Public Perception and Communication of Climate Change Risks in the Coastal Region of Bangladesh: A Grounded Theory Study

Dissertation

Zur Erlangung der Grades einer Doktors der Philosophie

„Dr. phil.“

am Fakultät Wirtschafts- und Sozialwissenschaften

der Universität Hamburg

(gemäß der PromO vom 24. August 2010)

vorgelegt von

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geboren in Dhaka

Hamburg 2016

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Datum der Disputation: 8. September 2016

Acknowledgements

Writing a doctoral dissertation is a huge challenge and I would never have been able to take this challenge without the support, guidance and encouragement from so many people. First and foremost, I would like to express my sincere gratitude to my first supervisor Prof. Dr. Irene Neverla, for her advice, support, and encouragement that helped me a lot in conducting this research. Thank you for all the meetings and discussions we had over the years. They mean a lot to me.

I am also indebted to my colleagues and friends at the Institute of Journalism and Communication Studies (IJK), the Graduate School of Media and Communication (GMaC) and the Cluster of Excellence Integrated Climate System Analysis and Prediction (CliSAP) at the University of Hamburg. My greatest gratitude goes to Prof. Dr. Uwe Hasebrink, Prof. Dr. Beate Ratter, Dr. Monika Pater, Sabine Hoffkamp, Dr. Corinna Lüthje, Dr. A S M Asaduzzaman, Tanvir Hossain, Uma Shankar Pandey, Prof. Dr. Monika Taddicken, Dr. Andreas Stuhlmann, Medha, Stefanie Trümper, Ines Lörcher, Dr. Judith Lohner and Dr. Imke Hoppe. A special thanks goes to Bastian Kießling who helped me in translating the abstract into German. Of course, I am grateful to the respondents who participated in this study.

Thanks is also due to my parents, in-laws, sisters, brothers and numerous friends for their continuous love, support and encouragement. Finally, I would like to thank my wife, Mily, who stood by me through the ups and downs. And, last but not least, my daughter Tultul deserves a special thanks for promising to read this dissertation someday when she grows up.

Abstract

This research explored public perception and communication of climate change risks in the coastal region of Bangladesh. This region grabbed a prominent position in the global imaginary of climate change because of its notorious record of regional geo-hazards. Two specific aims guided this research work. First, it aimed to explore patterns of public perceptions of climate change risks within the context of their existing vulnerability to regional geo-hazards. Second, it examined the role of communication in the process of constructing public perceptions and behavioural responses to the risks of climate change. This research took an exploratory theoretical approach considering specific socio-cultural characteristics of the study population and limited scientific knowledge about their perceptions of climate change risk. A systematic procedure of data collection and analysis as suggested in grounded theory research was applied. The purpose was to build a theory of how people in a specific socio-cultural and geographical condition perceived and communicated risks of climate change. A total of 38 in-depth interviews were conducted in villages located in the south-western coastal region of Bangladesh. Interview data were supplemented by participant and field observations.

Findings from this research indicated that construction of climate change risk perceptions in individuals' minds was a complex and evolving process in which 'local hazard culture' and 'local communication repertoires' played important roles. The lay people largely relied on the characteristics of local geo-hazards and their interactions with those hazards in interpreting climate change information from different communication sources. Theoretical

abstraction of the sources and processes of climate change information flows through different channels and actors led this research to draw the structural model of the communication process titled “the communication repertoires of climate change”. Two core theoretical categories – “local hazard culture” and “local communication repertoires” were merged together to develop the grounded theory of public perception and communication of climate change risks. This grounded theory infers that ‘people embed meanings, mainly derived from local hazard culture, in perceiving climate change risks from different communication sources’. Therefore, findings of this research emphasised the local approach to deal with climate change risks and the ways to communicate them. This local approach would enable hazard managers as well as media and other interest groups to effectively communicate risks of climate change to the lay people.

Zusammenfassung

Die vorliegende Forschungsarbeit verfolgt das Ziel, die öffentliche Wahrnehmung und Kommunikation von Risiken des Klimawandels in der Küstenregion von Bangladesch zu erklären. Die Region hat aufgrund von regionalen Geohazards bereits eine bedeutsame Rolle in der globalen Vorstellung des Klimawandels eingenommen. Zwei spezifische Forschungsziele leiten die Studie. Zum einen gilt es die Muster öffentlicher Wahrnehmung bezüglich der Risiken des Klimawandels im Kontext der bestehenden regionalen Geohazards zu erforschen. Zweitens wird die Rolle der Kommunikation im Entstehungsprozess von öffentlicher Wahrnehmung und Verhaltensreaktionen auf die Risiken des Klimawandels untersucht. Dabei wird ein explorativer theoretischer Ansatz unter Berücksichtigung der soziokulturellen Charakteristiken der Studienpopulation und der Forschungslücke über die Wahrnehmung der Risiken des Klimawandels entwickelt. Diesbezüglich wurde ein systematisches Verfahren zur Datenerhebung und Analyse angewandt, basierend auf der Grounded Theory Forschung. Das Ziel war die Entwicklung eines theoretischen Ansatzes, wie Menschen unter spezifischen soziokulturellen und geographischen Bedingungen die Risiken des Klimawandels wahrnehmen und darüber kommunizieren. Dafür wurden Daten mit Hilfe von 38 Tiefeninterviews in Dörfern der südwestlichen Küstenregion von Bangladesch erhoben und durch Teilnehmende Beobachtungen und Beobachtungen im Feld ergänzt.

Die Erkenntnisse aus dieser Studie zeigen, dass die Entstehung der individuellen Wahrnehmung von Klimarisiken ein komplexer und sich entwickelnder Prozess ist, bei dem die „lokale Hazard-Kultur“ und „lokale

Kommunikationsreportoires“ eine wichtige Rolle spielen. Laien beziehen sich bei der Interpretation von Informationen über den Klimawandel aus verschiedenen Kommunikationsquellen weitestgehend auf lokale Typen von Geohazards oder auf ihre Erfahrungen mit diesen Hazards. Die theoretische Abstraktion der Quellen und Prozesse des Informationsflusses über den Klimawandel führten zur Entwicklung des Strukturmodells „die Kommunikationsreportoires des Klimawandels“. Zur Weiterentwicklung der Grounded-Theory bezüglich öffentlicher Wahrnehmung und Kommunikation der Risiken des Klimawandels wurden die zwei theoretischen Hauptkategorien „lokale Hazard-Kultur“ und „lokale Kommunikationsreportoires“ zusammengeführt. Diese Grounded-Theory folgert, dass Menschen die Wahrnehmung von Klimawandel Risiken aus verschiedenen Kommunikationsquellen, vorrangig aus der lokalen Hazard-Kultur ableiten. Daher fokussieren sich die Erkenntnisse der Studie auf den lokalen Ansatz beim Umgang mit den Risiken des Klimawandels und deren Kommunikationswegen. Dieser lokale Ansatz würde Hazard-Managern, aber auch Medien und anderen Interessensgruppen eine effektive Kommunikation mit Laien über die Risiken und Gefahren des Klimawandels ermöglichen.

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List of Abbreviation

BBC	British Broadcasting Corporation
BBS	Bangladesh Bureau of Statistics
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BTV	Bangladesh Television
COP	Conference of the Parties
CSRL	Campaign for Sustainable Rural Livelihoods
DW	Deutsche Welle
EU	European Union
GBM	Ganges-Brahmaputra-Meghna
GDP	Gross Domestic Product
HDI	Human Development Index
IPCC	Intergovernmental Panel on Climate Change
MoEF	Ministry of Environment and Forest
MSL	Mean Sea Level
NASA	National Aeronautics and Space Administration
SARF	Social Amplification of Risk Framework
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WMO	World Meteorological Organisation

Glossary

Aila	A tropical cyclone that landed on the coastlines of Bangladesh and India in 2009.
Bay of Bengal	A part of the Indian Ocean to the east of India and south of Bangladesh.
Char	An area of newly formed land in the rivers through a continual process of erosion and deposition of silts.
Chowkidar	Village police.
Cyclone shelter	Brick-built multi-storied structures where people take refuge during storms.
Doordarshan	Indian terrestrial television channel.
GBM Delta	One of the world's largest deltas covering most of Bangladesh and part of West Bengal, India.
Ghat	Stairway leading down to a river.
Gher	Saline water shrimp enclosure.
Golpata	A species of palm tree available to the mangrove forest in Bangladesh.
Imam	A Muslim religious leader who leads prayers in the mosque.
Katrina	A deadly hurricane that struck the Gulf Coast of the United States in 2005.
Motki	Clay jar.
Polder	Designated areas surrounded by dikes to separate them from the main river system and to provide protection against floods.
Pond	A small area of water surrounded by land.
Purdah	Literally means veil or curtain. In practice the term is used

	to define socially accepted proper space of women.
Sidr	A tropical cyclone that struck Bangladesh's coastal area on 15 November 2007 killing around 3, 500 people.
Sundarbans	Literally means beautiful forest. This is the largest area of mangrove forest in the world.
Tube well	A well made by driving a tube into the earth to pump out ground water.
Upazila	The lowest tier of civil administration in Bangladesh.
Union Parishad	The lowest tier of the local government system in Bangladesh.
Uthan	Courtyard – an area in front of the house.
Zamindar	A landowner, especially one who used to lease land to tenant farmers during the British colonial period.

Chapter 1

Research Background and Context: Public Perception and Communication of Climate Change Risks

1.1 SETTING THE SCENE

It is Dutch anthropologist Willem van Schendel, who probably gave one of the most vivid geographical definitions of Bangladesh describing it as 'a land of water and silt'. In his book *A history of Bangladesh*, Van Schendel wrote:

> "Imagine yourself high in the air over the Himalayas. Look down and you see a forbidding landscape of snow-capped mountains and harsh vegetation. But now look to the south-east and discover an immense flood-plain stretching between the mountains and the sea. That shimmering green expanse is Bangladesh." (2009, p. 3)

He further argued that Bangladesh would not exist without the Himalayas. There are valid reasons to see the origin of Bangladesh in the snow-capped Himalayan mountains. In every spring, glaciers of the Himalayas melt and an enormous amount of water flows downwards forming into mighty rivers that travel thousands of miles before falling into the sea – the Bay of Bengal, located to the south of Bangladesh (Van Schendel, 2009, p. 3-4). The tidal streams of these rivers slow down once they reach the plains and begin to deposit thousands of tons of silt that is brought down all the way from the Himalayan mountains and the areas the rivers pass through. This process of continuous sedimentation has built up the world's largest delta, known as Bangladesh. The delta is huge and active; and as Van Schendel writes: "[it] pushes back the sea a little further with every annual deposit of new silt" (2009, p. 3). Bangladesh should have

gradual expansion of its coastal region in the south if the process of sedimentation continues. But, this may not be the case in reality. On the contrary, the country is on the brink of loosing a substantial part of its coastal lands because of the risk of sea level rising – a possible consequence of global warming.

In the global debate on climate change, Bangladesh is regarded as one of the most vulnerable countries. This South Asian country is trapped between two different, but mutually linked geomorphological conditions. On the one hand, the very origins of the country – the Himalayan glaciers to the North – threaten to flood the country with an enormous deluge of water in a situation where more than 80 per cent of its lands are floodplains (Brammer, Asaduzzaman, & Sultana, 1996, p. 149). On the other hand, to its South, the waters of the Bay of Bengal remain the source of notorious storms and storm surges that have already proven Bangladesh to be one of the most natural-hazard prone countries in the world. There are assumptions that global warming may increase the trends and frequencies of tropical storms (Schellnhuber, 2007, p. 3) apart from raising the sea level, thereby affecting the densely populated coastal areas of Bangladesh (Ahmed & Islam, 2013). With these double-edged risks, Bangladesh holds a prominent position in the global imaginary as a country at the forefront of climate change risks.

The bleak global imaginary of this South Asian country as a possible victim of climate change has been partly formulated by the country's record of natural hazards; and partly following the release of several IPCC reports (IPCC, 2001, 2007; Pachauri & Reisinger, 2007; Hartmann, Tank, & Rusticucci, 2013) indicating adverse impacts of climate change. These concerns have been further reinforced, both in Bangladesh

and at a global level, over the last decade – a high period of politicisation and mediatisation of climate change risks (Neverla, 2008). In Bangladesh, two consecutive high-magnitude floods, and two strong cyclones that severely affected the country's coastal areas between 2007 and 2009 (Paul 2012; Rashid & Paul, 2013, p. 1) contributed significantly to serious thinking about the possible impacts of climate change. In November 2007, the Cyclone *Sidr* lashed the coastal villages of Bangladesh, leaving more than 3,300 people dead and resulting in an estimated economic loss of US $ 1.7 billion (GoB, 2008). One and a half years later, the Cyclone *Aila* breached the coastal embankments, and flooded fields and inhabitants with seawater, killing around 200 people. In the meantime, Bangladesh's coastal people narrowly escaped another devastating cyclone named Cyclone *Nargis* in 2008 that killed at least 138,000 people in neighbouring Myanmar (Fritz, Blount, Thwin, Thu, & Chan, 2009). Storms of such intensity and frequency, however, are not unusual for a country like Bangladesh if one considers its geographical location and past record. Climate change may only make the problem worse.

One can thus argue that the coastal people of Bangladesh were familiar with the events of regional geo-hazards[1], such as storms, floods and seawater intrusion. For years, such geo-hazards were blamed either on the geographical location or the "wrath of the God" as causes (Ensor & Berger, 2009). However, recent media reports and policy documents indicate a transformation in understandings of causes of natural hazards in

[1] Regional geo-hazards are defined as particular form of human-nature interaction, and one precondition of this interaction is humankind's settlement in an endangered region despite potential threats (for details see: Lüthje, 2009; Neverla, 2009; Ratter, 2009).

many parts of the world. For example, climate change has appeared as a common 'point of reference' for the public and policymakers to describe causes of extreme weather events (Dessai *et al*., 2004; Leiserowitz, 2007; Kempton, 1997; Lorenzoni & Pidgeon, 2006). In Bangladesh, the hazard management policy and strategy documents have widely discussed possible impacts of climate change, often describing it as one of the major challenges to sustainable economic development. It has been argued that the coastal regions of Bangladesh may face the worst adverse impacts of global climate change because of its susceptibility to natural hazards and the limited resilience of the coastal people to those hazards (MoEF, 2009; Toufique & Islam, 2014). Yet, there is little scientific effort exploring how these people, dubbed as potential victims, perceive and respond to the risks of climate change.

This research takes this scholarly deficit as its starting point and aims at understanding public perceptions of climate change risks in the coastal regions of Bangladesh. It also aims to explore the role of communication in the process of perception construction in individuals' minds and their behavioural intentions to avert risks of climate change. These research aims are motivated by the understanding that, although climate change has emerged as a recent concern, risks of extreme weather events are not new to the people living in the coastal regions of Bangladesh. In other words, geo-hazards are a constant in the region – what human-induced climate change may do, is increase the possibility of such hazards. This is also the rationale to argue that, with increased social construction of climate change through media and other communication channels, people living in these vulnerable areas may rediscover their relationship with regional geo-hazards. This research aims to explore this

relationship by examining the ways in which people embed meanings to climate change risks within the context of the existing geo-hazards. At the same time, this research is also a response to the increasing demand in the academia to study climate change risk perception and communication at a regional level, especially since it is argued that climate change risk is best understood in its regional geographical, socio-economic and cultural contexts.

This Chapter offers a detailed description of the context of this research (*see Section 1.2*) by introducing the research background, statement of the research problem, purposes and primary research questions. As for research background, the transition of climate change as a risk issue from the domain of scientists to societal discourses is described along with Bangladesh's specific vulnerability and policy responses to climate change. Since this research project is primarily concerned with lay people's perception, communication and response to climate change risks in the coastal region of Bangladesh, theoretical contextualisation of the research is established with an overview of relevant literature in risk perception and communication. This process identifies some generic gaps in the literature and places the objectives of the current research within the cleavage of these gaps. Chapter 2 offers a detailed literature review of theoretical approaches and their limitations to study risk perception and communication.

1.2 RESEARCH BACKGROUND

1.2.1 Climate change: a transition from science to society

Anthropogenic climate change is widely regarded as one of the greatest risks of our time, posing a risk to natural and social systems

globally. Climate change is primarily a scientific topic and probably one of the most contentious one because of its inherent scientific uncertainty (Whitmarsh, 2011; Lewandowsky, Risbey, Smithson, Newell, & Hunter, 2014). The theory of climate change is based on the assumption that an increase in global mean temperature (defined as global warming) may influence the climatic conditions of the world (IPCC, 2007, 2014). Three scientists are widely recognised for developing the theory of human-induced global warming in the 19th century (Treut *et al*., 2007). They are: Joseph Fourier (1768 - 1830), John Tyndall (1820 – 1893), and Svante Arrhenius (1859 – 1927). In 1822, French scientist Joseph Fourier first recognised that the atmosphere trapped part of the radiation from heated surfaces and prevented it from escaping into space (Haugan, 2012). Irish scientist John Tyndall in 1857 refined Fourier's findings and found that much of the heat rising from the surface of the Earth was blocked by carbon dioxide in the atmosphere. Based on Fourier and Tyndall's works, Swedish scientist Svante Arrhenius studied the impact of increased concentration of carbon dioxide in the atmosphere. In April 1896, Arrhenius published his famous paper – "On the Influence of carbonic acid in the air upon the temperature of the ground" (Original in German titled: *Über den Einfluss des atmosphärischen Kohlensäure-gehalts auf die Temperatur der Erdoberfläche*). In this paper, Arrhenius estimated a correlation between increased carbon dioxide in the atmosphere and increased global temperature (Arrhenius, 1896). Later, human-induced global warming theory was further developed by Guy Stewart Callendar, who in 1938 demonstrated how fossil fuel burning resulted in the emission of millions of tons of carbon dioxide in the atmosphere, which might change the climate (Weart, 2010; Haugan, 2012).

Despite such an early discovery, human-induced global warming and its possible impacts on global climate was hardly recognised by policy makers until the end of the 1980s. For example, climate change was not a priority topic at the 1972 UN conference on human environment (UNEP, 1972). The conference gave birth to the United Nations Environment Programme (UNEP) after setting hazardous wastages and oil spills as priority concerns (Bodansky, 2001). Global warming finally attained policy recognition in the late 1980s, when scientists noticed a remarkable increase in global annual mean temperature (Moser, 2010). During the summer of 1988, the United States (US) experienced record high temperatures and drought. In the same year, NASA scientist James Hansen testified before a US Congressional committee that he was 99 per cent confident about a long-term trend towards human-induced global warming, probably caused by the greenhouse effect (Wilson, 2000; Hamblyn, 2009). In 1988, the UNEP and the WMO (World Meteorological Organization) formed the IPCC with an objective of collating and assessing evidence of anthropogenic climate change. These events gradually transformed climate change as a topic from the domain of scientists to other systems of society, notably to politics and media (Moser, 2010). In the following decades, politicisation and mediatisation of climate change as an important risk issue continued and by the beginning of the 21st century it became a mega issue of our time (Neverla, 2008; Neverla & Schäfer, 2010). This implies that global warming-led climate change has been a topic in scientific domains since late 19th century, but it took quite a long time for social and political recognition of the risk.

At the beginning of social construction of climate change, scientists were in dominant position to control the flow of climate science to society

mainly through news media. However, as the issue started to receive increased policy and social attention, climate scientists gradually lost what Anderson (2009) described as the "definitional control of the debate". Carvalho and Burgess (2005) also reflected on this transformation and found that increasingly "political actors took the lead to shape media agenda" of climate change. This transformation was also evidenced in media coverage of climate change issues when the emphasis of news coverage shifted from "a presentation of the issue in terms of its causes and problematic nature and toward a presentation more grounded in political debate and the proposal of solutions" (Trumbo, 1996, p. 281). This clearly indicates that politics of climate change received more attention in the media coverage than its scientific aspect.

Politicisation and mediatisation of human-induced climate change continued and further accelerated since the mid-2000s with a series of important events. Devastating damages by Hurricane *Katrina* in the United States in 2005, release of former US Vice President Al Gore's film and book *An Inconvenient Truth* in 2006, the Nobel peace prize that was awarded jointly to Al Gore and to the IPCC in 2007, the Stern Review report on economics of climate change (N. Stern, 2007), release of the Fourth Assessment Report by the IPCC in 2007, and the December 2009 UN climate change conference in Copenhagen styled as COP15 – all coincided to put climate change on the top of media and political agendas; and to some extent in public discourses. However, such a media hype and increased public concern about climate change were not consistent over the years. Rather, there has been a significant decline in media coverage of climate change in most parts of the world since 2010 (Schmidt, Ivanova & Schäfer, 2013). This period also witnessed declining public concern for

climate change risks particularly in many developed countries (Scruggs & Benegal, 2012; Ratter, Philipp, & von Storch, 2012).

As already indicated, climate change is a highly contested scientific and risk issue. Even though there is an overwhelming amount of empirical evidence to support the hypothesis of human-induced global warming, uncertainty remains central to the validity of climate change science. In the 1990s, some scientists questioned the reliability of 'global mean temperature as the data sets' used to develop the global warming theory (see Dunlap, 2013; Castree, 2010; Engels, Hüther, Schäfer, & Held, 2013). This section of scientists expressed doubts about projected future climate models, which they believed, overestimated the warming trend (Maslin, 2004). This gave birth to a group of scientists known as 'climate sceptics'. On the other hand, the mediatisation of climate change science fuelled its status as uncertain phenomena due to the journalistic norm of balanced coverage (Boykoff & Boykoff, 2004, 2007; Boykoff, 2007; McCright & Dunlap, 2010; Boykoff & Rajan, 2007). As a result, the small group of sceptic scientists ended up receiving more media attention as compared to a significant number of mainstream climate scientists, who believed in the possibility of anthropogenic climate change. Philo and Happer (2013) argue that sceptic climate scientists systematically exploited the media and emphasised those areas of climate change science in which there was the greatest level of uncertainty. However, recent research on media coverage of projections of climate change and sea level rises in the US and UK newspapers found that, barring a few exceptions, journalists had accurately portrayed the scientific research on climate change (Rick, Boykoff & Pielke, 2011). One of the most significant aspects of increased mediatisation of climate change was its apparent influence in constructing

public understanding of the issue (Brulle, Carmichael & Jenkins, 2012). As a result, public understanding of climate change has received a huge amount of scholarly attention in recent years, with researchers attempting to understand lay people's perceptions, factors influencing those perceptions, and the mechanism of changing behaviour to mitigate risks of climate change.

