyclone-induced migrants; mixed group	1	6
Flood-induced migrants; mixed group	1	6

Source: FGD: 5 & 6; 18/09/2012

Table 7.4 explains the details of the samples during the FGDs related to this section. This section attempts to assess whether there are any differential experiences of migrants induced by wind destruction such as Cyclone *Sidr*/*Aila* versus water destruction such as floods. According to the questionnaire survey, flood-induced migrants comprised 36% of the total climate-induced migrants of the research, while 45% were cyclone-induced migrants. Cyclone-induced and flood-induced migrants have almost similar incomes in the city as the difference is not significant in the independent samples t-test ($p=0.806$). However, no cyclone-induced respondents had an electricity connection in their house but more than half of the flood-induced migrants in the FGD reported having connectivity to electricity.

It was found from the FGD that most of the cyclone-affected people took their first steps outside their villages during this migration process. They were not committed to an urban way of life. On the other hand, flood-affected people in Bangladesh generally have developed a culture of seasonal migration as a survival strategy (Rayhan and Grote, 2007). Therefore, displacement from their places of origin was not a new concept for the flood-affected group. It was found that the flood-affected migrants had previously come to the city as seasonal migrants, leaving their families

at home, but this time they moved permanently. While discussing how they had managed their travel cost to Dhaka, it was found that the flood migrants had the money at least to bear the cost of travel to their destination. In contrast, most cyclone-affected people had to beg in order to manage the travel cost. This is probably due to the fact that cyclone-induced migrants lost more assets during the environmental events in their places of origin (Shamsuddoha *et al*., 2013) and brought fewer assets to the city than those of flood-affected people (which was assessed by the listing of current and destroyed assets during FGD). While discussing the linkage with their villages, it was evident that cyclone-induced migrants maintained a poor linkage because they did not leave any relative there. On the other hand, one flood-induced migrant in the focus group informed that he left his parents in the village during the process of migration and physically communication is now very poor (FGD 5 & 6: 18/09/2012). The term 'trapped' population (Black and Collyer, 2014) thus can be applied to the target group of the research who have been trapped in their destination with a high aspiration of return to places of origins.

Though cyclone-induced migrants' number of meals per day was similar to that of the flood-induced migrants, the flood-affected group can occasionally afford chicken or meat. On the other hand, this is not true for the cyclone-affected respondents who have to depend only on vegetables and small fishes. Therefore, nutritional levels were found to be lower among the cyclone-affected migrants.

However, these two migrant groups have similarities in many aspects, such as strong aspirations to return to their original home areas, health-related hazards faced in the city, fear of slum eviction and other social hazards. But it was found from the focus groups that cyclone-induced migrants have differences with flood-induced migrants in terms of past and present assets and nutritional levels.

7.2.5 AGE OF MIGRANTS

As said in Section 7.1, climate change will have the worst impact for socio-economically disadvantaged groups including the old (IPCC, 2007). This group is also more vulnerable due to lack of financial resources and institutional insolvency (Richards, 2003).

As discussed in Chapter Six (Section 6.3.3), most of the climate-induced migrants come to the city with everyone in the family irrespective of age. As a result, the research found large numbers of climate-induced migrants in the slum who are above sixty years of age.

In 2050, nearly one in every five people in the world will be above the age of sixty (HelpAge International website, 12/01/2014). Previously there has been research on older people's condition in the slum (e.g. Rao and Prasad, 2009). Also much research has been conducted on the vulnerability of the older people who are left behind in the village by the younger members of the family after a disaster (e.g. Nelson and Stathers, 2009; Beales, 2009) but research has rarely been conducted on the special vulnerability of elderly people due to climatic impacts (Neefjes *et al.*, 2009). This research has tried to understand how climate change is affecting aged climate-induced migrants in their urban destinations and to focus on their limited adaptive capacity.

Older people are physically and emotionally less able to cope with changing environments than others. Financially also they are weaker than the younger group of migrants. This may be due to some factors such as their lack of physical strength, reduced mobility, retirement from employment and consequently lower income. This older group also face different psychological stresses during and after a disaster (Filiberto *et al.*, 2010). The present section has tried to explore such differential experiences of the aged climate-induced migrants who are newly arrived in Korail.

Table 7.5: Focus groups with old-aged climate-induced migrants

Type of participant	Number of FGDs	Number of participants
Aged climate-induced migrants (above 60 years of age); mixed group	2	(5+5)=10

FGD: 13 & 14; 05/05/2013

The focus groups were organized with the selected samples from questionnaire respondents who were above the age of 60 (Table 7.5). The FGDs were mainly organized to assess whether the old-aged group needs special assistance in comparison to the younger climate-induced migrants. The summary of the discussion is given below:

i) Livelihoods, Working Opportunities and Commitment in the City

It was found that all of the respondents in the FGD session (FGD 13 & 14) migrated to the city with their whole family shortly after Cyclone *Sidr*, Cyclone *Aila*, flood and riverbank erosion. Most of them are now mainly dependent on their sons'/daughters' incomes. However, half of the respondents were found to be day labourers in the city. Others cannot work mainly due to illness. Respondents described how they experienced mental trauma during their days of unemployment in the city. *"If you don't have work which has monetary return, you are valueless in the city"*, said one of the respondents (FGD: 14; 05/05/2013).

They described the contrast between their village and city life. Village life was tension free and they used to enjoy mental peace. But after losing all livelihood assets in the specific environmental events, they had no option but to leave their villages in order to survive. For everyone, it was their first visit to Dhaka City. However, for the elderly women, it was their first ever visit outside their villages. They never thought that they will have to take such a big decision in their life. According to them, they were well settled in their villages before those environmental disasters. They described their decision to migrate to city as 'sudden', 'unexpected' and 'unfortunate'.

They also described their first impression of city life. Crowded, high expenses, frequent fever and diarrhoea were some commonly discussed issues which they experienced just after migrating to city. *"Nobody wanted to give us work as we were not as active as the young"*, said the respondents. At a point in time, their children wanted them to be sent back to villages but there was no way of going back because there was nothing left in their villages. *"Tara na pare rakhte, na pare charte"* which means *"our children cannot afford to keep us with them and also they cannot afford the travel cost to our villages to send us back"* (FGD:13; 05/05/2013).

They also said that if their children can save enough money to cover the travel cost to their villages and for constructing a home there, they will all go back to their villages. Unfortunately, according to the questionnaire survey, saving is very rare for this particular climate-induced group.

While in the city, this elderly group worked as rickshaw pullers, day labourers and maid servants. But in every case they were dismissed after a short time due to their low level of energy.

ii) Freedom of Choice

This group has very limited freedom of choice. They are not the decision makers at all. Their sons generally take every decision in the family. Rani (65), one of the respondents, said that her son managed a work for her which was 'breaking bricks for the whole day'. Rani said, *"I was surprised when he told me to do that because I was sick at that time. But my poor child, what could he do? He was helpless in context of this costly city life!"* (FGD: 13; 05/05/2013).

This group were asked about their decision if a big flood affects the city in the future. Most of them said that they don't have any choice and probably they would follow their sons and/or daughters. Their lack of social network in the city also affected their confidence level.

iii) Lower Scope of Religious Practice and Associated Worry

Psychological stress was found to be greater among the old-aged climate-induced migrants, a feature which is rarely discussed in literature (Filiberto *et al*., 2010). The aged group are mostly psychologically stressed as they still cannot accept the dramatically changed reality. According to the elderly climate-induced migrants, religious practices like daily prayers are hampered in the city by lack of privacy, dirty living environments and pressure of work. *"If we were in the village now, probably we used to be busy with reciting religious books or prayers or playing with our grand children. Alas! That flood snatched away everything from us"*- said one of the old aged respondents (FGD: 14; 05/05/2013).

iv) Health Impacts of Extreme Weather Events on Older Population

Previously some research explored the health impacts of extreme weather events on the older population (Beales, 2009; Day *et al.,* 2007). Research also found that the oldest old (age 85 and over) are most at risk from the negative health effects of climate change and variability (Haq *et al*., 2008).

Older people are more vulnerable in extreme weather such as cold and high temperatures (Nelson, 2011). As discussed in Chapter Two, Dhaka City is extremely vulnerable to the impacts of heat waves, especially during April-May (Rahman *et al.*, 2012). Also a few weeks of extreme cold affect the old-aged slum dwellers severely as they have lower physical capacity to cope with seasonal diseases and limited power over resources for heating arrangements and the like.

The city's vulnerability to such health-related hazards was completely unknown to the newly arrived climate-induced migrants. The unhealthy living conditions made them more susceptible to vector-borne diseases. All the respondents in the FGD informed about their poor health status, suffering from arthritis, joint pain, dengue, jaundice, malaria and other age-related chronic diseases. One of the respondents, Setara, said that her family have to spend a significant amount of money to bear her treatment cost in the city. Currently, the treatment is stopped as her family cannot afford to continue the treatment in the long-term. Setara said, *"I can die any day, but I wish I could die in my village!"* (FGD:13; 05/05/2013).

However, the older group can work as an asset for the society and can trace the changes in the weather patterns better than any other group. Old parents also demonstrate efficiency in child care and leadership ability. But unfortunately they are always at the end of the list of priorities set by humanitarian communities to address the most vulnerable group (Day *et al*., 2007). According to HelpAge International, the older people should be included in the definition of 'vulnerable groups' by UN member states in successor agreements to the Kyoto Protocol and in guidelines of adaptation fund (HelpAge International, 2007).

v) Vulnerability to Fire Hazards

Fear of fire hazard is another point which was emphasized by the old-aged group of population in the slum as one of the most significant city-based hazards. Fire is an everyday hazard in Dhaka City (Huq, 1999; Sayeeduzzaman, 1990). A study shows that from 2004 to 2006 there were 23,917 reported fire incidents in Bangladesh, 12% of which occurred in Dhaka City (BFSCDA, 2007). In the same study, the annual monetary loss due to fire hazards was assessed as the highest in Dhaka City due to the concentration of huge infrastructure and economic activities as well as high population densities. The slum areas are mostly vulnerable to the impacts of fire accidents due to their high population density, the physical proximity of the dwellings, and lower escape capacity (CUS, NIPORT and MEASURE Evaluation, 2006). Korail faces frequent fire accidents, especially in winter. The aged climate-induced migrants stated their fear of inability to respond quickly in case of fire hazard due to their physical condition.

"After coming to the city I experienced three big fire accidents in Korail. My neighbours lost their son two years back by a fire accident and after that I often cannot sleep in fear of sudden fire. Everyone remains outside in daytime; who will bring me out of fire if there is an accident?"- said Rashida Begum (70), one of the old-aged climate-induced migrants (Personal Interview: 8; 23/07/2013).

However, almost all respondents agreed that the main source of fire accidents is generally a faulty gas connection with the kitchen, which is generally illegal and therefore lacks maintenance (World Vision, 2013). Unlike the long-term climate migrants they don't have any idea that fire can be set in a pre-planned way in order to speed up the eviction process (see Section 7.2.1).

7.3 Dimensions of Politics and Governance: How this differs within the Climate-induced Migrants

This chapter so far revealed different dimensions of vulnerability among the climate-induced migrants in the study area. However, as previously discussed in Chapter Five (Section 5.7), urban politics and governance strongly influence the socio-economic conditions of climate-induced migrants. Chapter Six (Section 6.3.9) revealed that climate-induced migrants are the worst victims of such informal urban governance structures and associated corruption. Chapter Seven has shown that the dimension of politics and governance also play important role in shaping differences in intra-group vulnerability among climate-induced migrants.

As discussed earlier, the informality of urban environmental governance is characterized by higher charges for utility services than the market price; a syndicate of local *Mastaans* with the political leaders and government employees for conducting illegal business in the slum; and government's reluctance regarding the issue and overall informal regularization of an illegal system (Hossain, 2012; Hackenbroch, 2010). There have been studies seeking to identify the winners and losers in this system (Banks *et al.*, 2011; Hackenbroch *et al.*, 2008). However, this research found that climate-induced migrants are always the losers due to their lack of urban income, assets, education and contacts. This chapter attempts to reveal how the dimension of politics and governance differs among climate-induced migrants.

This chapter divides the target group into five different categories: duration in the city, gender, level of education, types of climatic problems in the origin and workability and age of migrants. Except the fourth category, all are found to be important in shaping differential vulnerability.

Duration in the city is the most important factor for the climate-induced migrants to realize and understand the strange and informal setting of urban governance. Those who have been living in the slum for a significant period are aware of the informal setting and also know who are the informal actors in the system. The newly arrived climate-induced migrants are largely unaware about the complex setting. This ignorance and lack of information makes the target group more vulnerable than others and they become easy victims of social vices. For example, they cannot negotiate properly with the service providers as they don't know the actual charges

for the service. On the other hand, long-term climate-induced migrants can take part in the negotiation process to some extent due to their long stay in the city. As a result, the newly arrived climate-induced migrants have to pay extra money for getting the services and thereby have to face more financial struggle in the city.

Gender is probably the most important category in this regard. There are always gender-based roles and responsibilities in the society. As managing the household utility services such as water and fuel is primarily the responsibility of the female members of the society, sometimes they have to take part in the negotiation process with the local leaders or *Mastaans*, especially the single mothers (divorcee/widow). The single female-headed households complained that they have to take part in the negotiation process and thus experience physical and mental embarrassment. *Mastaans* and influential leaders never ensure participation of female members in local meetings such as *Salish*. Therefore, female migrants cannot easily convey their special needs. Disturbance by the local *Mastaans* (important actors in urban governance) is the regular worry of the young women in the slum. The police force is also reluctant because they are well connected with the *Mastaans* and they are also an actor in this strange setting of so-called urban governance. Recently the Bangladesh Government has passed the 'Climate Change and Gender Action Plan 2013' where the urban aspects of gender vulnerability are ignored. It is high time to incorporate this new dimension of gender-based vulnerability of climate-induced migrant slum dwellers into analysis and policy.

Level of education is another important factor which determines the level of awareness and know-how about the urban way of life. Those who have a certain level of education were found to be aware of the local actors involved in urban governance and are more able to take part in the negotiation process when it comes to the question of establishing their rights to service provision in the slum. As a matter of fact, most of the climate-induced migrants in the study are illiterate and lack confidence to participate in the negotiation process.

Workability and age of migrants are important factors when there is a threat of slum eviction (already discussed in Section 7.2.5). The aged respondents revealed their fear of sudden slum eviction due to their limited mobility. So far Bangladeshi urban administrators have always supported the regular threat of slum eviction and in

this way the informal actors maintain their influence over slum communities. When there is a threat of slum eviction, the local *Mastaans* and other political parties become active in negotiation processes with the government. This is the only positive image of the *Mastaans* in the slums of Bangladesh. However, for the aged climate-induced migrants, the government's regular threat of eviction has been found to be the greatest fear of slum life.

Finally, it is evident from the results that the socio-economic conditions of the target group are greatly affected by the informal setting of urban governance and it also has differentiated impacts among different groups within climate-induced migrants.

7.4 CONCLUSION

Finally, Table 7.6 summarises the findings of this chapter. Experiences based on the duration of residence in the city, their gender, education, previous location and age were found to be valuable in term of gathering different dimensions of experiences which are stated briefly in the table.

Table 7.6: Summary of findings of Chapter Seven

Duration in the city
The long-term climate-induced migrants were found to be more confident, more aware of the city-based hazards. They showed better adaptive capacity in case of environmental and other social hazards than the newly arrived climate-induced migrants. But their long stay in the city could not enable them to move out of this slum to another better place.
Gender
Female migrants were found to be more vulnerable than the male migrants in the areas of flooding, waterlogging, high temperature, deteriorated gynaecological health, food insecurity, absent maternity health care and hampered personal dignity. These migrants came mainly from a better socio-economic background and therefore adjustment in the unhealthy city slums became difficult for these women. Also women raised some special issues upon which the male respondents didn't place much emphasis. These issues include: experience at cyclone shelter, inability to admit their children to school, fear of child trafficking, threat of slum eviction, and

risk during child birth. Therefore, there are gender-based differences also in their selection of priority topic.
Education
Experiences of educated climate-induced migrants were found to be different from those of uneducated climate-induced migrants. In the case of the educated respondents, their educational qualifications played a major role in securing better livelihoods in Dhaka. Education proved to be a factor which clearly made a difference in respect of their financial circumstances, coping capacities as well as their future aspiration. The educated migrants are now planning to move to other, safer places within the city because they think that they can now afford it.
Types of climatic problems in place of origin
The cyclone-induced migrants were found to be more vulnerable than the flood-induced migrants in the city in terms of past and present assets and nutritional level. As the cyclone-induced migrants had been affected hard by the cyclonic disasters, their asset loss was found to be huge. Some of them also reported begging as the way to cover the travel costs to the city. In contrast, the flood-induced migrants at least had the funds to meet their travel costs and a few of them also brought additional money and other assets like jewellery with them. However, for the flood-induced migrants (mainly male), previous seasonal migration to Dhaka was reported in FGDs and therefore, this group has better prior ideas about city-based hazards than the cyclone-induced group.
Workability/age of migrants
The aged climate-induced migrants in the city are mainly found vulnerable to different social and environmental hazards due to their poor working opportunities compared with younger migrants, lower freedom of choice, lower scope of religious practice and associated worry, health impacts of climate change, and fear of fire hazards. The old-aged group are always neglected and are never allowed to participate in decision-making processes. They are forced to do laborious work at cheap rates of pay in the city and also their health issues are always being ignored by their families, partly due to financial reasons and party due to ignorance. They are

also highly sensitive to the high temperature of Dhaka City and therefore heatstroke was reported by many of them. Psychological stress was another issue found among most of the old-aged climate-induced migrants, who termed the city as a 'hell' and believe that their stay in the city is the result of their previous bad conduct. However, this group strongly aspire to live and die in their own village, not in the city.

The chapter revealed that the newly arrived, uneducated female cyclone-induced migrants who are less able to work and of old age are the most vulnerable among the target group population to various hazards in the city. This group shared different but valuable experiences which opened many new windows of discussion. Their lower position in the power structure of the society, exclusion from decision-making processes and lack of awareness about the way of urban life made them more vulnerable to social and environmental hazards than any other group. The women and the aged climate-induced migrants have a different health needs, both physically and psychologically. The chapter also revealed clear differences between educated and uneducated members of the target group who aspire differently about their future. Unlike the illiterate climate-induced migrants, most of the educated climate-induced migrants are now planning to move to safer places within the city other than the slum due to their aspirations for better life and ability to afford it. Therefore level of education is also an important factor to assess the level of vulnerability.

Politics and urban governance were also analyzed in case of this chapter and it has found that the new dimension of urban environmental governance differently affects this group based on their duration in the city, gender status, workability and level of education.

The chapter has focused on the need to identify the most vulnerable among the vulnerable population due to their differential position in the society. Ignoring this social dimension can frustrate or undermine any development effort and therefore this marginal group should be given their rights and included in the overall decision-making process of the governance structure. The next and final chapter will provide relevant discussion on the policy options to address the plight of the most vulnerable.

CHAPTER EIGHT

CONCLUSIONS

8.1 INTRODUCTION

Along with the summary of the major findings, this chapter contains discussion on the major contributions of the study and the policy options to address the plight of the most vulnerable urban migrants. This research has applied multiple social science and statistical methods to examine perceptions, understandings and responses of the 'climate-induced' migrants in the city regarding their overall experience of the migration process and their stay in the city. This chapter also identified gaps for future research and how the study could be extended.

As explained in Chapter One, the inverted commas around the term 'climate-induced' indicated that the thesis has engaged in a critical evaluation of the common narrative of climate change. The term 'climate-induced' is not only about climate change, rather it defines a broader dimension of both climatic and anthropogenic elements. In short, 'climate-induced' migration, in this thesis, has been seen as a consequence of climate change and variability and/or human induced events (Auerbach *et al*., 2015) - which have been occurring in an accelerated rate for the last few decades (IPCC, 2014). Afterwards, the thesis discussed other environmental discourses in South Asia before the 1990s and established a critical review of the linkages of flood, cyclone and riverbank erosion with climate change (Section 2.4 of Chapter Two).

In the context of Bangladesh, there have been several research initiatives to explore the vulnerability of coastal populations (e.g. Shamsuddoha and Chowdhury, 2007; Climate Change Cell, 2009; Mallick and Vogt, 2012; Roy, 2011) and also the vulnerability of Dhaka City due to climate change (e.g. Alam and Rabbani, 2007; Haque *et al*., 2010; Khan, 2010), but research based on overall experiences of this particular group, namely 'climate-induced' migrants, is a new field of study. As such, this is very original primary research based on empirical data. Also, in the context of climate change and rapid urbanization, this was appropriate research to be conducted in Bangladesh due to the country's high urban population growth rate and vulnerability to climate change.

This thesis adds to the growing body of literature focused on 'climate-induced' rural-urban migration processes and the migrants' vulnerability to new hazards in their destinations (e.g. Adams *et al*., 2012; Gemenne *et al.*, 2012). This is a budding research area that this thesis has addressed. As this particular agenda of destination-based experience of 'climate-induced' migrants is under-researched, the research results are also likely to be useful in terms of policy implications.

In short, the research found that 'climate-induced' migrants are the migrant group in the city who are most environmentally vulnerable before and after migration and their current socio-economic conditions contrast sharply with those of their life in the village before the specific climatic event that triggered their migration. The thesis also found that the target group is different from the comparison group of 'non-climate-induced' migrants in terms of many socio-economic indicators. Finally the research explored the most vulnerable sub-groups among the target population, who were identified as the newly arrived, uneducated female cyclone-induced migrants who are less able to work and of old age.

8.2 THESIS OVERVIEW

The thesis has dealt with three major objectives. The first objective (to understand how 'climate-induced' migrants to the city perceive their socio-economic conditions and their hydro-geophysical vulnerability in the city) was addressed in chapters Four and Five. The second objective (to understand the differences between 'climate-induced' and 'non-climate-induced' migrants in Dhaka City) was addressed in Chapter Six. The final objective (to explore different dimension of vulnerability of 'climate-induced' migrants in Dhaka.) was addressed in Chapter Seven.

The next four sub-sections will discuss the chapter-based research findings in details:

8.2.1 Impacts of 'Climatic' Hazards upon the Lives of 'Climate-induced' Migrants

'Climate-induced' migrants were found to be the only migrant group who were affected by the adverse impacts of 'climate-induced' events in both their places of origin and destination. Chapter Four revealed their experiences of climatic hazards and disasters during their stay in their villages (see Section 4.3 of Chapter Four) and

also their struggle to deal with enormous environmental hazards in the city (see Section 4.4 of Chapter Four). Flood, cyclone and riverbank erosion were three major types of climatic event responsible for their migration decisions. They did not migrate due to a single event; rather these climatic events occurred repeatedly in their localities and weakened their socio-economic conditions in the society. These events contributed to their asset erosion and greater impoverishment than ever before. Finally such changed climatic conditions pushed them to cross the tipping point of migration decision-making and they eventually migrated to survive (see Section 4.2 of Chapter Four).

In the city, hazards such as waterlogging and heat stress were relatively new; these were termed 'unexpected' by the target group. Their livelihoods in the city were also constrained by the extreme rainfall, heat stress and prolonged waterlogged conditions. Their health was found to be at stake due to increased water- and vector-borne diseases. They didn't know how to cope with these diseases (see Section 4.5 of Chapter Four) due to their lack of previous knowledge and ideas about these new health related hazards, which they had never faced before.

A major finding was that the target group perceived themselves to have received better relief coverage while staying in their villages than in the city (see Section 4.4.1 of Chapter Four). According to them, now they don't have any recognition – neither as ‘climate-induced’ migrants nor as inhabitants of the city.

Their future aspiration was highly 'blank' in a sense that they didn't know where to go in case of a future climatic disaster in the city. *''God will guide us if another flood engulfs the city''* was the common response of this group. Both their destroyed asset bases in places of origin and constrained livelihoods in the city made them more vulnerable to the impacts of environmental hazards in their destination, which limit their adaptive capacity. Korail housing adaptation has been mentioned in the recent IPCC AR5 WGII report (IPCC, 2014) but, as ‘climate-induced’ migrants are too poor and mostly non-owners, they have been unable to make such adaptations themselves (see Section 4.5 of Chapter Four). Their non-owner status (97.5%) has been identified as a constraint in this research for building resilience in structural adaptation.

8.2.2 Socio-Economic Status of 'Climate-induced' Migrants in the city

The research revealed that the target group, who are now considered as urban poor, came from a solvent background. 90% of the respondents had their own house in the village and their own rural-based livelihoods with rich social networks and assets (see Section 5.2-5.5 of Chapter Five). Their current socio-economic conditions in the city were found to contrast sharply with those of their previous location (see Sections 5.2-5.5 of Chapter Five). The main reason for such contrast is the destruction of their rural asset base during the specific climatic events which pushed them to migrate, which left them with almost nothing in hand.

As the target group was the environmentally forced migrants, they did not have enough time to gather information about city life and plan their future in the destination. This made them unaware of city-based social hazards like the continual threat of slum eviction, fear of child trafficking, drug dealings, road accidents and crimes, as reported by my respondents.

Along with diminishing their level of dignity, their life in the slum also affected their confidence and self-respect. The 'climate-induced' migrants, who previously used to deal with climatic hazards on a regular basis, are now struggling in the city with higher costs, food insecurity and health problems (see Sections 5.4 - 5.5 of Chapter Five). They cannot easily gain access to essential services (see Sections 5.2.4 and 5.5 of Chapter Five) due to their limited affordability and inadequate sources of information. Their low-paid jobs and history of prolonged unemployment pushed them into debt and sometimes also forced them to take begging as a livelihood strategy (see Section 5.2.7 of Chapter Five). Lack of proper education, limited contacts and low levels of institutional affiliation do not allow them to improve their conditions (see section 5.3.1 - 5.3.3 of Chapter Five). However, Chapter Five explored such contrasting socio-economic conditions of 'climate-induced' migrants before and after migration.

That chapter also discussed national policies associated with 'climate-induced' migration and found lack of integration of the two terms 'climate change' and 'migration'- in the policy documents. In most cases, the adaptation potential of 'migration' has been ignored and migration is portrayed as a negative consequence of climatic disasters (Section 5.6.1 of Chapter Five). Finally the chapter revealed the

dimension of politics and governance both before and after migration and analyzed how this aspect shapes the vulnerability of the target group. The research found different governance patterns in terms of rural and urban areas and identified some informal actors who dominate the urban environmental governance regime (i.e. *Mastaans*, home owners, police force) and have a considerable impact on the socio-economic conditions of the target group.

8.2.3 Differences between 'Climate-induced' Migrants and 'Non-climate-induced' Migrants in the City

Chapter Six is a major results chapter which identified important differences and relationships between the two groups in the study: 'climate-induced' migrants (target group) and 'non-climate-induced' migrants (comparison group). Differences have been discussed both in terms of their current socio-economic conditions and characteristics. With the help of statistical tests such as Chi-square test and independent samples t-test, this research identified higher income, expenditure, savings, house ownership, levels of education, access to credit, contacts and food security level among the 'non-climate-induced' migrants than among the 'climate-induced' migrants (see Section 6.3 of Chapter Six).

An independent samples t-test was conducted to examine whether there was a significant difference between the two groups in relation to their current income in the city. The test revealed a statistically significant difference between them ($t = -9.748$; $df = 45.241$; $p < .001$). 'Non-climate-induced' migrants reported higher income level in the city ($M = 13325$; $SD = 4756.305$) than did 'climate-induced' migrants ($M = 5711.25$; $SD = 1886.863$) (see Section 6.3.1 of Chapter Six).

Monthly savings of the comparison group are also almost 27 times higher than those of the target group and is significantly different at 1% level ($t = -11.710$; $df = 42.696$; $P<0.001$). The mean monthly savings of the 'climate-induced' migrants is only 192.50 BDT ($SD=797.27$), which is not enough even to purchase a return ticket to their places of origin. By contrast, the comparison group reported higher mean savings at the end of the month ($M=5125$; $SD=2603.622$) (see Section 6.3.1 of Chapter Six).

Regarding access to credit, the chapter revealed contrasting situations among two groups. The research found that only 16.3% of 'climate-induced' migrants have institutional affiliations in the city compared to 30% in case of comparison group. The target group also cannot utilize NGO credits due to pressurized debt condition. Spending from savings was reported as the main coping strategy of the comparison group (59.5%) during emergency situations, where very few (7.4%) from the target group mentioned this as a strategy to cope. The target group's lower savings and pressurized debt conditions make them more vulnerable during crisis situations such as health emergencies or unemployment (see Sections 6.3.4 and 6.3.5 of Chapter Six).

An independent samples t-test was conducted to examine whether there was a significant difference between 'climate-induced' and 'non-climate-induced' migrants in relation to their level of education (see Section 5.3.1 of Chapter Five for more details on educational background of the target group). The test revealed a statistically significant difference between the two groups ($t = -2.121$; $df = 118$; $p=.036$). The comparison group ($M = 3.08$; $SD = 2.702$) reported significantly higher levels of education than did the target group ($M = 1.96$; $SD= 2.712$) (see section 6.3.2 of Chapter Six).

Unlike the target group, connections with places of origin are also better in the comparison group, who still have their rural-based assets and families there. Their annual number of visits to their places of origin is also higher than that of the target group. The comparison group was found to visit their villages at regular intervals, mainly to take care of rural properties, buy new land and administer income from agricultural production. The target group, on the other hand, hardly visit their villages (see Section 6.3.6 of Chapter Six).

'Climate-induced' migrants were found to live in the city with bigger family sizes with both economically active and inactive members. In contrast, the comparison group mainly migrated with only the active members (purely in order to join the urban working force) and now live in the city with small families. This reflected the clear differences in patterns of migration between the two groups. The target group's migration was sudden and unplanned; they had no alternative but to bring all their family members to the city because of their destroyed rural asset base. In contrast,

the migrants from the comparison group had more time to plan their migration, to collect city-based information and to connect with associated networks. Many members of the comparison group initially settled alone in Dhaka and after securing a job brought their families to join them in the city, which was never an option for the 'climate-induced' migrants (see Section 6.3.3 of Chapter Six). These contrasting characteristics clearly marked differences in their socio-economic condition as well as adaptive capacity in the city.

8.2.4 Different Dimensions of Vulnerability of 'Climate-induced' Migrants

Who are the most vulnerable among the 'climate-induced' migrants? Chapter Seven addressed this question by organizing the target groups into five different categories by gender, age, level of education, types of climatic events that pushed them to Dhaka and duration in the city. This categorization helped to uncover useful insights and valuable perceptions of the target group regarding their special needs in the society and their hydro-geophysical vulnerability in the city.

Women 'climate-induced' migrants contributed to useful discussions which were very different from the discussions with the male 'climate-induced' migrants. Therefore, there were also gender-based differences in the selection of priority topics. Women from the target group were more anxious about some city-based hazards such as inability to admit their children to school, fear of child trafficking, threat of slum eviction, risk during child birth. Their deteriorated gynaecological health, non-functional maternity health care, food insecurity and hampered personal dignity made them one of the most vulnerable categories among the 'climate-induced' migrants in Dhaka. As most of the women respondents came from previously well-off families, adjustment to the slum environment was difficult for them as well as 'psychologically depressing' (see Section 7.2.2 of Chapter Seven).

'Climate-induced' migrants above 60 years of age constituted another category among the target group. The existence of aged members was a distinct feature of 'climate-induced' households in this study. Therefore, understanding their special needs in the city was important. This group was found to be highly sensitive to the high temperature of Dhaka City and therefore heatstroke was reported by almost all of them. They have lower freedom of choice and limited scope of religious practice in the city due to their workloads. I found that they were forced to do laborious work

at low wage rates which eventually became the major reason for their physical as well as psychological stress. Their special needs are always neglected by their families and also by the researchers dealing with the needs of groups especially vulnerable to climate change. Finally, this group strongly aspired to live and die in their own villages, not in the city (see Section 7.2.5 of Chapter Seven).

The research also investigated whether education could make any differences in the condition of 'climate-induced' migrants in Dhaka. Both educated (who had completed secondary level of schooling) and uneducated migrants were interviewed and it was found that the educated members of the target group were now involved in better livelihoods in Dhaka. Education proved to be a major factor responsible for their better financial situation and coping capacities as well as their improved aspirations for the future. However, the number of educated 'climate-induced' migrants found in the slum was very small and they were planning to move to other, safer places within the city. Dignity achieved by education played a major role in overcoming their vulnerability to different hazards within the slum environment (see Section 7.2.3 of Chapter Seven).

The type of climatic events that pushed them to Dhaka was another category of my research where flood-affected and cyclone-affected migrants were compared based on selected socio-economic indicators. The flood-induced migrants were found to be in a better condition than the cyclone-induced migrants in the city in respect of past and present assets and nutritional level. As the cyclone-induced migrants were severely affected by the cyclonic disasters, their asset loss was found to be great. Most of the cyclone-induced migrants in the FGD reported begging as the way to manage travel costs to Dhaka. In contrast, flood-induced migrants could at least afford travel costs and the majority could bring some money to the city. Research revealed that most of the cyclone-affected migrants to the study had no previous urban or other rural experience and took their first steps outside their villages during this migration process. On the other hand, the research found that half of the flood-affected migrants in the FGD had previously come to the city as seasonal migrants at times of hardship to work as rickshaw pullers. From this, it seems evident that the flood-affected group has some prior idea about the pros and cons of city life, unlike the cyclone-induced group. All these factors above made them poorly resilient to the

different new hazards in the city compared with any other groups (see Section 7.2.4 of Chapter Seven).

Duration of residence in the city was another factor to determine the most vulnerable population. The long term 'climate-induced' migrants (who migrated before 2006) were found to have higher level of confidence and strong awareness of the city-based hazards. They had better adaptive capacity to face city-based hazards than the newly arrived 'climate-induced' migrants. But their longer stay in the city also did not enable them to move out of the Korail slum to another better place, which is a manifestation of their all time-constrained financial condition (see Section 7.2.1 of Chapter Seven).

Thus Chapter Seven revealed that the newly-arrived, uneducated female cyclone-induced migrants who are less able to work and of old age, perceive city-based hazards differently and are the most vulnerable among the target group population to different hazards due to their lower positions in the power structure of the society. This chapter helped to identify the most vulnerable among the vulnerable population due to their differential position in the society. This chapter also explored highly significant social dimension and the research expects these special needs of the most vulnerable to be incorporated in governmental policies and planning.

8.3 MAIN CONTRIBUTION OF THE RESEARCH

This study has made empirical, methodological, theoretical and policy level contributions to the field of climate-related impacts on migration.

In terms of empirical contribution, first the research recognized the existence of 'climate-induced' migrants in Dhaka and established that their level of vulnerability is different from that of the general urban poor (see Chapter Six). Second, the research also identified the most vulnerable population among 'climate-induced' migrants (see Chapter Seven) and thereby made it easy for the policy makers to address the need of the most appropriate segment of 'climate-induced' migrants. This research is likely to contribute to better integrate the migrants in their destination areas through adaptation and necessary policy changes.

The research found that although the ‘climate-induced’ migrants in Dhaka are now less exposed to environmental hazards and financially better off than their previous conditions during migration, they experience some additional/new socio-economic hazards/threats. Among them health and food security is a major issue and eventually they have to pay off to compensate such damage. The additional amount they earned in the city needs to be utilized in order to face those additional hazards/threats. The research also discovered the new dimension of politics and urban environmental governance in the city which is characterized by informal actors such as *Mastaans* and highly influence their socio-economic condition.

In terms of methodological contribution, the research contributed by developing the unique tracer survey questionnaire combined with snowballing sampling to explore the ‘climate-induced’ migrants in the city slums. This tracer survey can be applicable for other similar research in the coastal urban areas of the country where, according to the existing literature, large numbers of ‘climate-induced’ migrants are still living (Mallick and Vogt, 2012; Roy, 2011).

This research also makes a significant contribution to theoretical understanding. Migration has been termed as an adaptation option in many studies (McLeman and Smit, 2006; Barnett and Webber, 2009; Tacoli, 2009; Foresight, 2011; ADB, 2012). My research concludes that migration, if not properly planned, cannot be a suitable adaptation option. For better results, potential migrants must have an idea about different hazards and risks as well as advantages of several potential destinations and should have the scope to take what they regard as the best option. Institutional intervention in the post-disaster period might be a way to achieve this in practice.

To establish the above theoretical understanding, migration concepts, theories and models both with and without reference to environmental factors were discussed in Chapter Two, for example, the pressure and release (PAR) model, sustainable livelihoods framework, important terminologies related to the research topic, most notably an explanation of climate-related drivers of migration and social vulnerability and the climate change-gender-migration nexus. Chapter Five also explained livelihoods and the asset framework separately to assess the target group's changed livelihood pattern after migration. All these theories and discussion certainly

developed a better theoretical understanding in the field of destination-based research on ‘climate-induced’ migration.

The ‘climate-induced’ migrants were found to be active (supports Ravenstein's law of migration) but not educated and ambitious (rejects Lee model). Mabogunje (1970) admits that migration is likely to change the skill, attitude and behaviour of the migrants and most of the migrants eventually adopt an urban way of life, breaking up completely with their places of origin. The ‘climate-induced’ migrants living in the slum for a considerable period of time are also found to be coping better with the city-based challenges than the newly arrived migrants. That supports Mabogunje's assumption that migrants are likely to change their skill and attitude after a considerable period of stay in the urban area.

The ‘climate-induced’ migrants in my research, however, were never self-selected (thus contradicting Todaro model); rather they were forced to move to the city. The ‘non-climate-induced’ migrants (my comparison group) exemplify Todaro's self-selected migrants who are primarily economically motivated, informed enough to secure employment and young in age.

The ‘climate-induced’ migrants, just like those studied by Epstein, had limited information on the different potential destinations and therefore followed the path of their previous local migrants (Epstein, 2002; 2008). This PhD research sheds light on the problems associated with this unplanned migration and concludes that, if not properly planned, the migration outcome is not likely to improve the quality of life; hence this particular migration cannot be termed as adaptation.

The present research supports Ravenstein's theory (1889), Semple's theory (1911) and also Petersen's theory (1958) which stated that an unattractive climate can cause migration. Most of their views reflect that human beings will gradually increase their control over their environment, though the literature review part of this research showed that in the context of global environmental change, people still lack control over the environment and future generations will have to struggle to cope with these environmental adversities (Foresight Report, 2011). For example, the current research showed how urban-based health hazards and food insecurity are affecting the target group. If the situation is not improved, the problem of undernourishment is expected to affect their next generations too (Sections 5.4 and 5.5 of Chapter Five).

So just like the earlier mentioned theories, the target group will have to increase their control over the environment which actually means to increase adaptive capacity. Now they lack the elements and qualities needed to increase that capacity.

As stated in relation to the sustainable livelihoods framework (Section 2.7.2 of Chapter Two), the 'climate-induced' group has a different context of vulnerability (first stage of the framework), have limited assets (second stage of the framework) and governmental policies are also not in favour of their development (third stage of the framework). As stated in the sustainable livelihood framework, the institutions, organizations, policies, legislation, culture and power relation play major roles in shaping their position in the society which determines their context of vulnerability. If the livelihoods framework is examined, it is the third stage (Transforming structure and process) where the target group needed intervention. The third stage refers to the phase just after the climatic disaster when the target group suddenly became destitute. If properly guided at this stage, this group could take different livelihood strategies (fourth stage of the framework) other than migration or could choose different destinations.

The Pressure and Release Model (Section 2.7.3 of Chapter Two) is the most relevant model for the concept of this research. It says that pressure on population might come from two sides – natural hazards and other contexts of socio-economic vulnerability. There will be release of pressure when they take appropriate adaptation measures. Therefore, as the post-disaster migration could not release the pressure of the 'climate-induced' migrants, according to the PAR model, that was probably not the appropriate adaptation measure.

Finally, the research established that the 'climate-induced' migrants of Dhaka City represent a special group who need special assistance to increase their adaptive capacity and to ensure their rights as human beings. As a policy contribution, this research, therefore, produced an important first-hand document of policy review (Chapter Five, Section 5.6) for the policy makers in order to influence them to incorporate necessary and specific measures for assisting the 'climate-induced' migrants.

8.4 BENEFIT OF HINDSIGHT: LEARNING FROM METHODOLOGICAL LIMITATIONS

Some methodological limitations has already been stated in Chapter Three (see Section 3.6 of Chapter Three). However, there is always a benefit of hindsight. Based on that I identified some methodological areas which I would want to change if I had the opportunity to start the research again from the beginning.

First of all, choosing two case study locations of potential destination could have provided a better idea about where the migrants are now better off. This could help to compare the respective advantages and disadvantages of those locations which, in turn, could provide important information for future potential migrants and, therefore, could help them to take rational decision about choosing a migration destination.

Also, cross checking data by going to the places of origin could give an added dimension to the methodology. Specifically, this research could easily add some detailed case studies with the cyclone/flood affected migrants along with visits to their villages (accompanying the migrants). That could produce better insight about their overall vulnerability.

8.5 IMPORTANT POLICY IMPLICATIONS OF THE RESEARCH

The issue of climate related migration is hardly addressed by national policies in Bangladesh. Two main important documents on national climate change are the 'Bangladesh Climate Change Strategy and Action Plan' (BCCSAP) and the 'National Adaptation Programme of Action' (NAPA). In spite of being revised several times, neither of the documents properly addressed the issue of ‘climate-induced’ migration.

This research is significant in terms of establishing strong 'recognition' of the group of ‘climate-induced’ migrants in the city. The results would also help the policy makers to understand the special vulnerability of ‘climate-induced’ urban migrants and therefore is likely to contribute to better integrate the migrants in their destination areas through necessary policy changes.

This empirical research can be a very important resource for the government to understand the consequences of abrupt and unplanned rural-urban forced migration. This should help them to revise the structural and institutional milieu of the climatic affected areas of the country to prevent migration and to provide them necessary support such as: including them into social safety net programmes, starting a formal relocation programme in case of further climatic disasters, training for diversification of livelihoods in climatic vulnerable zones, improving cyclone shelters in terms of number and design, improving early warning systems in a way that must reach the most marginal and vulnerable population and rectify the relief operation which should address the most vulnerable.

The government in Vietnam has a programme known as 'living with floods' (Dun, 2009). As part of this flood management strategy, the government resettled people living in vulnerable zones along riverbanks in the An Giang province (Le *et al.*, 2007). This type of government initiative is going on across developing countries, though the previous examples of resettlement were never fully achieved desired success (Oliver-Smith, 2014). For example, resettlement in Vietnam reduced exposure but increased vulnerability by distancing people from their sources of employment, credit and social support (Dun, 2009). Therefore, resettlement should not only offer housing but also means of sustainable livelihoods. Finally, the most important measure should be to increase adaptation capacity at local and regional scales which will regulate and/or control the migration flow towards other vulnerable areas.