As the transformation of climate change science from the domain of natural scientists to other systems in society continues, it demands critical reflection on epistemological divergences between physical and social sciences. In other words, an understanding of how these two fields of knowledge attempt to understand the truth of climate change science. Kincheloe (2008) argues that epistemology shaped the "way we think, the way we see the world" (p. 133). Natural science usually attempts to discover natural laws of phenomena in the physical world, while social sciences understand the social aspect in human interaction. Accordingly, the positivist epistemological approach of natural scientists asserts that the complexity of science of climate change can be objectively known with a singular truth even as uncertainties are part of scientific discovery (Kuntz, 2012). Constructivists, on the other hand, theorise the notion that there might be multiple constructions of reality in individuals' minds (Adoni & Mane, 1984; Gamson, Croteau, Hoynes, & Sasson, 1992). Such multiple realities have been found in research about public perceptions of climate change risk. Hulme (2009), for example, argued that "climate change is not simply a 'fact' waiting to be discovered, proved or disproved using the tenants and methods of science" (p. xxviii). On the contrary, as Hulme (2009) argued, social phenomena of climate change science could help to explain the multiple understandings and perceptions of climate change

among different societal groups and individuals. This implies that climate change perceptions are individually and collectively constructed in different social spheres through a complex interplay of beliefs, attitudes and behaviour of people (Hulme, 2009). Other researchers made similar arguments. It has been argued that the so-called *objective* scientific information of climate change is received, processed and responded in multiple ways by members of different societal groups when climate science travels from the domain of [natural or physical] science to other social spheres (Storch, 2009; Hulme, 2009; Hansen, Sato & Ruedy, 2012; Lowe, 2006; Pettenger, 2013). This clearly emphasises the importance of individuals' socio-cultural and geographical conditions in perceiving climate change information. In other words, social construction of climate change should be understood from the context of social settings, in which individuals form their perceptions. Social scientists responded to this theoretical conception since the beginning of social construction of climate change in the late 1980s, and there is now an ample body of literature investigating the nature and process of public perceptions of climate change (Lahsen, 2005; Rosa & Dietz, 1998).

Stehr and von Storch (1995), for example, examined the way in which climate change transformed as it travelled from the realm of science to society and recognised the important role that communication and cultural industries played in this process. They argue that the desire of climatologists to communicate their findings in an unequivocal fashion for public discourse was challenged for two main reasons: first, by the obstacle of modern cultural industries (e.g., media) and their peculiar contingencies. Second, various segments of the public interpreted research findings in ways, which might or might not correspond to the intentions of climate

scientists (Stehr and Storch, 1995). Like Hulme (2009), Stehr and von Storch (1995) point to the constructivist perspective of understanding public perception of climate change. Based on this, one can argue that divergence of perceptions of climate change risks between scientists and lay people is inherent since people's perceptions are largely influenced by their social and cultural milieus.

1.2.2 Global risk goes local: Bangladesh's vulnerability to climate change

In general, climate change poses risks at the global level. However, it has been widely documented that climate change risks will not be equally distributed around the world. Even different regions in a country may have different levels of vulnerability to climate change risks. Climate scientists have also begun to focus their research towards examining possible regional variability of climate as a possible impact of global warming (von Storch *et al*., 2011; Hall, 2014; Rannow *et al*., 2010; Rummukainen, 2010). Some developing countries, least responsible for the rise in greenhouse gases, may feel severe impacts of global warming in the forms of extreme weather, sea level rise, decreasing agricultural outputs, human health costs, and economic hardships as compared to countries in the developed world (UNFCCC, 2007; Rosenzweig & Parry, 1994; Mirza, 2003; Mertz, Halsnaes, Olesen, & Rasmussen, 2009). These inequalities of distribution of climate change risks are exacerbated by limited hazard management capacities in developing countries (Nagel, Dietz & Broadbent, 2009; Ali, 1999; Adger, Barnett, Brown, Marshall, & O'Brien, 2013). Accordingly, Bangladesh has been identified as a country situated on the frontline of climate change risks, mainly because of its records of natural hazards (Khan, Xun, Ahsan, & Vineis, 2011; Karim & Mimura, 2008; Ali,

1996). For many, climate change impact in Bangladesh is no longer a statistical probability, but a present reality (Coirolo, Commins, Haque & Pierce, 2013). In particular, millions of people living in the coastal areas are largely dubbed as "climate victims" in political and civil society discourses (Friedman, 2013; Mcadam & Saul, 2010; Walsham, 2010; Karim & Mimura, 2008). There are specific reasons for the attribution of such a metaphorical description about possible climate change impacts in Bangladesh.

Bangladesh's particular geographical location, socio-economic characteristics, and existing natural hazard profile demand a contextualisation of its vulnerability to climate change. It has been already discussed at the beginning that Bangladesh is located at the interface of two different geographical conditions – the Bay of Bengal to the South and the Himalayan mountains to the North (Ali, 1999). These two conditions connect it to several hundred rivers and tributaries originating in the Himalayas and falling in the Bay of Bengal (*see Figure 1.1*).

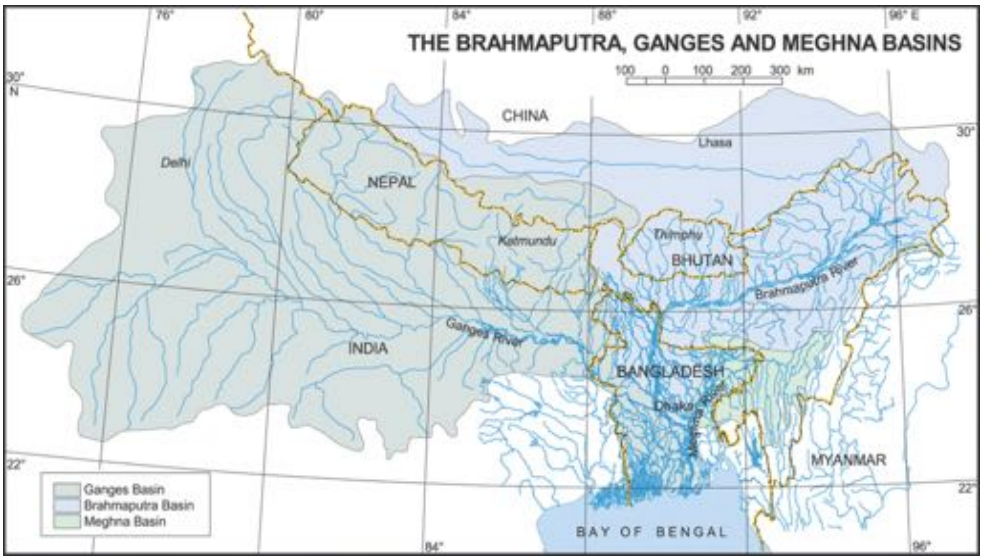

Figure 1.1: The *Ganges, Brahmaputra and Meghna* (GBM) river basins. Source: Ministry of Disaster Management and Relief, Government of Bangladesh, 2014.

In the South, the waters of the Bay of Bengal and the adjoining North Indian Ocean are sources of tropical cyclones, tidal surges, coastal erosion, and monsoon wind (Ali, 1999). While in the North, Tibetan glaciers are sources of several of the world's largest rivers, which have crisscrossed Bangladesh before falling in the sea. This particular geography plays an important role in the South Asian monsoon system. Increased rainwater during the monsoon season often results in severe floods affecting millions of people living downstream. The general topography of Bangladesh is very low and flat, except for some hilly areas in northeast and southeast regions. About 10 per cent of the country is hardly one meter above the mean sea level (MSL), and one-third of it is under tidal excursions (Ali, 1999; MoEF, 2009).

As this research is being conducted among the coastal people, it requires an overview of Bangladesh's coastal area. Bangladesh's coastal area covers 32 per cent of the total lands and 28 per cent of the population of Bangladesh (Islam, 2006). There is an increasing trend of population growth in the coastal region. In 2001, around 36.8 million people lived in the coastal areas and this grew to 44 million in 2013 (BBS, 2013). In the absence of any industrialisation, most people live on agriculture, fishing and working as daily labourers. National poverty indicators show a slightly higher percentage of the population living below the absolute poverty line in coastal areas (52 per cent) as compared to the country (49 per cent) as a whole (Islam, 2006).

Ali (1999) divides Bangladesh's coastal areas into three distinct geographical zones – western, central, and eastern coastal zones (*see Figure 1.2*). He describes the western part, known as the *Ganges* tidal plain, as comprising the semi-active delta, criss-crossed by numerous

Figure 1.2: Map of Bangladesh shows coastal zones.
Source: Ali (1999).

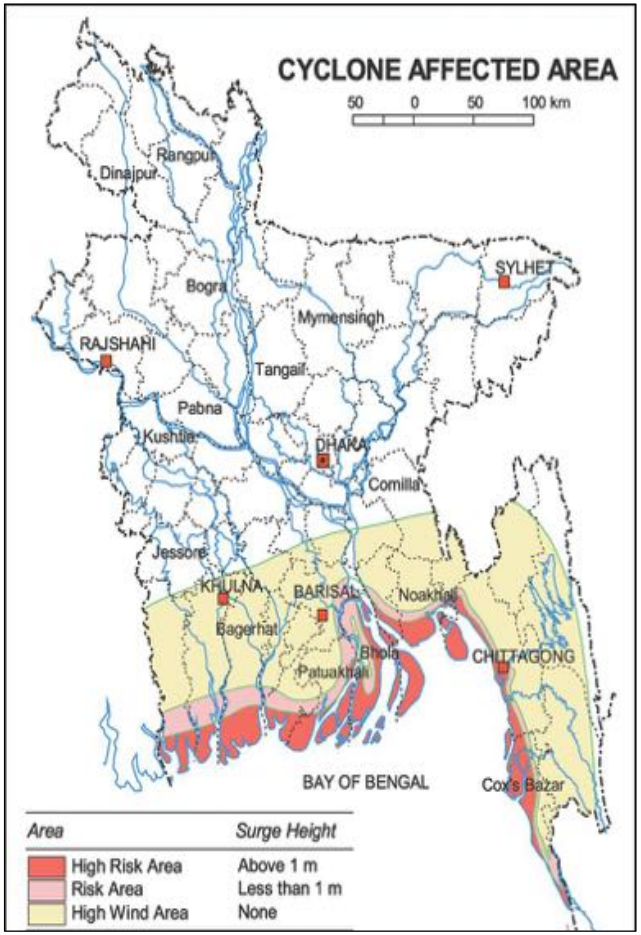

Figure 1.3: Cyclone affected areas of Bangladesh.
Source: Bangladesh Space Research and Remote Sensing Organization (SPARRSO).

channels and creeks. The topography of this zone is very low and flat. This section of the coastal region is partly covered by the world's largest mangrove forest, known as the *Sundarbans*. The mangrove forest acts as a natural deterrent to the threats of storms and storm surges. This was evidenced during the Cyclone *Sidr* in 2007 that landed in Bangladesh's coastal region with an average wind speed of 250 km per hour and a tidal surge of several meters (Paul, 2009, 2012). The study areas of this research are located in this western zone of Bangladesh's coastline. The central part of the coastal area, as described by Ali (1999), is the most active, with the continuous process of accretion and erosion while the eastern region, being covered by hilly areas, seems more stable. In general, storm surges are higher in Bangladesh than in neighbouring countries because the Bay of Bengal narrows towards the north, where Bangladesh is located, taking on a funnel like shape (MoEF, 2009).

With these geomorphological conditions, natural hazards in the form of tropical cyclones, floods, increased salinity in water and soil, storm surges and coastal erosion are very common experiences for coastal people in Bangladesh. For example, a UNDP report identified Bangladesh as the country most vulnerable to tropical cyclones and the sixth most vulnerable to floods (UNDP, 2004). Severe flooding, covering over 60 per cent of the country occurs every four to five years and a severe tropical cyclone hits Bangladesh, an on average, every three years (MoEF, 2009, p 7). Tropical cyclones in 1970 and 1991 are estimated to have killed 300,000 and 140,000 people, respectively (*see Table 1.1*). In the period 1877-1995, about 53 per cent of global deaths from cyclones took place in Bangladesh (Ali, 1999). Scientific research on the causal link between global warming and increased frequency of tropical cyclones is often conflicting, and no

clear answer has yet been found. Knutson *et al*. (2010), for example, argue that a paucity of global records of tropical cyclones make it difficult to understand trends of cyclones in different parts of the world. They, however, make the prediction that the intensity of cyclones might increase in the future because of global warming, though the frequency may decrease slightly. As Knutson and colleagues describe:

> "Greenhouse warming will cause the globally averaged intensity of tropical cyclones to shift towards stronger storms, with intensity increases of 2–11% by 2100. Existing modelling studies also consistently project decreases in the globally averaged frequency of tropical cyclones, by 6–34%." (Knutson et al., 2010)

Date/Name	**Year**	**Maximum wind speed (km/h)**	**Storm surge height (meter)**	**Death Toll**
11 May	1965	161	3.7-7.6	19,279
15 December	1965	217	2.4-3.6	873
1 October	1970	224	6.0-6.7	850
12 November	1970	224	6.0-10.0	300,000
25 May	1985	154	3.0-4.6	11,069
29 April	1991	225	6.0-7.6	138,882
15 November (*Cyclone Sidr*)	2007	223	3.1-4.6	3363
25 May (*Cyclone Aila*)	2009	92	2.0-3.0	190
16 May (*Cyclone Mahasen*)	2013	130	--	16

Table 1.1: Major cyclones and estimated death tolls in Bangladesh. Source: Bangladesh Meteorological Department, 2013.

Scientific studies for the evaluation of possible impacts of climate change on Bangladesh began in the late 1980s. These studies (e.g., Mahtab, 1989; Ahmed, 2006; Walsham, 2010; Huq, Karim, Asaduzzaman & Mahtab, 1999) identify climate change to be an additional burden to this poverty-stricken and disaster-prone country, forcing the formulation of national policies and international negotiations for minimizing risks and adapting to any change of climate. Bangladesh is one of the few countries in the developing world, which has formulated its national climate change strategy plans (MoEF, 2009). The policy paper titled "Bangladesh Climate Change Strategy and Action Plan" (BCCSAP) has identified the following impacts: (i) increased frequency of tropical cyclones; (ii) heavier and more erratic rainfall; (iii) lower and more erratic rainfall; (iv) sea-level rise; (v) warmer and more humid weather leading to increased prevalence of disease; and (vi) increased intensity of drought in the country's northern and western parts. The BCCSAP has asserted that each of these climatic changes will seriously affect agriculture (i.e., crops, livestock and fisheries) and livelihoods. Citing IPCC's fourth assessment report of 2007, the BCCSAP has estimated that by 2050 rice production in Bangladesh could decline by 8 per cent and wheat production by 32 per cent (against a base year of 1990). Moreover, sea level rise will lead to inundation of low-lying coastal areas displacing millions of people and paving the way for saline water intrusion. The exposure to such risks is further increased by the country's high population density. Bangladesh is the world's eighth most populous as well as one of most densely populated country with an estimated 157 million people living in an area of 147, 570 sq. km. (World Bank Country Report, 2014; UNDP, 2014). In any development indicator, Bangladesh is a poor country with per capita income of US$ 1080 per year

Indicators		Country		
		Bangladesh	**India**	**Germany**
Area	in sq. km	147,57	3,287,590	357,168
Demography	Population total (millions)	156.59	1252.14	82.73
	Urban (%of population)	29.36	32	74.18
	Sex ratio at birth (male to female births)	1.05	1.11	1.06
	Population growth	1.37	1.2	0.3
	Adult mortality rate (per 1000) female	136	159	51
	Adult morality rate (per 1000), male	163	247	96
	Health expenditure (% of GDP)	3.72	3.87	11.06
Education	Mean years of schooling	5.07	4.43	12.95
	Adult literacy rate (% ages 15 and older)	57.7	62.8	na
	Expenditure on education (% of GDP)	2.23	3.32	5.06
Income	Gross national income (GNI) per capita (2011 PPP$)	2713.09	5149.81	43048.68
	GDP (2011 PPP$) (billions)	365.67	6245.4	3375.18
	GNI per capita, Atlas method (current US$)	1080	1570	4846
	Annual GDP growth (world bank, 2014)	6.1	7.4	1.6
Gender	Maternal mortality ratio (deaths per 1000,000 live births)	240	200	7
	Share of seats in parliament (% held by women)	19.71	10.89	32.37
	Labour force participation rate, female (% of ages 15 and older)	57.3	28.8	53.5
	Labour force participation rate, male (% of ages 15 and older)	84.1	80.9	66.4
Poverty	Population living below $1.25 a day (%)	43.25	32.68	na
	Population in multidimensional poverty (%)	49.46	55.28	na
Internet use	Internet users (% of population)	6.3	12.58	84
Environment	Carbon dioxide emissions per capita (tonnes)	0.37	1.67	9.11
	Primary energy supply, Fossil fuel (% of total)	71.53	72.3	80.19
	Impact of natural disasters: number of deaths (per year per million people)	5.12	1.45	0.12
	Forest area (% of total land area)	11.06	23.07	31.78

Table 1.2: An overview of Bangladesh's socio-economic characteristics as compared to India and Germany. Compiled from UNDP Human Development Index 2014 and World Bank Country Reports 2014.

(2014). About 50 per cent of the people live in multidimensional poverty; and 43.25 per cent people live below US $ 1.24 a day (UNDP, 2014). Table 1.2 illustrates the basic socio-economic data of Bangladesh as compared to India and Germany. Bangladesh's economy is based on agriculture, which contributes about 22 per cent to the country's GDP and accommodates 48 per cent of its labour force (BBS, 2013). Around 70 per cent of the people live in rural areas whereas the overall adult literacy rate is only 58 per cent. Bangladesh is almost homogenous ethnically. Around 98 per cent of its population are ethnically Bengalis and speak Bangla. Rest two per cent are members of different indigenous groups with their own languages. However, most of the indigenous people speak Bangla and consume either Bangla or English media products in absence of any indigenous media. As for religion, constitutionally Bangladesh is a secular country with majority Muslims (89.5 per cent), followed by Hindus (9 per cent) with Buddhists, Christians and some other religions making up the remainder.

1.3 RESEARCH PROBLEM AND SCOPE OF THE STUDY

This section defines and delimits the scope of the current research within the general scholarly debate of social construction of climate change; and in particular, within the topic area of risk perception and risk communication. Risk perception and communication are widely regarded as two important components in studies of risk and hazard management. Related concepts, such as hazard, geo-hazard, risk, and disaster will be explained in this section. However, the main objective of this section is to identify gaps in existing literature of climate change risk perception and communication, upon which the current research is founded.

1.3.1 Related concepts: hazard, geo-hazard, risk and disaster

This research project[2] originated in the domain of (natural) hazard management. Hazard management is defined as an iterative process, involving the identification of hazards, assessment and analysis of associated risks, and understanding public perceptions, and institutional interventions for protective measures (Wisner, Gaillard & Kelman, 2012). Socio-cultural and geo-physical conditions, as well as individuals' interactions with hazard events play important roles in the operational philosophy of hazard management. The role of communication is also recognised in the literature because public perceptions and reactions to hazard events or issues are largely constructed by the information received from different communication sources. Within this context, it suffices to argue that public understanding of hazards and associated risks are social constructions.

A clear distinction between the concepts of 'hazard', 'risk', and 'disaster' at the beginning of this research is necessary because the terms are often considered synonymous. Hazards are broadly defined as naturally occurring or human-induced processes or events with a potential to create risks or losses (Blaikie, Cannon & Davis, 2014; Alexander, 1993; Tobin, 1997). On the other hand, risk is viewed as the probability of the occurrence of an event or a process, and human exposure to that event or process is important. Risk is also defined as a socio-cultural construct from

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[2] This research was part of a project titled "Adaptive Hazard Management and Climate Change Communication in South Asia (HazMan)" at the Cluster of Excellence "Integrated Climate System Analysis and Prediction" (CliSAP), University of Hamburg, funded by the Excellence Initiative of the German Research Foundation (Deutsche Forschungsgemeinschaft- DFG). The HazMan project studied strategies of regional geo-hazard management in the coastal regions of India, Bangladesh and Myanmar within the context of climate change risks.

a social constructivist perspective (Krüger, Bankoff, Cannon, Orlowski, & Schipper, 2015; Lupton, 1999). This implies that while hazard is the actual event or process, risk is the potential outcome of that event or process. A related concept that is also familiar in the discourses of hazard management is 'disaster' – another contested term often used interchangeably with 'hazard'. Hazards, particularly environmental hazards, originate from natural events but disasters are social phenomena. Disasters occur as a result of hazards when a community or society suffers exceptional levels of disruption and loss (Heath & O'Hair, 2009). That is, a hazard event may turn into a disaster, provided that it has "a large impact on society" (Tobin and Montz, 1997, p. 6).

To put the concepts more into the context of environmental hazard management, it could be argued that hazards are natural phenomena and they can occur even in an uninhabited area. But, risk and disaster can only occur in places where people and their properties are located. This means that all environmental hazards involve different levels of risks, and the probability of a hazard event turning into a disaster depends largely on the community or society's level of vulnerability and resilience. For example, a category three level tropical storm (hazard) may pose different levels of risks for people in Jamaica, the United States, and Bangladesh. Even in the same country, different communities in its different regions may face different levels of risks originating from the same hazards. In this sense, hazards are natural phenomena, while risks and disasters are social constructs.

A related concept of regional geo-hazard has also recently attained importance in the discussion about the relationship between the impacts of climate change and natural hazards. Regional geo-hazards are defined as

particular forms of human-nature interaction, and one precondition is mankind's settlement in an endangered region despite the potential risk (Neverla, 2009; Lüthje, 2009). Lüthje (2009), for example, identified three distinct dimensions of regional geo-hazards — spatial, socio-cultural, and temporal. The spatial dimension of geo-hazard refers to the geo-physical condition in which hazards occur. The socio-cultural dimension refers to different societal fields, such as media, economy, science, politics as well as individual members of the society that share responsibilities for managing geo-hazards, according to their respective competences. These competences may include cultural practices of people (e.g., specific building design) or institutional interventions by hazard management authorities (e.g., building stronger and heightened dikes, establishing cyclone shelters, etc.). Finally, the temporal dimension refers to the particular time-reference of geo-hazards, that is, geo-hazards remain present in individuals' minds through past recollection of traumatic events and future anticipation to avert them (Lüthje, 2009). This third dimension of geo-hazard refers to the social memory of hazard events that influence the measures that people take and change livelihood practices either to avoid the hazards or to adapt in extreme situations.

Taking these dimensions into consideration, it could be argued that the coastal people in Bangladesh are particularly exposed to "regional geo-hazards" because of their settlement in the areas (spatial dimension); efforts to manage those hazards and sustain livelihoods (societal and cultural dimension); and develop a certain culture of hazards through constant interactions with the events of geo-hazards over a period of time (temporal dimension). On this note, storms and tidal surges could be described as

events of regional geo-hazards while climate change is the risk of accelerating those hazards.

1.3.2 Origin of risk perception and communication research

This section sets out the theoretical scope of the current research, followed by some generic findings in the literature on public perceptions of climate change. This process has helped find gaps in the existing literature, generate specific research questions and set objectives of the current research. In Chapter 2, a detailed review of literature on theoretical approaches to studying risk perception and scope of communication is given with the aim of developing a conceptual framework to guide the current research to its objectives.

Risk perception and communication is a recent addition to the discipline of risk research, but the concept of risk and risk management have their roots in ancient times. Risk management is considered to be an integral part of the survival and sustenance of human civilisation and society. The concept of creating, organising and maintaining society is closely related to risk identification, assessment, management and control of uncertainties within certain socio-cultural contexts (Johnson & Covello, 1987; Tansey & O'Riordan, 1999; Wildavsky & Dake, 1990). Records of ancient civilisations as well as folk discourses of different cultures exhibit existence of different methods of hazard assessment and prediction of their risky outcomes (Covello & Mumpower, 1985). Ancient societies used rituals, myths, symbols and metaphors to assess potential risks originated from environmental hazards and to communicate the knowledge necessary either to adapt or avoid those risks (Krimsky & Plough, 1988). In most cases, their risk analysis techniques ended in mysteries. But, some had a

scientific basis, which are now termed as indigenous knowledge (Covello & Mumpower, 1985). Techniques of risk analysis, communication and management developed and institutionalised over time with the growth of human civilisation, emergence of modern nation states and technological advancements. Over the years, modern tools and techniques have replaced indigenous knowledge of managing risks. Yet, many of the traditional techniques of environmental risk analysis and communication are still in use, particularly in traditional societies (e.g., observing behaviour of animals and insects at times of ensuing natural hazards).

As compared to the concept of risk, scientific risk analysis is a more recent development. It began at the beginning of the 20th century with an objective to analyse mainly technological risks (Kates & Kasperson, 1983; Palenchar, 2009, p. 32), which many authors conceived as results of the industrial revolution. Since the 1970s, the study of risk assessment was followed by two important sub-topics – public perception and risk communication (Heath & O'Hair, 2009, p. xi). This period witnessed a widespread public debate on technological risks, such as atomic energy and industrial pollution, in many western societies (Golding, Krimsky, & Plough, 1992).

Risk communication emerged as an offshoot of risk perception research, originally conceptualised and developed in the 1970s and 1980s (Golding, Krimsky, & Plough, 1992; Lindell & Perry, 2004). The term 'risk communication' was first coined in academic literature only in 1986 (Leiss, 1996). Significant gaps between objective (as assessed by experts) and subjective (as perceived by lay people) risks inspired scholars to examine the reasons for such gaps and to find ways to minimise them. Initially, researchers emphasised the significance of effective

communication of identified risks to the public in bringing them to the perceptual levels of scientists and policymakers. In a nutshell, the basic idea of risk perception studies in the 1980s and 1990s was that understanding public perception of a risk issue or event would enable communicators to develop more effective communication models and strategies (Gurabardhi, Gutteling, & Kuttschreuter, 2004). And, this is where these two components of risk management – risk perception and risk communication – are intertwined. It could be argued that both risk perception and risk communication studies have a common origin in risk management and they are mutually inclusive to each other. Therefore, any attempt to manage risk of climate change should equally emphasise the way in which people perceive the risk, and how it is communicated to them.

1.3.3 Public perceptions of climate change: empirical findings

Climate change risk perceptions are generally defined as people's awareness about causes of climate change and its adverse impacts (Leiserowitz, 2006; Whitmarsh, 2008a). It is important to note that perception is narrowly defined here with an explicit importance on awareness or familiarity of the issue. However, this research project has extended the concept of perception to the level of knowledge, which reflects individuals' awareness of facts, concepts and relationships concerning causes, consequences and solutions to climate change. This definition of perception indicates a conscious understanding of climate change and associated risks, not a mere 'awareness' or 'familiarity' of the topic.

Research about public understanding of climate change began in the late 1980s with an assumption that public understanding of the adverse effects of climate change would help them in making conscious livelihood behaviour (Ockwell, Whitmarsh, & O'Neill, 2009). Public understanding has also been regarded as an important factor in influencing policy decisions of climate change issues (Leiserowitz, 2006). The scientific literature on public understanding of climate change risks is diversified in methods, theoretical approaches, disciplinary biases and cases, and most importantly in conflicting results. Yet, there exist some common features that provide a general picture of lay people's perception patterns and behavioural intentions. They include paradoxical divergences between increased awareness and declining concern; misconceptions about causes and solutions to climate change risks; scientific complexity and uncertainty; perceiving climate change as spatially distant and temporally future risk; and uncertain behavioural response to mitigate risks. Some critical notes on these generic findings are given below.

Investigating the level of public awareness and concern was one of the major topics in the scientific research concerning public perception of climate change. Most studies found widespread public awareness and high level of perceived concern about climate change and its possible impacts since the issue emerged as a major social issue in the late the 1980s (Lorenzoni & Pidgeon, 2006; Nisbet & Myers, 2007). However, this high level of perceived concern was not stable; rather trends of fluctuating public concern of climate change in different periods were found. Capstick and colleagues (2015) provided a thorough review of empirical literature on public perception of climate change published between 1980 and 2014. With a reference to public opinion surveys conducted across the member

states of the EU between 2009 and 2013, they argued that despite some divergences in public opinion at times, the relative importance of climate change was consistent in the public's minds. Jasanoff's (2010) study, however, contradicted this and found a widening gap between public and experts in assessing climate change risks when lay people were losing faith in climate science and showing a lower level of concern as compared to other socio-economic risks. This clearly indicates the fact that while public awareness or familiarity of climate change is increasing, concern or seriousness of the issue has been fluctuating since the late 2000s, particularly in developed countries (Poortinga, Spence, Whitmarsh, Capstick, & Pidgeon, 2011; Capstick *et al*., 2015; Whitmarsh, 2011). Pidgeon (2012) found misleading media representations and the global financial crisis of 2008 and 2009 as determining factors that could be largely attributed to declining public concerns about climate change. In this context, one may argue that mere awareness of risks does not lead to high level of concern and behavioural response to avert them among individuals.

The second genre of risk perception studies identifies some generic misconceptions with regard to causes and impacts of climate change (Kempton, 1991, 1997; Lorenzoni & Pidgeon, 2006; Leiserowitz & Smith, 2010). These studies found that lay people demonstrated an awareness about climate change issues without being able to identify its causes and impacts. For example, Leiserowitz and Smith's (2010) study in the United States found that despite being aware of climate change most respondents failed to explain reasons of global warming. Kempton's (1991) early work on public understanding of global warming revealed that the public had only a vague understanding of climate science and the nature of scientific debates surrounding the topic. For instance, lay people perceived ozone

depletion as either synonymous or closely associated with global warming, although these were two distinct physical processes (Kempton, 1991, 1997). Other studies indicated lay people's confusion in making conceptual differences between weather and climate (Etkin & Ho, 2007; Bostrom *et al*., 1994; Kempton, 1997) when changing weather patterns were often attributed as evidences of climate change (Capstick & Pidgeon, 2014; Hulme, 2014). Irrelevant and incorrect beliefs about causes and consequences of climate change were also found even among the people with a high level of education (Read *et al*. (1994). As such, Etkin and Ho (2007) rightly argued that people were largely confused, not polarised, about consequences and solutions to climate change problems.

Third, the literature highlights the significance of physical and psychological distances in perceptions of risks of climate change. Risk perception studies make the general argument that a risk issue is likely to attain public attention if its cause, effect, and possible victims are easy to recognise (Slovic, Fischhoff & Lichtenstein, 1980). But, studies of public perceptions of climate change risks in the developed countries revealed that people perceived such risks as both spatially and temporally distant (Spence, Poortinga & Pidgeon, 2012; Burgess, Harrison, & Filius, 1998). This indicates that climate change is not conceptualised as a significant personal risk on the grounds that the risks are more immediate (temporally) for other people living in vulnerable regions (spatially). Whitmarsh's (2005) study in the UK has supported this when it found a prevailing belief among the respondents that climate change was essentially a distant and future problem. Leiserowitz (2005) found similar public perceptions of climate change risks in the US when people believed that climate change would mainly affect geographically and temporally distant people and

places. On the basis of these findings, we can expect that people living in areas vulnerable to natural hazards or with direct experiences of natural disasters (e.g., storms and floods) may have high level of concerns about climate change risks. But, findings of research examining relations between people's experiences of natural hazards and concern for climate change are contradictory. Leiserowitz (2006), for example, found that people who personally experienced environmental disasters tended to perceive climate change more emotionally as compared to the people who did not have such experiences (see also Bulkeley, 2000; Chamila Roshani Perera & Rathnasiri Hewege, 2013). On the other hand, Whitmarsh's (2005, 2008b) research clearly contradicts these findings and finds that personal experiences of floods in the UK had little impact on climate change risk perceptions. This suggests that though personal experiences of environmental disasters and physical proximity to natural hazards may be important filters in evaluating climate change risk information, but, construction of public perception is a complex and iterative process that needs to be examined in the context of other socio-cultural factors.

Fourth, the extant literature on public perception of climate change demonstrates a clear gap between perceived high concern and behavioural intentions for minimising risks of climate change. That is, increased awareness of climate change and high level of concern do not lead people towards conscious livelihood behaviour for mitigating the risk. Whitmarsh's (2005) study in the UK found that climate change was not the most important issue for the public when compared to other personal, social and environmental concerns. Whitmarsh (2005) as well as other researchers (see Brulle, Carmichael & Jenkins, 2012; Weber & Stern, 2011; Fresque-Baxter & Armitage 2012; Knez, 2005) demonstrated that

public concern about climate change is largely influenced by contextual factors. These contextual factors include media coverage, socio-demographic background, education, place of living, environmental values, and recent experience of unusual weather patterns. Similar trends in public concern of climate change were reflected in the *Eurobarometer* surveys (Eurobarometer, 2008, 2009, 2011, 2013, 2014). This clearly indicates that a thorough understanding of public concern about climate change and possible behavioural changes need to consider contextual factors upon which public perceptions are constructed.

Fifth, most studies on climate change communication focus on media content analysis leaving the influence of media contents on public perception largely unexplored (Neverla & Taddicken, 2011; Taddicken, 2013; Olausson, 2011). Olausson (2011), for example, argue that the complexity of relationship between media content and public perception was oversimplified and existing literature hardly explained how media content affected the way people think about risks of climate change. Taddicken (2013) took on this scientific scarcity and surveyed role of media use in constructing public perception in Germany. Taddicken's study (2013) did not find significant correlation between print media use and climate change knowledge. This is contradictory to Sampei and Aoyagi-Usui's (2009) study of daily newspapers, which found a significant link between newspaper readership and high level of concern about climate change in Japan. Taddicken, instead, found that it was television that played an important role in influencing public knowledge of climate change. This supports the assumption that visuals are more effective in communicating complex and abstract scientific topic such as climate change as compared to print media. For Stamm, Clark and Eblacas (2000)

too television turned out to be the most important medium for learning about consequences of climate change.

1.3.4 Climate change risk perceptions and communication: gaps in the literature

As discussed in the previous section, the existing scientific literature on public perception and communication of climate change risks is able to describe some generic patterns of public understandings. Yet, a number of research gaps remain. A critical look at the existing research of public perception and communication of climate change risk reveals at least three identifiable research gaps. They ranged from sample and case selection to other methodological procedures, and narrow theoretical approaches.

First, most studies on lay people's perceptions of climate change were conducted in developed countries, leaving the scientific world largely ignorant about the development of public understanding in developing and least developing countries. To be precise, too little is known in the literature about perceptions of people dubbed as possible victims of climate change impacts. Existing literature, thus, is able to explain public understandings of climate change only in the countries largely charged as being "responsible" for the global warming problem due to their emissions of the greenhouse gases. As such, these studies emphasise public understanding and response to "mitigation" of climate change while the issues of "adaptation" are largely ignored. There is an increasing demand in academia about the way in which public understanding of climate change risks is unfolding in countries facing the brunt of climate change, but which have contributed to the emissions of greenhouse gases only in a rather limited way. In addition, existing literature is unable to explain public

perceptions in cases where people are constantly exposed to geo-hazards with the possibility that such hazards may increase and intensify as a consequence of climate change. Accordingly, it will be interesting to understand how people localise impacts of global climate change risks, on the one hand, and how they understand "adaptation" to changing climatic conditions, on the other. This indicates the necessity of scholarly contribution from non-western contexts to the existing knowledge of climate change risk perception and communication.

Second, the volume of literature is mainly drawn from quantitative analysis of public perception and behaviour, which is now able to describe the level of public knowledge, understanding and attitude towards climate change risks and related issues to a large extent. Yet, factors that actually influence behavioural actions of individuals in dealing with climate change risks, and why, remain unexplained. In many ways, the quantitative approach based on generating research questions and hypothesis from existing theoretical models and testing them against empirical data (Flick, 2009, p. 2) has been unable to answer these questions. It is therefore necessary to address this existing methodological deficiency. There remains a need for qualitative research on the ways in which individuals define, perceive and understand risks of climate change and related issues within a specific socio-cultural context.

Third, although risk perception and communication are not mutually exclusive, most studies have approached the phenomena separately. There remains a gap in integrating these two concepts in understandings of public perceptions of climate change. Additionally, only a handful of studies attempt to identify individuals' different sources of climate change knowledge, influencing their perceptions. Even in these

studies, the primary focus is on the role of the news media in communicating climate change to the people. This is partly understandable since most of the studies were conducted in developed countries, where people receive climate change information primarily from news media. Yet, other formal and informal sources of communication (e.g., social relations) may also have important influence on public understanding and response to climate change risks and this needs scholarly attention. This aspect becomes even more important in traditional societies where much of the communication still occurs beyond the mass media.

1.4 PURPOSE OF THE STUDY

1.4.1 Research aims and objectives

This research aims at exploring the ways people describe, explain and understand risks of climate change within the context of constant negotiations with regional geo-hazards. Specifically, this research aims to:

- Explore how people construct meanings of climate change risks in the specific situational contexts of geo-hazards;
- Understand the process of meaning construction (communication) and how the people act (i.e., livelihood behaviour) within their constructed realities; and
- Draw a structural model of climate change risk communication, and locate important channels and actors in the model.

1.4.2 Research questions

This study has formulated two interrelated sets of research questions after identifying gaps in the literature about climate change risk perception and communication. The first set of questions relates to lay people's perceptions of climate change risks; and the second set is about

identifying different communication actors, channels, and the overall communication process of climate change risk. Accordingly, the following primary research questions have been formulated for this study:

RQ 1. How do people in the coastal region of Bangladesh perceive and respond to the risks of climate change?

RQ 2. How do people describe the roles of different communication sources in communicating climate change risks?

These two main research questions are further broken down into relevant sub-research questions to give this research specificity. The first primary research question has been split into three sub-research questions to explore public perceptions of causes, impacts and solutions to climate change. They are:

RQ 1.1. How do people describe causes of climate change?

RQ 1.2. How do people perceive possible impacts of climate change?

RQ 1.3. How do people describe solutions to climate change, particularly the ways to adapt to changing climatic conditions?

The second primary research question (RQ2) is aimed at exploring people's sources of climate change knowledge upon which their perceptions are constructed. Its emphasis is on identification of climate change communication structure, roles, process, and its different elements at the community level. Accordingly, this research question is divided into following sub-research questions:

RQ 2.1. What are the main sources of climate change knowledge for the people?

RQ 2.2. How do people describe the roles of different types of communication in constructing their perception and responses to climate change risks?

RQ 2.3. How is the communication of climate change structured at the community level?

1.5 CHAPTER SUMMARY AND DISSERTATION STRUCTURE

Chapter 1 of this dissertation has introduced the study with a general historical overview of the origin of climate change science and its gradual social construction since the late 1980s as an important media and political issue. This Chapter has also reviewed existing scientific knowledge of public perceptions and communication of climate change risks, and has identified a number of theoretical and methodological gaps in the literature. This is followed by the formulation of the purposes of the current research and its main research questions based on the identified research gaps. Chapter 2 offers a detailed review of literature and critically discusses various theoretical approaches for studying risk perception and communication. It reaches the conclusion that rather than relying on any specific theoretical approach to test or verify in this study, it would be far more useful to sensitise theoretical understandings of risk perception and communication to enable the current researcher to gain critical insight into the ensuing data and extracting meaning from the data. The chapter also describes the conceptual framework that guides the current research. Chapter 3 then discusses the methodological design of the study, specifically the approach towards gathering and analysing data. Chapters 4 and 5 present the major findings of the current research. While chapter 4 reports findings concerning trends of public perceptions of climate change,

Chapter 5 presents findings related to communication of climate change. Chapter 6 critically discusses these findings in the context of the existing literature of climate change risk perception and communication. Finally, chapter 7 sets out the theoretical and policy implications of the findings. It also identifies the limitations of the present study and makes suggestions for further research.

Chapter 2

Theoretical Approaches to Studying Public Risk Perception and Communication

2.1 INTRODUCTION

This Chapter reviews existing literature in the fields of risk perception and risk communication. It serves three main purposes: first, it introduces major theoretical approaches for studying public risk perception and the role of communication; second, it identifies limitations in existing theoretical approaches; and third, it develops a conceptual framework for the current study. The conceptual framework developed in this Chapter does not formulate any specific theoretical concept for verification of the identified social phenomena. Instead, it provides theoretical sensitivity to the researcher to design and operationalize the current research as well as to interpret its findings.

At the beginning of this Chapter, it is necessary to draw a thin, but clear distinction between the role of theoretical and conceptual frameworks in social science research. Theoretical frameworks are usually based on a specific theory or theories, and consist of an interrelated coherent set of ideas and models (Argyris & Schön, 1974; Merriam, 2009; Anfara & Mertz, 2014). As a necessary step in social science research, researchers develop theoretical frameworks to establish the perspective through which research problems are addressed. Conceptual frameworks, on the other hand, usually summarise main interrelated variables or concepts as found in scientific literature to guide the research problem. This suggests that unlike theoretical frameworks, conceptual frameworks do not test a theory, but

instead provide direction to the planned study and to keep it within the bounds of the research objectives. In qualitative social science research (e.g., grounded theory research), this process is often described as 'theoretical sensitivity' when researchers review existing literature to develop critical and analytical skills for the ensuing data (Glaser, 1978). This process helps researchers think about the data in conceptual terms (D. Douglas, 2003). This implies that with 'theoretical sensitivity' researchers can identify theoretical categories in the data and make abstract interpretations of them (Strauss & Corbin, 1990; 2008).

2.2 RISK PERCEPTION AND COMMUNICATION RESEARCH: MAJOR APPROACHES

The modern analysis of risk and its public perception has been a topic of empirical investigation for several decades (Slovic, Fischhoff & Lichtenstein, 1982; Fischhoff, 1995; Zinn & Taylor-Gooby, 2006). Initial works addressing this theme were rooted in the disciplines of technology and economics, where risks, originating from different social, technical, natural and environmental hazards, were measured quantitatively (Rohrmann, 2000a, p. 105). This stream of knowledge is known as the technical assessment of risk. Large discrepancies in risk assessment between actual (as measured by the experts and scientists) and estimated (as perceived by the lay people) were the main focus of the technical risk assessment research (Rohrmann, 2000a, p. 107).

From 1970s onwards, an important paradigm shift in risk research was noticed. The focus now shifted from a narrow positivistic risk analysis to an approach that incorporated qualitative, social, cultural, and normative aspects in theorising public perception and response to risks (Hermans, Fox & Asselt, 2012). Chauncey Starr (1969) is often credited for introducing

the distinction between "objective" and "perceived" risk for differentiating between "scientific definition" and "lay perception" of risks (Starr & Whipple, 1980, cited in Hermans Fox, & Asselt, 2012). After Starr's seminal work, risk perception research was taken up first by cognitive and social psychologists; and then by sociologists and cultural anthropologists (Zinn & Taylor-Gooby, 2006). The area of risk perception research has by now been enriched by an enormous volume of scientific knowledge, which can explain, to a large extent, factors behind lay people's perceptions, behavioural intentions towards different types of risks, and the role of communication in the process. Yet, risk perception and risk communication studies are a highly contested research field. Scholars remain engaged in debates regarding the range of risk characteristics; and individuals' cognitive, and socio-cultural factors in the process of perception construction. Over the years, a number of research paradigms have been developed and among them two major approaches can be distinguished, primarily on the basis of their disciplinary focuses (Rippl, 2002; Zinn, 2009). They are: the psychometric approach and the socio-cultural approach of risk research. Mental model research of risk perception (e.g., Morgan, 2002) is considered to be an off-shoot of the psychometric research. Of the socio-cultural approaches of risk perception research, Zinn (2009) has identified at least five theoretical conceptions: cultural theory, risk society, edgework, governmentality, and systems theory. Major theoretical approaches for studying risk perception are summarised in Table 2.1.

In general, the psychometric paradigm lays emphasis on risk characteristics and individuals' cognitive and affective factors in shaping

Approach	*Theoretical conceptions*	*Risks are defined as*	*Perspective*	*Major research*
Realist approaches	Technical/ realist	Real events or dangers	Approaches risk objectively without being influenced by subjective and social factors (e.g., technical risk assessment by insurance companies, etc.	Starr (1969); Tversky & Kahneman (1974, 1987); Brehmer (1987).
	Psychometric research	Subjectively biased	Objective risks are subjectively perceived. Quality of risks (e.g., its scale, dreadfulness, or likelihood) influences responses to risks. Risks are assessed through individual cognitive processes.	Fischhoff *et al*. (1978); Slovic (1992, 1999, 2000); Renn (1992); Fischhoff, Bostrom, & Quadrel (1993); Zinn & Taylor-Goody (2006).
Sociological and cultural approaches	Cultural theory	Socially transformed	Risks are social construction and influenced by social relations (patterns of interpersonal relations) and cultural biases (shared values and beliefs).	Douglas & Wildvsky (1982); Douglas (1985, 1992); Tulloch & Lupton (2003); Johnson & Covello (1987).
	Risk society	Real and socially constructed	Reality and talk about risks mutually influence and produce each other. Claims to combine both a realist and a constructivist perspective.	Beck (1992, 1999); Giddens (1991, 1999).
	Edgework	Socially mediated	The subjective experience of real risks is socially mediated.	Lyng (1990, 2005); Miller (2005).
	Governmentality	Construction through social processes	Emphasises on social processes, which constitute risks. Events are risks insofar as they are part of a calculative technology.	Foucault & Lemke (1999); Ewald (1991); Dean (2010).
	Systems theory	Socially dynamic process	Risks are socially ascribed decisions.	Luhmann (1993); Japp & Kusche (2008)

Table 2.1: Different approaches and perspectives to study risk perception (adapted from Zinn, 2009, p. 8).

risk perception. Socio-cultural research, on the other hand, theorises risk as a 'social and cultural construct' (Johnson & Covello 1987). This approach considers people's socio-cultural and contextual factors as important determinants in construction of risk perception and responses to risks (Plough & Krimsky 1987; Covello, 1995). These two main approaches to risk research together propose a number of psychological (cognitive) and socio-cultural (contextual) factors, which have been found to have substantial roles in shaping individuals' perception of and reaction to risks.

2.2.1 The psychometric approach: 'risk as a cognitive construct'

The concept of "perceived risk" became prominent in the scientific literature only since the late 1970s, with the publication of the seminal works of Paul Slovic, Baruch Fischhoff and Sarah Lichtenstein. These researchers introduced methodologies of attitude research to investigating risk perception (see Fischhoff *et al*., 1978; Slovic, Fischhoff, & Lichtenstein, 1979, 1980, 1981, 1984, 1985; Slovic, 1987, 1992). This is now referred to as the psychometric paradigm of risk research. The psychometric approach investigates the extent to which the public's risk evaluations are biased or contain inaccuracies when compared to 'actual risks'. In this approach, individuals' subjective evaluations of risks are compared with 'actual risks' as estimated by experts (Siegrist, Keller & Kiers, 2005).