For the climate-affected people who have already migrated, the research findings will be helpful in terms of identifying their special dimensions of vulnerability. Treating the 'climate-induced' migrants as simply part of the general urban poor is not enough, because this research found that they are different from others. By identifying differences from other urban poor in the city, this research urges special initiatives for the target group because of their special needs. Such needs should be recognized in the relevant national policy documents and should implement adaptation strategies and development efforts accordingly. For example, government should take the initiative in formulating gender-sensitive policies to protect the rights of the target group and train them to adopt diversified new urban-based livelihoods.

One important policy suggestion is that this group should be given priority in obtaining vocational/technical training in order to produce more skilled personnel for the nation in the forms of training related to computer skills, furniture making, automobile engine mechanism, driving, sewing machine operation and fixing electronic equipment.

Last but not least, the need for psychological counselling of 'climate-induced' migrants cannot be ignored because of their drastically changed socio-economic status in the destination. Ignoring an especially vulnerable group while formulating policy can never bring desirable development to the society. This research, therefore, is a signal for the policy makers that the 'climate-induced' migrants are real and still struggling for survival in the capital of the country.

8.6 CONCLUSION

This has been a conceptually informed empirical research conducted in the capital city of Bangladesh, which has explained the term- 'climate-induced' migration critically and identified 'climate-induced' migrants as an especially vulnerable group by means of primary findings and social and statistical analysis. Had time and resources allowed, this study could have been extended towards the peripheries of the city and also in other coastal urban centres of the country.

So far very few such studies have been applied to 'climate-induced' migrants of other parts of the country. Comparing the current socio-economic conditions of 'climate-induced' migrants in different destinations is now a real research need in order to discover suitable livelihood options and policies necessary for the development of the target group. This will enable the policy makers to understand where the migrants are now better off or vice versa and where they have better work opportunities and/or scope of adaptation. The findings might have significant policy implications such as creating similar livelihood options/policies in the affected regions in order to prevent migration and/or make policy changes to better integrate the migrants in their destination areas.

REFERENCES

Abrar, C. R. and Azad, S. N. 2004. *Coping with Displacement: Riverbank erosion in North West Bangladesh*, Dhaka: University Press Limited.

Adamo, S. B. 2008. *Addressing Environmentally Induced Population Displacements: A Delicate Task*, Background Paper for the Population-Environment Research Network Cyber Seminar on 'Environmentally Induced Population Displacements', 18-29 August.

Adamo, S.B. 2010. Environmental migration and cities in the context of global environmental change, *Current Opinion in Environmental Sustainability* 2(3), 161–165.

Adams, H., Adger, N., Bennett, S., Deshingkar, P. Sward, J. and Waters, J. 2012. *Impact of Migration on Urban Destination Areas in the Context of Climate Change*, European Commission policy reflection on climate change and migration, United Kingdom: Foresight.

Adato, M., Lund, F., and Mhlongo, P. 2007. Methodological Innovations in Research on the Dynamics of Poverty: A Longitudinal Study in KwaZulu-Natal, South Africa, *World Development* 35 (2), 247-263.

ADB, 1994, *Climate Change in Asia: Bangladesh Country Report*, Manila: Asian Development Bank (ADB).

ADB, 2010. Project Completion Report (Technical) on Pilot and Demonstration Activity for Bangladesh: Field-Based Research on the Impacts of Climate Change on Bangladesh Rivers, Dhaka: CEGIS.

ADB, 2012. *Addressing Climate Change and Migration in Asia and the Pacific (Final Report)*, Mandaluyong City, Philippines: ADB.

Adepoju, A. 1995. Emigration dynamics in sub-Saharan Africa, *International Migration* 33(3-4), 313-390.

Adepoju, A. 2002. Fostering free movement of persons in West Africa: achievements, constraints, and prospects for intraregional migration. *International Migration* 40 (2), 3-28.

Adger, W. N., Arnell, N. W. and Tompkins, E. L. 2005. Successful adaptation to climate change across scales, *Global Environmental Change* 15, 77–86.

Adger, W.N. 2006. Vulnerability, *Global Environmental Change* 16 (3), 268-281.

Adnan S., Barrett A., Nurul Alam S.M. and Brustinow A. 1992. People's Participation: NGOs and the Flood Action Plan, Research and Advisory Services, Dhaka.

Adnan, S. 1991. Floods, people and environment: Institutional aspects of flood protection programmes in Bangladesh, Research and Advisory Services, Dhaka, Bangladesh.

Adnan, S. 1993. 'Social and Environmental Aspects of the Flood Action Plan in Bangladesh: a Critical Review', Paper presented at Conference on the Flood Action Plan in Bangladesh, European Parliament, Estrasburgo, Mayo.

Adri, N. 2006. *Encroachment into Natural Drainage System in Dhaka City: A Case Study of Begunbari Canal*, BURP Thesis, Jahangirnagar University, Savar, Dhaka.

Adri, N. and Islam, I. 2012. Vulnerability and Coping Strategy in Waterlogged Area: A Case Study from Keshabpur, Bangladesh, *International Journal of Environment* 2 (1), 48-56.
Agarwal, S. and Taneja, S. 2005. All Slums are Not Equal: Child Health Conditions Among the Urban Poor, *Indian Pediatrics* 42 (3), 233-244.

Ahamad, M. G., Khondker, R. K., Ahmed, Z. U. and Tanin, F. 2011. Seasonal Unemployment and Voluntary Out-migration from Northern Bangladesh, *Modern Economy* 2 (2), 174-179.

Ahmed, A. U. 2013. *Bangladesh: Environmental and Climate Change Assessment- Main Report*, report prepared for IFAD's Country Strategic Opportunities Programme 2012-2018, International Fund for Agricultural Development (IFAD).

Akter, M. N. 2013. Impact of Climate Change on Riverbank Erosion, *International Journal of Sciences: Basic and Applied Research (IJSBAR)* 7 (1), 36-42.

Akter, T. 2009. *Climate Change and Flow of Environmental Displacement in Bangladesh,* Dhaka: Unnayan Onneshan - The Innovators, (http://www.unnayan.org/documents/Climatechange/climate_change_flow_environmental_displacement.pdf), Accesses March, 2014.

Akter, T. 2012. Migration and living conditions in urban slums: implications for food security, www.unnayan.org, Accessed in June, 2013.

Alam, M. A., Faruk, M. O. and Siddiqua, R. 2013. Urban Habitus and Crime: An Empirical Study on Dhaka City, *ASA University Review* 7 (2), 43-57.

Alam, M. and Rabbani, M. D. G. 2007. Vulnerabilities and Responses to Climate Change for Dhaka, *Environment & Urbanization* 19 (1), 81-97.

Alexander, K. A., Carzolio, M., Goodin, D. and Vance, E. 2013. Climate Change is Likely to Worsen the Public Health Threat of Diarrheal Disease in Botswana, *International Journal of Environmental Research and Public Health* 10 (4), 1202-1230.

Ali, A. N. M. A. 2013. Food safety and public health issues in Bangladesh: a regulatory, *European Food and Feed Law Review* 8 (1), 31-40.

Allison, I. *et al*., 2009. The Copenhagen Diagnosis, 2009: Updating the World on the Latest Climate Science, The University of New South Wales Climate Change Research Centre (CCRC), Sydney, Australia, 60pp.

Allison, M. A., 1997. Historical changes in the Ganges-Brahmaputra delta front, *Journal of Coastal Research* 14 (4): 1296-1275

Almeria Statement, 1994. The Almeria Statement on Desertification and Migration, Statement following the International Symposium on Desertification and Migrations, Almeria, 8-11 February.
Alston, M. 2011. Gender and Climate Change in Australia, *Journal of Sociology* (47): 53-70.

Angeles, G., Lance, P., Barden-O'Fallon, J., Islam, N., Mahbub, A.Q.M. and Nazem, I. 2009. The 2005 census and mapping of slums in Bangladesh: Design, select results and application, *International Journal of Health Geographics* 8, 1-32.

Anthes, R. A., Corell, R. W., Holland, G., Hurrell, J. W., Maccracken, M. C., Trenbetrth, K. E. 2006. Hurricane and Global Warming- Potential Linkages and Consequences, *Bulletin of American Meteorological Society* 87, 623-628.

Anwer, S. 2012. *Climate Refugees in Bangladesh: Understanding the migration process at the local level*, Stuttgart, Germany: 'Bread for the World'.
Appadurai, A. 2012. Why enumeration counts, *Environment and Urbanization* 24 (2), 639-42

Arya, S. and Roy, A. 2006. When poor women migrate, In Arya, S. and Roy, A. (eds.). *Poverty, gender and migration: Women and migration in Asia*, Sage Publications.

Asian Cities Climate Change Resilience Network (ACCCRN), 2009. *Responding to the Urban Climate Challenge*, Colorado, USA: Institute for Social and Environmental Transition (ISET).

Alam, N. and Khuda, B. 2011. Out-migration from Matlab- A Rural Area of Bangladesh, *Asian Population Studies* 7 (1), 35-50.

Auerbach, L. W., Goodbred Jr., S. L., Mondal, D. R., Wilson, C. A., Ahmed, K. R., Roy, K., Steckler, M. S., Small, C., Gilligan, J. M. and Ackerly, B. A. 2015. Flood Risks of Natural and Embankment Landscapes on the Ganges-Brahmaputra Tidal Delta Plain *Nature Climate Change Letters*, 1-5.

Awumbila, M., Owusu, G. and Keye, J. K. 2014. Can Rural-Urban Migration into Slums Reduce Poverty? Evidence from Ghana, working Paper 13, *Migrating Out of Poverty Research Programme Consortium*, United Kingdom.

Bachofen, C., Cameron, E. and Lewis, P. K. 2010. SDCC Learning in Focus, Climate Change and Human Mobility: Involuntary Displacement and Migration, World Bank, visit: worldbank.org/sdcc.

Bahadur, A. and Tanner, T. 2014. Policy climates and climate policies: Analysing the politics of building urban climate change resilience, *Urban Climate* 7, 20-32.

Baker, J. L. (ed.). 2012. *Climate change, disaster risk and the urban poor: Cities building resilience for a changing world*, Washington D. C.: World Bank.

Balica, S. F., Wright, N. G. and Van der Meulen, F. 2012. A flood vulnerability index for coastal cities and its use in assessing climate change impacts, *Natural Hazards* 64 (1), 73-105

Bangladesh Bank, 2008. "Recent employment situation and labour market developments in Bangladesh", Dhaka, Bangladesh: Bangladesh Bank.

Bangladesh Bureau of Statistics (BBS), 2011. National Population Data, Dhaka.

Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2008.

Bangladesh Gazette, 2009. City Corporation Law 2009, Registration Number: D-A1, Government of Bangladesh.

Bangladesh Gazette, 2012. Disaster Management Act, 2012. Registration Number: D-A1, Government of Bangladesh.

Bangladesh Inland Water Transport Authority (BIWTA), Bangladesh Tide Tables, BIWTA.

Bangladesh Meteorological Department, 2014

Bangladesh Water Development Board (BWDB) Website: http://www.bwdb.gov.bd/index.php?option=com_content&view=article&id=177&Itemid=150; Accessed in February, 2014.

Bangladesh Water Development Board (BWDB), 2010. Annual Flood Report, 2010. Flood Forecasting and Warning Centre (FFWC), BWDB, Dhaka.

Bank, N., Roy, M and Hulme, D. 2011. Neglecting the Urban Poor in Bangladesh: Research, Policy and Action in the Context of Climate Change, Environment and Urbanization 23 (2), 487-502.

Barnett, J. and Webber, M. 2009. *Accommodating Migration to Promote Adaptation to Climate Change*, Stockholm: Commission on Climate Change and Development.

Barnett, T.P., et al., 2008. Human-induced changes in the hydrology of the western United States, *Science* 319 (5866), 1080–1083.

Barnum, H. and Sabot, R., 1976. *Migration, education and urban surplus labour: the case of Tanzania*. Paris: Development Centre of the Organisation for Economic Co-operation and Development.

Barnum, H.N. and Sabot, R.H. 1977. Education, employment probabilities and rural-urban migration in Tanzania, *Oxford Bulletin of Economics and Statistics* 39(2), 109-26.

Bashir, A., Hassan-Firoz-ul, A. S. M. and Islam, M. T. 2014. Disaster induced Migration and Social Conflict in Bangladesh: Study on Cyclone Sidr, *International Journal of Interdisciplinary and Multidisciplinary Studies* 1 (4), 11-16.

Baten, M. A., Ahmed, M. M. and Azad, T. M. A. 2011. *Eviction and the challenges of protecting the gains: A case study of slum dwellers in Dhaka city*, Shiree Working Paper No. 3, Dhaka, Bangladesh.

Bates, B.C., Kundzewicz, Z. W., Wu, S. and Palutikof, J. P. (eds.). 2008. Climate Change and Water. Technical Paper of the Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva, 210 pp.

Bates, D. 2002. Environmental refugees? Classifying human migrations caused by environmental change, *Population and Environment* 23 (5), 465-477.

Bauer, T., Epstein, G.S. and Gang, L.N. 2000. *What Are Migrant Networks?* IZA Discussion Paper No. 200, Bonn: IZA.

BBC News, 14th September, 2004. (http://news.bbc.co.uk/2/hi/south_asia/3654480.stm); Accessed in July 2013.

BBS-UNICEF, 2007. *Multiple Indicator Cluster Survey*, Dhaka.

Beales, S. 2009. *Witness to climate change: learning from older people's experience*, London: HelpAge International.

Begum, A. 1999. *Destination Dhaka, Urban Migration: Expectations and Reality*, The University Press Limited, Dhaka.

Bell, M. and Ward, G. 2000. Comparing Temporary Mobility with Permanent Migration, *Tourism Geographies* 2(1), 97-107.

Benson, T. 2004. *Africa's food and nutrition security situation – Where are we and how did we get here?,* 2020 Discussion Paper no. 37. Washington, DC: IFPRI.

Bergold, J. and Thomas, S. 2012. Participatory Research Methods: A Methodological Approach in Motion, *Forum: Qualitative Social Research* 13 (1), Art. 30, Germany: FQS.
Bernstein, H., Crow, B. and Johnson, H. (eds.). 1992. *Rural Livelihoods: Crises and Responses,* Oxford University Press.

BFSCDA, 2007. *BFSCDA Annual Report 2001-2007,* Dhaka: Bangladesh Fire Service and Civil Defence Authority (BFSCDA).

Biswas, S. and Chowdhury, M. A. A. 2012. Climate Change Induced Displacement and Migration in Bangladesh: The Need for Rights-Based Solutions, *Refugee Watch* (39&40), 157-180.

Black, R. 2001. *Environmental Refugees: Myth or Reality?,* New Issues in Refugee Research Working Paper No. 34, Geneva: UN High Commissioner for Refugees.

Black, R. and Collyer, M. 2014. Populations 'trapped' at times of crisis, *Forced Migration Review* (45), 52-56.

Black, R., Kniveton, D. and Schmidt-Verkerk, K. 2013. Migration and Climate Change: Toward an Integrated Assessment of Sensitivity. In Faist, T. and Schade, J. (eds.). *Disentangling Migration and Climate Change: Methodologies, Political Discourses and Human Rights,* Netherlands: Springer, pp. 29-53.

Black, R., Kniveton, D., Skeldon, R., Coppard, D., Murata, A. and Schmidt-Verkerk, K. 2008. *Demographics and climate change: future trends and their policy implications for migration,* Working Paper, Development Research Centre on Migration, Globalisation and Poverty, University of Sussex.

Bogardi, J. J. 2004. Hazards, risks and vulnerabilities in a changing environment: the unexpected onslaught on human security?, *Global Environmental Change* 14 (4), 361-365.
Bohle, H., Downing, T. and Watts, M. 1994. Climate Change and Social Vulnerability, *Global Environmental Change* 4 (1): 37- 48.

Bouwer, L.M., Crompton, R. P., Faust, E., Hoppe, P and Pielke Jr, R. A., 2007. Confronting disaster losses, *Science* 318, 753.

Bradnock, R. W. 2015. *The Routledge Atlas of South Asian Affairs*, Taylor and Francis Ltd.

Bradnock, R. W. and Saunders, P. L. 2000. 'Sea-level rise, subsidence and submergence: The political ecology of environmental change in Bengal delta' in P. Stott and S, Sullivan (eds.). *Political Ecology: Science, Myth and Power*, London and New York, Arnold and Oxford University Press.

Brammer, H. 1990. Floods in Bangladesh: Geographical Background to the 1987 and 1988 Floods, *The Geographical Journal* 156 (2):158-165.

Brammer, H. 1993. Geographical complexities of detailed impact assessments for the Ganges-Brahmaputra-Meghna delta of Bangladesh. In Warwick, R. A., Barrow, E. M. and Wigley, T. M. L., *Climate and sea-level change,* Cambridge: Cambridge University Press, 246-62.

Brammer, H. 2013. Bangladesh's dynamic coastal region and sea-level rise, *Climate Risk Management* (1): 51-62.

Brody, A., Demetriades, J. and Esplen, E. 2008. *Gender and Climate Change: Mapping the Linkages—A Scoping Study on Knowledge and Gaps*, report prepared for the UK's Department for International Development (DFID) and Institute of Development Studies (IDS), University of Sussex, Brighton.

Brown, O. 2008. *Climate change and forced migration: observations, projections and implications*, Background Paper for the 2007 Human Development Report, Geneva: United Nations Development Programme.

Brydon, L. 2006. Ethical Practices in Doing Development Research. In Desai, V., and Potter, R. B. (eds.). *Doing Development Research*. London: Sage, pp. 25-33.

Bryman, A. 2008. *Social Research Methods*, UK: Oxford University Press.

BTRC (Bangladesh Telecommunication Regulatory Commission) Website: http://www.btrc.gov.bd/; Accessed in April, 2014.

Buechler, S. 2009. Gender, water and climate change in Sonora, Mexico: implications for policies and programmes on agricultural income-generation, *Gender Development* 17 (1), 51-66.

Bulkeley, H. and Betsill, M. 2005. Rethinking sustainable cities: multilevel governance and the 'urban' politics of climate change, *Environmental Politics* 14, 42–63.

Bulkeley, H. and Newell, P. 2010. *Governing Climate Change*, London: Routledge.
Butterworth, D. 1972. Two Small Groups: A Comparison of Migrants and Non-Migrants in Mexico City, *Urban Anthropology*, 1 (1), 029-050.

Byerlee, D. 1972. *Research on migration in Africa: Past, Present and Future*, African Rural Employment Paper no. 2. Department of Agricultural Economies, Michigan State University.

Byerlee, D. 1974. Rural-urban migration in Africa: theory, policy and research implications, *The International Migration Review* 8 (4), 543-566.

Caldwell, J. C. 1969. *African rural-urban migration: the movement to Ghana's towns*, Columbia University Press, New York.

Cannon, T., Twigg, J. and Rowell, J. 2003. *Social Vulnerability, Sustainable Livelihoods and Disasters*, Report to DFID Conflict and Humanitarian Assistance Department (CHAD) and Sustainable Livelihoods Support Office, United Kingdom.

Carney, D. (ed.). 1998. *Sustainable Rural Livelihoods: What contribution can we make?*, London: DFID.

Carr, E. 2005. Placing the environment in migration: economy, environment and power in Ghana's central region, *Environment and Planning A* 37 (5), 925-946.

Carter, K.A. and Beaulieu, L.J. 1992. *Conducting A Community Needs Assessment: Primary Data Collection Techniques*. Gainesville, FL: University of Florida—Institute of Food and Agricultural Sciences.

Casetti, E. 1980. Equilibrium population partition between urban and agricultural occupations, *Geographical Analysis* 12 (1), 47-54.

Castles, S. 2002. *Environmental change and forced migration: making sense of the debate*, New Issues in Refugee Research, Working Paper No. 70, Refugee Studies Centre, Oxford University, Geneva: UNHCR.

Centre for Urban Studies (CUS), 2009. *Socio economic study of korail: Urban Capacity Building Support for NDBUS in Dhaka Bangladesh*, Dhaka.

Centre for Urban Studies (CUS), National Institute for Population Research and Training (NIPORT) and MEASURE Evaluation, 2006. *Slums of Urban Bangladesh: Mapping and Census 2005*, Dhaka, Bangladesh and Chapel Hill, USA.

Chambers, R. 2007. *From PRA to PLA and Pluralism, Practice and Theory*, Working Paper No. 286, Institute of Development Studies, Brighton, UK.

Chambers, R. and Conway, G. 1992. *Sustainable rural livelihoods: Practical concepts for the 21 st century*, IDS Discussion Paper 296, Brighton: IDS.

Chaudhury, R. H. 1978. Determinants and consequences of rural out migration: Evidence from some villages of Bangladesh, *Oriental Geographer* 22 (1 and 2), 1-20.

Chew, L. and Ramdas, K. 2005. Caught in the Storm: The Impact of Natural Disasters on Women, San Francisco (USA): The Global Fund for Women.

Chindarkar, N. 2012. Gender and climate change-induced migration: proposing a framework for analysis, *Environmental Research Letters* 7 (2), 1-7.