A significant number of studies have been conducted taking different risk issues as cases within this theoretical approach. These studies investigate the cognitive and affective processes of making risk perceptions in individuals' minds and found that lay people held different understandings and levels of concern for different kinds of risks. This

theoretical approach argues that risk perception occurs at the individual level and it is primarily a cognitive function of individuals (Breakwell, 2014). This paradigm of research proposes a number of cognitive factors, often dubbed as the cognitive map of risk evaluation. Cognitive factors are identified as important determinants for understanding public risk perceptions and evaluations (Otway & Tomas, 1982; Rippl 2002). Studies replicating Slovic and his colleagues' methodological design and theoretical conception revealed that individuals embedded emotional attributes to risks that originated from their feelings, even as individuals' feelings towards risks were linked to the characteristics of the risks (Slovic *et al*., 1985). Accordingly, 'feelings' about 'characteristics' of risks were found to be important factors in risk perception. As for risk characteristics, proponents of the psychometric research proposed that two main characteristics of a risk might explain one's perceptual construct. They were – "dread" and "unknown" characteristics of risk (Slovic, 1987, 1992; Slovic *et al*., 1981). The 'dread' risk characteristics included perceived lack of control, catastrophic potential, fatalities, distribution of risks and their benefits. (Slovic *et al*., 1985, p. 93). On the other hand, the 'unknown' characteristic of risk was described as "the extent to which it is observable, known, new and delayed in its manifestation of harm" (Slovic et al., 1985, p. 93).

Later studies within the field of psychometric research of risk perceptions paid particular attention to risk heuristics. Heuristics are generally defined as mental shortcuts or 'rules of thumb', which people use for problem solving and information processing. In other words, heuristics are mental models that make certain information more salient than others. Two heuristics – 'availability' (Tversky & Kahneman, 1974) and 'affect'

(Finucane *et al*., 2000) – were found to be important in understanding individuals' information processing and cognition making about risk issues or events.

The availability heuristic refers to the cognitive process that people tend to use to evaluate a risk by quickly recalling mental images and examples, already constructed in their minds. Psychometric researchers argue that, in evaluating risk, people usually estimate the likelihood of it by recalling information from memories (mental images) of similar events (Slovic *et al*., 1980; Whitmarsh, 2008a). This implies that if people could quickly come up with examples or mental images of the risk (e.g., from media or personal experiences), they are likely to express more concern about it (Bostrom *et al*., 1994). In other words, availability heuristics could be described as the imaginary visibility of risks. Media and other communication channels can play important roles in creating these imaginary visibilities in individuals' minds. In the literature, it was found that people in general highly overestimated the risk of publicised (often in the media) hazards such as tornadoes, floods and homicide, but underestimated less publicised risks such as diabetes, asthma and stroke (Slovic, 2000, p. 117).

While the 'availability' heuristic describes the cognitive process of 'rationale' thinking in understanding risk, social psychologists argue that this process also involves one's feelings towards the risks. Thus, the 'affect' heuristic or 'risk as feelings' hypothesis (Loewenstein *et al*., 2001; Slovic *et al*., 2004) was developed as an important cognitive factor for understanding risk perception and communication. In psychology, 'affect' means positive or negative feelings generated by stimulus (Slovic *et al*., 2005). It is argued that one's emotional attachments or feelings of fear or

excitement influence the perceived level of riskiness of the event. Affective reactions are also described as the quick and automatic response to the risk (Zajonc 1980). For example, reaction to the question – 'what comes to your mind when thinking about climate change?' individuals may differ in responding not only because of 'availability' heuristic but also because of the affective heuristic or their feelings about climate change risks.

One of the major contributions of psychometric research in risk perception is in identifying gaps between actual (objective) and perceived (subjective) risks. This is often described as the gap of perceived risks between experts and the lay people (Slovic, 1987; Weyman & Kelly, 1999). Slovic's (1987) cognitive maps of risk attitudes and perceptions, for example, found considerable differences in evaluation of similar risks by experts and laypeople. The theoretical conception of psychometric research was also widely replicated to understand expert and lay people's understanding of climate change risks (Bostrom *et al*., 1994; Read *et al*., 1994; Leiserowitz, 2006). Almost all studies reported large discrepancies between the general public's awareness of global warming and scientific consensus on the topic. In particular, research using the mental modelling (Bostrom *et al*., 1994; O'Connor, Bord & Fisher, 1999; Read *et al*., 1994; Lowe & Lorenzoni, 2007) approach, similar to Slovic's (1987) cognitive maps, indicated that lay people were particularly confused about the precise nature, causes and consequences of global warming and climate change.

Based on such findings, risk communication strategies were taken to narrow down the gap of risk perception between experts and lay people. This was, however, widely criticised as being a top-down approach aimed at filling 'the empty vessels' of lay people (Löfstedt & Renn, 1997). The main thrust of the top-down communication initiative was to increase

public knowledge of climate change risks with increased information. This approach was grounded in the assumption of a public knowledge deficit that called for a transfer of knowledge from the top (scientists, policymakers, and risk managers) to the down (the lay people). Since the late 1970s, numerous initiatives were taken to increase public knowledge of science and associated risks involving media and other communication channels. However, in most cases this knowledge deficit model didn't result in expected outcomes (Bauer, 2009). Instead, public distrust and scepticism about science and their sources (i.e., scientists) were increasing (Sturgis & Allum, 2004). Bauer (2009) rightly pointed out that failure of the public knowledge deficit model was rooted in the one-way model of communication it relied on. Communication *per se* is grounded in a dialogical model, *albeit* flow of information from different participants in the network of dialogue is not equal. As for climate change communication, we can posit the notion that the lay people may have limited understanding about causes and consequences of scientific complexities of climate change, but they have relevant and rich knowledge of their own socio-geographic conditions, on the one hand, and centuries old coping strategies to deal with extreme weather, on the other. This theoretical notion can be developed further if one considers the findings of media use and reception research. Irwin & Wynne (1996), for instance, demonstrate that audiences often act as critical consumers and even producers of information for their own purposes in contrast to the previous idea of passive receivers of media contents.

The psychometric research of risk perception can be also criticised on the ground that individuals' perception of certain risk is not a mere cognitive construction. Rather, risk perception is a social construct in

which socio-cultural factors play important roles. The psychometric research largely failed to address the role of these contextual factors in analysing individual's risk perception. Social scientists and cultural anthropologists respond to this deficit by examining risk as a socio-cultural construct.

2.2.2 The socio-cultural approach: 'risk as a socio-cultural construct'

Socio-cultural approaches to risk perception studies are mostly rooted in cultural and anthropological research. The main argument of this paradigm is that individuals' perception of risk is not a mere cognitive function. Instead, risk perceptions are constructed by norms, value systems and cultural traits of societies as well as social relations among the people (e.g., Beck, 1992; Dake, 1991; Douglas & Wildavsky, 1982; Thompson, Ellis & Wildavsky, 1990). There are a number of sub-categories of the socio-cultural approaches to theorising risk perception (*see Table 2.1*). However, many of these theoretical propositions hardly go beyond conceptual explanation and do not have the qualities to become a theoretical postulation (see Zinn, 2009, for details). Of the socio-cultural approaches, Douglas and Wildavsky's (1982, 1983) 'cultural theory' is the most prominent and this theory has been widely discussed over the last years. The cultural theory argues that people perceive what to fear in terms of their way of life and in relation to the 'culture' they belong to (Douglas & Wildavsky, 1982; Thompson, Ellis & Wildavsky, 1990; Wildavsky & Dake, 1990). The foundational works of this theory is grounded in Mary Douglas' (1966, 1992) anthropological research. Douglas proposed an explanatory framework for how people organised in their world, including what they believed to be dangerous. Later, Douglas and Wildavsky further

developed the cultural theory of risk with particular emphasis on the influence of people's cultural ways of life and social relations in risk evaluation. Wildavsky (1990) wrote:

> "…what to favor and what to fear are cultural constructs that enable us to walk right past snarling monsters and run away from little-bitty things. If we want to know why we are fearful about what and whether we should be, this is equivalent to asking the cultural question: How should we live'?" (p. 126)

This theory argues that social structure and context significantly shape individuals' values, attitudes, and worldviews to evaluate risks. It uses two central dimensions of sociality – control (grid) and social relations (group) – to explain one's risk evaluation (*see Figure 2.1*). Grid dimensions are described as social prescriptions on which individuals' behaviour is

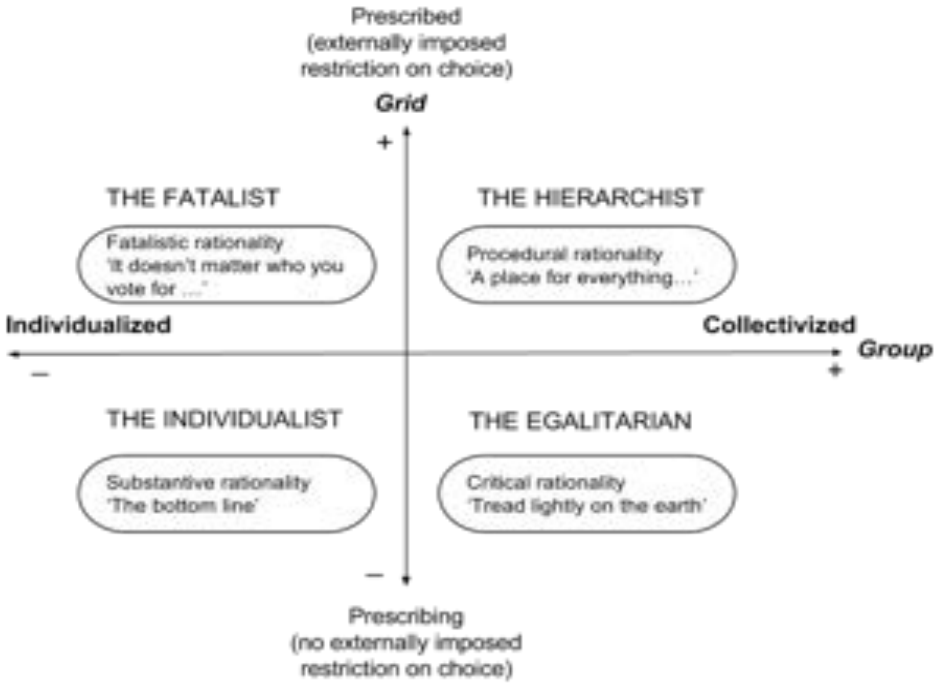

Figure 2.1: The two dimensions of sociality and the four rationalities of cultural theory of risk (Schwarz & Thompson, 1990, p. 7).

formed (Schwarz & Thompson, 1990, p. 6). While group dimensions postulate that personal identity of individuals is determined by their relationships to groups.

On the basis of these two 'dimensions of sociality' (grid and group), the cultural theory of risk proposes four cultural types based on the argument that these cultural types determine the ways in which people understand and respond to risks. The cultural types are: *egalitarian, hierarchic, individualistic and fatalistic*. People are grouped into these four cultural types based on their particular social relations and cultural biases. According to Wildavsky and Dake (1990), these four types of cultures can "predict and explain what kind of people will perceive which potential hazards to be how dangerous" (p. 42). In other words, the cultural theory offers a clear hypothesis about types of risk perceptions for each of the four cultural types where different people belong. It argues that people with *hierarchic* orientations fear those risks that may hamper social order. This group of people, however, tends to accept risks, which are justified by authorities or experts. In contrast to the risk perceptions of hierarchic people, *egalitarians* are assumed to distrust decisions of experts and government authorities and believe these people (experts) are enforcing risks on them. *Fatalists*' risk perception depends on their belief of controllability. They are reluctant and hardly express worries about things that they believe are beyond their capacity to control. Finally, people who belong to *individualist* culture perceive risk as opportunity. For instance, individualists may perceive nuclear technology more as an opportunity and less as a danger.

The cultural theory approach of risk research clearly contradicts psychometric paradigm's main thesis that risk perception is mainly shaped

by individuals' cognitive factors and can be explained by risk characteristics (i.e., dread and unknown); and risk heuristics (availability and affects). Instead, cultural theory proposes considering two concepts in understanding risk perception – first, 'cultural biases', and second, 'social relations'. Cultural biases are defined as 'shared values and beliefs' of people while social relations are 'patterns of interpersonal and group interactions' (Wildavsky & Dake, 1990; Dake, 1992; Douglas, 1992). Accordingly, cultural theory argues that these factors work as filters for individuals in evaluating risk information from different societal fields.

As for the application of socio-cultural theory to risk perception, Rosa, Mazur and Dietz's (1987) work on public understanding of risks about nuclear waste repository in the United States found two types of social relations that considerably influenced individuals' perception. First, one's risk perception was shaped by the social and cultural meanings that had been transmitted through primary sources such as family, friends, and co-workers (see also Dietz *et al*., 1996, p. 46). Public figures (i.e., opinion leaders) and mass media were considered important secondary influences over individuals' risk perception. Taken together, this clearly indicates that social factors – one's engagement in social contacts and sources of information play important roles in constructing risk perceptions. However, influence the sources of information exert in risk judgement depends largely on the level of trustworthiness of the sources. Worsley (1989), for example, argues that risk information from credible, interpersonal sources was more likely to influence individuals' behaviour than information gained from mass media. Yet, this does not suggest that we underestimate the influence of mass media in affecting individuals' knowledge of risks. As Singer and Endreny (1993) point out, despite evidence that people were

motivated to change their behaviour based on interpersonal conservations, it was important to recognise that these interpersonal sources most likely obtained their information from the mass media. That is, news media do not only communicate risk information to the 'audiences', but also to the people (e.g., opinion leaders), with whom the audiences discuss what they have seen, heard, or read (Robinson & Levy, 1996). On this note, it could be argued that mass media and interpersonal networks work in mutual ways in the process of informing, constructing perceptions, and making responses to risks. Therefore, any research seeking to understand climate change risk perception and communication should take a holistic approach, taking into account the importance of media and other forms of communication.

2.3 LIMITATIONS OF EXISTING THEORTICAL APPROACHES

Both the 'psychometric approach' and the 'cultural theory' of risk research have made significant contributions in understanding underlying factors involved in shaping public risk perception. The role of communication has also been emphasised in research conducted within both these approaches. In general, the psychometric research is found to be strong in methodology and empirical results. One of the main arguments of the approach is that individuals differ in their perceptions of risks of similar hazards. But, like other quantitative research, the psychometric studies are unable to explain 'how' and 'why' these individuals differ in their evaluation of similar risks (Kraus & Slovic, 1988). In particular, the influence of socio-cultural factors is not adequately explained.

Proponents of psychometric research argue that one of the main strengths of this approach was its explanatory power coming from the

aggregated data. However, this was also the main concern for many critics (see Brenot, Bonnefous, & Marris, 1998; Marris, Langford, & O'Riordan, 1998; Siegrist *et al.,* 2005) who found that this approach lumped individuals together and thus ignored variations within groups. Cutter (1993) and Lupton (1999), for example, criticise psychometric research for treating respondents as independent actors, rather than as individuals situated within certain socio-cultural contexts. Accordingly, Gustafsod (1998) rightly made the assertion that the psychometric research of risk perception provided only a snapshot of the social phenomena, removed from situational contexts of the individuals. These criticisms emphasise the socio-cultural contexts of respondents (e.g., location, experiences, infrastructure, world views, etc.) that might have substantial influence in perceiving and communicating risks. Sjöberg (2000) makes a detailed criticism of psychometric approach and argues that "when perceived risk is regressed on the psychometric factors across respondents individually, and for one hazard at a time, the level of explained variance is found minimum" (see also Gardner & Gould, 1989; Sjöberg, 1996). Marris and colleagues (1997) echo a similar view about aggregate data and argue that strong correlations between risk characteristics and individual perceptions are not supported when analyses are conducted at the individual level.

As for the cultural theory of risk research, the emphasis is on socio-cultural contexts. This approach proposes a potentially interesting theoretical framework of risk perception and the scope of communication. However, the theoretical proposition of cultural theory is not substantially supported by empirical data (Boholm, 1996; Sjöberg, 1997, 2000). Various research initiatives seeking to understand socio-cultural perspectives of risk perception mainly reflect respective disciplinary biases without yielding

any consensus on the determining socio-cultural factors. Marries and colleagues (1998), for example, argue that cultural theory explains only a minor part of the variance in how people perceive risks based on their cultural adherences. They did not find strong correlation between cultural adherences and risk judgements. The cultural theory assumes that people in different cultures perceive risks differently according to their respective cultural orientation. But Sjöberg's (1997) work compared risk evaluation of Swedish and Brazilian samples and found that both groups perceived risk in a similar manner, despite assumed cultural differences. Sjöberg (1997) explains this anomaly by suggesting that real risks indeed shaped public perceptions, not the assumptions and cultural groups of the individuals.

In addition, one of the main problems of the cultural theory is related to the very concept of 'culture'. The use of the term seems somewhat ambiguous. It is not clear whether the cultural adherence is fixed or whether it is continually negotiable through the grid-group dynamics of the four types of cultures discussed above. Marris *et al*. (1998) referred to this ambiguity as 'stability' versus 'mobility'. Oltedal and colleagues (2004) went further and argued that the mobility view of culture makes it possible for individuals to adhere to different cultures in different situations or stages of life. Marris *et al*. (1998) made similar arguments in asserting that a person could be *hierarchical* at home but simultaneously *individualistic* at work. Finally, Douglas's (1982, 1985, 1992) work on cultural theory is based on a theoretical synthesis of western philosophy and social scientific theory. As the cultures of study locations of this research are different, increasing social changes imply that it might be misleading to explain cultural traits of risk perception based on Douglas's work.

Thus it is clear that existing theoretical approaches do not produce any integrative theoretical framework that takes both cognitive and socio-cultural factors into consideration for the study of risk perception. In addition, neither of these approaches adequately address the complexity of communication and its roles in risk perception. Yet, in the literature of risk communication, we find some attempts to combine cognitive and socio-cultural variables to explain public risk perception and communication (Raupp, 2014, p. 523). Perhaps one of the most significant developments in that attempt was the social amplification of risk framework (SARF). This model was developed with a clear aim of providing an integrative theoretical framework for analysing risk evaluation and the role of communication (see Kasperson *et al.,* 1988, 2003; Renn *et al*., 1992; Pidgeon, Kasperson, & Slovic, 2003). The theoretical and empirical foundations of SARF were discussed in detail in Kasperson *et al*. (2003), and Kasperson and Kasperson (1996). This framework brought together insights from a diverse range of approaches in studies focusing on psychological, cultural, media and organisational dimensions of risk (Anderson, 2006, p. 118). As Pidgeon *et al*. (2003) described:

> "[the SARF] aims to examine broadly, and in social and historical context, how risk and risk events interact with psychological, social, institutional and cultural processes in ways that amplify or attenuate risk perceptions and concerns, and thereby shape risk behaviour, influence institutional processes, and affect risk consequences." (p. 2)

This approach gave particular importance to the communication of risks that eventually tended to determine whether the risk issue or event would be intensified or attenuated (reduced) in individuals' minds (Renn, 1991, cited in Bennett, 2010, p. 54-55). Despite its apparent face validity, SARF was criticised for being a fledging conceptual framework instead of

being a theory. As argued by Machlis & Rosa (1990, p. 164, cited in Kasperson & Kasperson, 2005) a theory would require specification and explication of linked concepts, including the "application of correspondence rules for converting abstract or inexact concepts into exact, testable ones." Proponents of SARF accepted this criticism and later described it not as a theory in the classical sense, but as a useful analytical tool for explaining relevant phenomena concerning public risk perception and communication (see Kasperson *et al*., 2003).

2.4 SENSITIZING THEORETICAL CONCEPTS: TOWARDS AN INTEGRATIVE APPROACH TO STUDYING RISK PERCEPTION AND COMMUNICATION

Considering the limitations of existing theoretical approaches, this research posits the notion that any attempt to understand lay people's risk perception and risk communication through the lens of the major theoretical approaches will reveal only a part of the reality. As already argued, both contextual and cognitive factors of individuals play important roles in shaping risk perception, and these factors are interlinked in a complex way. In the whole process, communication plays a significant role by making links between contextual and cognitive factors. For this reason, this research takes an inductive and holistic approach to address the research questions after sensitization of related theoretical concepts in a conceptual framework. This conceptual framework would guide this research to its objectives. Major analytical categories of this conceptual framework are illustrated in Figure 2.2.

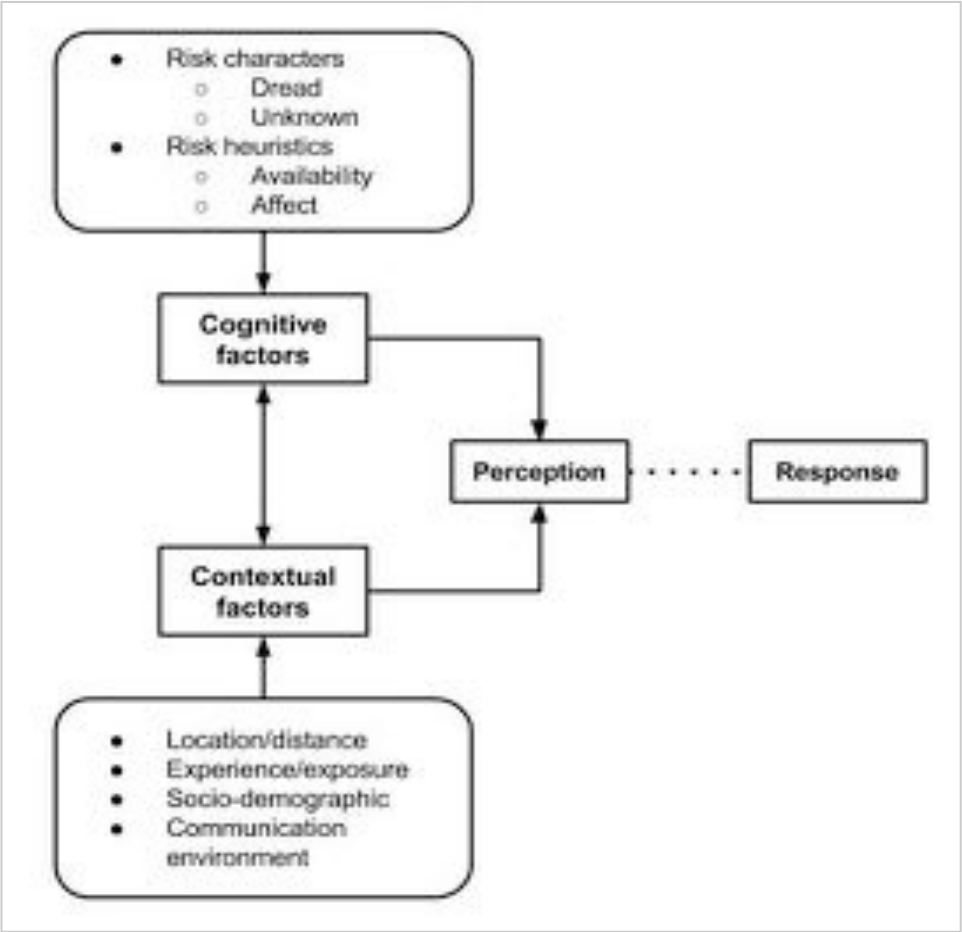

Figure 2.2: The conceptual model to study climate change risk perception and response (researcher's own model). This model describes two categories of influences – contextual and cognitive factors – in constructing individuals' perception of risks. This model attempts to integrate both psychological and socio-cultural factors in studying perception and communication of climate change risk. Tobin and Montz (1997) proposed a similar approach to study risk of natural hazards.

The conceptual framework for studying climate change risk perception contains both 'contextual' and 'cognitive' variables as important determinants of individuals' risk perception. Based on previous research, components of the contextual factors were identified as 'location',

'experience', 'communication environment', and 'socio-economic variables'. On the other hand, cognitive factors included individuals' risk heuristics ('availability' and 'affect') and risk characteristics ('dread' and 'unknown' risks). Following is a description of these two sets of factors along with their respective components. In many cases, we will see that some of the variables are linked to each other and encompass characteristics of both cognitive and contextual factors. For example, location could refer to both, physical distance to events or sources of hazards, as well as psychological proximity (feelings) of living in an endangered area.

2.4.1 Contextual factors of risk perception

2.4.1.1 Location and distance

Geographical location or place of living is an important indicator explaining one's perception of risk particularly if the risks are linked to climate change impacts. People develop certain understandings and reactions to risks of geo-hazards, which originate in their geographical location. This research defines location both as 'distance' and 'proximity' to grasp the breadth of the concept, and to consider its physical, social and cognitive aspects. The literature on risk perception widely demonstrates the correlation between location of living and risk evaluation. For example, people living on the coastline or flood-prone areas, tended to express more concerns about potential risks of natural hazards (Wester-Herber, 2004). Similarly, people living close to nuclear power plants perceived risk of nuclear hazards more seriously (Venables, Pidgeon, Parkhill, Henwood, & Simmons, 2012). This is mainly because of physical or geographical proximity to the origin of hazards. But, the notion of 'proximity' or

'distance' also encompasses psychological factors. For example, Trope and Liberman (2010) in the 'construal level theory' outlined four key dimensions of psychological and physical distances (or proximities) that might influence one's understandings and judgements of risks. They are: spatial or geographical distances; hypothetical or likelihood distances; temporal or psychological distances; and social distances. These distances could be contextualised taking the risk of climate change as an example.

As noted, 'spatial' or geographical distances are linked to the physical environment and location, implying that people may perceive climate change risks either too close to them or as something that will occur far away. Brody *et al*. (2008) and Kumar & Geneletti's (2015) study on coastal people's climate change risk perception in the US found that people's physical location determines the level of concern they attribute to risks. Furthermore, there is evidence that people's geographical proximity to the coastline influenced their behavioural intentions to reduce emissions of carbon dioxide (Brody, Grover, & Vediltz, 2012). This was also supported in studies examining public perceptions of natural hazards (Montz, 1982; Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007; Weber 2006) when people living close to the geographical origin of hazards were more likely to take protective measures.

The 'likelihood' or 'hypothetical' distance could be described as one's understanding of whether climate change is real or not. This refers to the 'uncertainty' phenomenon of climate change risk and raises questions about its scientific validity. Some people may ask questions whether climate change 'really' exists on the one hand; and whether it is caused by human activity at all, on the other. Whitmarsh (2008a), for example, found that although outright rejection of climate change among the people was

not widespread, but a considerable number of people expressed some degree of uncertainty about possible effects of climate change.

Third, 'psychological' distance could be defined as a temporal aspect of climate change risk. This refers to apprehensions about whether climate change is happening now or if it is a future risk. Studies, such as that of Leiserowitz (2006), found that people in general perceived climate change as a risk for future generations. On the contrary, Whitmarsh (2008b) found that many people attributed evidence of changing climate in their lifetime by relying upon their personal observations and experiences.

Finally, 'social' distances describe the way people perceive risks of climate change 'for others' instead of 'for us'. This clearly points to a dichotomy between "we" and "others" with regard to possible victims of climate change. It was found both in Europe and the United States that people generally perceived climate change risks as serious for distant locations (Spence & Pidgeon, 2010; Spence *et al*., 2011) where 'other people' would be affected. People in developing countries, on the other hand, tended to express more concern about the local impact of climate change and localise the possible effects (Dunlap, Gallup & Gallup, 1993). This clearly indicates to "local-global" dimensions of climate change effects when people in developed countries in general viewed climate change more as a global problem than its local impacts (Uzzell 2000; Gifford *et al*., 2009).

2.4.1.2 Experience

Climate change is a gradual and long-term phenomenon, which is not possible to experience and observe by lay people in their daily life. Yet, most people describe their concerns about climate change by bringing

evidence from personal experience and observation (van der Linden, 2014). Changes in weather patterns and events of extreme weather are two possible impacts of climate change are often discussed in scientific and political domains. These discourses are transferred to the public through news media and other communication channels. Eventually, lay people see and recall their personal experiences of weather variances and natural hazard events in evaluating mediated knowledge of climate change risks. A number of studies support this notion that individuals' direct experience and exposure to unusual weather events were important determinants of risk perceptions and responses (Barnett & Breakwell, 2001; Lawrence, Quade, & Becker, 2014; Lujala, Lein, & Rød, 2014; Reser, Bradley, & Ellul, 2014; Whitmarsh, 2008b). The literature of risk perception also been widely demonstrates that perceived likelihood of a risk increases if it has been experienced through individuals' sensory evidences (Whitmarsh, 2005). Social psychologists describe this as 'the availability heuristics' with the notion that events of a recent natural hazard and heavy media coverage of it is likely to influence public perceptions of related risks (Slovic, 1987; Tversky & Kahneman, 1974). In other words, direct experience or exposure to hazards as well as indirect experience either through media or other communication channels work as filters or heuristics in evaluating or prioritising risks of similar events. Accordingly, it could be argued that people trust the evidence they get through their senses (e.g., experiences of hot summer or unusual rainfall) in evaluating risks of climate change. On the other hand, secondary risk information from media and social contacts is further taken into consideration to reconstruct the perceptions they have already constructed through direct sensory evidence. Kempton's (1997) anthropological work on public

understanding of global warming supported this phenomenon with lay people explaining evidence of climate change with reference to their personal observation of changes in weather patterns. Other studies (e.g., Krosnick *et al*., 2006; Deryugina, 2013; Borick & Rabe, 2010) also found personal experiences of weather variances to be important 'points of reference' for substantiating effects of climate change.

People's experience, however, may have different dimensions. First, the frequency of exposure, that is, how frequently the extreme weather events occur is an important manifestation of one's tendency to link it to climate change. Increased number of events related to climate change impacts (e.g., natural hazards, unusual weather) and increased exposure to them through primary (e.g., direct experience) and secondary sources (e.g., media and social contacts) may increase the level of concern towards climate change. Second, there is a temporal dimension of personal experiences of extreme weather events. Spence and colleagues (2001) argue that people, in general, tended to believe more in climate change if they had a recent experience of extreme weather events. As such, a recent experience of a severe storm, flooding or heat wave is likely to increase one's concern for climate change risks more than experience, which occurred a long time ago (Goebbert *et al*., 2012). This is also supported in the literature of natural hazards as public's concern about hazards reduces over time and only extremely damaging events are sustained in memories (van der Linden, 2014).

2.4.1.3 Socio-economic and demographic factors: gender, education, income and age

The effects of socio-economic characteristics such as age, gender, education, income, race and political affiliation on public perceptions of

environmental, technological and natural hazard risks have also been subjects of scientific research over the last three decades (see Liere & Dunlap, 1980; Jones & Dunlap, 1992; Dietz, Stern & Guagnano, 1998; Dunlap & McCright, 2008). This genre of research has, in recent years, been further extended to examine the influence of socio-economic and demographic factors in influencing public perceptions of climate change risks (O'Connor *et al*., 1999; Leiserowitz, 2006; Dietz, Dan & Shwom, 2007; McCright, 2010; McCright & Dunlap, 2011a; McCright & Dunlap, 2011b). However, results of these studies are not consistent. It is difficult to understand how and why socio-economic and demographic factors influence individuals' understanding of climate change risks. For example, risk researchers investigating gender dynamics of risk perception generally found that women and men differed in their perceptions of risk. However, the vast volume of literature on the topic fails to explain substantially how and why women and men perceived risks differently. One general explanation was grounded in the idea that women and men performed different societal roles in managing risks (Davidson & Freudenburg, 1996) and their perceptions of risks were accordingly constructed on the basis of their social roles. O'Connor *et al*. (1999) particularly examined women's perceptions of global warming and found that women showed more willingness to change their daily activities for reducing effects of global warming, but were less supportive of global warming polices. This is, however, contradicted by other research. For example, Leiserowitz (2006) and Zahran *et al*. (2006) found that women expressed more support for national policies tackling global warming as compared to men respondents.

As for the current study, it holds that differences of power relations between men and women in a societal context (Gustafsod, 1998) and their

impacts on climate change risk perception are important. The power structure of men and women as determined by societal values is likely to limit women's access to climate change information from secondary sources (e.g., media) as well as from social contacts. In many traditional societies, men as heads of the families control and regulate access to radio and television for other members of the family. Accordingly, men have better choices to be informed and to learn about issues that are discussed in media. Similarly, women are often restricted from social interactions with others (e.g., males and strangers), thus limiting their access to information on social matters. This aspect of gendered-control over information may have considerable influence on the level of knowledge about climate change between women and men.

As with gender, the influence of age in lay people's perceived concerns for climate change has also not found to be identical. The extant literature does not provide a clear picture in the ways in which age influences knowledge and the level of concern towards climate change. Works, such as that of O'Connor *et al*. (1999) and Jaeger et al., (1993), found that older people were more interested in supporting government policies and take actions against climate change risks. However, as Semenza *et al*., (2008) argue older people are less likely than younger ones to participate in voluntary actions for reducing emissions of greenhouse gases.

Among other socio-economic and demographic factors, education and income were generally hypothesized as being positively linked to individuals' higher level of environmental concerns (Liere & Dunlap, 1980). As for the climate change issue, it was demonstrated that people with higher level of education were usually more supportive of policies

aimed at reducing greenhouse gas emissions (O'Connor *et al*., 1999), and participate voluntarily in actions mitigating global warming (Semenza *et al*., 2008). Some studies also identified income as an important predictor of public support for climate change policy (Dietz *et al*., 2007). This correlation has, however, not been substantially established in the literature. For example, the works of Brody *et al*. (2008) and Kellstedt, Zahran & Vedlitz (2008) did not find a significant link between individuals' education or income and perceived concern about climate change. On the contrary, a number of studies found that individuals with higher level of education tended to show lower levels of concern for climate change (e.g., Malka, Krosnick & Langer, 2009; McCright & Dunlap 2011b).

To summarise, it could be argued that socio-demographic variables such as age, gender, education and income may play an important role in determining one's risk perception and response to climate change. However, the causal relation between socio-demographic variables and risk perception is not identical. There is a clear indication that other socio-cultural, contextual and psychological variables also play an influential role in the overall process of individual risk perception.

2.4.1.4 Communication and information environment

Public understanding of climate change significantly relies on the information that people get through a number of information sources, such as media and social contacts. In modern urbanised societies, people usually come to know about climate change risks through news media and this contributes significantly to the process of constructing public understanding of risks (Neverla & Schäfer, 2012; Smith, 2005; Fischhoff,

1995). News media play a crucial role by building a bridge between experts (e.g., scientists, government officials, activists, and policymakers) and lay people in communicating risks of climate change (Kenski & Zaller, 1993). However, news media are not the only sources of climate change information for the general public. Interpersonal communication in the form of formal advocacy programmes by different activist groups and informal social interactions are other important channels through which lay people obtain climate change knowledge. All these prospective channels of communication form the 'communication infrastructure' in the conceptual framework of this research. This 'communication infrastructure' is broadly defined as the "networks through which people obtain, evaluate, and share information through mediated and interpersonal channels" (Heath & Gay, 1997). Consumption of media content and interpersonal interactions in the community are two major sets of information channels in this communication infrastructure. Both sets have variations. Television, radio and newspapers are parts of the mass media while interpersonal communications refers to both formal and informal social contacts. New communication technologies, such as the Internet and its applications, and the mobile phone include the characteristics of both mass and interpersonal communication. This research posits that an understanding of public perceptions of climate change needs a thorough investigation of roles and structure of different types of communication in the process.

The role of mass media is particularly crucial in this communication infrastructure as it brings climate change knowledge from the domain of sciences and politics to the lay people. Storch (2009) described mediated knowledge of climate change as a 'cultural construct' when media transferred 'framed' climate change information to the public. Accordingly,

the cultural construct of climate change differs from its scientific construct. In fact, Stamm and colleagues (2000) categorically referred to the limited and erroneous public understanding of climate change as a communication problem. Social scientists quickly responded to this problem and developed a considerably large volume of research on the media coverage of climate change (e.g., Trumbo 1996; Carvalho & Burgess, 2005; Olausson, 2009; Dirikx & Gelders, 2010); relations between media coverage and public understanding (e.g., Bord *et al*., 1998; Stamm *et al*., 2000; Bell, 1994); and challenges to climate change communication through mass media (e.g., Wilson, 2000; Boykoff & Boykoff, 2007; Neverla, Lüthje, & Mahmud, 2012; Feresin, 2009; Moser, 2010).

As for the influence of mediated climate change knowledge, it has been argued that as with other issues, people do not take media information for granted. Instead, mediated knowledge of climate change is processed in public minds in a complex way. Individuals' already held perception and social interactions play important roles in interpreting mediated knowledge of climate change (Ungar, 2000; Nicholson-Cole, 2005, Pidgeon, 2012). Individuals are engaged in different types and levels of social relations (i.e., creating social networks) in their communities and professions. Individuals' perceptions are largely influenced by the ways in which others in their networks perceive the issue (Zerubavel, 1997, cited in H. Bell, 2007, p. 31). Hence, any attempt to understand role of communication in examining public perception of climate change should not focus only on mass media, especially in cases of traditional societies where informal social relations are important parts of community life. This research attempts to emphasise this aspect by examining the role of both mediated

and non-mediated communication in influencing public understanding of climate change.

2.4.2 Cognitive factors of risk perception

Two important aspects of psychological research on risk perception and communication have been taken into consideration for the conceptual framework of this research. They are 'risk characteristics' and 'risk heuristics'. It is widely discussed in the literature that both factors have important influences in the cognitive construction of risk perception and response.

2.4.2.1 Risk characteristics: 'dread' and 'unknown' risks

Two main characteristics of risks, namely "dread" and "unknown" risks, (see Slovic *et al*., 1980; Slovic 1987, 1992) explain much of the risk perception of individuals. For a more clear understanding of Slovic *et al*.'s (1985) 'dread' and 'unknown' characteristics of risks, we can compare them with risk characteristics of climate change. The 'dread' aspect of climate change risk has been discussed in a number of studies (Lorenzoni & Pidgeon, 2006; Dessai *et al*., 2004; Leiserowitz, 2005) which found that respondents overwhelmingly attributed catastrophic effects of climate change to take the forms of natural hazards and unusual weather patterns. Dreadful images of climate change were also found in public evaluation of the issue as an important health and economic risk (Leiserowitz, 2006; Weber & Stern, 2011). As for the 'unknown' characteristic of climate change risk, a number of studies demonstrated 'lack of controllability' as an important barrier to engaging people in climate change mitigation and adaptation programmes (Dessai *et al*., 2004). Scientific uncertainty about possible impacts was another important finding that also pointed to

'unknown' characteristic of climate change risk (Weber, 2006; Etkin & Ho, 2007).

Interestingly, on the one hand public depicted the 'dread' picture of climate change, and on the other hand, expressed inadequate knowledge and various misconceptions about climate change (Bostrom *et al*., 1994; Kempton, 1991, 1997). In one of the early works on lay people's perceptions of global warming, Kempton (1991, 1997) found that people embedded climate change information into their pre-existing mental models of stratospheric ozone depletion. Although conceptually different, people mistakenly perceived stratospheric ozone depletion as a cause of climate change. Similarly, Semenza *et al*. (2009) identified "air pollution" as an important pre-existing mental model through which lay people perceived risks of climate change. This aspect of perceived risk of climate change can also be categorised as 'unknown' risk. The 'unknown' characteristic of climate change also came to the fore in public understandings that the risk of climate change was largely uncontrollable at individual levels (Tomkins *et al*., 2010; Pidgeon, 2012; Lorenzoni, Nicholson, & Whitmarsh, 2007).

2.4.2.2 Risk heuristics: 'availability' and 'affect'

As indicated in Slovic's (1987, 1992) research, risk communication plays a significant role in influencing the 'availability' heuristic of people by creating imaginary visibility. First, the availability of risks can be constructed in individuals' minds through experiences, for example, personal experiences with the events of risks (Weinstein, 1989). Victims of a recent extreme weather event may have different risk perception of climate change as compared to people who had a similar experience long

time ago. Second, different secondary sources, such as mass media, social contacts and other channels of risk information, may also influence one's availability heuristic (Kasperson *et al*., 1988). Applying this to climate change, it could be argued that one's concern for climate change might increase following personal experience of a recent natural hazard because these events are often linked to the effects of climate change. This notion is described as the 'recency effect' in the literature of public perceptions of natural hazards (Hogarth and Einhorn, 1992). Besides, increased media coverage and information campaigns by interest groups about climate change may also create 'availability' heuristics of the issue in lay people's minds.

On this note, it could be argued that an information campaign through mediated and non-mediated channels may not only make climate change issue salient in public's mind, but also frame it in a certain way. These framings possibly influence one's imaginary pictures of climate change. This has been described as the 'affect' imaginary in the individuals' minds. Social psychologists argue that individuals consciously and unconsciously create a pool of affects (Slovic *et al*., 2004) with all the negative and positive constructs associated with the risk issue or event. As for climate change risk, it is often argued that public perceive it through the lens of extreme weather events mainly because of the way in which the media frames it (Nisbet, 2009). Many people make a quick link between climate change and extreme weather events based on their already constructed mental images. Kasperson and Kasperson's (1988) theoretical conception of "the social amplification and attenuation of risk" was also motivated by the availability heuristic when they argued that socio-cultural processes regulated the amount of attention of risk, and therefore,

availability of risk issues to the public. Here, we can see a marriage of contextual and cognitive information processing in individuals' minds. In this marriage, risk communication infrastructures are part of socio-cultural contexts while perception is created in individuals' cognitive (psychological) stage.

2.5 CHAPTER SUMMARY

This Chapter has reviewed the literature on risk perception and communication with the objective of contextualising the current research within the cleavage of existing pool of knowledge. It has been demonstrated that individuals' socio-cultural contexts and social relationships play important roles in affecting risk perception and intentions of risk behaviour. However, the causal link between contextual factors and risk perception is not unidirectional, but quite complex and cannot be addressed fully without due considerations to the individuals' cognitive and affective factors. Accordingly, a conceptual framework integrating both contextual and cognitive factors in influencing public perceptions of climate change risks is proposed to guide the current research.

Chapter 3

Research Design and Methodology

3.1 INTRODUCTION

This Chapter is organised in four main sections, namely: (i) epistemological position of the research; (ii) data collection methods; (iii) data analysis procedures; and (iv) scientific rigors of the study. Particular emphasis was given to selection of study location, sampling strategies and sample characteristics as they were considerably influenced by the overall epistemological position of the research. The approach of the current research was exploratory in nature because little was known in the scientific literature about perceptions and communication of climate change risks among the people in coastal regions of Bangladesh. Accordingly, this research took a decision on the matter that it would be more appropriate to use a methodology, which could explicate the phenomena from the perspectives of the people. This objective in general fit very well with the purpose of a qualitative study and particularly with grounded theory research. The grounded theory research methodology is a particular type of qualitative research, which investigates social phenomena in their own worlds (Gibson & Hartman, 2013). Therefore, this chapter begins with arguments, first, justifying the choice of qualitative research approach for the current study. Then, it goes on explaining rationale for employing the grounded theory methodology in investigating meanings of climate change risks in lay people's minds; their behavioural responses towards those risks; and role of different communication sources in the process of constructing climate change risk perceptions and responses. The

subsequent sections of this Chapter describe methods of data collection and analysis; and scientific rigors, such as validity and reliability of the data.

3.2 RESEARCH DESIGN: EPISTEMOLOGICAL LOGIC OF THE STUDY

The research design of a study is driven by its purposes and related research questions, which are usually formulated after identifying gaps in the literature. Two important decisions are made at this phase – first, a decision about the theoretical or conceptual framework to guide the research (see Chapter 2, Section 2.4); and second, formulation of an appropriate research design to investigate identified research problems. These are the most critical decisions of a research project that eventually determine trustworthiness of the findings. Therefore, setting the design of a research project and identifying its epistemological position is utmost important. Here, it is worth to briefly clarify differences between the concepts of 'research design' and 'research method'. These two concepts are inherently linked, yet they are distinct from each other. David and Sutton (2011, p. 205) defined research design as the logical framework of the study, upon which the research project was conducted. As such, research design is based on epistemological choice of the research that helps researchers to decide on theoretical concepts, and methods to gather data (e.g., employing different methods of data collection) to address the research questions. This clearly indicates that research design is the overall framework while research method is the actual procedures and processes of getting data and analysing them (Whittaker, 2012).

As for the current study, it was aimed at exploring how people communicated and constructed meanings about risks of climate change; and how these meanings had influenced their behavioural intentions or

actions in specific situational contexts. Situational contexts of the current research were largely characterised by its geographical position, vulnerability to regional geo-hazards, socio-economic conditions, and cultural traits (e.g., culture of hazards). Culture of hazards was defined as frequent exposure to regional geo-hazards and development of certain cultural traits to deal with those hazards.

One way to understand public perception and communication of climate change risks within these situational contexts could be objective measurement of public perception, attitude and behavioural actions through standardized quantitative measurement tools and techniques – surveys, for example. This approach is called quantitative research within the epistemological perspective of 'positivism' or 'objectivism'. The stream of positivist research emphasises deductive reasoning and usually numerical (quantitative) data are gathered to measure different social phenomena (Grey, 2013). Many qualitative social science researchers, however, criticised this perspective. They argued that such an epistemological perspective of social science research was modelled following epistemologies of the physical sciences and "attempts were made to make the social sciences as objective as the physical sciences" (Taylor, 2005, p. 4). In the literature of risk perception and communication, a considerable reservoir of knowledge has already been developed in the last two and half decades through studies primarily based on quantitative approach. The theoretical premise of such research was influenced by the psychometric analysis of risk perception, which was stemmed from the fields of social psychology and behavioural sciences (Zinn & Taylor-Gooby, 2006). The volume of literature was able to describe level of public knowledge,

understanding and attitude towards climate change as well as scope of communication.

Yet, this was largely unexplained what factors actually influence perceptions and behavioural actions of individuals against the risks of climate change. For example, what factors influenced people to take either adaptive or mitigation measures? On the other hand, role of socio-cultural contexts in perceiving and responding to the risks of climate change were largely unexplored in the studies of psychometric paradigm. As such, Flick (2009) rightly argued that in many ways the quantitative research that was to generate research questions and hypotheses from existing theoretical models and testing them against empirical evidence was unable to understand social phenomena about which little was known in the existing scientific literature. In addition, changing socio-cultural contexts and perspectives, caused by social changes and diversifications of life worlds, make it more challenging for contemporary social scientists to understand social phenomena merely depending on positivist methods (Flick, 2009). Therefore, developing research questions and hypothesis, and testing them against the existing theories, which were mostly generated within the Western social contexts and variables, was somehow misleading for the cases that had been selected for the current study. One remedy to these challenges was to design a research based on inductive reasoning with an aim to go deeper into the situation, derive concepts, and extract theoretical explanations directly from the data. This approach is considered as qualitative social research, which investigates social phenomena within their natural settings, and researchers assume to interact with their research subjects. This is a clear contrast to the main tenet of quantitative research, which assumes that researchers are independent of the variables under

study (Creswell, 1994). Table 3.1 describes philosophical foundations of quantitative and qualitative research.