Christensen, J. H., Hewitson, B., Busuioc, A., Chen, A., Gao, X., Held, I., Jones, R., Kolli, R. K., Kwon, W. T., Laprise, R., Magaña Rueda, V., Mearns, L., Menéndez, C. G., Räisänen, J., Rinke, A., Sarr, A. and Whetton, P. 2007. Regional Climate Projections, In *Climate Change 2007: The Physical Science Basis*, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon S, Qin D, Manning M, Chen Z, Marquis M, Averyt K B, Tignor M and Miller H L (eds.).], Cambridge University Press. Cambridge, United Kingdom and New York, NY, USA.

Christian Aid, 2007. *Human tide: the real migration crisis*, A Christian Aid Report.

CIDA, 2002. *Gender Equality and Climate Change: Why Consider Gender Equality when Taking Action on Climate Change?*, Quebec: Canadian International Development Agency.

Cities Alliance Website, *Climate Migration Drives Slum Growth in Dhaka*, website: http://www.citiesalliance.org/node/420, Accessed in July 2012.

Clark, W. A. V. 1986. *Human migration*, London: Sage publications.

Climate Change Cell (CCC), 2009. *Climate Change, Gender and Vulnerable Groups in Bangladesh*, Climate Change Cell, Dhaka: DoE, MoEF; Component 4b, CDMP, MoFDM.

Combs, D. L., Parrish, R. G., McNabb, S. J. and Davis, J.H. 1996. Deaths Related to Hurricane Andrew in Florida and Louisiana, 1992, *International Journal of Epidemiology* 25: 537–44.

Connell, J., Dasgupta, B., Laishley, R. and Lipton, M. 1976. *Migration from Rural Areas: The Evidence from Village Studies*, Delhi: Oxford University Press.

Cook, J. T. and Frank, D. A. 2008. Food security, poverty, and human development in the United States, *Annals of the New York Academy of Sciences* 1136, 193-209.

Corbett, J. 1988. Famine and household coping strategies, *World Development* 16 (9), 1099-1112.

Cowden, J. R. 2008. *Planning and Adaptation Measures for Urban Slum Communities in West Africa: Stochastic Rainfall Modeling Applied to Domestic Rainwater Harvesting and Climate Change Adaptation*, Unpublished PhD Thesis, Department of Civil and Environmental Engineering, Michigan Technological University.

Dana, T. 2011. Unhygienic Living Conditions and Health Problems: A Study in Selected Slums in Dhaka City, *OIDA International Journal of Sustainable Development* 2(11), 27-34.

Dasgupta, S., Huq, M., Khan, Z. H., Ahmed, M. M. Z., Mukherjee, N., Khan, M. F. and Pandey, K. 2010. *Vulnerability of Bangladesh to Cyclones in a Changing Climate: Potential Damages and Adaptation Cost*, Policy Research Working Paper 5280, Development Research Group Environment and Energy Team: The World Bank.

Dasgupta, S., Laplante, B., Murray, S. and Wheeler, D. 2009. *Climate Change and the Future Impacts of Storm-Surge Disasters in Developing Countries*, Working Paper 182, Washington D. C.: Centre for Global Development.

Dash, S., Jenamani, R. K., Kalsi, S. R. and Panda, S. K. 2007. Some evidence of climate change in twentieth century India, *Climatic Change* 85, 299–321.

Davies, S. 1996. *Adaptable Livelihoods*, London: Macmillan.

Davis, M., Oswald, K. and Mitchell, T. 2009. *Climate adaptation, disaster risk reduction and social protection. Promoting pro-poor growth: social protection*, Organization of Economic cooperation and Development (OECD).

Day, W., Pirie, A. and Roys, C. 2007. Strong and Fragile: Learning from Older People in Emergencies, London: HelpAge International.

Daze, A., Ambrose, K. and Ehrhart, C. 2009. *Climate vulnerability and capacity analysis: Handbook*, 1st Edition, Geneva, Switzerland: CARE International.

DCC, 2014. "Dhaka City Corporation Overview", published by Dhaka City Corporation (North), DCC, Banani, Dhaka.

De Haas, H. 2008. *Migration and development: a theoretical perspective.* International Migration Institute Working Paper 9. International Migration Institute, University of Oxford, Oxford, UK.

De Vaus, D. 2002. *Surveys in Social Research*, 5th Edition, London: Routledge.

Demetriades, J. and Esplen, E. 2010. The gender dimensions of poverty and climate change adaptation. In Mearns, R. and Norton, A. (eds.). *Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World*, Washington DC: The World Bank, pp. 133-143.

Denton, F. 2004. Gender and Climate Change: Giving the "Latecomer" a Head Start, *Institute of Development Studies Bulletin* 35(3), 42-49.

Desai, V. and Potter, R. (eds.). *Doing Development Research*, London: Sage, pp. 163-171.

DFID, 1999. "Sustainable Livelihoods Guidance Sheets", Department for International Development.

DFID, 2004a. *Climate Change deepens Poverty and Challenges Poverty Reduction Strategies*, London: Department for International Development.

DFID, 2004b. *The Impact of Climate Change on the Vulnerability of the Poor*, Department for International Development, London.

Dinse, K. 2011. Climate Variability and Climate Change: What is the Difference?, Michighan: Michigan Sea Grant.

Disaster Management Bureau Website: http://www.dmb.gov.bd/reports/stormsurge_inundation_riskmap.pdf, Accessed in July, 2012.

Dodman, D. 2008. *Against the tide: Climate change and high risk cities*, brief, IIED.

Dodman, D. and Mitlin, D. 2011. Challenges for community based adaptation: discovering the potential for transformation, *Journal of International Development* 25(5), 640-659.

Douglas, I. 2009. Climate change, flooding and food security in south Asia, *Food Security* 1 (2): 127–136.

DS & YPSA, 2014. Climate Displacements in Bangladesh: Stakeholders, Laws and Policies-Mapping the Existing Institutional Framework, Displacement Solutions (DS) and Young Power in Social Action (YPSA): Bangladesh Housing Land and Property Rights Initiatives.

DSK (Dushtha Shasthya Kendra), 2010. *Description of Korail Slum*, Dhaka: Dushtha Shasthya Kendra.

DSK, 2012. *Eviction and the challenges of protecting the gains: A case study of slum dwellers in Dhaka city*, Shiree Working Paper 3, The Extreme Poverty Research Group, Dhaka.

Dun, O. 2009. *Linkages between Flooding, Migration and Resettlement in the Mekong Delta, Vietnam*, Case Study Report for the EACH-FOR Project, Germany: United Nations University Institute for Environment and Human Security (UNU-EHS).

Dun, O. and Gemenne, F. 2008. Defining Environmental Migration. *Forced Migration Review* 31,10-11.

Ebi, K. L. and Semenza, J. C. 2008. Community-Based Adaptation to the Health Impacts of Climate Change, *American Journal of Preventive Medicine* 35(5), 501-507.

ECHO (Humanitarian Aid and Civil Protection Department of the European Commission), 2009. *In-depth Recovery Needs Assessment of Cyclone Aila Affected Areas*,(http://wwww.reliefweb.int/rw/RWFiles2009.nsf/FilesByRWDocUnidFilename/SKEA-7YRJ2A-full_report.pdf/$File/full_report.pdf), Accessed in February, 2014.

El-Hinnawi, E. 1985. *Environmental Refugees*, Nairobi: United Nations Environmental Programme.

Else, A. 1999. *Hidden hunger: food and low income in New Zealand*, Wellington: New Zealand Network Against Food Poverty.

Elsner, J. B., Kossin, J. P., Jagger, T. H. 2008. The increasing intensity of the strongest tropical cyclones, *Nature* 455: 9295

Emanuel, K. 2005. Increasing destructiveness of tropical cyclones over the past 30 years, *Nature* 436, 686-688.

Emanuel, K. A., Sundararajan, R. and Williams, J. 2008. Hurricanes and global warming: Results from downscaling IPCC AR4 simulations, *Bulletin of American Meteorological Society* 89, 347–367.

Emerole, C. O., Ihedioha, O. B., Anyiro, C. O., Nwachukwu, A. N., Osondu, K. C. and Ibezim, G. M. C. 2014. Comparative Gender Dimensions in Food Unsecured Farm Households in Orsu Local Government Area of Imo State, Nigeria, *American Journal of Experimental Agriculture* 4(4): 391-404.

Enarson, E. 1999. Women and Housing Issues in Two U.S. Disasters: Hurricane Andrew and the Red River Valley Flood, *International Journal of Mass Emergencies and Disasters* 17 (1), 39-63.

Enarson, E. 2001. What Women Do: Gendered Division of Labor in the Red River Valley Flood, *Environmental Hazards* 3 (1), 1-18.

Enarson, E. 2002. *Environmental Management and Mitigation of Natural Disasters: A Gender Perspective*. Panel II, Commission on the Status of Women, 46th Session, UN, New York.

Enarson, E. 2006. Women and Girls Last?: Averting the Second Post-Katrina Disaster, New York: Social Science Research Council, (http://understandingkatrina.ssrc.org/Enarson/), Accessed in March, 2014.

EPA (Environmental Protection Agency), 1992. "Cooling Our Communities – A Guidebook On Tree Planting and Light-Colored Surfacing", USA, p.22.

Epstein, G.S. 2002. *Informational Cascades and Decision to Migrate*, ISA Working Paper 445, Bonn: ISA.

Epstein, G.S. 2008. Herd and network effects in migration decision-making, *Journal of Ethnic and Migration Studies* 34(4), 567-583.

Etzold, B., Ahmed, A. U., Hassan, S. R. and Neelormi, S. 2014. Clouds gather in the sky, but no rain falls: Vulnerability to rainfall variability and food insecurity in Northern Bangladesh and its effects on migration, *Climate and Development* 6 (1), 18-17.

FAO Climate Change and Bioenergy Glossary; (www.fao.org/climatechange/65923/en/); Accessed in March, 2014.

FAO Climate Change and Bioenergy Glossary; (www.fao.org/climatechange/65923/en/); Accessed in March, 2014.

FAO, 2003. Trade reforms and food security: Conceptualizing the linkages, Rome, Commodities and Trade Division, FAO

.

Filiberto, D., Wethington, E., Pillemer, K., Wells, N. M., Wysocki, M. and Parise, J. T. 2010. Older People and Climate Change: Vulnerability and health effects, *Generations*: *Journal of the American Society of Aging* 33 (4), 19-25.

Finch, C., Emrich, C. and Cutter, S. 2010. Disaster disparities and differential recovery in New Orleans, *Population and Environmen*t 31 (4), 179-202.

Fink, G., Gunther, I. and Hill, K. 2014. Slum residence and child health in developing countries, *Demography* 51 (4), 1175-1197

Follmann, A. 2011. "Urban Environmental Governance- New Actors and Power Relations", Bonn: EADI.

Food and Agriculture Organization of the United Nations (FAO), 2008. *Climate change adaptation and mitigation in the food and agricultural sector*, Technical Background Document from the Expert Consultation held on 5-7 March, 2008, Rome.

Ford Foundation, 2004. Building Assets to Reduce Poverty and Injustice, New York.

Foresight, 2011. *Migration and Global Environmental Change*, Final Project Report, London: The Government Office for Science, London.

Fothergill, A. 1996. Gender, risk and disaster, *International Journal of Mass Emergencies and Disasters* 14 (1), 33–56.

Fothergill, A. and L. Peek. 2004. Poverty and disasters in the United States: A review of recent sociological findings, *Natural Hazards* 32 (1), 89-110.

Friend, R., Jarvie, J., Reed, S. O., Sutarto, R., Thinphanga, P. and Toan, V. C. 2014. Mainstreaming urban climate resilience into policy and planning; reflections from Asia, *Urban Climate* 7, 6-19.

Fussell, E., Sastry, N. and VanLandingham, M. 2010. Race, socioeconomic status, and return migration to New Orleans after Hurricane Katrina, *Population and Environment* 31 (1-3), 20-42.

Gain, P. and Ray, S. K. 2010. Aila, shrimp and failed mud walls. In *FORUM: A monthly publication of Daily Star* 3 (1), January 2010.

Geller, A. M. and Zenick, H. 2005. Aging and the Environment: A Research Framework, *Environmental Health Perspectives* 113 (9), 1257–62.

Gemenne, F., Brucker, P. and Ionesco, D. (eds.). 2012. *The State of Environmental Migration 2011*, Institute for Sustainable Development, International Relations (IDDRI)/ International, and Organization for Migration (IOM), Paris, France.

Gibson, J. and Rozelle, S. 2002. How elastic is Calorie Demand? Parametric, Nonparametric, and Semi-parametric Results for Urban Papua New Guinea, *Journal of Development Studies* 38(6), 23-46.

Gleditsch, N. P., Nordås, R. and Salehyan, I. 2007. *Climate Change and Conflict: The Migration Link*, Coping with Crisis Working Paper Series, New York: International Peace Academy (IPA).

GoB (Government of Bangladesh), 2008. Cyclone *Sidr* in Bangladesh: Damage, Loss and Needs Assessments for Disaster Recovery and Reconstruction.

GoB (Govt. of Bangladesh), 2014. Ministry of Disaster Management and Relief. (http://www.drr.gov.bd/index.php?option=com_content&view=article&id=62&Itemid=54), Accessed in February, 2014.

GoB, 2012. Master Plan of Haor Area: Voloume-I (Summary report), Ministry of Water Resources, Bangladesh Haor and Wetland Development Board, CEGIS, Gulshan, Dhaka.

Gray, C. L. and Mueller, V. 2012. Natural disasters and population mobility in Bangladesh, *Proceedings of the National Academy of Sciences of the United States* 109 (16), 6000-6005.

Groisman, P. Y., Knight, R. W., Easterling, D. R., Karl, T. R., Hegerl, G. C. and Razuvaev, V. N. 2005. Trends in intense precipitation in the climate record, *Journal of Climate* 18, 1326–1350.

GTZ, 2005. Linking Poverty Reduction and Disaster Risk Management, GTZ: Bonn, p. 88.
Gururaja, S. 2000. Gender dimensions of displacement, *Forced Migration Review* 9, 13–16.

Habib, M.A., Armed, M., and Siddiquee, M. Z. H. 2005. *Transportation Problems and System Deficiencies of Dhaka City: an Integrated Approach for Solutions*, BURP thesis, Department of Urban and Regional Planning (URP), Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh.

Habibullah, M. 1996. *The Constitution of the People's Republic of Bangladesh*, Government Printing Press, Tejgeon, Dhaka, 10-65.

Hackenbroch, K., Hossain, M. S. and Rahman, M. A, 2008. Coping with Forced Evictions: Adaptation Processes of Evicted Slum Dwellers in Dhaka, TRIALOG 98, 17-23.

Hacknbroch, K. 2010. No security for the urban poor- Contested space in low-income settlements of Dhaka, Geographische Rundschau International Edition 6 (2), 44-49.

Hadley, C. 2011. The Three Pillars of Food Insecurity: Getting to the Guts of Utilization, Society for the Anthropology of Food and Nutrition, (http://foodanthro.com/2011/05/24/the-three-pillars-of-food-insecurity-getting-to-the-guts-of-utilization/), Accessed in April, 2014.

Hales, S., Edwards, S.J. and Kovats, R.S. 2003. Impacts on health of climate extremes. In McMichael, A.J., Campbell-Lendrum, D. H., Corvalan, C. F., Ebi, K. L., Githeko, A. K., Scheraga, J. D. and Woodward, A. (eds.). *Climate Change and Human Health: Risks and Responses*, Geneva: World Health Organization (WHO), pp. 79-102.

Hampton, T. 2007. Food insecurity harms health, well-being of millions in the United States, *JAMA* 298 (16), 1851-1853.

Haq, G., Whitelegg, J. and Kohler, M. 2008. *Growing Old in a Changing Climate: Meeting the Challenges of an Ageing Population and Climate Change*, Stockholm Environment Institute: Stockholm, Sweden.

Haq, M. Z., Robbani, M., Ali, M., Hasan, M. Mainul., Hasan, M. Mahmudul., Uddin, M. J., Begum, M., Teixeira da Silva, J. A., Pan, X and Karim, M. R. 2012. Damage and Management of Cyclone *Sidr*-affected homestead tree plantations: A case study from Patuakhali, Bangladesh, *Natural Hazards* 64 (2), 1305-1322.

Haque, A. N., Dodman, D. and Hossain, M. M. 2014. Individual, communal and institutional responses to climate change by low-income households in Khulna, Bangladesh, *Environment and Urbanization* 26 (1), 112-129.

Haque, A. N., Grafakos, S. and Huijsman, M. 2010. *Assessment of adaptation measures against flooding in the city of Dhaka, Bangladesh*, IHS Working Paper no. 25, The Netherlands.

HelpAge International website: www.helpage.org., accessed on 12/01/2014.

HelpAge International, 2007. *Older people's associations in community disaster risk reduction - A resource book on good practice*, London: HelpAge International.

Hirabayashi, Y., Kanae, S., Emori, S., Oki, T., Kimoto, M. 2008. Global projections of changing risks of floods and droughts in a changing climate, *Hydrological Sciences Journal* 53 (4), 754–772.

Hofer, T. and Messerli, B. 2006. *Floods in Bangladesh: History, Dynamics and Rethinking the Role of Himalayas,* United Nations University Press, Newyork.

Hope, K. R. and Ruefli, T. 1981. Rural-urban migration and the development process: a Caribbean Case Study, *Labour and Society* 6 (2), 141-148.

Hoque, M. and Alam, M. 1997. Subsidence in the lower deltaic areas of Bangladesh, *Marine Geodesy* 20 (1), 105-120.

Hossain, M. Z., Islam, M. T., Sakai, T. and Ishida, M., 2008. Impact of Tropical Cyclones on Rural Infrastructures in Bangladesh, *Agricultural Engineering International: the CIGR E-journal* 10 (2), 1-13.

Hossain, S. 2012. The informal practice of appropriation and social control- experience from a *bosti* in Dhaka, *Environment and Urbanization* 25 (1): 209-224.

Howard, S. 1997. Methodological issues in overseas fieldwork: experiences from Nicaragua. In Robson, E. and Willis, K. (eds.). *Postgraduate fieldwork in developing areas: a rough guide,* DARG monograph 9, 19–37.

Hoyos, C. D., Agudelo, P. A., Webster, P. J. and Curry, J. A. 2006: Deconvolution of the factors contributing to the increase in global hurricane intensity, *Science,* 312, 94–97.

Hugo, G. 1996. Environmental concerns and international migration, *International Migration Review* 30 (1), 105-131.

Hunter, L. M. and David, E. 2009. *Climate Change and Migration: Considering the Gender Dimensions*, IBS Population Programme, Institute of Behavioral Science, University of Colorado at Boulder.

Hunter, L. M. and David, E. 2011. Climate Change and Migration: Considering Gender Dimensions, In Piguet, E., De Guchteneire, P. and Pecoud, A. (eds.). *Climate Change and Migration*. Cambridge: UNESCO Publishing and Cambridge University Press.

Huq, S. 1999. Environmental hazards in Dhaka, In Mitchell, J. K. (ed.). *Crucibles in hazard: mega cities and disasters in transition,* United Nations University Press.

Huq, S. 2001. Climate Change and Bangladesh, *Science* 294 (5547), 1617.

Huq, S. and Ayers, J. M. 2007. *Critical list: the 100 nations most vulnerable to climate change*, in IIED Sustainable Development Opinion, International Institute of Environment and Development (IIED): London.

Huq, S., Karim, Z., Asaduzzaman, M. and Mahtab, F. (eds.). 1998. *Vulnerability and Adaptation to Climate Change for Bangladesh*, Kluwer Academic Publishers, pp. 135.

Huq, S., Kovats, S., Reid, H. and Satterthwaite, D. 2007. Reducing Risks to Cities from Disasters and Climate Change, *Environment and Urbanization* 19 (1), 3-15.

IASC, 2008. *Climate Change, Migration and Displacement: Who will be affected?*, Working Paper submitted by the informal group on Migration/ Displacement and Climate Change of the IASC, Geneva.

ICDDRB, 2007. ICDDRB's Humanitarian Services during 2007 Floods, *GLIMPS* 29 (3), 1-8, Mohakhali, Dhaka.

IDPAA (Institute for Development Policy Analysis and Advocacy) at PROSHIKA, 2007. *Accountability Arrangements to Combat Corruption in the Delivery Infrastructure Services in Bangladesh* From the Partnering to combat corruption series, WEDC, Loughborough University, UK.

IFRC-BDRCS (Bangladesh Red Crescent Society- International Federation of Red Cross and Red Crescent Societies), 2010. Bangladesh: Flash Flood, Information Bulletin no. 1, Glide no. FL-2010-000124-BGD.

IIED (International Institute for Environment and Development), 2007. *Community Based Adaptation to Climate Change Bulletin* 135 (2), 1-13.

IOM (International Organization for Migration), 2007. *Discussion note: migration and the environment.*

IOM, 1996. *Environmentally-Induced Population Displacements and Environmental Impacts Resulting from Mass Migrations*, International Symposium, 21-24 April. Geneva: UNHCR, RPG, IOM.

IOM, 2005. *Dynamics of Remittance Utilisation in Bangladesh*, IOM Migration Research Series No.18. International Organisation for Migration, Switzerland.

IPCC, 2001. *Climate Change 2001: Impacts, Adaptation Vulnerability*. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Geneva: UNEP/WMO.

IPCC, 2007. *Climate Change 2007: The Physical Science Basis*, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press, pp. 996.

IPCC, 2012. *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation,* A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press, pp. 582.