Describing main characteristics of qualitative research, Denzin and Lincoln (2005) argued that this stream of research emphasised socially constructed nature of reality, the situational contexts, and the process of interactions among the people. Such a research approach attempts to answer how social experience is created and how people give meanings to those experiences (Denzin & Lincoln, 2005). Accordingly, qualitative research emphasises more on the process of the social phenomena instead

Philosophical Foundations	RESEARCH STRATEGIES	
	Qualitative Research Designs	Quantitative Research Designs
ONTOLOGY (Perceptions of Reality)	Researchers assume that multiple, subjectively derived realities can coexist.	Researchers assume that a single, objective world exists.
EPISTEMOLOGY (Roles for the researcher)	Researchers commonly assume that they must interact with their studied phenomena.	Researchers assume that they are independent from the variables under study.
AXIOLOGY (Researchers' Values)	Researchers overtly act in a value laden and biased fashion.	Researchers overtly act in a value-free and unbiased manner.
RHETORIC (Language Styles)	Researchers often use personalized, informal, and context-laden language.	Researchers most often use interpersonal, formal, and rule-based text.
METHODOLOGY (Approaches to Research)	Researchers tend to apply induction, multivariate, and multi processes interactions, following context-laden methods.	Researchers tend to apply deduction, limited case-and-effect relationships, with context-free methods.

Table 3.1: Philosophical foundations of qualitative and quantitative research (adapted from Creswell, 1994).

of finding causal relationships among them. This epistemological logic clearly fit with objectives of the current study for two main reasons.

First, this study attempted to explore individuals' perspectives about climate change risks, responses, and communication; and how these risks were managed within a certain socio-cultural and geographical setting. Qualitative research approach enables researchers to get closer to individuals' point of view what Denzin and Lincoln defined as the way of "study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them" (2005, p. 3). Merriam (2009, p. 13) takes a similar position, arguing that qualitative researchers are interested in understanding the meanings people construct and how people make sense of their experiences in certain socio-cultural settings. This clearly implies that the epistemological perspective of qualitative research is interpretive, which attempts to describe, understand and interpret social phenomena with a notion that multiple constructions of objective realities are possible.

Second, a qualitative research design is more suitable for the phenomenon and situations about which little is known in the scientific literature (Strauss & Corbin, 1990, p. 20). Flick (2009) supported this view and as an alternative to the deductive methodology, suggested to 'sensitize concepts' for approaching social contexts to be studied. The concept of theoretical sensitivity has been described in detail in Section 3.2.2.1 of this Chapter. Here, this suffices to argue that existing theories of risk perception and communication were mainly developed within certain socio-cultural and geographical contexts (e.g., mostly in Western societies), which were different as compared to situational contexts of the current research. Therefore, this might be misleading to 'measure' public perception and

communication of climate change risk in the coastal region of Bangladesh based on these theoretical concepts. This led the researcher to think about a research design, which considered situational contexts of the study population in investigating their perceptions and communication of risks. A qualitative approach seemed to be an appropriate decision. Denzin and Lincoln's (2008) assertion supported this decision when it had been categorically suggested that knowledge and practice were local and should be studied within the local conceptual frameworks. In such cases, Denzin and Lincoln (2008) suggested to conduct subjective analysis of the phenomenon instead of applying quantitative and standardized techniques. Wasserman and de Beer (2009) carried similar view while discussing research about journalism culture of non-Western countries. They argued that the very categories within which (journalism) research in non-Western countries were made, were often deduced from concepts that had historically been rooted to Western, liberal-democratic normative notions of journalism. As like, "other" (non-Western) journalisms were presented in terms of their correspondence with or deviation from established categories in Western societies (Wasserman & de Beer, 2009). Accordingly, Wassermann and de Beer (2009) suggested to work "inductively from non-western contexts, through 'thick descriptions', to re-establish epistemological dimensions for global journalism" (p. 430-431). This research took this suggestion and attempted to understand climate change risk perception and communication taking a qualitative approach of social science research which was based on inductive reasoning.

Taking a decision on methodological approach was not the end of the challenges to attaining the research goals. The final challenge of designing the research strategy was to find an appropriate method of data

collection and analysis within the qualitative approach. There were different strategies and procedures of doing qualitative research and many of these strategies were largely biased towards the disciplinary boundaries of researchers (Merriam, 2009). As such, Creswell (2007) rightly argued that "there is no consensus as to how to classify the baffling numbers of choices or approaches" to qualitative research (Creswell, 2007, cited in Merriam, 2009, p. 21). Given this complexity of classifying qualitative research, Merriam (2009) came up with six more commonly used approaches and they were: basic qualitative research, phenomenology, grounded theory, ethnography, narrative analysis, and critical qualitative research. This research chosen grounded theory methodology to gather data and analyse them for specific reasons. At first, grounded theory methodology is especially useful in new and applied cases, in which there is little theory or concepts currently available to describe and explain a phenomenon (Goulding, 2002). On the other hand, one major feature of the grounded theory what differentiates it from other types of qualitative research is its focus on discovering theory from data (Glaser & Strauss, 1967; Corbin & Strauss, 2008; Charmaz, 2009). In this way, grounded theory research is a clear contrast to the positivistic research approaches, which are based on *logico-deductive* methods. In grounded theory study, as argued by Goulding (2005), "the enquiry is always situational (context bound) and facts should be viewed as both theory-laden and value-laden" (p. 42) A detailed description of grounded theory methodology – its origin and basic principles – would provide more justifications for selecting this specific kind of qualitative research methodology for the current study.

3.2.1 Grounded theory methodology: origin and approaches

The grounded theory methodology[3] is currently one of the most widely used and popular qualitative research methodologies across a wide range of disciplines and subject areas (Bryant & Charmaz, 2011, p. 1). Charmaz (2006, p. 2) defined grounded theory as systematic, yet flexible, qualitative methods of data collection and analysis to construct theories grounded in the data. This is an inductive research approach, which attempts to derive meanings from the data and provides theoretical explanations of those meanings. Barney Glaser and Anselm Strauss first developed the grounded theory methodology in the 1960s as a response to positivist and deductive approach to social research. Glaser and Strauss's (1967) now seminal book *The Discovery of Grounded Theory* was largely based on the theoretical perspective of the symbolic interactionism. They argued that systematic strategies in data collection and analysis would develop theories, which were grounded in the data (Glaser & Strauss, 1967). The main idea of the methodology was that data collection and analysis in a research project should not be influenced by predetermined theories. Rather, systematic data collection and analysis should lead to discovery of a theory, which is grounded in the data (Glaser & Strauss, 1967). This epistemological position indeed established distinct characteristics of grounded theory as compared to other qualitative research methods. This method considers individuals' understanding of social phenomena as plural and relative; and these understandings are largely social constructs rather than objective facts (Charmaz, 2009; Strauss & Corbin, 1998). As such, theoretical underpinning of grounded theory

[3] This needs to be clarified that grounded theory is not a theory at all, but a qualitative research method that attempts to generate theory from the data following some specific procedures and techniques.

research was premised within the constructivist paradigm or symbolic interactionism (Stern, 1994). Stern (1994) even argued that any discussion to understand the grounded theory methodology and its central tenets was not plausible without a reference to the theory of symbolic interactionism from where the epistemology of the grounded theory research actually emerged.

Theoretical arguments of the symbolic interactionism attempt to describe how people develop a complex set of symbols through constant social interaction to give meanings to reality. Charles Cooley (1864-1929) and George Herbert Mead (1863-1931) introduced this perspective in the American sociology and introduced the concept of 'social behaviourism'. Herbert Blumer (1986) studied the perspective further and coined the term 'symbolic interactionism', which later became one of the major social psychological theories of human behaviour. As a theory of human behaviour, symbolic interactionism analyses society by addressing the subjective meanings that people embed on objects, events and behaviours (Blumer, 1986). This theory proposes that meanings are generated through social interactions (or communication), and they influence the way people behave in certain social contexts (Blumer, 1986). To put the theoretical premise of symbolic interaction in a more categorical fashion, one can argue that individuals' behaviour in a society do not depend on objectivity of true events, but what they believe as true. Accordingly, symbolic interactionism posits the notion that any social phenomenon (e.g., perceptions of climate change risks) is a social construct of human interaction (communication) and interpretation, not a mere cognitive process based on objective facts.

However, understanding the process of social construct is a major methodological challenge. As Blumer (1986) argued there was at least three core principles of symbolic interactionism that one ought to consider to understand the process – first, human beings act toward people and things according to the meanings that are given to those people and things; second, these meanings are derived from social interaction in one's social life; and third, these meanings are modified through an interpretative process when people encounter with other social phenomena. In the process, the symbolic interactionism paradigm argues, the 'self' (individual) situates itself within the social contexts and continuously negotiates their prior knowledge with new meanings that they receive through different communication sources. This iterative process results in constructing subjective meanings of objective realities what Berger and Luckmann (1967, 1979) described as social construction of reality. Unlike symbolic interaction theory, Berger and Luckmann's focus was not primarily on the interaction process at the micro level, such as, individual to individual (Johnson, 2008). Yet, the social construction of reality perspective incorporates the basic insights of symbolic interaction theory. These included interrelations between subjective consciousness and everyday life practices; and patterns of communication where cultural meanings are sustained (Johnson, 2008, p. 155). In other words, Berger and Luckmann (1967, 1979) emphasised shared and inter-subjective dimensions of symbolic life, which were related to macro level cultural meaning systems (Johnson, 2008, p. 155).

Both symbolic interactionism and social construction of reality, however, posit the notion that individuals' understanding of reality is situational and temporal. This indicates that perceptions, attitude and

behaviour of human beings can only be understood in their specific socio-cultural settings, and by understanding patterns of interactions both at micro and macro levels. Taking this theoretical underpinning into consideration, grounded theory methodology was chosen for the current study as this methodology gave importance on situational and temporal contexts in which people construct and share their constructed social worlds with others (Charmaz, 2006, 2009).

As already indicated, unlike other qualitative research methodologies, grounded theory is a highly contested research methodology. In the literature, there exist a number of versions of grounded theory methodologies, which are largely influenced by researchers' own ontological and epistemological positions. Dey (1999, p. 2) rightly asserted that there were "probably as many versions of grounded theory as there were grounded theorists". Yet, two distinct streams of grounded theory research were often discussed in scientific debates on qualitative social science research. These two streams were originated after a split between two co-originators (Barney Glaser and Anselm Strauss) of the method. After the initial publication in 1967, Glaser and Strauss were split and travelled their own paths producing literature on how a grounded theory was to be developed from the data. As a result, we can find the *Glaserian* and the *Straussian* versions of grounded theory research. Describing the split, Walker and Myrick (2006) argued that the main difference between the versions was about contrasting perspectives regarding data analysis process and techniques.

Sengstock (2015) described the *Glaserian* grounded theory as a method, which "is ontologically rooted in critical realism, assuming that an objective world exists independently of our knowledge and belief" (p. 175).

As such, Glaser's method of grounded theory emphasises researcher's detachment from the subjects so that theoretical explanations can be developed from the data without any influence. In a clear contrast, Strauss (1987) [and later together with his co-author Juliet M. Corbin (Strauss & Corbin, 1990, 2008)] took a flexible approach. The *Straussian* version of grounded theory has its ontological roots in relativism and it is argued that reality is interpreted (Sengstock, 2015, p. 175). Glaser (1992) criticised Strauss and Corbin's procedures for forcing data and analysis into preconceived theoretical concepts with an argument that Strauss's procedures would not lead to grounded theory, but "full conceptual description" of the social phenomena (p. 5). A third school of thought of the grounded theory methodology emerged in the late 1990s amid the strong differences between two originators of the method. This is known as constructivist grounded theory. Kathy Charmaz (2003, 2006, 2009), one of the proponents of the constructivist grounded theory, proposed that in grounded theory research, data and analysis was co-created by researcher and participants. As Charmaz (2000) wrote, "Constructing constructivism means seeking both respondents' meanings and researchers' meanings" (p. 525) in the way to explain social phenomena. Constructivist grounded theory highlighted the flexibility of the method as described in Glaser and Strauss's original work (1967) and took a position against "mechanical application" of the method. The constructivist grounded theory describes the method as a set of principles and practices, not as prescriptions (Charmaz, 2006). Importantly, Charmaz (2006) acknowledged the subjectivity of social phenomena and researcher's involvement in the construction and interpretation of data. This research took Charmaz's constructivist grounded theory to guide the process of data collection and

analysis because this approach accommodated the basic tenets of the methodology as described in the *Glaserian* and the *Straussian* versions.

3.2.2 Essential components of grounded theory research

Regardless of divergences in approaches, grounded theory research follows a number of essential methodological procedures and techniques during the simultaneous process of data collection and analysis. These techniques are: *theoretical sensitivity; constant comparative analysis; theoretical sampling; memo writing; theoretical saturation; and abstraction for theory generation*.

3.2.2.1 Theoretical sensitivity

Glaser and Straus in their original text (1967) described theoretical sensitivity as researchers' ability to be theoretically analytic about the research subject. This is primarily derived from related scientific literature as well as professional and personal experiences of the researcher about the study subject. Theoretical sensitivity of a researcher is also developed through continuous interactions with the data. Glaser (1992) described theoretical sensitivity as an essential ability of grounded theory researchers in the way to generate codes and categories from data and merge them into theoretical categories. During the interviews and analysing them, theoretical sensitivity helps researchers to recognise what is important in data and attribute theoretical meanings to it within the context of the research. Developing theoretical sensitivity about the study subjects, however, does not mean to impose any predetermined theoretical concepts on the data (Schreiber, 2001, p. 59). Rather, sensitized theoretical concepts are constantly compared with the data to move towards the construction of a theory grounded in the data. Theoretical sensitivity for the current study

was derived primarily through a review of major scholarly research of risk perception and risk communication, and public perceptions of climate change risk (see Chapter 2). In addition, researcher's personal experiences, familiarity with study location, its culture, and socio-economic characteristics also helped to develop theoretical sensitivity about the study subject, data and emerging theoretical categories. This process resulted in a loosely structured conceptual framework (see Chapter 2, Section 2.4) to guide different phases of the study, most importantly to analyse data, develop initial codes and merge them into theoretical categories.

3.2.2.2 Constant comparison

Constant comparison is one of the main features of the grounded theory research. It refers to the process of summarising, explicating and abstracting the data in the form of codes, categories and themes; and then compares them with each other (Strauss & Corbin, 1998; Birks & Mills, 2011). This process also involves comparing one case to another as well as one statement to other. Unlike other qualitative methods, the grounded theory suggests an iterative process of data collection and analysis. Accordingly, data analysis of the grounded theory research begins in the field when the very first interview is conducted. Open coding (e.g., line-by-line coding) begins the process and initial codes are assigned to data. Initial codes are then compared to the text as well as with other codes in a more focused coding process. This process results in a number of initial categories, which accordingly guide to find the next interviewees (i.e., procedure of theoretical sampling) to gather further data. In grounded theory research, the simultaneous process of data collection (finding new interviewees) and data analysis (process of coding, categorising and

abstracting them into theoretical concepts) continues until the gathered data comprehensively explain the study subjects (Dey, 2004).

As the process of constant comparison technique suggests, grounded theory is essentially an inductive research method. However, the method is not entirely based on inductive logic (Reichertz, 2007). In this approach, data analysis does not end when researcher identifies initial theoretical categories from the first set of data applying the inductive reasoning. During the phase of focused coding or second level coding, grounded theory researchers go back to the field to explore, compare, and test the initial theoretical categories with additional data. In this phase, researchers look for availability of initially identified theoretical categories in the ensuing set of data. This phase of data analysis actually uses a deductive logic. For this, some scholars (e.g., Locke, 2007; Reichertz, 2007; Richardson & Kramer, 2006; Timmermans & Tavory, 2012) described grounded theory as a method, which combined both inductive and deductive logics. This combination of inductive and deductive logics is often dubbed as "*abductive*" or the "back and forth" process of data analysis.

3.2.2.3 Theoretical sampling

The process of theoretical sampling is another technique, which distinguishes grounded theory from other types of qualitative research. Grounded theory researchers enter the research field without any pre-determined number of respondents to be recruited as samples (Dey, 2004; Charmaz, 2006). Instead, after conducting initial interviews data analysis begins, and some initial theoretical categories are identified. Researchers then look for additional interviewees to saturate the emerging theoretical

categories. At the start of data collection, theoretical sampling begins with a strategic decision about which sources are 'information-rich' to meet the analytical needs of the study (Strauss & Corbin, 1998). After analysing data from the 'information-rich' samples, researchers move to find new interviewees to compare theoretical categories and concepts, which are derived from initial data set. This process of data collection and analysis continues until the point of data and theoretical saturation is reached, that is, no new concept emerges from the data. Accordingly, the sample size of a grounded theory study is not predetermined as recruitment of interviewees changes over the course of the research. On the other hand, representativeness of samples in grounded theory research is not validated in the same way as it does in positivist research. Oktay (2012, p. 17), for example, argued that demographic characteristics of study participants in a grounded theory research might be irrelevant as researchers seek to saturate relevant theoretical concepts in the data, not the socio-demographic representativeness of the population. In this research, initial interviews were conducted with participants who were dubbed as information-rich about the study subjects (e.g. local school teacher, elderly people, and NGO worker). Then, the interviews were analysed to develop initial codes. After merging the initial codes into categories through the process of focused coding, the researcher identified a number of emerging theoretical categories (e.g., localisation of climate change risks; getting climate change knowledge from different communication sources) in the data and moved to find more interviewees to saturate these theoretical categories. Analysis of the later interviews also revealed a number of new theoretical categories.

3.2.2.4 Memo writing

Memos are the analytical notes that grounded theory researchers carry during the entire period of their research – from getting data to saturating theoretical explanations of the research problem (Glaser & Strauss, 1967; Strauss & Corbin, 1998; Charmaz 2006). In other words, memos are analytical explanations of the codes that are derived from the data (Bryant & Charmaz, 2007; Cooney, 2011). This is suggested in the literature of grounded theory research that researchers should keep notes on their analytical thoughts about the codes and emerging categories. As such, memos could be also described as the record of thoughts and ideas, which help researchers not only to develop codes and categories but also to find relations among them. Metaphorically, we can describe memo writing as the dialogue between the researcher and the data. In this study, memos were written continuously throughout the data analysis process to explore, explicate and theorise emergent patterns of the codes and categories. In fact, it was the integration of these abstract analyses in the memos that led to the theoretical explanation of public perception and communication of climate change risks. Apart from writing analytical memos of the data, this research kept detailed field notes while conducting interviews.

3.2.2.5 Theoretical saturation and theory development

In grounded theory research, techniques of constant comparative analysis of data, memo writing and theoretical sampling continue until theoretical saturation is achieved. Theoretical saturation means no further theoretical variation in a theoretical category emerges from the data being analysed (Charmaz, 2009). This is important to note that saturation of all theoretical categories is not the goal of grounded theory research. Instead, researchers seek to reach a point of saturation of the 'core categories'

(Charmaz, 2009). After identifying the initial codes, researchers conduct focused coding to merge initial codes into theoretical categories. Then, theoretical categories are compared with each other to find mutual inclusiveness and to condense them into a number of core categories. These core categories usually explain the research problems and at this point of saturation, grounded theory researchers have been suggested to stop getting new data and analysis. In this research, data collection and analysis ceased once the core categories of "perception" and "communication" were saturated with theoretical categories and codes in the data. In categorising both "perception" and "communication", it was found that localisation (e.g., local hazard culture; and local communication environment) explained much of public perception and communication of climate change risks. Once, this link was established in the data and there was no emerging theoretical category, this researcher ceased the process of data collection and analysis, and moved to draw a theoretical abstraction of the research problem.

3.3 DATA COLLECTION

3.3.1 Timeline of field research

There were three defined periods of data collection in this research project, which spanned from the end of 2010 to the middle of 2013. The first phase of data collection with simultaneous analysis began in December 2010 and ended in January 2011. The second phase of data collection was in between December 2011 and March 2012. The third phase spanned from June to August 2013, and during this time, the present study mainly validated the data and preliminary findings through member checking with a section of previously interviewed respondents.

3.3.2 Sample

The main data source for this study was participants' interviews, which was supplemented by field observations and notes. Sampling techniques involved two levels – at first, study locations were selected from the coastal region of Bangladesh, and then participants were recruited following the theoretical sampling strategy as suggested in grounded theory research. Descriptions of these two levels of sampling process and techniques are given below.

3.3.2.1 Selection of study location

The study area was selected from Satkhira, a south-western coastal district in Bangladesh, considering its geographical location, regional geo-hazard profile, and vulnerability to possible impacts of climate change. In particular, this study was conducted in two adjacent *Unions*[4] namely *Gabura* and *Padmapukur* in Shyamnagar *Upazila* (sub-district) of Satkhira district (*see Figure 3.1 and 3.2*). Both *Unions* shared similar characteristics in terms of socio-economic conditions of inhabitants, rural livelihood patterns, occupations, and vulnerability to natural hazards. The study locations were around 350 kilometres away from the capital city Dhaka and 30 kilometres away from the nearest higher administrative unit called Shyamnagar *Upazila* centre. The two *Unions* had a population of around 78,000. An overall picture of the study location showed that the villages were separated from mainland by rings of rivers, a common geographical characteristic in the lower Ganges delta and the mangrove forest area. Like other coastal regions, the villages were characterised by low-lying lands

[4] Union Council is the lowest tier of local government system in Bangladesh. At present there are 4,480 Union councils, which are run by directly elected representatives. Each Union Council is consisted of one chairman, nine members and three women members.

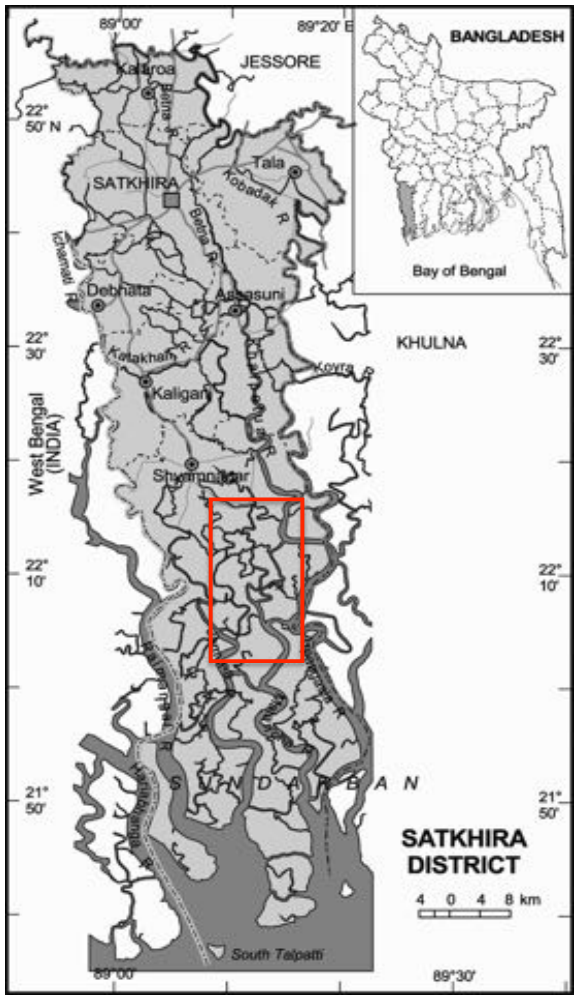

Figure 3.1

Figure 3.2

Figure 3.1 shows the study location in the map of Bangladesh and *Satkhira* district.

Figure 3.2 illustrates a detailed map of the selected villages (see the red marks) where the study was conducted. Source of the maps: *Banglapedia*. Retrieved from http://en.banglapedia.org/index.php?title=Main_Page

protected by mud-built embankments (*see Figure 3.3*). Geographically, the villages were considered the last inhabited areas before the world's largest mangrove forest the *Sundarbans* begins. Overall, the study locations symbolised human's struggles against nature and predators of the *Sundarbans*. Inhabitants of the area struggled with tigers and crocodiles in claiming resources of the mangrove forest while regularly exposed to natural hazards such as storms, storm surges and intrusion of saline water. The most notorious storms in the area were recorded in 1970, 1985, 1988, 1991, 2007 and 2009. Saline water intrusion from nearby rivers was a regular hazard for the villagers. Local inhabitants experienced a devastating storm in May 2009. Impacts of the storm were visible in the villages during the field visits, yet after one and half year of the storm. Most people in the study locations lived in houses made of mud walls, bamboo and thatch, or roofs made of corrugated tins and thatches (*see Figure 3.4*). But, a few affluent members of the communities lived in houses made of bricks and corrugated tins, locally known as *semi-pukka*. Shops in nearby commercial marketplaces, community buildings (e.g., schools, mosques, cyclone centres) were generally made of bricks and concretes, or sometimes *semi-pukka*.

As for livelihood, people of the area traditionally depended on rice cultivation, resources of the *Sundarbans* and rivers (e.g., fishes, crabs, honey and wood). However, in the last two decades, most of the agricultural lands were transformed into shrimp enclosures because of high profit as compared to cultivating rice (*see Figure 3.5*). It was clear that people's livelihood dependency was changed to farming shrimps in former croplands, and shrimp became one of the main export products of Bangladesh. There was no major industry except a couple of brick kilns in

Figure 3.3: A mud-built dike to protect the villages from intrusion of saline water during the times of high tides and storm surges (researcher's own photo).

Figure 3.4: A common house structure made of local materials in *Gabura* village. A solar panel is visible on top of the thatched-roof (researcher's own photo).

nearby areas. As many shrimp enclosures, locally known as *gher*, were damaged in the 2009 storm, most people were either unemployed or worked as day-labourer. Mud works to rebuild the damaged dikes, financed by government and different aid agencies, were the main jobs for day labourers. Teachers at local schools and field workers of NGOs were the only jobs for educated people. During the field visits, some women were seen working alongside their husbands either in the fields or rivers. The general educational situation was no different from other rural areas of Bangladesh. The literacy rate was 49 per cent[5]. There were a number of primary schools, a couple of secondary schools and *madrasas* (Islamic religious schools) in the villages. Table 3.1 illustrates general socio-demographic characteristics of the study location.

Total area	1968.23 sq. km.
Land area	429.43 sq. km.
Reserved forest	1534.88 sq. km.
Population	318,254
Sex ratio (M/F)	93
Average household size	4.39
Literacy rate	Average: 48.6 Male: 55.3 % Female: 43.9%

Table 3.2: Socio-demographic data of Shyamnagar sub-district. Source: District Statistics 2011, Bangladesh Bureau of Statistics (BBS).

[5] Data of literacy rate was available only at the Upazila level. According to the Bangladesh Bureau of Statistics, BBS (2011), male literacy rate in Shyamnagar was 55 per cent and female literacy rate was 44 per cent.

Figure 3.5: Paddy fields are turned into saline water shrimp enclosures (researcher's own photo).

In general, the villages were poverty stricken like many other coastal areas of Bangladesh. This was also characterised by a lack of infrastructure and poor health and education facilities. The roads were mostly muddy, and people mainly depended on boats, and engine or paddle-run three-wheelers in the absence of proper transportation facilities. The villages were not connected to the national power-grid line of Bangladesh, thus depriving them of getting mainline electricity. However, it was interesting to observe that many houses were equipped with solar panels for electricity. The comparatively high-cost solar panels were purchased with micro-credits from the NGOs. *Grameen Shakti*, an enterprise of the Grameen Bank, provided solar panels to the villagers on credits. The presence of solar panels on the thatched-roof houses (see Figure 3.4) was quite contrasting if one considered general socio-economic conditions of the area. It seemed that people in these villages were living in

different ages. In one hand, people were deprived of basic livelihood facilities and depended largely on century-old traditional knowledge to gather resources from nature to sustain the livelihood. On the other, they used renewable power at homes. Another noticeable presence of new technology in the areas was mobile phones. It was almost omnipresent in every household. All the interviewees had at least one mobile phone set. Of the other media, television was available only at the households, which could afford high costs of buying television sets.

There were a number of marketplaces where people gathered to buy and sell essential commodities as well as to meet other people. Marketplaces, particularly their tea stalls, provided people with an opportunity to meet and talk as well as to consume media contents, for example watching television. These places usually turned into vibrant social gathering centres from late afternoon to late in the evening when people (mainly men) after finishing daily works meet, chat, discuss, and consume television and radio programmes. Like other parts of the country, most of the people in the area were Muslims in religion. In the study villages, religion appeared to be an important part of local life with the visible presence of mosques and *Madrasas* (Islamic schools).

In the study locations, NGOs were found important providers of services ranged from disaster management to health, education, agriculture and banking facilities. Major NGOs of the country such as BRAC[6] and Grameen Bank[7] had activities in the villages, which included poverty reduction programmes mostly through microcredit schemes and post

[6] BRAC was founded in 1972 as Bangladesh Rehabilitation Assistance Committee and later renamed as Bangladesh Rural Advancement Committee.

[7] The name *Grameen* is derived from the word *gram,* which means "rural" or "village".

disaster rehabilitation programmes. As this research found NGOs as important agents of providing services in the study location, a general overview of NGOs in Bangladesh was necessary to contextualise scopes and influences of these organisations in rural livelihood.

Many of the major NGOs began activities after the independence of Bangladesh in the early 1970s to support relief and rehabilitation programmes following a number of natural hazards. Later, the organisations expanded activities to education, health, banking, and small enterprises through grass root initiatives. Two factors contributed unparalleled growth of the NGO sector in Bangladesh – first, the presence of mass poverty; and second, the absence of good governance by the state (Lewis, 2011, p. 135). NGOs addressed these gaps introducing a number of creative programmes (e.g., microcredit schemes, providing renewable energy, and low-cost health and education facilities) targeting the poor, particularly the women. Around 22,000 to 24,000 NGOs were registered with the government's NGO Affairs Bureau and the Department of Social Welfare (Zohir, 2004). Two largest NGOs, BRAC and the Grameen Bank, deserved a reference to illustrate importance and scope of NGOs' presence in rural Bangladesh. Founded in 1972, BRAC is the largest NGO in the world employing more than 100,000 people and roughly 70 per cent of them are women. It has activities in 14 countries in Asia and Africa. At the beginning, BRAC initiated its programmes with foreign financial assistances, but now 70 to 80 per cent of its programmes are self-funded when it has expanded businesses through commercial enterprises, such as dairy and food project, commercial bank, and handicraft stores. As of December 2014, BRAC's total annual expenditure was US$ 932.4 million

while it had 111,000 trained community health workers and 45,000 non-formal schools in rural areas[8].

Grameen Bank was founded in 1976 and it won Nobel Peace Prize in 2006 as recognition of its contribution to eradicating poverty through microfinance schemes. In 2010, the Grameen Bank had total revenue of US$ 176.67 million, and net income of US$ 10.76 million[9]. The organisation employs more than 22,000 people and most of them are women. Grameen Bank is one of the pioneering organisations to bring telecom services to the rural women by introducing the village phone programmes. By 2004, Grameen Bank provided phones in some 28,000 villages in Bangladesh when services of mobile phones were still limited mostly in urban areas. Like the BRAC, Grameen Bank also expanded its business activities to telecommunications, textile and garments factories, solar energy, fisheries, and information technology (IT). Grameen Bank's subsidiary *Grameen Telecom* own 34.2 per cent of the shares of Bangladesh's largest mobile phone operator, named Grameen Phone.

Brief profiles of these two NGOs clearly indicate that traditional roles of NGOs as small civil society organisations have been transformed in Bangladesh. Many of them go beyond their conventional strengths and roles; and have emerged as important social actors (Shah, Wodon, & Ravallion, 1999, p. 43). In some cases, several of the large NGOs offer services that are superior to the services provided by the government. For example, BRAC's non-formal primary education programme operates around 45,000 schools enrolling more than one million students in rural

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[8] These data were taken from the official website of the Brac at http://www.brac.net/partnership?view=page

[9] Data about Grameen Bank was derived from its official website at http://www.grameen-info.org/monthly-reports/

Bangladesh. While, the total number of primary schools run by the government is around 38,000.

3.3.2.2 Selection of study participants

Techniques of theoretical sampling, as described in the previous section, were maintained in this study to recruit interview participants. Initially, this researcher approached the people for interviews who had comparatively more experiences (information-rich) of the social phenomena under study. A local guide, who was working as a journalist in a local newspaper, assisted the researcher to find and organise the initial interviews. Thus, first five interviewees included a school teacher (male), a Union Council member (male), a shop keeper (male), an NGO field worker (female) and an elderly person (male). These interviews were semi-transcribed during the researcher's stay in the field and data analysis began. Initial data analysis resulted in a number of open codes from the data. The codes were compared with each other and then they were merged into initial theoretical categories. This process helped to see the trend of emerging theoretical categories, which could explain pattern of public perception and communication of climate change risks. Once a general trajectory (identifying initial theoretical categories) was identified from the initial data, the sampling technique had been changed. In this phase, the technique of theoretical sampling was applied to saturate the missing lines of the identified theoretical categories with additional data. New interviewees were recruited to fill in the gaps in the emerging theoretical categories. Emerging categories and researcher's increased understanding of the social phenomena directed the process of selecting new interviewees

in this phase. In addition, previously interviewed persons helped to find subsequent interviewees for the study.

The first phase of field study ended after conducting 24 interviews (see Table 3.3) with an assumption that the collected data had saturated the emerging theory. However, a more in-depth and focused analysis resulted in a number of data gaps to explain the core categories of risk perception and communication. For example, analysis (focused coding) of first set of data revealed "newly acquired adaptation knowledge" as important category to explain people's perception about solutions to climate change risks at local level. However, there was not enough data to explain this category, particularly types of newly acquired knowledge, their sources, and how these newly acquired knowledge were transmitted to the community members. Similarly, analysis of some of the interviews conducted during the first field study identified recent "experience" of hazard events (e.g., storms and surges) as important determinant to show high concern about climate change risks. A related question emerged whether respondents' concern of climate change had declined over time. It was important to note that the first set of interviews was conducted one and half year after the storm *Aila* devastated the area and the people were still struggling with its impacts. With this in mind, a second set of interviews was conducted in 2012 (after three years of the storm) to see how public concern of climate change was changed over a period of time. In addition, in the first set of interviews it had been found that there were little differences between male and female respondents in terms of their familiarity of climate change topics and perceived concerns. This was somehow contradictory as the data revealed limited access of climate change information for women through mass media. However, a couple of

Field Study 1 Data collection period: December 2010 to January 2011					
Code	**Name (pseudonym)**	**Gender**	**Age**	**Education**	**Occupation**
BD01	M Abul Bashar*	M	36	M.A.	School teacher
BD02	GM Rafiqul Islam*	M	41	12th grade	UP member
BD03	Liakot Gazi	M	38	4th grade	Shop-keeper
BD04	Shaheena Akhter	F	38	MA	NGO worker
BD05	Abul Hossain Mollah	M	70	8th grade	Retired
BD06	Rashida Begum	F	50	Functional literacy	Housewife
BD07	Golam Mustafa Gazi	M	53	Illiterate	Honey hunter
BD08	Lutfunnesa	F	35	9th grade	Housewife
BD09	Nipendranath Mondol	M	45	12th grade	Crab farmer
BD10	Jeher Ali Mirza	M	55	Illiterate	Crab farmer
BD11	Abdus Samad Azad	M	39	8th grade	Village police member
BD12	Hajera Akhter*	F	50	Illiterate	Housewife
BD13	Mohaseskh Sardar	M	44	Illiterate	Shrimp & agriculture
BD14	Mohsin Alam	M	31	M.A.	NGO worker
BD15	Khairul Alam	M	36	B.A.	NGO worker
BD16	Maloti Mondol	F	42	Illiterate	Housewife/crab farmer
BD17	Gazi Mohhamad Ayub	M	32	9th Grade	Unemployed
BD18	Babul Gazi	M	25	6th grade	Fishing & forestry
BD19	Moksed Ali	M	64	Illiterate	Unemployed
BD20	SM Yunus Ali*	M	55	Illiterate	Shrimp farmer
BD21	Sharbanu Khatun*	F	30	5th grade	Day labourer
BD22	Sonaban	F	25	Illiterate	Housewife
BD23	Mohammad Fuad	M	35	7th grade	Day labourer
BD24	Avinash Mondol	M	42	3rd grade	Shrimp farmer

*Participants joined for member-checking meeting during the third phase of field study in June-August 2013.

Table 3.3: Sample characteristics of the first phase of data collection.

female interviewees hinted NGOs as sources of their climate change knowledge during the first phase of the field study. Accordingly, in the second phase, particular emphasis was given on the data to see whether

other women had similar experiences in getting climate change knowledge from NGOs, and how these NGOs communicated the issue to the people. In the second phase, another 14 interviews were conducted (see Table 3.4), and all together 38 people were interviewed for the study. Of them, 12 were female interviewees.

Field Study 2 **Data collection period: December 2011 to March 2012**					
Code	**Name (pseudonym)**	**Gender**	**Age**	**Education**	**Occupation**
BD25	Abdul Hannan	M	31	BA	School teacher
BD26	Amzad Hossain	M	42	Functional literacy	Day labourer
BD27	Ashish Kumar Mondol	M	48	Illiterate	Shrimp farmer
BD28	Jasim Uddin	M	24	10th grade	Unemployed
BD29	Sabina Akhter	F	25	6th grade	Housewife
BD30	Jaheda Akhter	F	40	Illiterate	Housewife
BD31	Momtaj Begum	F	30	Illiterate	Fishing
BD32	Nurul Alam*	M	42	2nd grade	Shrimp farmer
BD33	Gazi Nur Uddin	M	45	Functional literacy	Fishing and forestry
BD34	Shomsher Ali	M	33	Illiterate	Boatman
BD35	Shahida Begum*	F	35	12th grade	NGO worker
BD36	Borhan Uddin*	M	31	5th grade	Shrimp farmer
BD37	Khadiza Banu	F	45	Functional literacy	Housewife
BD38	Shahidul Islam	M	40	7th grade	Shop-owner

*Participants joined for member-checking meeting during the third phase of field study in June-August 2013.

Table 3.4: Sample characteristics of second phase of data collection.

In approaching potential interviewees, the researcher explained the research purpose and confidentiality issue, and asked them to sign a consent form (*see Appendix A*). As many interviewees were illiterate or little education to read and understand the consent form, consent conditions

were read out to them and their consents were recorded in a tape recorder. It had been also explained to the respondents that their participation would be voluntary and anonymous. Then, they were asked if they would be willing to provide approximately one hour to participate in a study about hazard management. This research intentionally avoided the terms related to climate change and global warming in the interview consent form to avoid any social desirability. The researcher didn't want to impose climate change issues on discussion about local geo-hazards. Instead, it was planned to see whether study participants bring the issues of climate change while talking about local geo-hazards. No remuneration was offered to the interview participants. However, the researcher paid the bills of snacks and tea while interviewing some participants at local tea-stalls.

3.3.3 Establishing rapport

This researcher had a pre-existing familiarity with linguistic and socio-economic characteristics of rural Bangladesh. That is, researcher's cultural knowledge of the environment, along with his verbal repertoire both in standard Bangla and the local dialects helped him to communicate with the community members easily. As for building rapport with the participants, this is important to note that in the first phase of data collection, it was observed that some respondents were hesitant in revealing their knowledge of climate change and related risks with the assumption that they might be wrong. It was then explained to the participants that it was their views, which was important regardless of whether they were correct or false. The researcher's position as an urban elite (being a university researcher) seemed to be a barrier to engage with some of the participants in the beginning. However, such barriers were reduced as the

research phase advanced with more involvement with the participants and their daily activities, such as taking food and tea together.

3.3.4 Research instruments

A flexible interview guide was used to conduct the interviews (*see Appendix B*). This guide was mainly to help the researcher to keep track of the conversation within the research focus, but not to influence direction, content and quality of the conversation. The order of the most questions was flexible and depended on the flow of the interviews. The interview guide was a 'living document' because the initial guide was modified to include emerging categories from early interviews and also to adapt with situational contexts of the respondents. Additional probes and supplementary questions were used during the interviews for detailed description or explanation of certain topics or experiences. At the end of each interview, a demographic data questionnaire form (*Appendix C*) was used to collect demographic information of the participants.

3.3.5 Interview settings and sessions

Most of the interviews took place at the participants' place of living, such as their homes. In some cases, interviews were conducted at public places, which included local bazars (marketplaces), tea-stalls, school premises, ferry-*ghat*[10], and in front of a mosque. This type of natural setting allowed for observation of the study location as well as dynamic social relations of the participants at the community level. As for conducting interviews in public places, it was observed how importantly these places were integrated into local livelihood practices as being the centres of meeting other people and transferring information from each other. In other

[10] Places to transport people across the river usually by boats.

words, such local public places act as information hubs for the community lives.

The process of conducting interviews was dialogic in nature. In general, interviews started in a very open manner – mainly talking about participants' everyday lives and local hazards, and then asking about their personal experiences during the events of cyclones that they had experienced most recently. This helped the researcher to establish a rapport, and from respondents' ends, these issues were comparatively easier to talk about. Then, the conversation went on with a strong focus on the participants' knowledge, attitude and behaviour, and management of risks in relation to dealing with the events of local hazards. The researcher did not pose any direct question about climate change, or its possible links to natural hazards to avoid any imposition from the researcher's end. Rather, in most cases respondents volunteered to talk about climate change while diverging their perceptions of local geo-hazards. Thereafter, interviews focused on respondents' understanding of different aspects climate change issues and the sources of their perceived understandings. However, in a couple of cases the researcher brought the issues of climate change in the discussion by asking questions like - *"Have you heard about climate change or global warming?"* This was done when respondents did not refer to climate change or global warming issues yet after certain time of the conversation. During the entire process of conducting the interviews the researcher and a female research assistant[11], who conducted three interviews with women participants, were aware of not to influence the

[11] During the second phase of data collection, a female research assistant helped to conduct three interviews of female participants because they were not comfortable in discussing climate change perception with a male researcher. The female research assistant was duly briefed about the purpose of the research and basic tenets of the grounded theory study.

content and flow of conversations. It was not the point of view of the researcher, but perspectives of the participants that guided the interviews. For instance, the researcher did not intervene even though some of the respondents were giving erroneous statements about causes of global warming (i.e., greenhouses and nuclear power plants in developed countries). The interviewer's role was to guide the conversation on the topic of the study. Probe questions, such as *'Can you tell me in detail?' 'Can you give me an example?'* were asked only for explanation of any concept or incident. The overall process helped the researcher to elicit statements and stories from the participants' point of views.

Observation of participants and the study location was an important type of data in this study. During each field visit, field notes were taken before and after each interview. Field notes and memos also contained a description of the area, details of the socio-economic features, and any important comments or actions made during the interviews. As the initial data analysis revealed local public places such as *bazars* and tea-stalls as important meeting places for local people, this study made several observations in local bazars to see patterns and structures of such gatherings.

3.3.6 Data preparation and storage for analysis

All the interviews were conducted face-to-face in local language (Bangla) and recorded in a digital audio recorder with prior permission of the respondents. Then, the initial interviews were transcribed, with coding and analysis initiated with the first interviews, in accordance with techniques of the grounded theory methodology. This study adopted a method of quick coding for the initial interviews in the field for pragmatic

reasons. It was not possible to transcribe and code all the interviews because of limited time in the field. Only the first four interviews were semi-transcribed in the original language (Bangla) and coded while the researcher was in the first field trip. This helped the researcher to update the interview guide, finding new respondents, and identify the emerging core categories from the data. Other interviews, conducted during the second field visits, were also transcribed in Bangla with the help of a research assistant (*see Appendix D*, an example of interview transcript with assigned initial codes). The entire data analysis was conducted in original Bangla transcription of the interviews for specific reasons. Merriam and Tisdell (2015) suggested two strategies of data analysis when researchers collected data in a language other than English (or the language of their research institution). The first strategy suggested to prepare transcripts in the original language and to make verbatim translations into English for data analysis. The second strategy asked for data analysis in original language and then to translate the findings and supporting evidences (excerpts of the interviews) into English. This research took the second strategy to avoid any distortion of data due to translation into English. Bazeley (2013) made similar suggestions, pointing to the dangers of distorting meanings in the process of data translation. Taking Bazeley's (2013) suggestion into consideration, this research also argued that some nuances of one language were never possible to adequately translate into another. However, in presenting study findings this research translated some selected excerpts of the interviews and related codes into English. In the excerpts when the exact English terms were unavailable, this research used the original Bangla word or phrase in the text, with a footnote or parenthesised explanation of the terms.

3.4 DATA ANALYSIS

3.4.1 The coding process: *initial and focused coding*

Grounded theory methodology proposes an iterative process of data analysis[12], which involves simultaneous data collection, analysis and gathering further data to saturate core theoretical categories. Yet, in the literature we find a wide range of divergences about how this iterative process of data collection and analysis should be conducted (Walker & Myrick, 2006). For the current research, a decision was taken to follow Charmaz's (2006, 2009) suggestions about data analysis in constructive grounded theory approach. Charmaz divided the data analysis process into two main phases – initial coding and focused coding[13]. These two coding processes lead the researcher to the theoretical abstraction of the social phenomena under study, that is, to integrate the core theoretical categories in their relationships. This is often described as the third phase of coding which helps to identify relationships among the substantial theoretical categories, and also to construct theoretical explanations of the study subject. The entire research procedure, including the processes of data collection and analysis, is illustrated in Figure 3.6.

Initial coding is defined as the closed reading of the data and usually involves labelling each word, line (often sentence) or segment of the data (paragraph). In this phase, interview transcripts are read and analysed applying the constant comparative techniques. Charmaz (2009)

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[12] This is important to clarify that following the basic tenets of grounded theory methodology, this research did not use any pre-defined coding manual or codebook for data analysis. This is actually one of the basic differences between qualitative content analysis and analysis of data in grounded theory research.

[13] Coding is defined as the process of attaching conceptual labels to data. In this research, these labels are called codes or concepts. While categories are higher order concepts, which are generated after merging similar first order (initial) concepts or codes. Categories contain more explanatory power as compared to initial codes. Integration of (core) categories usually leads to a theoretical explanation of the social phenomena under study.