IPCC, 2014. Climate Change 2014: *Impacts, Adaptation, and Vulnerability*, Working Group II Contribution to the IPCC 5th Assessment Report (WGII AR5).

IPCC, 1990. *First Assessment Report*, Policy Maker Summary of Working Group 2 (Potential Impacts of Climate Change), p. 103, para. 5.0.10.

IRP-UNDP, 2010. Guidance note on recovery livelihood, Japan: International Recovery Platform Secretariat (IRPS).

ISDR (International Strategy for Disaster Reduction), 2005. "Hyogo Framework for Action 2005-2015: Building the Resilience of Nation and Communities to Disasters", Extract from the final report of the World Conference on Disaster Reduction.

Islam, K. M. S. 2004. Rooftop Gardening as a Strategy of Urban Agriculture for Food Security: The Case of Dhaka City, Bangladesh, *Acta Horticulture* 643: 241-247

Islam, M. T. and Fujita, K. 2012. Dimension of Decentralization Process and Rural Local Government in India: A Comparison with Bangladesh, Kyoto Working Papers on Area Studies No. 130., Japan.

Islam, S., Haque, A. and Bala, S. K. 2008. *Hydrological aspects of flood 2007*, Institute of Water and Flood Management, BUET.

Islam, T. and Neelim, A. 2010. *Climate Change in Bangladesh: A closer look into temperature and rainfall data*, The University Press Limited.

IUCN, 2007. Climate Change Briefing: Gender and Climate Change, Women as Agents of Change, (http://cmsdata.iucn.org/downloads/climate_change_gender.pdf), Accessed in January, 2014.

Ives J. D. 2004. Himalayan Perceptions: Environmental Change and the Well-being of Mountain Peoples, Abingdon, United Kingdom: Routledge.

Ives, J. and Messerli, B. 1989. The Himalayan dilemma reconciling development and conservation. London & New York: The United Nations University and Routledge.

Ives, J. D. and Messerli, B. 1981. Mountain Hazard Mapping in Nepal: Introduction to an applied mountain research project, *Mountain Research and Development* 1 (3-4), pp. 223-230.

Jabeen, H., Johnson, C. and Allen, A. 2010. Built-in resilience: learning from grassroots coping strategies for climate variability, *Environment and Urbanization* 22(2), 415-431.

Jacobson, J. 1988. *Environmental Refugees: A Yardstick of Habitability*, Worldwatch Paper No. 86, Washington, D.C.: Worldwatch Institute.

Jahan, F., Hulme, D., Roy, M. and Shahan, A. 2011. Reframing the Problem: 'From Climate Change in Urban Areas' to 'Urban Governance in an Era of Climate Change', *The Journal of Development Studies* 40 (4), 31-49.

Jahan, M. 2012. Impact of rural urban migration on physical and social environment: The case of Dhaka city, *International Journal of Development and Sustainability* 1 (2), 186–194.

Jankowska, M. M., Weeks, J. R. and Engstrom, R. 2011. Do the Most Vulnerable People Live in the Worst Slums? A Spatial Analysis of Accra, Ghana, *Annals of GIS* 17(4): 221–235.

Johnston, L. G. and Sabin, K. 2010. Sampling hard-to-reach populations with respondent driven sampling, *Methodological Innovations Online* 5(2), 38-48.

Kaestner, R. and Malamud, O. 2011. Self-Selection and International Migration: New Evidence from Mexico, *The Review of Economics and Statistics* 96 (1), 78-91.

Kabir, R., Khan, H. T. A, Ball, E. and Caldwell, K. 2014. Climate Change and Public Health Situations in the Coastal Areas of Bangladesh, *International Journal of Social Science Studies* 2 (3), 109-116.

Kakissis, J. 2010. 'Environmental refugees unable to return home', In *New York Times*, 3 January, 2010, (www.nytimes.com/2010/01/04/world/asia/04migrants.html), Accessed in June 2010.

Kalin, G. 2000. "Guiding Principles on Internal Displacement: Annotations", The American Society of International Law and The Brookings Institute Project on Internal Displacement, Studies in Transnational Legal Policy, No. 32

Kamal, A. 2000. Accountable Governance and Poverty Alleviation Commissioned Papers for the Regional Workshops Democracy Forum 2000: Democracy and Poverty: A Missing Link?, Kathmandu, Nepal.

Kamiguchi, K., Kitoh, A., Uchiyama, T., Mizuta, R. and Noda, A. 2006. Changes in precipitation–based extremes indices due to global warming projected by a global 20-km-mesh atmospheric model, *SOLA* 2, 64–67.

Kelman, I., Mercer, J. and Gaillard, J. 2012. Indigenous knowledge and disaster risk reduction, *Geography* 97(1), 12-21.

Kernaghan, S. and Da Silva, J. 2014. Initiating and sustaining action: Experiences building resilience to climate change in Asian cities, *Urban Climate* 7, 47-63.

Kartiki, K. 2011. *Climate change and migration; A case study from rural Bangladesh,* Gender and Development *19 (1), 23-38*

Khan, A. H. 1993. Farakka Barrage: Its impact on Bangladesh-an overview, Dhaka.

Khan, A. N. M. M. 2010. Impact of Climate Change on the Livelihood of the Urban Poor: A Case of Dhaka City, Master's Thesis in Public Policy and Governance Programme, Department of General and Continuing Education, North South University, Bangladesh.

Khatun, M. 2013. Climate Change and Migration in Bangladesh: Golden Bengal to Land of Disasters, *Bangladesh e-journal of sociology* 10 (2), 64-79.

Kienholz, H., Hafner, H., Schneider, G., and Tamrakar, R. 1983. Mountain hazards mapping in Nepal's Middle Mountains, maps of land use and geomorphic damage (Kathmandu-Kakani area), *Mountain Research and Development* 3(3): 195–220.

Kienholz, H., Schneider, G., Bichsel, M., Grunder, M. and Mool, P. 1984. Mapping of mountain hazards and slope stability, *Mountain Research and Development* 4(3): 247–266.

Kitchin, R. and Tate, N. J. 2000. *Conducting Research in Human Geography: Theory, Methodology and Practice*, Harlow: Prentice Hall.

Klein Tank, A. M. G., *et al.*, 2006. Changes in daily temperature and precipitation extremes in central and south Asia, *Journal of Geophysical Research* 111, D16105, doi:10.1029/2005JD006316.

Koko, W., Afifi, T., Henry, K., Rawe, T., Smith, C. and De Sherbinin, A. 2012. *Where the rain falls: Climate change, food and livelihood security, and Migration*, CARE France, United Nations University Institute for Environment and Human Security (UNU-EHS) and

Centre for International Earth Science Information Network (CIESIN) at The Earth Institute of Columbia University.

Kolmannskog, V. 2008. "Future floods of refugees: a comment on climate change conflict and forced migration," Report by the Norwegian Refugee Council, April

Kolmannskog, V. 2008. *Future Floods of Refugees*, Norwegian Refugee Council, Oslo.

Kolmannskog, V. 2009. Climate change, disaster, displacement and migration: initial evidence from Africa, *New Issues in Refugee Research No. 180*, United Nations High Commissioner for Refugees.

Koubi, V., Spilker, G., Schaffer, L. M. and Bernauer, T. 2013. *Environmental Degradation and Migration*, Paper prepared for presentation at the annual meeting of the American Political Science Association, Chicago, IL., August 2013.

Kristjansson, B., Petticrew, M., MacDonald, B., Krasevec, J., Jansen, L., Greenhalgh, T. and Wells, G. A. 2007. School feeding for improving the physical and psychosocial health of disadvantaged students, *Cochrane Database of Systematic Reviews*, Issue 1, Art No. CD004676.

Krueger, R. A. 2000. *Focus groups: A practical guide for applied research*, 3rd edition, Thousand Oaks, CA: Sage.

Kumar, K. 1987. *Conducting focus group interviews in developing countries*. A.I.D. Programme Design and Evaluation Methodology Report No. 8. Washington, D.C.: U.S. Agency for International Development.

Kumar, S. 2002. *Methods for Community participation: A Complete Guide for Practitioners*, New Delhi: Vistaar Publications.

Kundzewicz, Z.W., et al., 2013. Flood risk and climate change: global and regional perspectives. *Hydrological Sciences Journal* 59 (1), 1–28.

Labonte, R. 1997. *Power, participation and partnership for health promotion*, Melbourne: Victoria Health Promotion Foundation.

LaFleur, V., Purvis, N. and Jones, A. 2008. Double Jeopardy: What the Climate Crisis Means for the Poor, Brooking Blum Roundtable on Global Poverty, Washington DC: Brookings Global Economy and Development.

Lal, B., Gautam, P., Panda, B.B. and Raja, R. 2013. Boro Rice: A Way to Crop Intensification in Eastern India, *Popular Kheti* 1 (1), 5-9.

Lambrou, Y. and Piana, G. 2006. *Gender: The Missing Component of the Response to Climate Change*, New York: Gender and Population Division, Sustainable Development Department, Food and Agriculture Organization of the United States.

Landsea, C. W. 2005. Meteorology: Hurricanes and Global Warming, *Nature* 438, E11-E12

Le, T. V. H., Nguyen, H. N., Wolanski, E., Tran, T. C. and Haruyama, S. 2007. The combined impact on the flooding in Vietnam's Mekong River delta of local man-made structures, sea level rise and dams upstream in the river catchment, *Estuarine, Coastal and Shelf Sciences* 71 (1-2), 110-116.

Leck, H. and Simon, D. 2013. Fostering Multiscalar Collaboratin and Co-operation for Effective Governance of Climate Change Adaptation, *Urban Studies* 50 (6), 1221-1238.

Leck, H. J. 2011. *Rising to the Adaptation Challenge? Responding to Global Environmental Change in eThekwini and Ugu Municipalities, South Africa*, PhD Thesis, Department of Geography, Royal Holloway, University of London.

Lee, E. S. 1966. A Theory of Migration, *Demography* 3 (1), 47-57.

LGED, 2011. "UPPR Project Book 2011", Agargaon, Dhaka

Lipton, M. 1977. *Why poor people stay poor: a study of urban bias in world development*, London: Maurice Temple Smith.

Lloyd-Evans, S. 2006. Focus Groups. In Desai, V. and Potter, R. (eds.). *Doing Development Research*, London: Sage, pp. 153-162.

Mabogunje, A. L. 1970. Systems Approach to a Theory of Rural-Urban Migration, *Geographical Analysis* 2 (1), 1-18.

Macklin, A. 2008. Legal aspects of conflict-induced migration by women, *Reproductive Health Matters* 16(31), 22-32.

Madge, C. 1997. Ethics of research in the Third World. In Robson, E. and Willis, K. (eds.). *Postgraduate Fieldwork in Developing Areas: a Rough Guide*, 2nd edition, London: Developing Areas Research Group, 113-124.

Mahmood, S. A. I. 2012. Impact of Climate Change in Bangladesh: The Role of Public Administration and Government's Integrity, *Journal of Ecology and the Natural Environment* 4(8), 223-240.

Mallick, B. and Vogt, J. 2012. Cyclone, coastal society and migration: empirical evidence from Bangladesh, *International Development Planning Review* 34 (3), 217-140.

Mandiyanike, D. 2009. The dilemma of conducting research back in your own country as a returning student – reflections of research fieldwork in Zimbabwe, *Area* 41 (1), 64-71.

Mann, M. E., and Emanuel, K. A. 2006. Atlantic hurricane trends linked to climate change, *Eos Trans. AGU*, 87(24), 233–241

Mann, M. E., Woodruff, J. D., Donnelly, J. P. and Zhang, Z. 2009. Atlantic hurricanes and climate over the past 1500 years, *Nature* 460, 880-883.

Mann, M. E., Zhang, Z., Hughes, M. K., Bradley, R. S., Miller, S. K., Rutherford, S and Ni, F. 2008. Proxy-Based Reconstructions of Hemispheric and Global Surface Temperature Variations over the Past Two Millennia. *Proceedings of the National Academy of Sciences* 105, 13252-13257.

Maplecroft, 2011. Climate Change Risk Atlas, (http://developmentwatchuk.files.wordpress.com/2011/03/vulneravel.jpg).

Maplecroft, 2012. Climate change vulnerability index 2013 – Most at risk cities, United Kingdom, (http://www.preventionweb.net/files/29649_maplecroftccvisubnationalmap.pdf), Accessed in April, 2013.

Marshall, N.A., Marshall, P.A., Tamelander, J., Obura, D., Malleret-King, D. and Cinner, J.E. 2009. *A Framework for Social Adaptation to Climate Change: Sustaining Tropical Coastal Communities and Industries*, Gland, Switzerland: International Union for the Conservation of Nature.

Martin, M., Billah, M., Siddiqui, T., Black, R. and Kniveton, D. 2013. Policy analysis: Climate Change and Migration in Bangladesh (Working Paper 2), Refugee and Migratory Movements Research Unit (RMMRU), Dhaka; Sussex Centre for Migration Research (SCMR), Brighton.

Marusteri, M. and Bacarea, V. 2010. Comparing groups for statistical differences: how to choose the right statistical test?, *Biochemia Medica* 20(1),15-32.

Marx, E. 1990. The Social World of Refugees: A Conceptual Framework, *Journal of Refugee Studies* 3 (3), 189-203.

Masika, R. 2002. Editorial, *Gender & Development* 10 (2), 2-9.

Massey, D.S., Arango, J., Hugo, G., Kouaouci, A., Pellegrino, A. and Taylor, J.E. 1998. *Worlds in Motion: Understanding International Migration at the End of the Millennium*, Oxford: Clarendon Press.

Maxwell, S. and Smith, M. 1992. Household food security: a conceptual review. *In* Maxwell, S. and Frankenberger, T. (eds.). *Household food security: concepts, indicators, and measurements: a technical review*. New York, NY, USA and Rome, UNICEF and IFAD.

Mayntz, R. 2004. Governance Theory als fortentwickelte Steuerungstheorie? MPIfG Working Paper 04/1, March 2004. http://www.mpifg.de/pu/workpap/wp04-1/wp04-1.html

McAdam, J. and Saul, B. 2010. Displacement with Dignity: International Law and Policy Responses to Climate Change Migration and Security in Bangladesh, German Yearbook of International Law: 233–87.

McCarney, P. L., Halnafi, M. and Rodriguez, A. 1995. Towards and Understanding of Governance: The emergence of an Idea and Its Implication for Urban Research in Developing Countries in Stren, R. E. and Bell, J. K. (eds.). *Urban Research in the Developing World*, Volume 4: Perspectives on the City, Centre of Urban an Community Studies: University of Toronto.

McCarthy, J. J., Canziani, O. F., Leary, N. A., Dokken, D. J. and White, K. S. 2001. *Climate Change 2001: Impacts, Adaptation and Vulnerability*, Contribution of working group II to the third assessment report of the IPCC, Cambridge: Cambridge University Press.

McGeehin, M. A. and Mirabelli, M. 2001. The Potential Impacts of Climate Variability and Change on Temperature-Related Morbidity and Mortality in the United States, *Environmental Health Perspectives* 109 (Suppl. 2), 185–9.

McGranahan, G., Balk, D. and Anderson, B. 2007. The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones, *Environment and Urbanization* 19(1), 17-37.

McGranahan, G., Turok, I and Martine, G. 2014. Could a more positive approach to Urbanization in the BRICS have facilitated both economic growth and social inclusion?, In McGranahan, G. and Martine, G. (eds.). *Urban Growth in Emerging Economies: Lessons from the BRICS*, New York: Routledge, pp 233-261.

McGregor, J. 1993. Refugees and the environment. In Black, R. and Robinson, V. (eds.). *Geography and Refugees: Patterns and processes of change*, London: Belhaven Press, pp 157-170.

McLeman, R. A. 2014. *Climate and Human Migration: Past Experiences, Future Challenges*, Cambridge University Press, New York.

McLeman, R. and Smit, B. 2006. Migration as an adaptation to climate change, *Climatic Change* 76 (1-2), 31–53.

Memon, N. 2012. *Disasters in South Asia: A Regional Perspective*, Karachi: Pakistan Institution of Labour Education and Research.

Messerli, B., Grosjean, M., Bonani, G., Burgi, A., Geyh, M.A., Graf, K., Ramseyer, K., Romero, H.M., Schotterer, U., Schreier, H., Vuille, M. 1993. Climate change and natural resource dynamics of the Atacama Altiplano during the last 18,000 years: a preliminary survey, *Mountain Research and Development* 13, 117– 127.

Ministry of Environment and Forest, 2005. National Adaptation Programme of Action (NAPA), Final Report. Government of the People's Republic of Bangladesh, Dhaka, Bangladesh.

Mirza, M. M. Q. 1997. Hydrological changes in the Ganges system in Bangladesh in the post-Farakka period, *Hydrological Sciences Journal* 42 (5): 613-631

Mirza, M. M.Q., Warrick, R. A. and Ericksen, N. J. 2003. The implications of climate change on floods of the Ganges, Brahmaputra and Meghna Rivers in Bangladesh, *Climate Change* 57, 287–318.

Mirza, M. M.Q., Warrick, R.A., Ericksen, N. J., Kenny, G. J. 2001. Are floods getting worse in the Ganges, Brahmaputra and Meghna basins?, *Environmental Hazards* 3: 37-48.

Mirza, M.M.Q. 2011. Climate Change, Flooding in South Asia and its Implications, *Regional Environmental Change* 11 (sup 1), 95-107.

Mirza, M.M.Q. and Ahmad, Q. K., 2005. *Climate Change and Water Resources in South Asia*, London: Taylor and Francis.

Mitchell, T., Tanner, T. and Lussier, K. 2007. *We Know What We Need: South Asian Women Speak Out on Climate Change Adaptation*, ActionAid and Institute of Development Studies (IDS) at the University of Sussex.

Mitlin, D and Satterthwaite, D. (eds.). 2013. *Urban Poverty in the Global South: Scale and Nature*, Newyork: Routledge, p. 298.

MoEF, 2008. Bangladesh Climate Change Strategy and Action Plan 2008, Ministry of Environment and Forests, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh.

MoEF, 2009. Bangladesh Climate Change Strategy and Action Plan 2009, Ministry of Environment and Forests, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh. xvii +76 pp.

MoEF, 2013. Bangladesh Climate Change and Gender Action Plan 2013, Ministry of Environment and Forest, Government of the People's Repblic of Bangladesh, Dhaka, Bangladesh, xvi+122 pp.

Moench, M. and Gyawali, D. 2008. Desakota: Reinterpreting the Urban-Rural Continuum, Conceptual foundations for understanding the role ecosystem services play in the livelihoods of the poor in regions undergoing rapid change, Part II A.

MoFDM, 2010. Standing Orders on Disaster 2010, Ministry of Food and Disaster Management, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh, 230 pp.

Morgan, D. L. (ed.). 1993. *Successful Focus Groups: Advancing the State of the Art.* Newbury Park, California: Sage.

Morgan, D. L. 1997. *Focus groups as qualitative research*, 2nd edition, Thousand Oaks, CA: Sage.

Moriniere, L.C.E., Taylor, R., Hamza, M. and Downing, T. 2009. *Climate Change and Its Humanitarian Impacts*, Oxford: Stockholm Environment Institute.

Morton, A., Boncour, P. and Laczko, F. 2008. Human Security Policy Challenges, *Forced Migration Review* 31, 5-7.

Moser, C. and McIlwaine, C. 2004. *Encounters with Violence in Latin America: Urban Poor Perceptions from Colombia and Guatemala,* New York: Routledge.

Moser, C. and Stein, A. 2010. *Implementing Urban Participatory Climate Change Adaptation Appraisals: A Methodological Guideline,* Global Urban Research Centre Working Paper Series, Global Urban Research Centre, Manchester: University of Manchester.

Moser, C. O. N. 1998. The Asset Vulnerability Framework: Reassessing Urban Poverty Reduction Strategies, *World Development* 26 (1), 1–19.

Moser, C., Norton, A., Stein, A. and Georgieva, S. 2010. *Pro-Poor Adaptation to Climate Change in Urban Centers - Case Studies of Vulnerability and Resilience in Kenya and Nicaragua,* Sustainable Development Network, Social Development Department: The World Bank.

Moses, M. M. D. 2014. Urban Local Governance Implications and Challenges on Sustainable Development in Lesotho, *Journal of Sustainable Development in Africa* 16 (2): 130-146.

Mridha, M. K., Hossain, A., Alam, B., Sarkar, B. K., Wahed, T., Khan, R. and Roy, S. 2009. *The Perceptions of Community Groups to Improve MNCH in Urban Slums: An Exploratory Case study of Korail Slum in Dhaka,* Manoshi Working Paper Series 9, Dhaka: ICDDRB and BRAC.

Munasinghe, M. and Swart, R. 2005. *Primer on Climate Change and Sustainable Development: Facts, Policy Analysis and Applications*, Cambridge: Cambridge University Press.

Myers, G. 2011. *African Cities: Alternative Visions of Urban Theory and Practice*, London: Zed Books.

Myers, N. 1993. Environmental Refugees in a globally warmed world, *Bioscience* 43 (11), 752-761.

Myers, N. 1997. Environmental refugees, *Population and Environment* 19 (2), 167–182.

Myers, N. 2001. Environmental refugees: a growing phenomenon of the 21st century, *Philosophical Transactions: Biological Sciences* 357 (1420), 609-613.

Myers, N. 2002. Environmental Security: what's new and different?, based on a policy background for the university of peace, (http://www.envirosecurity.org/conference/working/newanddifferent.pdf), Accessed in January, 2012.

NAPA (National Adaptation Programme of Action), 2005. *Final Report: 2005*, Ministry of Environment and Forest, Government of the People's republic of Bangladesh.

Naser, M. M. 2012. Climate Change, Environmental Degradation, and Migration: A Complex Nexus, *William & Mary Environmental Law and Policy Review* 36 (3), 713-768.

Naser, M. M. 2014. Climate Change and Migration: Law and Policy Perspectives in Bangladesh, *Asian Journal of Law and Society*, 1-19.

Neefjes, K., Hai, V. M., Nelson, V., Dankelman, I., Anh, T.V. and Fitzgerald, I. 2009. *Responding to climate change in Viet Nam: Opportunities for improving gender equality: A policy discussion paper.* Ha Noi, Vietnam: UNDP-Vietnam and Oxfam, Vietnam.

Neelormi, S. 2009. *Climate-change related migration from a gender perspective: patterns, challenges and opportunities for intervention*, Gender CC-Bangladesh, SBSTA Side Event, Bonn, 09 June 2009.

Neelormi, S. and Ahmed, A.U. 2012. *Loss and Damage in a Warmer World: Whither Gender Matters? Gender perspectives on the Loss and Damage Debate*, Bonn: CDKN.

Neelormi, S., Adri, N. and Ahmed, A.U., 2009. Gender dimensions of differential health effects of climate change induced waterlogging: A case study from coastal Bangladesh, *IOP Conference Series: Earth and Environmental Science* 6.

Nelson, V. 2011. Gender, generations, social protection and climate change: A thematic review, University of Greenwich, Overseas Development Institute.

Nelson, V. and Stathers, T. 2009. Resilience, power, culture, and climate: A case study from semi-arid Tanzania, and new research directions, *Gender & Development* 17(1), 81-94.

Nishat, A., Reazuddin, M., Amin, R. and Khan, A. R. (eds.). 2000. *The 1998 flood: impact on the environment of Dhaka city*, Department of Environment and IUCN Bangladesh, Dhaka.

O'Brien, K., Sygna, L., Leichenko, R., Adger, W. N., Barnett, J., Mitchell, T., Schipper, L., Tanner, T., Vogel, C. and Mortreux, C. 2008. *Disaster Risk Reduction, Climate Change Adaptation and Human Security*, Report prepared for the Royal Norwegian Ministry of Foreign Affairs by the Global Environmental Change and Human Security (GECHS) Project, GECHS Report 2008:3, University of Oslo.

OCHA (The United Nations Office for the Coordination of Humanitarian Affairs), 2004. *Guiding principles of internal displacement*, United Nations.

OCHA/IRIN and UN-HABITAT, 2007. Tomorrow's Crises Today: The Humanitarian Impact of Urbanisation, Integrated Regional Information Networks (IRIN), Kenya, East Africa.

Oliver-Smith, A. 2009. Nature, Society, and Population Displacement: Toward an Understanding of Environmental Migration and Social Vulnerability, InterSecTions No. 8, published by UNU-EHS

Oliver-Smith, A. 2014. Climate Change, Displacement and Resettlement, In Leckie, S. (ed.). *Routledge studies in development, displacement and resettlement: Land Solutions for Climate Displacement*, Routledge, New York, pp. 53-109.

Oxfam International Website, http://www.oxfam.org/en/emergencies/cyclone-aila, Accessed in May, 2012.

Oxfam, 2009. "Swelled Sufferings: Challenges After 3 Months Of Cyclone Aila", Emergency Capacity Building Project, Oxfam, Bangladesh.

Paavola, J. and Adger, W. N. 2006. Fair Adaptation to Climate Change, *Ecological Economics* 56(4), 594–609.

Panday, Pranab. K. And Panday, Pradip. K., 2008. The development of the urban government system in Bangladesh: Does coordination exist?, *Local Government Studies* 34 (5): 559-575.

Parnell, W. R. and Smith, C. 2008. Food Security: Current Research Initiatives, Globally and in New Zealand, *Nutrition Society of New Zealand*, Christchurch.

Patel, S. and Baptist, C. 2012. Documenting by the undocumented, *Environment and Urbanization* 24(1), 3-12.

Patwardhan, S.K. and Bhalme, H. N. 2001. A Study of Cyclonic Disturbances over India and the adjacent ocean, *International Journal of Climatology* 21: 527-534.

Pelling, M. 2011. *Adaptation to Climate Change: From resilience to transformation,* London and New York: Routledge.

Pender, J. 2008. Community-led adaptation in Bangladesh, *Forced Migration Review* 31, 54-55.

Penning-Rowsell, E. C., Sultana, P. and Thompson, P. M. 2013. The 'last resort'? Population movement in response to climate-related hazards in Bangladesh, *Environmental Science and Policy* 27 (1), S44–S59.

Petersen, W. 1958. A General Typology of Migration, *American Sociological Review* 23(3), 256-266.

Pielke Jr., R. A., Landsea, C., Mayfield, M., Laver, J. and Pasch, R. 2005. Hurricanes and Global Warming, *Bulletin of America Meteorological Society* 86, 1571-1575.

Pielke Jr., R. A., Landsea, C., Mayfield, M., Laver, J. and Pasch, R. 2006. Reply to "Hurricanes and Global Warming- Potential Linkages and Consequences", *Bulletin of America Meteorological Society* 87, 628-631.

Piguet, E., Pécoud, A. and Guchteneire , P. (eds.). 2013. *Migration and Climate Change*, UNESCO and Cambridge University Press.

Piguet, E., Pecoud, A. and Guchteneire, P. 2010. *Migration and Climate Change: an Overview*, Working Paper No. 79, Centre on Migration, Policy and Society, University of Oxford.

Pinnawalla, M. 2008. Engaging in trans-local Management of Households: Aspects of Livelihood and Gender Transformations among Sri Lankan Women and Migrant Workers, *Gender, Technology and Development* 12 (3), 439-459.

Poncelet, A., Gemenne, F., Martiniello, M. and Boussetta, H. 2010. A country made for disasters: Environmental vulnerability and forced migration in Bangladesh. In T. Afifi & J. Ja¨ger (eds.). *Environment, forced migration and social vulnerability*, pp. 211–222, Berlin, Germany: Springer.

Population Reference Bureau, 2013. World Population Data Sheet, (http://www.prb.org/pdf13/2013-population-data-sheet_eng.pdf), Accessed in March, 2014.

Prasad, N., Ranghieri, F., Shah, F., Trohanis, Z., Kessler, E. and Sinha, R. 2009. *Climate Resilient Cities: A Primer on Reducing Vulnerabilities to Disasters*, Washington DC: The World Bank.

Press, V. 2004. Nutrition + food poverty: a toolkit for those involved in developing a local nutrition and food poverty strategy, London: National Heart Forum.

Prothero, R. M. 1987. Populations on the Move, *Third World Quarterly* 9(4), 1282-1310.

Rabbani, G., Rahman, S. H. and Faulkner, L. 2013. Impacts of Climatic Hazards on the Small Wetland Ecosystems (ponds): Evidence from Some Selected Areas of Coastal Bangladesh, *Sustainability* 5 (4), 1510-1521.

Rahman, A. and Alam, M. 2003. *Mainstreaming Adaptation to Climate Change in Least Developed Countries (LDCs): Bangladesh Country Case Study.* IIED Working Paper No. 2. Nottingham: Russell Press.

Rahman, M. M. 2001. Bostee Eviction and Housing Rights: A Case of Dhaka, Bangladesh, *Habitat International* 25 (1), 49-67.

Rahman, M. M., 2011. Country Report: Bangladesh, ADBI-APO Workshop on Climate Change and its Impact on Agriculture, Seoul, Republic of Korea, 13-16 December 2011.

Rahman, M. M., Islam, M. N., Ahmed, A.U. and Georgi, F. 2012. Rainfall and temperature scenarios for Bangladesh for the middle of 21st century using RegCM, *Journal of Earth System Science* 121 (2), Indian Academy of Sciences, 287–295.

Rahman, M. M., Rahman, M. R. and Asaduzzaman, M. 2010. Establishment of Dams and Embankments on Frontier River of North east Part of India: Impact on North-Western Region of Bangladesh, *Journal of Science Foundation* 8 (1-2): 1-12.

Rahman, M., Islam, S. and Rahman, S. H. 2014. Coping with flood and riverbank erosion caused by climate change using livelihood resources: A case study of Bangladesh, *Climate and Development*, 1-7

Rahman, R., Haque, A., Khan, S.A., Salehin, M. and Bala, S. K. 2005. *Investigation of hydrological aspects of flood -2004 with special emphasis on Dhaka city*, Institute of Water and Flood Management, BUET.

Raillon, C. 2010. *Bangladesh, Climate Disasters Humanitarian practice challenged by populations 'resilience'*, Bangladesh: URD and Rupantar.

Rana, S. M. M., Kamruzzaman, M., Rajib, M. A. and Rahman, M. M. 2011. Changes in Cyclone Pattern with Climate Change Perspective in the Coastal Regions of Bangladesh, *Environmental Research, Engineering and Management* 2(56), 20-27.

Rao, K. S. and Prasad, K. C. M. E. 2009. Condition of Older Persons Living in Slum in Tirupati, *HelpAge India-Research & Development Journal* 15 (3), 20-27.

Rashid, S.F. and Hossain, Y. 2005. "Constraints in delivering services to the urban poor living in slums in Dhaka, Bangladesh", World Bank , Washington DC.

Ratha, K., Touch, S., Akara, O. and Sokhom, H. 2010. *The Impacts of Climate Change on Bank Erosion and its Effects on Social-economic and Environment*, Workshop on Dissemination of Environmental Research Findings, CJCC, Royal University of Phnom Penh: Cambodia Japan cooperation Centre (CJCC).

Ravenstein, E. G. 1885. The Laws of Migration, *Journal of the Royal Statistical Society* 48 (2), 167-285.

Ravenstein, E. G. 1889. The Laws of Migration, *Journal of the Royal Statistical Society* 52 (2), 241-302.

Rayhan, I. and Grote, U. 2007. Coping with Floods: Does Rural-Urban Migration Play any Role for Survival in rural Bangladesh?, *Journal of Identity and Migration Studies* 1 (2), 82-98.

RDRS, 2006. *Monga* Mitigation in Northern Bangladesh: Contextual Analysis, Initiatives and Experiences in RDRS Programmes. Rangpur: Rangpur-Dinajpur Rehabilitation Service

Reid, H. and Sims, A. 2007. *Up in smoke? Asia and the Pacific*, Up in Smoke Working Group on Climate Change and Development. p. 92.

Rempell, H. 1970. Labour Migration into Urban Centres and Urban Employment in Kenya, University of Wisconsin, unpublished. Ph D. Thesis, Wisconsin.

Renaud, F.G., Bogardi, J.J., Dun, O. and Warner, K. 2007. *Control, Adapt or Flee: How to Face Environmental Migration?*, InterSecTions no. 5/2007, Bonn: United Nations University Institute for Environment and Human Security.

Rennie, J. K. and Singh, N. 1996. *Participatory Research for Sustainable Livelihoods*, International Institute for Sustainable Development, Winnipeg.

Revi, A., Satterthwaite, D., Aragón-Durand, F., Corfee-Morlot, J. Kiunsi, R. B. R., Pelling, M., Roberts, D., Solecki, W., Gajjar, S. P. and Sverdlik, A. 2014. Towards transformative adaptation in cities: the IPCC's Fifth Assessment, *Environment and Urbanization* 26 (1), 11-28.

Richards, M. 2003. *Poverty Reduction, Equity and Climate Change: Global Governance Synergies or Contradictions?,* Globalization and Poverty Programme, Overseas Development Institute, London.

Rienzo, C. 2013. *Characteristics and Outcomes of Migrants in UK Labour Market,* Migration Observatory Briefing, COMPAS, UK: University of Oxford.

Rosenzweig, C., Casassa, G. Karoly, D. J., Imeson, A., Liu, C., Menzel, A., Rawlins, S., Root, T. L., Seguin, B., Tryjanowski, P. 2007. Assessment of observed changes and responses in natural and managed systems. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds.). Cambridge University Press, Cambridge, UK, 79-131.

Rosenzweig, C., Solecki, W. D., Hammer, S. A. and Mehrotra, S. 2011. Urban Climate Change in Context. In Rosenzweig, C., Solecki, W. D., Hammer, S. A. and Mehrotra, S. (eds.). *Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network*, Cambridge: Cambridge University Press, pp. 3–11.

Roy, D.C. 2011. Vulnerability and Population Displacements due to Climate-induced Disasters in Coastal Bangladesh. In Leighton, M., Shen, X. and Warner, K. (eds.). *Climate Change and Migration: Rethinking Policies for Adaptation and Disaster Risk Reduction*, Publication Series No. 15/2011, Germany: UNU-EHS, pp. 24-33.

Roy, M., Guy, S., Hulme, D. and Jahan, F. 2011. Poverty and climate change in urban Bangladesh (CLIMURB): An analytical framework. BWPI Working Paper . The University of Manchester.

Roy, M., Hulme, D. and Jahan, F. 2013. Contrasting adaptation responses by squatters and low-income tenants in Khulna, Bangladesh, *Environment & Urbanization* 25(1), 157-176.

Rush, E. and Rusk, I. 2009. *Food security for Pacific Peoples in New Zealand: a report for the Obesity Action Coalition*, Wellington: Obesity Action Coalition, New Zealand.

RVCC, 2003. *Report of a Community Level Vulnerability Assessment Conducted in Southwest Bangladesh.* A report prepared by the Reducing Vulnerability to Climate Change (RVCC) Project, CARE Bangladesh, Dhaka.

Rychetnik, L., Webb, K., Story, L. and Katz, T. 2003. *Food security options paper: a planning framework and menu of options for policy and practice interventions,* Improving Nutrition in NSW Series, Sydney: NSW Centre for Public Health Nutrition.

Sabates-Wheeler, R., Devereux, S., Mitchell, T., Tanner, T, Davies, M. and Leavy, J. 2008. Rural disaster risk- poverty interface, prepared for global assessment report on disaster reduction, IDS, University of Sussex.

Sabot, R. H. 1972. *Education, Income Distribution and Rates of Urban Migration in Tanzania*, University of Dar-es-Salaam, Economic Research Bureau.

Sadekin, M. N., Aktar, M. A. and Pulok, M. H. 2014. Socioeconomic Analysis of the Migrated Rickshaw Pullers in Comilla City of Bangladesh, *International Journal of Innovation and Applied Studies* 8 (3), 1142-1147.

Saha, S. R. and Rahman, H. 2006. Understanding Urban Livelihoods in a Secondary Town in Bangladesh, In Stevens, L., Coupe, S. and Mitlin, D. (eds.). *Confronting the Crisis in Urban Poverty: Making integrated approaches work*, Rugby: Intermediate Technology Publications, pp. 209-224.

Sahota, G. S. 1968. An Economic Analysis of Internal Migration in Brazil, *Journal of Political Science*, 76 (2), 218-245.

Sarker, M. S. H. 2009. *Climatic Variability And Its Trend Over Different Region Of Bangladesh*, Poster presented at American Meteorological Society, 89th Annual Meeting, Phoenix, AZ.

Sarker, S. and Hossain, M. S. 2012. Climate Change Disaster and Community Based Mitigation Options at Ramgati Coast, Bangladesh, *Agricultural Science Research Journal* 2(6), 346 –354.

Satterthwaite, D. and Dodman, D. 2009. The Costs of Adapting Infrastructure to Climate Change. In Parry, M., Arnell, N., Berry, P., Dodman, D., Fankhauser, F., Hope, C., Kovats, S., Nicholls, R., Satterthwaite, D., Tiffin, R. and Wheeler, T. (eds.). *Assessing the Costs of Adaptation to Climate Change: A Review of the UNFCCC and Other Recent Estimates*, IIED and Grantham Institute for Climate Change, London, pp. 73-89.

Satterthwaite, D. and Mitlin, D. 2014. *Reducing Urban Poverty in the Global South*, Routledge, New York.

Satterthwaite, D., Huq, S., Pelling, M., Reid, H., Pelling, M. and Romero Lankao, P. 2009. Adapting to Climate Change in Urban Areas-The possibilities and constraints in low and middle income nations. In Bicknell, J., Dodman, D. and Satterthwaite, D. (eds.). *Adapting Cities to Climate Change: Understanding and Addressing the Challenges*, London: Earthscan, pp. 3-34.

Saunders, P. L. 2000. Environmental Refugees: The Origins of a Construct, In Scott, P. and Sullivan, S. (eds.). *Political Ecology: Science, Myth and Power*, Oxford University Press.

Sayeeduzzaman, M. 1990. A Fire Hazard Assessment Model and Fire Hazard Zone in Dhaka SMA, In Islam, M. A. (ed.). *Environment, Land Use and Natural Hazards in Bangladesh*, Dhaka: University of Dhaka.

Scheyvens, R. and Storey, D. 2003. *Development Fieldwork: A Practical Guide*, London, Thousand Oaks and New Delhi: Sage.

Schuck, N. G., Allen, B. L. and Larson, K. 2004. *Focus Group Fundamentals: Methodology Brief*, Departments of Agricultural Education and Studies and Sociology, Iowa State University.

Schultz, T. P. 1971. Rural-Urban Migration in Colombia, *Review of Economics and Statistics* 53 (2), 157-163.

Semenza, J. C., McCullough, J. E., Flanders, W. D., McGeehin, M. A. and Lumpkin, J. R. 1999. Excess hospital admissions during July 1995 heat wave in Chicago, *American Journal of Preventive Medicine* 16 (4), 269-77.

Semple, E. C. 1911. *Influences of geographic environment*, New York: Holt.

Shamsuddoha, M. and Chowdhury, R. K. 2007. Climate Change Impact and Disaster Vulnerabilities in the Coastal Areas of Bangladesh, Dhaka: COAST Trust and Equity and Justice Working Group (EJWG).

Shamsuddoha, M., Islam, M., Haque, M. A., Rahman, M. F., Roberts, E., Hasemann, A. and Roddick, S. 2013. Local Perspective on Loss and Damage in the Context of Extreme Events: Insights from Cyclone-affected Communities in Coastal Bangladesh, Bangladesh: Centre for Participatory Research and Development (CRPD).

Shen, C., Wang, W., Hao, Z. and Gong, W. 2008. Characteristics of anomalous precipitation events over eastern China during the past five centuries, *Climate Dynamics* 31 (4), 463–476.

Siddiqui, T. 2011. *Climate change induced displacement: Migration as an adaptation strategy*, The Daily Star, November 15, 2011. (http://www.thedailystar.net/newDesign/news-details.php?nid=210113), Accessed in February, 2014.
SIDS (Screening Information Dataset), 2002, "Formaldehyde", UNEP.

Simon, D. 2006. Your Questions Answered? Conducting Questionnaire Surveys. In Thomas, S. J. 1999. *Designing Surveys that Work!: A Step-by-Step Guide*, London: Sage.

Simon, D. 2007. Global Change and Urban Risk: The Challenge for African Cities, *The Constitution* 17 (1), 3-21.

Simon, D. 2010. The Challenges of Global Environmental Change for Urban Africa, *Urban Forum* 21 (3), 235-248.

Simon, D. 2012. Hazard, Risks and Climate Change. In Wisner, B., Gaillard, J.C., and Kelman, I. (eds.). *Routledge Handbook of Natural Hazards and Disaster Risk Reduction and Management*, London: Routledge.

Simon, D. and Fragkias, M. 2008. 'The Dynamic Relationships between Cities and Global Environmental Change', Paper prepared for the Urban Researcher's Roundtable on Cities and Climate Change WUF4, Nanjing, 5 November 2008.

Simon, D. and Leck, H. J., 2010. Urbanizing the Global Environmental Change and Human Security Agendas, *Climate and Development* 2, 263-275.

Singh, O. P. and Rout, R. K. 1999. Frequency of cyclonic disturbances over the North Indian Ocean during ENSO years. *Proceeding of TROPMET-99*, Chennai.

Sinthia, S. A. 2013. Sustainable Urban Development of Slum Prone Area of Dhaka City, *World Academy of Science, Engineering and Technology* 7, 328-335.

Smith, L. C., and Subandoro, A. 2007. *Measuring Food Security Using Household Expenditure Surveys, Food Security in Practice technical guide series*, Washington, D.C.: International Food Policy Research Institute (IFPRI).

Spring, U. O. 2008. *Gender and disasters, human, gender and environmental security: a HUGE challenge*, Source No. 8, Bonn: UNU-EHS.

Stern, N. 2006. *The Economics of Climate Change: The Stern Review*, Cambridge: Cambridge University Press.

Stojanov, R. and Novosak, R. (eds.). 2008. *Migration, Development and Environment: Migration Processes from the Perspective of Environmental Change and Development Approach at the Beginning of the 21st Century.* Newcastle upon Tyne: Cambridge Scholars Publishing.

Subhan, F. 2013. Shab-e-Barat: A pious Celebration, In *Amader Kotha: Commitment to Women*, Weekly Web Portal, issue 60, June 22, 2013.

Suditu, B. and Vâlceanu, D. G. 2013. Informal Settlements and Squatting in Romania: Socio-Spatial Patterns and Typologies, *Human Geographies – Journal of Studies and Research in Human Geography* 7 (2), 65–75.

Sultana, F. 2007. Reflexivity, positionality and participatory ethics: Negotiating fieldwork dilemmas in international research, *ACME: An International E-journal for critical geographies* 6 (3), 374-385.

Swai, O. W., Mbwambo, J. S. and Magayane, F. T. 2012. Gender and Adaptation Practices to the Effects of Climate Change in Bahi and Kondoa Districts Dodoma Region, Tanzania, *Journal of Sustainable Development* 5 (12), 65-77.

Sweetman, C. (Ed.). 1998. *Gender and migration*, Oxford: Oxfam.

Sweetman, C. 2009. Introduction, *Gender and Development* 17 (1), 1-3.

Tacoli, C. 2009. Crisis or adaptation? Migration and climate change in a context of high mobility, *Environment and Urbanization* 21 (2), 513-525.

Tacoli, C. 2011. *Migration and global environmental change. CR2: The links between environmental change and migration: a livelihoods approach.* Foresight Project, Government Office for Science, London, UK.

Taha, H., Sailor, D. and Akbari, H. 1992. High-albedo Materials for Reducing Building Cooling Energy Use, Lawrence Berkeley National Laboratory Report No. 31721 UC-350: 71.

The Daily Observer, 2004. 'Three killed in Mohakhali slum fire', 5 March, Dhaka. (http://www.bangladesh-web.com/view.php?hidRecord=2630), Accessed in July 2013.

The Daily Star, 22 May, 2014.

Thomas, S. J. 1999. *Designing Surveys that Work!: A Step-by-Step Guide*, London: Sage.

Todaro, M. P. 1976. *Internal migration in developing countries*, Geneva: International Labour Organization.

Trenberth, K. E., Dai, A., Rasmussen, R. M. and Parsons, D. B. 2003. The changing character of precipitation, *Bulletin of American Meteorological Society* 84, 1205–1217.

Turnbull, M., Sterrett, C. L. and Hillaboe, A. 2013. *Toward Resilience: A Guide to Disaster Risk Reduction and Climate Change Adaptation*, UK: Hobbs the Printer.

Turner, B. L., Kasperson, R. E., Matson, P. A., McCarthy, J. J., Corell, R.W., Christensen, L., Eckley, N., Kasperson, J. X., Luers, A., Martello, M. L., Polsky, C., Pulsipher, A., and Schiller, A. 2003. Framework for Vulnerability Analysis in Sustainability Science, *Proceedings of the National Academy of Sciences* 100 (14), 8074-8079.

UN, 2004. *Women 2000 and Beyond - Making Risky Environments Safer*, New York: Division for the Advancement of Women, Department of Economic and Social Affairs, United Nations.

UNDP (United Nations Development Programme), 2004. *Reducing Disaster Risk: A Challenge for Development*, New York: Bureau for Crisis Prevention and Recovery.

UNDP (United Nations Development Programme), 2007. *Settled to move: The decision to migrate and its associated risks.* New Delhi: UNDP.

UNDP, 2010. Cyclone Aila: Joint UN Multi Sector Assessment and Response Framework.

UNEP (United Nations Environment Programme), 2011. *Livelihood Security: Climate Change, Migration and Conflict in the Sahel*, Geneva: UNEP.

UNFCCC (United Nations Framework Convention on Climate Change), 2007. *Climate change: impacts, vulnerabilities and adaptation in developing countries*, Bonn: UNFCCC Secretariat.

UNFCCC (United Nations Framework Convention on Climate Change), 2007. *Climate change: impacts, vulnerabilities and adaptation in developing countries*, Bonn: UNFCCC Secretariat.

UNFCCC (United Nations Framework Conventions on Climate Change), 2007. *Climate Change: Impacts, Vulnerabilities and Adaptation in Developing Countries*, Germany: Climate Change Secretariat (UNFCCC).

UNFPA, 2009. *State of World Population 2009—Facing a Changing World: Women, Population, and Climate*, New York: United Nations Population Fund.

UN-HABITAT, 2004. *State of the World Cities 2004/05*, Nairobi.

UN-HABITAT, 2009a. Planning Sustainable Cities: Policy Directions: Global Report on Human Settlements, United Human Settlements Programme: Nairobi.

UN-HABITAT, 2009b. Case Study: Dhaka's Extreme Vulnerability to Climate Change In *State of the World's Cities 2008/2009*, Nairobi, Kenya.

UNHCR (United Nations High Commissioner for Refugees), 2002. A Critical Time for the Environment, *Refugees* 127, 2-13.

UNISDR-RAED, 2011. An overview of environment and disaster risk reduction in the Arab Region: A community perspective, United Nations Office for Disaster Risk Reduction-Arab Network for Environment and Development.

Unwin, T. 2006. Doing Development Research 'at Home', In Desai, V. and Potter, R. B. (eds.). Doing *Development Research*, London: Sage, pp. 104-118.

UPPR (Urban Partnerships for Poverty Reduction), 2009. *Annual Progress Report 2009: Urban Partnership for Poverty Reduction Project*, Dhaka: UKAID (DFID), UNDP, LGED.

USAID (U.S. Agency for International Development), 2009. *Adapting to Coastal Climate Change: A Guidebook for Development Planners*, USA: Coastal Resources Centre, University of Rhode Island.

Van der Land, V. and Hummel, D. 2013. Vulnerability and the role of education in environmentally induced migration in Mali and Senegal, *Ecology and Society* 18(4): 14.

Van Zoest, J. V. and Hopman, M. 2014. Taking the economic benefits of green space into account: The story of the Dutch TEEB for Cities project, *Urban Climate* 7, 107-114.

Vine, D. 2005. The other migrants: cause and prevention in involuntary displacement and the question of "environmental refugees", in *International Migration and the Millennium Development Goals: Selected Papers on the UNFPA Expert Group Meeting*, Marrakech (Morocco): UNFPA. pp. 141-151.

Vogel, C. 1998. Vulnerability and global environmental change, *LUCC Newsletter* 3, 15–19.

Vuichard, D. and Zimmermann, M. 1987. The 1985 catastrophic drainage of a moraine-dammed lake, Khumbu Himal, Nepal: cause and consequences, *Mountain Research and Development* 7: 91-110.

Walsham, M. 2010. *Assessing the Evidence: Environment, Climate Change and Migration in Bangladesh*, Geneva: IOM.

Wamsler, C. and Brink, E. 2014. Interfacing citizens' and institutions' practice and responsibilities for climate change adaptation, *Urban Climate 7*, 64-91.

Warner, K. 2010. *Assessing Institutional and Governance Needs Related to Environmental Change and Human Migration*, Climate Change and Migration: Study Team on Climate-induced Migration, Washington DC: The German Marshall Fund of the United States.

Warner, K. and Afifi, T. 2014. Where the rain falls: Evidence from 8 countries on how vulnerable households use migration to manage the risk of rainfall variability and food insecurity, *Climate and Development* 6 (1), 1–17, Institute for Environment and Human Security (UNU-EHS), United Nations University, Bonn, Germany.

Warner, K., Afifi, T., Henry, K., Rawe, T., Smith, C., de Sherbinin, A. 2012. *Where the Rain Falls: Climate Change, Food and Livelihood Security, and Migration*, Global Policy Report of the Where the Rain Falls Project. Bonn: CARE France and UNU-EHS.

Warner, K., Ehrhart, C., de Sherbinin, A., Adamo, S. and Chai-Onn, T. 2009. *In Search of Shelter. Mapping the Effects of Climate Change on Human Migration and Displacement*, Care International, Chatelaine, Switzerland.

Warrick, R. A. and Ahmad, Q. K. (eds.). 1996. *The Implications of Climate and Sea-Level Change for Bangladesh*, Dordrecht, Boston, London.: Kluwer Academic Publishers, 415 pp.

WEDO (Women's Environment and Development Organization), 2008. Climate Change and Displacement: What it means for women, *Forced Migration Review*. 31, 56.

WFP (World Food Programme), 2002. Food Security Assessment in Bangladesh, Issues and Implications for Mapping Food Insecurity and Vulnerability, Vulnerability Analysis and Mapping, Bangladesh.

Wikipedia, 2013. http://en.wikipedia.org/wiki/Cyclone_Aila, Accessed in November, 2013.

Wilson, L., O'Brien, G., O'Keefe, P. and England, K. 2014. Barriers to adaptation in Newcastle upon Tyne, UK: Preliminary findings, *Urban Climate* 7, 33-46.

Wisner, B., Blaikie, P., Cannon, T. and Davis, I. 2004. *At risk: Natural hazards, people's vulnerability and disasters*, Second Edition, London and New York: Routledge.

Wongbusarakum, S. and Loper, C. 2011. Indicators to assess community level social vulnerability to climate change: An addendum to SocMon and SEM Pasifika regional socioeconomic monitoring guidelines, (www.socmon.org/download.ashx?docid=64623), Accessed in March, 2014.

Wood, W. 2001. Ecomigration: linkages between environmental change and migration. In Zolberg, A. R. and Benda, P. M. (eds.). *Global migrants, global refugees. Problems and solutions*, New York: Berghahn Books. pp. 42-61.

World Bank, 1996. *The World Bank participation Source Book*, Washington D. C. : Environmentally Sustainable Development (ESD).

World Bank, 2007. *Improving Living Conditions for the Urban Poor*, Bangladesh Development Series, Paper No. 17, Dhaka: World Bank.

World Bank, 2010. *Cities and Climate Change: An Urgent Agenda*, Urban Development Series Knowledge Papers 10, Washington D.C.

World Vision, 2013. *Cities Prepare! Reducing Vulnerabilities for the Urban Poor: Asia Pacific Disaster Report*, Bangkok: World Vision.

WWF (World Wide Fund For Nature ; Formerly World Wildlife Fund), 2009. Mega-Stress for Mega-Cities: A Climate Vulnerability Ranking of Major Coastal Cities in Asia, published in Switzerland.

Zhang, X., Zwiers, F. W., Hegerl, G. C., Lambert, F. H., Gillett, N. P., Solomon, S., Stott, P. A. and Nozawa, T. 2007. Detection of human influence on twentieth-century precipitation trends, *Nature*, 448 (7152): 461–465.

Zimmerman, R., Restrepo, C. E., Nagorsky, B., Culpen, A. M. 2007. Vulnerability of the Elderly During Natural Hazard Events. In *Proceedings of the Hazards and Disasters Researchers Meeting*, July 11–12, Boulder, CO:Natural Hazards Center, pp. 38–40.

Zimmermann, M., Bichsel, M., Kienholz, H. 1986. Mountain hazards mapping in the Khumbu Himal, Nepal, with prototype map, scale 1:50,000. *Mountain Research and Development* 6: 29–40.

Appendix I

Questionnaire Part-I

Tracer Survey

1. Name: 2. Sex: 3. Age

4. Address: 5. Year of recent migration:

6. Place of Origin:

7. Reason(s) for Migration (Starting with the most important)

a) …….....

b) …….....

c) …….....

d) …….....

8. Did you lose your livelihood in your place of origin due to any of these causes below? Indicate which is most relevant (also may be a combination).

1) Flood 2) Cyclone 3) Salinity intrusion 4) Riverbank erosion 5) Drought 6) Waterlogging 7) Landslide/Flash flood 8) Excessive Heat 9) Excessive Rain 10) None of the above

9. Did you lose your homestead in the place of origin due to any of these causes below (also may be a combination)?

1) Flood 2) Cyclone 3) Riverbank erosion 4) Waterlogging 5) Landslide/Flash flood 6) Excessive Rain 7) None of the above

10. What type of migrant do you consider yourself?

a) Opportunistic

b) Environmentally forced

c) Politically forced

d) Other. Please specify:…….……

11. If you consider yourself as climate-induced migrant, then please answer the following question:

What was the pattern of the problem in your origin, for which you have migrated?

a) It was a regular event for many years
b) Increased intensity and frequency in last few years

Questionnaire Part-II

A. General Information

1. Current Occupation:

1) Rickshaw puller
2) Day laborer
3) Garments worker
4) shop keeper
5) Driver
6) Hawker
7) Housewife
8) Unemployed
9) Maid servant
10) Other. Please specify.....

2. Occupation before migration:

1) Farmer
2) Fisherman
3) Rickshaw puller
4) Day Laborer
5) Maid servant
6) Housewife
7) Other. Please specify.....

3. Educational Status:

1) No education
2) Can only signature
3) Primary school pass
4) Secondary school pass
5) Higher secondary pass
6) Graduate
7) Other. Please specify.....

4. Religion: 1) Islam 2) Hindu 3) Christian 4) Buddhist 5) Other

5. Information of family members including yourself (indicate household head also)

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

Questionnaire Part-III

In-depth Information

B Information on Environmental Conditions

1. Which were the main environmental problems in your place of origin?

1) Flood 2) Cyclone 3) Salinity intrusion 4) Riverbank erosion 5) Drought 6) Waterlogging 7) Landslide/Flash flood 8) Excessive Heat 9) Excessive Rain 10) None of the above

2. Which are the main environmental problems in the City?

1) Flood 2) Cyclone 3) Waterlogging 4) Excessive Heat 5) Excessive Rain 6) None of the above 7) Other. Please specify.....

3. List any major environmental disasters you have faced after migrating to Dhaka

.....
.....
.....

4. Do you feel Dhaka City has a higher temperature than that of your place of origin?

1) Yes 2) No

5. After heavy rainfall do you face waterlogging in your slum?

1) Yes 2) No

6. If yes, what problems do you face due to waterlogging?

……
……

7. How long does the water stay after one heavy rainfall?

1) 1-6 hour 2) 6-12 hours 3) 12 hour - 1 day 4) More than one day

C. Information on Livelihood

1. Since coming to Dhaka, have you ever changed your occupation?

1) Yes 2) No

2. If yes, please explain the reason of changing occupation.....

3. Have the relatively high temperature in the City decreased your working efficiency?

1) Yes 2) No

4. Your current income/month (BDT):

1) Less than 2000 2) 2000-3000 3)3000-4000

4) 4000-6000 5)6000-8000 6) More than 8000

5. Your current expenditure/month:

1) Less than 2000 2) 2000-3000 3)3000-4000

4) 4000-6000 5)6000-8000 6) More than 8000

6. Your current savings/month:

1) Less than 2000 2) 2000-3000 3)3000-4000

4) 4000-6000 5) Nothing 6) Negative savings (have to take loan)

7. Difference between the pre migration and present income:

8. What is the major source of your expenditure?

1) Food 2) House rent 3) Transportation 4) Health Treatment 5) Other. Please specify.....

9. In your place of origin, what was the major source of expenditure?

1) Food 2) House rent 3) Transportation 4) Health Treatment 5) Other. Please specify.....

10. Have you taken any loan after migrating to City……

a. Yes b. No

11. If yes, how much and from what source?……..

12. Did you ever have to take any loan while staying in the place of origin?

1) Yes 2) No

13. If the above answer is yes, please state the reason.....

14. Have you ever become jobless in the City?

1) Yes 2) No

15. If the above answer is yes, please state the reason.....

16. If the answer of no. 16 is yes, please tell how did you cope with the situation?

1) Taking loan 2) selling asset 3) taking help from government/NGO 4) begging 5) Other. Please specify.....

D. Information on Housing

1. Type of housing:

1) Tenant 2) Landlord

2. Type of Housing (in place of origin):

1) Tenant 2) Landlord

3. Location of the house:

1) Closely situated by Gulshan Lake 2) Not closely situated by Gulshan Lake

3) Above the lake with temporary structure 4) Others. Please specify.....

4. Can you see the water of Gulshan Lake from your house?

1) Yes 2) No

5. What is the main construction material of the walls of the house?

1) Wood and bamboo 2) CI sheet 3) Clay 4) Plastic Paper 5) Brick 6) Others

6. What was the main construction material of the walls of the house in the origin?

2) Wood and bamboo 2) CI sheet 3) Clay 4) Plastic Paper 5) Brick 6) Others

7. Number of rooms in the house:

8. Number of rooms before migration:

9. Does water enter into your house during normal rain?

1) Yes 2) No

10. In your place of origin, did water use to enter your room during normal rain?

1) Yes 2) No

11. What kinds of problems do you face during excessive rain? Please make a list.

……..

…….....

……..

12. Was it flooded during the last rainy season?

1) Yes 2) No

13. Has the house ever broken due to cyclonic storm surges/extreme rainfall?

1) Yes 2) No

14. Do you face any difficulty to live in the house due to high temperature?

1) Yes 2) No

15. If the above answer is yes, please explain…….

16. Have you (or your landlord) repaired your house due to above mentioned climatic factors (extreme rainfall/storm surges/floods/others)?

1) Yes 2) No

17. If the above answer is yes, please mention the name of that climatic event…….....

18. What other problems do you face to live in this room? Please make a list:

.....

.....

.....

.....

19. Make a list of the problems that you used to face in the house of your place of origin.

.....

.....

.....

.....

20. Have Govt./NGO ever helped regarding house repairing due to environmental problems?

1) Yes 2) No

21. If yes, please describe in details…….

E. information on Utility Services

1. What was the source of drinking water before migrating to City?

1) Tube well

2) Well

3) Pond

4) Supply water

5) Others (Please specify)……

2. What is the current source of your drinking water?

1) Tube well

2) Well

3) Pond

4) Supply water by WASA (illegal connection)

5) Others……

3. Do you drink water after boiling or purifying?

1) Yes 2) No

4. In your place of origin, did you have to boil water before drinking?

1) Yes 2) No

5. What is the source of water used for other purposes?

1) Tube well

2) Well

3) Pond

4) Supply water by WASA (illegal connection)

5) Others……

6. What is the quality (taste, colour and odour) of drinking water in general?

1) Good 2) Moderate 3) Bad

7. If the above answer is moderate or bad, please specify the reason……..

8. In your place of origin, what was the quality (taste, colour and odour) of drinking water in general?

1) Good 2) Moderate 3) Bad

9. Do you face any difficulty regarding collection of water during excessive rain?

1) Yes 2) No

10. If yes, please explain…….

11. In your place of origin, did you use to face any difficulty regarding collection of water due to environmental events such as cyclone/floods/storm surges etc.?

1) Yes 2) No

12. If yes, please state the reason…….

13. Did you face any problem regarding managing water during any recent flood in the city (2004/2007)?

1) Yes 2) No 3) Not applicable

14. If yes, explain…….

15. Do you face any difficulty regarding collection of water during excessive temperature?

1) Yes 2) No

16. If yes, please explain.....

17. Where do you normally go for defecation?

1) Pucca latrine

2) Katcha latrine

3) Hanging latrine

4) No specific place

5) Others (Please specify)…….

18. Where did you normally use to go for defecation in your place of origin?

1) Pucca latrine

2) Katcha latrine

3) Hanging latrine

4) No specific place

5) Others…….

19. In your place of origin, where did you use to go for defecation during any environmental events such as storm surges/cyclones/floods etc.?

1) Same latrine 2) Special arrangement at home 3) Other. Please specify.....

20. Currently where do you go for defecation during any environmental events such as storm surges/cyclones/floods etc.?

1) Same latrine 2) Special arrangement at home 3) Other. Please specify.....

21. Do you face any problem regarding defecation during excessive rainfall?

1) Yes 2) No

22. If yes, then what kind of …….

23. Where do you throw your everyday household waste?

1) On the street 2) into the water body

3) Randomly throw anywhere 4) specific space in the community

24. Where did you use to throw everyday household waste in your place of origin?

1) On the street 2) into the water body

3) Randomly throw anywhere 4) specific space in the community

25. What is the quality of the sewerage system of your slum?

1) Good 2) Moderate 3) Bad

26. What problems do you currently face regarding the waste and sewerage?

.....

.....

.....

.....

27. What happens to the sewerage system during excessive rain/flood/waterlogging?

1) It fully blocks and overflows garbage

2) It partially blocks and sometimes garbage is seen

3) Nothing happens

28. Have you received any help from Govt./NGO regarding water and sanitation after coming to Dhaka?

1) Yes 2) No

29. If yes, please explain.....

30. In your place of origin, have you ever received any government/NGO support regarding water and sanitation?

1) Yes 2) No

31. If yes, please explain.....

32. Do you have electricity connection?

1) Yes 2) No

F. Information on Health

1. What kind of health problems have you faced after coming to Dhaka City? (Make a list according to decreasing severity)

1) …….

2) …….

3) …….

4) …….

2. What kind of health problems did you use to face in your place of origin? (Make a list according to decreasing severity)

1) …….

2) …….

3) …….

4) …….

3. Your current annual medical cost (in BDT):

4. Your annual medical cost before migration:

5. In your place of origin, were you capable enough to meet expenditure regarding medical treatment?

1) Yes 2) No

6. Are you now capable enough to meet the expenditure regarding medical treatment?

1) Yes 2) No

7. If no, how do you meet up?

1) Taking loan 2) selling asset 3) taking help from government/NGO 4) begging 5) Other. Please specify.....

8. Since coming to Dhaka, have you or your family members ever suffered from diarrhoea/malaria/cholera/dengue?

1) Yes 2) No

9. If yes, who, when and what was the reason?.....

10. In Dhaka, have you or your family members ever been admitted into hospital for the above reason?

1) Yes 2) No

11. If yes, then please state the approximate cost of that specific treatment.....

12. In your place of origin, had you ever been admitted into hospital?

1) Yes 2) No

13. If yes, then please state the approximate cost of that specific treatment.....

14. Where do you generally go for treatment?

1) Public hospital

2) Private clinic/hospital

3) Local health centre

4) Homeopath

5) don't go anywhere because cannot afford

6) Others. Please specify.....

15. What is the quality of the health treatment you are getting in the city?

1) Good 2) Moderate 3) Bad

16. If the answer of the above question is not 1, then please state the reasons.....

17. Do you/your HH members know the reason of diarrhoea/malaria/dengue?

1) Yes 2) No

18. Have Govt./any NGO ever tried to aware the community in your area regarding this issue?

1) Yes 2) No

19. Do you or your family members face any problem during high temperature in summer and low temperature in winter?

1) Yes 2) No

20. If yes, please explain…….

21. How many hours can you work in general?

..... hours

22. How many hours can you work during extreme summer and in winter?

……hours

G. Information on Food Security

1. How many times a day your household members usually eat?

a) Three times a day
b) Two times a day
c) Once in a day
d) Sometimes starve for whole day

2.How many times a day your household members usually used to eat at your place of origin?

e) Three times a day
f) Two times a day
g) Once in a day
h) Sometimes starve for whole day

3. Generally what is the number of items in one meal?.....

4. Generally what was the number of items in one meal at your place of origin?.....

5. In the last week, have you and your household members eaten the following food items?

1	2	3	4	5
Fish	Meat	Egg	Milk/Milk products	Lentil

6. While in the origin, did you and your household members use to eat the following food items in a week?

1	2	3	4	5
Fish	Meat	Egg	Milk/Milk products	Lentil

7. Do you exchange food with your neighbours/ friends/ relatives?

1. Once a week 2. Once a month 3. Once a year 4. Never

8. At your place of origin, did you use to exchange food with your neighbours/ friends/ relatives?

1. Once a week 2. Once a month 3. Once a year 4. Never

9. How often do you invite your friends/ relatives/ neighbours at your household?

1. Once a year 2. More than once a year 3. Once a month

4. Once a week 5. Never

10. How often did you use to invite your friends/ relatives/ neighbours at the place or origin?

1. Once a year 2. More than once a year 3. Once a month

4. Once a week 5. Never

11. Do you receive any help from the society regarding food?

1. Yes 2. No

12. If yes, from whom?

1. Relatives 2. Friends 3. Neighbours

4. Government 5. NGOs 6. Others ……

13. At your place of origin, did you use to get any help regarding food from the society?

1. Yes 2. No

14. If yes, from whom?

1. Relatives 2. Friends 3. Neighbours

4. Government 5. NGOs 6. Others ……

15. At your place of origin, did you have any scavenging opportunity?

1. Yes 2. No

16. If yes, how many days in a week did this scavenging help you to prepare your family meal? Please specify.....

17. Do you have any scavenging opportunity now?

1. Yes 2. No

18. If yes, how many days in a week does this scavenging help you to prepare your family meal? Please specify.....

19. On average, how many days in a week does your food consumption come from your own production in the City?.....

20. Please comment on the types of the production:.....

20. On average, how many days in a week did your food consumption come from your own production at your place of origin?.....

Please comment on the types of the production:.....

H. Information on mobility and linkage with the place of origin

1. Is this the first slum you are living in Dhaka City?

1) Yes 2) No

2. If the above answer is no, then how many times have you relocated since coming to this slum? .....

3. If this is not your first slum, please give details where you have been in Dhaka before coming to this slum (including reason of changing places):

.....
.....

4. What transportation modes do you use every day?

1) Bus 2) Auto rickshaw 3) Rickshaw 4) Boat 5) on Foot 6) Other

5. Type of access road to your house:

1) Mud 2) pitch 3) brick 4) water

6. Do you have to face traffic congestion of Dhaka City while going to work?

1) Yes 2) No

7. How many times do you visit your village in a year?

1) Once a year
2) Twice a year
3) several times in a year
4) Can't visit because there is nothing left in there
5) Can't visit because cannot afford the cost
6) Both 4 and 5

8. If you ever visited your place of origin after coming to Dhaka City, please state the reason……...

9. Among your close relatives, whom did you left in your village while coming to this City?

……..

I. Information on Institutional Support

1. Do you have any institutional affiliation?

1) Yes 2) No

2. If yes, please state the name of that Institution(s) …….

3. Did you have any institutional affiliation in your place of origin?

1) Yes 2) No

4. If yes, please state the name of that Institution(s) …….

5. Among the following services, which one have you received in Dhaka through an institution? (you can tick more than one)

1) Loan 2) Training 3) Relief 4) Information services 5) None

6. Among the following services, which one did you receive in your place of origin through an institution? (you can tick more than one)

1) Loan 2) Training 3) Relief 4) Information services 5) None

7. In your place of origin, did you use to send your children to schools?

1) Yes 2) No 3) Not applicable

8. Which sector in the slum, according to you, has been improved due to government/NGO intervention?

1) Education 2) Health treatment facility 3) Food security 4) Employment security 5) ICT 6) Others (please specify).....

J. Information on Coping Strategies

1. What is your most common coping strategy for combating high temperature in Dhaka?

1) More use of electricity for running a fan 2) Bathing frequently
3) Drinking liquid frequently 4) Changing housing structure/material
5) Other. Please specify.....

2. What is your most common coping strategy during floods in Dhaka?

1) Increase height of the house 2) Using durable housing material
3) again shifting to other slums/cyclone shelter 4) never faced heavy floods in the city
5) Other (Please specify)……..

3. What is your most common coping strategy during cyclonic storms in Dhaka?

1) Going to cyclone shelter 2) using durable housing material
3) Regular maintenance of house 4) Doing nothing and remain at home
5) never faced cyclonic storms in the city 6) Other (Please specify)……..

4. What is your most common coping strategy during erratic and heavy rainfall in Dhaka?

1) Use of polythene to cover the roof
2) use of bucket to protect the floor from raindrops
3) Both 1 and 2
4)Other (Please specify)……..

5. What is your most common coping strategy during waterlogging?

1) Structural modification of house and/or toilet
2) Changing mode of transport
3) remain at home and missing work
4) Other (Please specify)…….

6. During heavy rain or floods, do you change your mode of transport?

1) Yes 2) No

7. If yes, specify the changed mode of transport…….

8. In case of any income loss, how do you cope with the situation?

1) Taking laons
2) Selling assets
3) Getting support from government/NGO
4) Begging in the street
5) Others……..

K. Information on Assets

Quick assessment of household assets: Please tick or cross the appropriate box

Sl. no.	Types of assets		
	Name	At your place of origin (Before the specific climatic event)	Now in Dhaka
1	Land		
2	House		
3	Pond		
4	Agricultural equipment		
5	Tubewell		
6	Tree		
7	Livestock		
8	Rickshaw/van		
9	Jwellery/oranmnets		
10	Furniture		
11	Mobile phone		
12	Radio		
13	TV		
14	Other, please specify.....		

-----Thank You-----

Appendix II

Institutional Questionnaire Survey

1. Name of organization:

2. Type of Organization:

   a) Government b) NGO

   c) CBO (Community Based Organization) d) Other, specify…….

3. Type of work:

   a) Desk based research b) Field based research

   c) Action research d) Policy making

   e) Advocacy in International climate change negotiations

   f) Capacity building

   g) Others

4. Main duties/responsibilities:

5. Implemented projects related to climate change:

6. According to you, how Dhaka is affected due to Global Environmental Change/Climate Change?

   ……
   ……
   ……..

7. Please mention some different dimension of vulnerability of cc induced migrants.
   ……
   ……
   ……..
   .....
   .....
   .....
   .....
   .....

8. Did any of your projects/works address the issue of climate-induced migration?
   a) Yes b) No

9. If the above answer is yes, please give details of the projects…….....
.....
.....
.....
.....
.....
.....
.....

10. Have you ever worked on the issue of climate change impacts and adaptation in the slums of Dhaka City?
    a) Yes b) No

11. If the above answer is yes, please give details of the projects with the name of the slums .....

12. If the answer of Number 10 is yes, what proportion of your work over the last 5 years was related to this issue/ CC impacts in urban slums?

13. Do you know, what national policies are their especially for the group 'climate-induced migrants'?
    a) Yes b) No

14. If the above answer is yes, Please write down the policies……

Appendix III

Personal Interviews:

1) Salma; from Cox's Bazar District
   Interview Date: 12/09/2013
   Event: Flood;
   Newborn daughter died from Diarrhoea recently. Recently she is also diagnosed with kidney problem

2) Lipi; from Barguna District
   Interview Date: 12/12/2012
   Event: Cyclone *Sidr*;
   Belonged to a wealthy family but now lives in a very poor condition

3) Liton; from Patuakhali District
   Interview Date: 29/10/2012
   Event: Cyclone *Sidr*;
   Liton lost both his mother and sister during the Cyclone *Sidr*. He migrated afterwards to Dhaka and after some year's struggle he is now relatively in a better condition. He has built up his own shop in Korail slum.

4) Al Amin; from Barguna District
   Interview Date: 21/12/2012
   Event: Cyclone *Sidr*;
   On the night of *Sidr*, Alamin was in deep sea to catch fish. The cyclone pushed him away into India and the Indian government jailed him as being illegal in that country. After one year he became free and on coming back to his village, he started working as day laborer, fish and paddy farmer etc. But unfortunately after the cyclone, salinity increased in that area and he could not continue his agriculture based livelihood. Finally he decided to migrate.

5) Setara Begum; from Barguna District
   Interview Date: 22/08/2012
   Event: Cyclone *Aila*;
   This old woman migrated after Cyclone *Aila* but currently severely suffering from skin diseases because she used to take bath in the polluted canal water and thus became sick.

6) Siddique; from Thakurgaon District
   Interview Date: 14/12/2012
   Event: Flood;
   This person strongly feels that he has lost his self dignity to live in such a poor condition, he does not deserve this. A very frustrated respondent, who still cannot mentally adjust with Dhaka City's environment.

7) Hawa Begum; from Barguna District
   Interview Date: 29/10/2012
   Event: Cyclone *Sidr*;

This person lost everything in Cyclone *Sidr* but after migrating to Dhaka City her husband learned driving and now working as a car driver. She is also working in BRAC delivery centre. Now they are living comparatively a better life. The interview has focused on the point that what made it possible for them to settle in the city.

8) Rashida Begum; from Sherpur District
Interview Date: 20/07/2013
Event: Flood;
An old aged respondent, frustrated with social hazards in the city such as fire accident threat of slum eviction and crime.

9) Maruf Mia from Thakurgaon District
Interview Date: 20/09/2012
Event: Flood;
Previously he was a farmer but the local paddy fields were destroyed completely after a local flood in Thakurgaon in 2010. Now he is a rickshaw puller in the city and living in Korail with his family.

10) Rashid Alam from Barisal District
Interview Date: 07/12/2012
Event: Riverbank Erosion;
Rashid lost his agricultural field in 2009 and his house and poultry farm in 2011 due to riverbank erosion and flood. He eventually migrated to city in 2012 with family. He is now a day labourer.

11) Shahenur Akter from Barguna District
Interview Date: 25/09/2012
Event: Cyclone *Sidr*;
Shahenur lost her daughter, house and poultry farm during Cyclone *Sidr* and suffered from mental trauma. Eventually migrated to Dhaka in 2008.

Appendix IV

List of organizations visited for secondary data:

	Organization	**Date of Visit**
1	Centre for Global Change (CGC)	Worked based on this organization
2	Bangladesh Centre for Advanced Studies (BCAS)	09/08/2012
3	Centre for Urban Studies (CUS)	10/07/2012; 15/07/2012; 17/07/2012; 18/07/2012
4	Libraries of different universities in UK and Bangladesh	2011, 2012, 2013
5	Bangladesh Institute of Development Studies (BIDS)	05/05/2013
6	Action Aid, Bangladesh	28/10/2012
7	Oxfam, Bangladesh	29/10/2012
8	Refugee and Migratory Movement Research Unit (RMMRU), Dhaka University	09/02/2013
9	Bangladesh Water Development Board (BWDB)	06/01/2013
10	Centre for Environmental and Geographic Information Services (CEGIS)	15/07/2012; 16/07/2012
11	International Centre for Climate Change and Development (ICCCAD)	04/04/2013
12	Bangladesh Bureau of Statistics (BBS)	03/02/2013
13	Bangladesh Fire Service and Civil Defence Authority	08/01/2013
14	Disaster Management Bureau, Mohakhali, Dhaka.	09/01/2013
15	Local Government Engineering Department	20/11/2012
16	Nagar Daridra Bastee Unnayan Sangstha (NDBUS)	Several times during fieldwork, as it is based in Korail

17	CARE Bangladesh	05/08/2012
18	BRAC Development Institute	10/02/2013
19	Climate Change Cell, GoB	07/08/2013
20	Practical Action, Bangladesh	17/12/2012

Appendix V

Key Informant (Institutional):

	Name	**Designation**	**Date**
1.	Dr. Akter Mahmud	Professor, Department of Urban and Regional Planning, Jahangirnagar University.	18/07/2012
2	Dr. Ishrat Islam	Professor, Department of Urban and Regional Planning, BUET.	05/07/2012
3	Dr. Nurul Islam Najem	Professor, Department of Geography and Environment, Dhaka University.	12/07/2012
4	Dr. Ahsan Uddin Ahmed	Executive Director, Centre for Global Change (CGC), Dhaka	07/07/2012
5	Dr. Anwara Begum	Senior Research Fellow, Bangladesh Institute of Development Studies (BIDS)	15/05/2013
6.	Dr. C. R. Abrar	Professor, Department of International Relations and Co-ordinator of Refugee and Migratory Movement Research Unit (RMMRU)	26/05/2013
7.	Azahar Ali	National Project Co-ordinator, UPPR project of UNDP, Bangladesh	17/09/2012

8.	Ina F. Islam	Assistant Director, International Centre for Climate Change and Development (ICCCAD)	25/09/2012
9	Md. Asaduzzaman	Programme officer, Centre for Urban Studies (CUS)	2/08/2012
10	Mamtaj Akhter Aduri	Senior Member, Nagar Daridra Bastee Unnayan Sangstha (NDBUS)	10/10/2012
11	Md. Anowar Hossain Bhuyan	Slum Development Officer (DCC-North)	15/12/2014

Appendix VI

Workshops and conferences attended during fieldwork period

Event	**Date**
International conference namely 'Planet under Pressure' in London, UK (supported by CDKN funding).	26-29 March, 2012
Participatory workshop in BRAC centre (Dhaka) on 'community and institutional responses to the challenges facing poor urban people in an era of global warming in Bangladesh'.	10/09/2012
Two days of participatory workshop on 'Qualitative Research' offered by Bangladesh Institute of Planners (BIP).	08-09 December, 2012
SPSS (Statistical Package for Social Science) course offered by Dhaka University	January-February, 2013
Meetings of a National Learning Group (NLG) on Climate Resilient Cities in Bangladesh.	09/03/2013; 06/04/2013
My field summary presentation during the PDS PhD Presentation Day in the department of geography, RHUL	30/05/2013

‘Metropolis Nonformal-Anticipation’ Conference and the inauguration of the UN-HABITAT hub on informal urbanism in Munich.	20-22 November, 2013
PhD research presentation at Doctoral college of TUM (Technical University of Munich)	23/11/2013
Poster presentation on 'the food security of climate-induced migrants in Dhaka' in a collaborative workshop of Thailand as an IFS (International Foundation for Sciences) grantee	28 November-4 December, 2013.

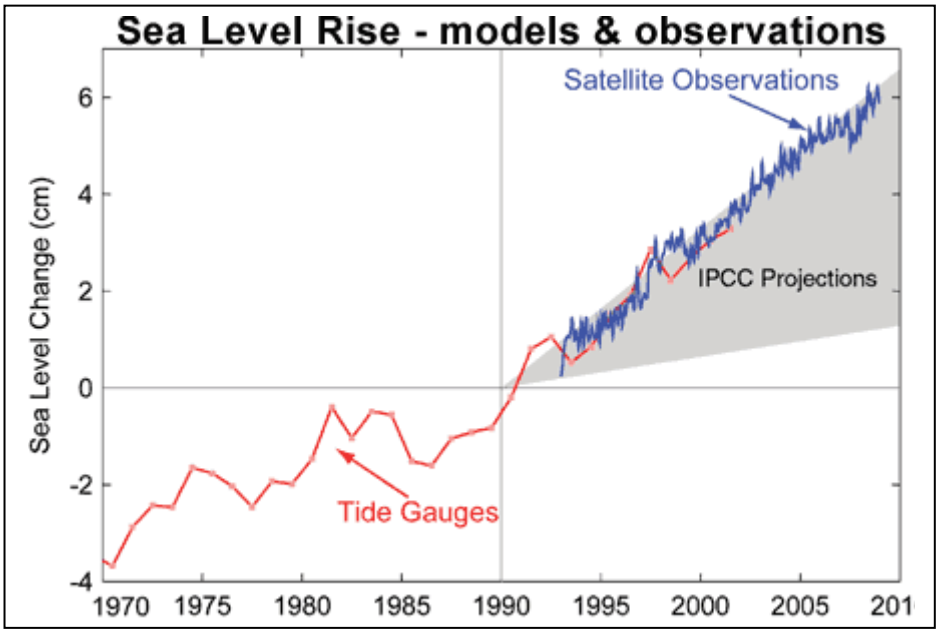


Figure 1: Sea level change. Tide gauge data are indicated in red and satellite data in blue. The grey band shows the *projection*s of the IPCC Third Assessment report (Allison et al., 2009)

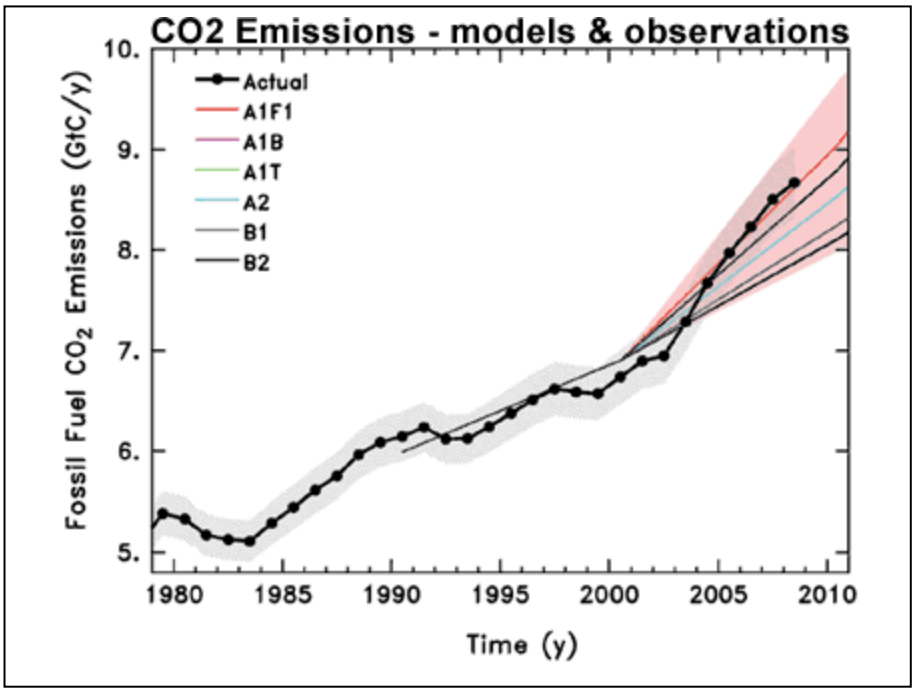


Figure 2: Observed global CO_2 emissions from fossil fuel burning and cement production compared with IPCC emissions scenarios. The coloured area covers all scenarios used to project climate change by the IPCC (Allison et al., 2009).

Appendix VIII

Frequency of cyclones in the Arabian Sea, the Bay of Bengal and on land, 1891-2009

	Bay of Bengal	Arabian Sea	Land	Total
a.1891-1910	92	33	2	116
b. Mean	**4.6**	**1.65**	**0.1**	**5.8**
a.1911-1930	100	15	4	119
b. Mean	**5**	**0.75**	**0.2**	**5.95**
a.1931-1950	93	15	4	118
b. Mean	**4.65**	**0.75**	**0.2**	**5.9**
a.1951-1970	80	20	2	102
b. Mean	**4**	**1**	**0.1**	**5.1**
a.1971-1990	81	17	2	100
b. Mean	**4.05**	**0.85**	**0.1**	**5**
a.1991-2009	49	24	1	74
b. Mean	**2.58**	**1.26**	**0.05**	**3.89**

Source: Bradnock (2015); In Press; with the permission of the author.

a. Total number of cyclones during the period.

b. Mean number of cyclones per annum for the period.

Frequency of severe cyclones in the Arabian Sea, the Bay of Bengal and on land, 1891-2009

	Bay of Bengal	Arabian Sea	Land	Total
a.1891-1910	29	13	1	43
b. Mean	**1.45**	**0.65**	**0.05**	**2.15**
a.1911-1930	32	6	2	40
b. Mean	**1.6**	**0.3**	**0.1**	**2**
a.1931-1950	33	10	0	43
b. Mean	**1.65**	**0.5**	**0**	**2.15**
a.1951-1970	46	10	0	56
b. Mean	**2.3**	**0.5**	**0**	**2.8**
a.1971-1990	51	13	1	65
b. Mean	**2.55**	**0.65**	**0.05**	**3.25**
a.1991-2009	27	15	0	43
b. Mean	**1.42**	**0.79**	**0.00**	**2.26**

Source: Bradnock (2015); In Press; with the permission of the author.

a. Total number of severe cyclones during the period.

b. Mean number of severe cyclones per annum for the period.