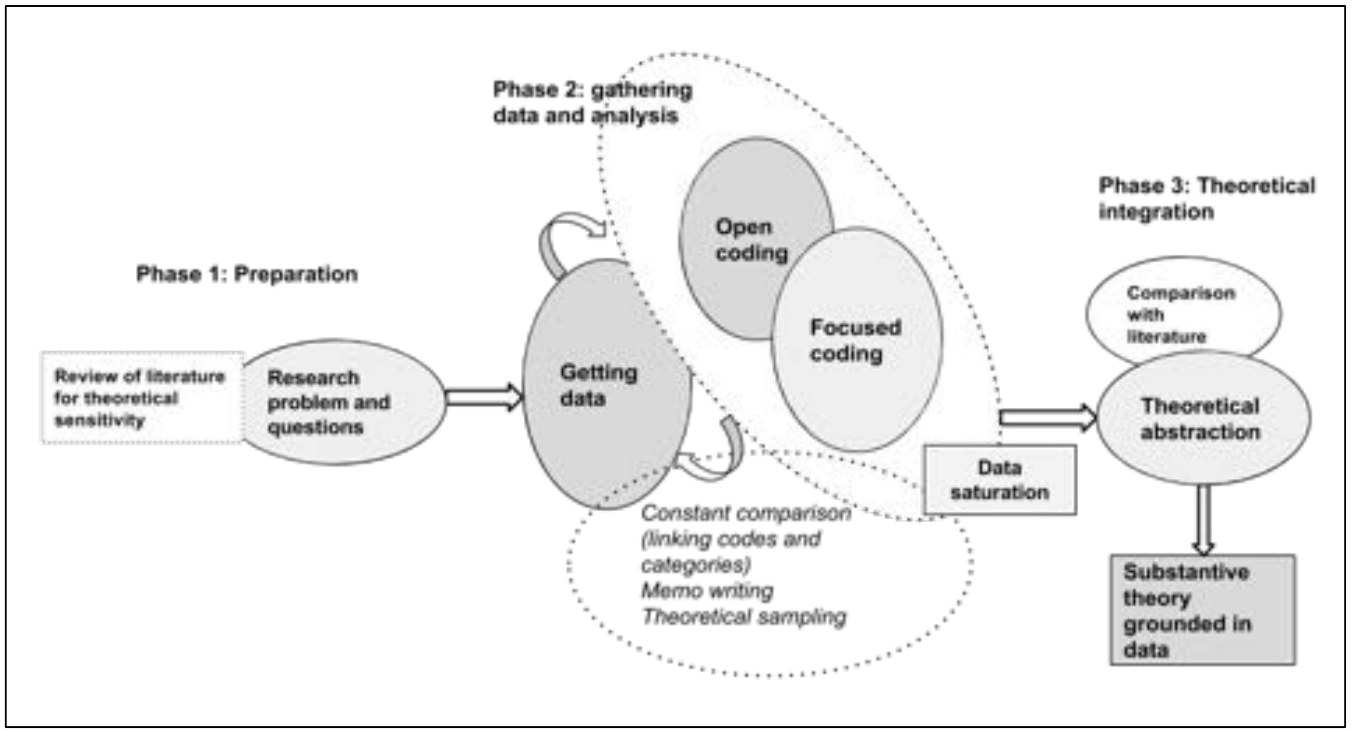

Figure 3.6: This model illustrates the overall research procedures (researcher's own model) in three main phases. Phase 1 or preparation stage involved review of existing scientific literature, finding research problems, and setting research objectives. This phase helped to develop researcher's theoretical sensitivity about the study topic. In phase 2, data collection and analysis went on simultaneously following the basic tenets of the grounded theory research methodology. In this phase, initial codes from the interview data were merged together and collapsed into theoretical categories. In phase 3, identified core categories were compared with each other as well as will existing literature to draw a theoretical abstraction of the social phenomena under study. In this phase, a substantive theory was developed to explain trend and patterns of public perception and communication of climate change risk in the coastal region of Bangladesh.

defined constant comparative techniques as the process of comparing data both within and between the interviews, and giving initial codes that described substance of the data. During this time, the researcher remained open to all possible theoretical directions indicated by the readings of the data. The unit of coding of the current study was line-by-line (later it was changed to focus on segment of the paragraphs) analysis of the interview transcripts by giving short labels of each segment and writing analytical memos (notes) in the margin of the transcripts. This research used the traditional paper-and-pencil method for coding. Interview transcripts were printed out with wide right margin for writing codes and analytical memos. An example of developing initial codes from the interview transcript is given in Figure 3.7. As the initial codes were developed, they were compared with each other and then condensed into theoretical categories. These theoretical categories gave analytical direction to the data during the second phase of data analysis – focused coding.

Focused coding began once a general analytical trajectory was identified in the initial codes. In this phase, initial codes were compared to find mutual exclusiveness and to reduce them into only those that have analytical values (Charmaz, 2006, 2009; Stern, 1985). Accordingly, coding of this phase was more directed, selective and conceptual. These are the 'selective' codes with much explanatory power as compared to the codes developed in the initial coding. Charmaz (2009, p. 57) described this phase as the process of identifying frequent initial codes and filter through large amount of data with those codes. This phase of data analysis followed the deductive logic. Thus, the focused coding of this research only emphasised the data, which were related to respondents' knowledge of climate change

Respondent: There is fresh water and it's not too far from here. It's only few kilometres away and you will get fresh water there through tube wells. I heard that some organizations [NGOs] are supplying fresh water through pipelines in a village. [I] don't know exactly which one, but they are supplying water. So, I think it's possible to supply that fresh water to our area as well through pipelines. Its not too far... only 6 – 7 kilometres. This is the main problem right now for us. I mean scarcity of fresh water. If we can do it, I think the problems will be resolved soon. We need external help for that. It's not possible by us.	NGOS ARE SUPPLYING FRESH WATER; CRISIS OF FRESH WATER IS THE MAJOR PROBLEM; SEEKING EXTERNAL HELP;
Interviewer: Well, you have also mentioned something like risks of natural hazards here in Gabura. For example, you said it's very risky to do agriculture because of floods and cyclones. Could you please tell me more about these issues?	
Respondent: Yes, it's always uncertain to grow rice or to do some kind of agricultural production. I mean shrimp farming is also risky as it could also be washed away by storm surges. As we are living close to rivers natural disaster can happen anytime. It's occurring every year – either flood or storms. It was also in the past, but now the trends are increasing. Risks of natural hazards are increasing because of climate change. We don't know what will come after Sidr and Aila. Three years have passed since the last one and I guess next one is not too far.	DESCRIBING UNCERTAINTY OF AGRICULTURE; AWARENESS OF LIVING IN HAZARD PRONE AREA; CLIMATE CHANGE INCREASES RISK OF NATURAL HAZARDS; STORMS ARE LINKED TO CLIMATE CHANGE;
Interviewer: You were referring to climate change. I assume you heard about this. Could you please tell me what do you know about climate change?	
Respondent: Hmmm... Yes, we heard a lot. [We are] hearing that climate is changing. We are not responsible for it, but the foreigners. It's their (foreigners) responsibility... [We are] hearing this. Climate change is happening. We are witnessing weather variances. For example, lack of rain during the monsoon and heavy rainfall in dry season. These are because of climate change. We are hearing these things. ***Interviewer:*** When did you first hear about this?	HEARD A LOT ABOUT CLIMATE CHANGE; FOREIGNERS ARE RESPONSIBLE; CLIMATE CHANGE IS HAPPENING; WEATHER VARIANCES AS EVIDENCES OF CLIMATE CHANGE;
Respondent: It's a long time that we are hearing about climate change. At least 10 years or so... climate change and season change. That is, season is changing because of climate change. ***Interviewer:*** Anything else that you know about climate change?	HEARING ABOUT CC FOR A LONG TIME; SEASONAL VARIANCES ARE LINKED TO CLIMATE CHANGE;
Respondent: It's difficult to explain, but as I said we do hear a lot about climate change nowadays, specially after Aila and Sidr. I mean I have been hearing about climate change for a long time, but we now are hearing the word more frequently. We didn't experience storms so frequently in the past. It's happening now what we heard about impacts of climate change. Climate change is bringing more storms and	DIFFICULTY IN EXPLAINING; HEARING MORE ABOUT CC AFTER THE STORMS; STORMS WERE NOT SO FREQUENT IN THE PAST; CLIMATE CHANGE IS

Figure 3.7: Example of interview transcript and initial coding. Reproduced from original Bangla transcript (Interviewee code: BD13, p. 8.)

risk, and sources of their knowledge. During this phase, the researcher interviewed new respondents to find detailed explanation of the emerging theoretical categories. For example, 'localising climate change impacts' emerged as an important theoretical category in the data when initial codes, such as 'place of living', 'living inside dikes', 'living outside dikes', 'structure of houses', 'local geo-hazards', 'living close to rivers', 'living in a cyclone-prone area' and 'victims of climate change' were merged together. As the data analysis continued, this research wrote an analytical memo (note) that respondents' physical location or physical and psychological proximity to geo-hazards (i.e., experiences and memories of extreme weather events) largely explained their perceptions about impacts of climate change.

3.4.2 Theoretical coding: abstraction and theory development

In constructivist grounded theory research, Charmaz (2006, 2012) suggests a third level coding – theoretical abstraction of the core categories. In this phase, theoretical categories were compared with each other to see their relationships as the hypothesis about emerging theory of the studied social phenomena began to develop. As such, selective theoretical categories were merged into core categories and attempts were made to integrate relationships of the main constructs in the core theoretical categories into a framework for the development of the grounded theory. Sorting of analytical memos, which were written during the phases of initial and focused coding, helped to formulate an abstract theoretical narrative about the data that ultimately led to the development of the grounded theory about public perceptions and communication of climate change risks. An example would clarify this process of integrating core

categories into the abstract theoretical concept. In the data, "regional geo-hazards are linked to climate change" was emerged as a theoretical category after merging the initial codes which included 'unprecedented storms', 'frequent storms', 'increased storms', 'salinity in water and soil', 'tidal surges', and 'drowning in the sea'. This theoretical category was compared with other related categories such as "localising climate change impacts" and "hazards of unsustainable development are linked to climate change". A comparison of core constructs of these categories led to identifying a core category – "climate change as local hazards". Accordingly, hazard culture emerged as an important theoretical construct in the emerging grounded theory when lay people embedded meanings mainly derived from local hazard culture in perceiving risks of global climate change. Examples of theoretical abstraction are given in describing findings of this research (see Chapter 4).

3.5 TRUSTWORTHINESS OF THE RESEARCH

Trustworthiness of a research is evaluated on the basis of validity and reliability of the data, and their analytical procedures. The validity of a study is measured by examining whether it has investigated the subject that it was supposed to investigate (Creswell, 2015). While, reliability refers to the extent to which research findings can be replicated (Merriam 2009, p. 220). These two concepts to evaluate rigors of a study have their origin in positivist research. Hence, many qualitative researchers suggest that validity and reliability of a qualitative study should not be measured using the measurement tools of a quantitative study. Rather, qualitative studies should follow their own rigors for the trustworthiness of the research (Golafshani, 2003; Maxwell, 1992; Morse, Barrett, Mayan, Olson, &

Spiers, 2002). In the current research, the following techniques were applied for validity and reliability of the data.

3.5.1 Prolonged engagement and persistent observation in the field

Prolonged engagement and persistent observation in the field are highly suggested techniques of data validation in qualitative research (Creswell, 2007, p. 209). This researcher conducted three field visits in the study locations to build rapport with the participants, gather data and understand local socio-cultural and geo-physical conditions. Prolonged engagement helped the researcher to reduce cultural gaps in discussing the research topic and check any invalid data originating because of misunderstanding between the researcher and study participants. As part of the process, detailed observational notes were written about study participants and their surroundings, which later helped in analysing the data interviews. One experience of the researcher during the time of data collection could be cited here when the researcher needed to employ a female investigator to interview some female study participants. During the second phase of data collection, it was found that some female respondents were considerably reserved or showing uneasiness in discussing the research topics with the researcher. It was observed that as the researcher was a 'male' person, some female participants were in an uneasy situation in discussing the research topic. Such uneasiness was justified considering the patriarchal social system in the rural areas where many women rarely communicate with outsider male persons. After identifying this uneasiness, a female investigator was employed to interview them. Here, data collection was validated through researcher's responsiveness to the situation and triangulating different investigators.

3.5.2 Thick description

Thick description is one of the most commonly suggested techniques for the validity of data in qualitative research. Stenbacka (2001) indeed asserts that good quality qualitative research "stems from a thorough description of the whole process, enabling conditional intersubjectivity" (p. 552). This refers to researcher's task of both describing and interpreting observed social action or behaviour within its particular context (Ponterotto, 2006). In this research, efforts were taken to provide a detailed description of every decision regarding methodological choices, data collection, analysis, verbatim narratives of interview data, and descriptions of emerging theoretical categories and integrating them into core categories. This is expected that these descriptions would allow other researchers to make decisions regarding replicability of the method of the current research.

3.5.3 Avoiding social desirability

Social desirability is an attempt by the study participants to exhibit the "correct" or expected behaviour, without revealing true feelings" (Rubin & Babbie, 2009, p. 80). In such cases, study participants are tended "to misrepresent their opinions in the direction of answers consistent with prevailing social norms" (Polit & Beck, 2008, p. 766). Both in qualitative and quantitative research, social desirability may substantially influence the quality of collected data and subsequent analysis. As for the current research, particular attention was given during the time of data collection to minimise effects of social desirability. Questions to the respondents were open and neutral so that they could reveal their perspectives on the topics. Building rapport with study participants and ensuring them their identity would be kept completely confidential were other strategies of reducing

social desirability. It was also explained to the respondents that there was no correct or wrong answer to the issues they were discussing.

In few instances, one concern became apparent when a couple of respondents started to talk about impacts of climate change in their locality although the researcher's questions were about their livelihood patterns. The researcher sensed a sense of 'social desirability' and later found that the local research guide had briefed the potential participants that they might be asked about impacts of climate change in their livelihood. As soon as the problem was identified, the local research guide was retrained and asked not to provide details of the research project to the participants, other than saying the research is mainly about hazard management at the local level. This was done to avoid pre-determined imposition of climate change on the topics related to regional geo-hazards.

3.5.4 Auditing the research process

Among the techniques of auditing research process, 'peer reviewing' and 'member-checking' were particularly followed in this research. "Peer reviewing" is defined as the process of external check of theoretical concepts, methods, data collection instruments and interpretations of the findings (Lincoln & Guba, 1985). Regular meetings with research supervisors, presentations in research groups at the university (e.g., graduate school research colloquiums), and in international conferences helped the researcher with critical suggestions in different phases of the research. In particular, peer reviewers made important and critical insights in updating the interview guideline to keep the research focus within the context of its objectives and research questions. Member checking is the process of checking major findings and their interpretations

with the study participants (Ely *et al*., 1991; Merriam, 1988; Miles & Huberman, 1994). For this data validation strategy, this research held a group meeting with some of the study participants (eight participants attended) during the third field visit and asked them to reflect on the accuracy of the findings. This process didn't find any significant inconsistency between the interview data and their interpretations by the researcher.

3.6 CHAPTER SUMMARY

This chapter introduced and discussed the choice of grounded theory methodology as an appropriate research methodology for the current study. Essential components of grounded theory research methodology were described in detail. In addition, detailed descriptions were provided about different phases of data collection and analysis with relevant examples from the research field and data. This chapter also made notes on scientific rigor of the current research within the scope of qualitative social science research.

Chapter 4

Findings: Public Perceptions of Climate Change Risks

4.1 INTRODUCTION

This study was guided by two main research questions. First, how did people perceive risks of climate change? Second, what roles communication played in constructing those perceptions? Accordingly, findings of this study were presented in two chapters. This chapter described respondents' perceived knowledge of climate change risk in three main sections – its causes, impacts and solutions. Study findings concerning the role of different types of communication in constructing public perceptions would be described in the next Chapter. In general, findings were presented in a narrative order around the theoretical categories, which were emerged from interview data. Respondents' name (pseudonym), age, gender and profession were inserted in parenthesis following excerpts of the interview transcripts.

Initial data analysis indicated lay people's "general awareness" and "occasional interest" about climate change. Almost all respondents were able to recognise climate change[14] and at least one of the related terms, for instance, global warming, greenhouse effect, and greenhouse gases. However, these terms were often cited along with a number of other terms, which were not linked to climate change. At the beginning of data analysis, it seemed that lay people might be aware of scientific conceptualization of climate change process. This was unexpected for two main reasons – first,

[14] Bangla term for climate change is '*jolobayu poriborton'*, while global warming means '*boishhik ushnayon*', and greenhouse effect means '*greenhouse protikria*'.

because of socio-demographic variables of the study participants (e.g., limited education, and limited access to media and other sources of climate change information); and second, because of inherent scientific complexity of the climate change topic. As the data analysis and further data collection progressed simultaneously discussing details of the process of global warming and climate change, it was found that respondents' general familiarity with basic topics did not necessarily translate into adequate knowledge. In particular, there existed considerable misconceptions regarding scientific conceptualization of global warming and climate change.

In the process of data analysis, this research found a general trend of "culturally shared" understanding among the respondents about climate change risks. By culturally shared, this research meant that people of a certain socio-cultural and geographical settings attributed specific meanings to climate change issues while interpreting knowledge from different communication sources. For example, localisation of climate change risks within the context of local geo-hazards emerged as a theoretical category, which played substantial roles in interpreting both mediated and non-mediated climate change information. A more focused analysis of the data led this research to identify "local hazard culture" as one of the core theoretical categories to understand individuals' perceptions and responses to climate change risks. As for communication, this research found that both mediated and non-mediated communication channels form the "communication repertoire" of climate change at the community level. In this communication repertoire, different channels and actors (e.g., media, NGOs, social contacts and opinion leaders) played various roles in creating awareness, making the issue salient and constructing perceptions.

Respondents' perceived knowledge regarding causes, impacts and solutions to climate change risks are described in the following sections.

4.2 PERCEIVED CAUSES OF CLIMATE CHANGE RISK

A constant comparison of emerging initial codes regarding respondents' self-described understandings about causes of climate change and merging them into theoretical categories resulted in four distinct patterns. They were: "Climate change is caused by atmospheric holes"; "Climate change is caused by environmental pollution"; "Climate change is caused by deforestation"; and "Climate change is caused by rich countries". A comparison of these patterns to related analytical memos and interview data led to the theoretical abstraction that respondents held more clear understanding about the political aspect of the causes of climate change than its scientific conception (see Figure 4.1).

4.2.1 'Climate change is caused by atmospheric holes'

"Atmospheric hole" was the most salient concept that respondents attributed as one of the main causes of global warming-led climate change. They referred to a number of related terms as possible causes of climate change, which included 'greenhouse effect', 'greenhouse gases', 'carbon emission', and emissions of different 'poisonous gases' from factories, automobiles and 'greenhouses'. Their descriptions went on explaining how these gases created some 'holes' in the sky (atmosphere). Respondents tended to believe that these 'hot' and 'poisonous' gases, including greenhouse gases created global warming problem in two important ways. First, concentration of such 'hot' and 'poisonous' gases in the atmosphere resulted in temperature rise; and second, these gases created some holes in

Real → Abstract				
Data/open codes	**Selective codes/initial theoretical categories**	**Analytical memos/notes**	**Emerging theoretical abstraction**	**Core category**
	"Atmospheric holes"	- Inherent scientific complexity; - Literal translation of terms (e.g., greenhouses); - Misinterpreted as ozone holes; - Doubt about self-reported knowledge; - Depending on pre-existing constructs (e.g., ozone holes); - Drawing a self-explanatory theory.	- A clear gap between awareness and knowledge. - Widespread misconception about physical mechanism of climate change, but correctly identified responsible actors/countries. - Lay people are more informed about political aspect of climate change than its physical mechanism. - Trends of citing evidences from local surroundings.	**Political aspect of the causes of climate change was more clearly understood than its scientific conception.**
	"Environmental pollution"	- Grounded in pre-existing concept of pollution; - Negative connotation of pollution is embedded on climate change; - Drawing a self-explanatory theory; - Partly grounded on pollution at local surroundings.		
	"Deforestation"	- Grounded in local phenomena of deforestation; - Disturbance of natural balance; - Originated from local hazards (e.g., salinity).		
	"Rich countries are responsible"	- Consistent with scientific and policy debates - Confidence in describing political aspect of climate change than its physical mechanism.		
Real → Abstract				

Figure 4.1: Perceived causes of climate change (theoretical abstraction from data).

the atmosphere that allowed more sunlight on the earth. This was, of course, an erroneous assumption, which contradicted the physical mechanism of human-induced global warming theory. Yet, this finding indicated lay people's general 'awareness' of climate change and related issues. The following excerpt illustrated respondents' general perception concerning links between emissions of gases and creation of atmospheric holes.

> "I think some holes have been created in the sky by gases, I mean poisonous gases such as greenhouse gases, carbon and other hot gases." *(Golam Mustafa Gazi, M, 53, Fisherman)*

Similar perceptual constructs were found in other respondents' descriptions.

> "This is because of greenhouse effect. This means more heat is coming from the sun through some holes in the sky." *(SM Yunus Ali, M, 55, Shrimp farmer)*

A shrimp-farmer gave detailed description of the "atmospheric hole" theory while responding to a question about how the "holes" were created:

> "Well, I may not explain you properly. But, what I have learnt from TV, organisation [NGO] people, and others also say that there are emissions of gases and other chemicals, for example, carbon, green house gas, hydrogen. I even don't remember all of them. You know what I mean? Environment and climate… these are very hot gases and they can increase the temperature by mixing with air. And, at the same time, these poisonous gases are destroying the shield in the sky that is protecting us from very hot and dangerous sunlight. Now, more sunlight can easily come on the earth through these holes to make it warm." (*Avinash Mondol, M, 42, shrimp-farmer*)

This type of responses was prevalent among the respondents regardless of their socio economic, gender and educational backgrounds. Consider the view of an NGO field worker, who was a university graduate

and worked in the region for around three years in livelihood development and disaster management projects.

> "… there are like holes in the atmosphere and the sun is more powerful because of that. What else? Yes, this is what now comes to my mind." *(Mohsin Alam, M, 31, NGO field worker)*

As for "atmospheric holes" theory, this could be argued that there was a widespread confusion among the respondents between two distinct atmospheric processes – "greenhouse effect[15]" and "ozone depletion[16]". In the interviews, respondents did not make any direct attribution to 'ozone layer depletion' as causes of global warming. Yet, their detailed descriptions of 'holes in the sky' were similar to the concept of 'ozone holes', which was found as a prevalent public construct of climate change in many developed countries. Our inference to equate 'atmospheric holes' with the perceptual construct of 'ozone layer depletion' grew further when some respondents categorically indicated to 'ultraviolet radiation' process while describing negative impacts of 'holes in the atmosphere'. As described by a shrimp farmer:

> "I heard something like that the sky protects us from harmful rays from the sun and now some gases are creating holes in the sky allowing more harmful rays. I heard something about, what they call it? Yes, I remember, violet rays from the sun. I think this is also linked to climate change." (*Avinash Mondol, M, 42, shrimp-farmer*)

As for sources of self-described knowledge, respondents indicated that their perceptions of 'holes in the sky' were mainly based on information from media and NGOs. Accordingly, this could be argued that respondents received information about both 'global warming' and 'ozone

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15 Bangla term for "greenhouse effect" is "*greenhouse protikria"*.

16 Bangla term for ozone depletion is "*ozon obokkhoy*".

holes' from media and other sources, and then interpreted these two distinct[17] atmospheric processes to draw a self-explanatory theory of climate change.

Misconceptions regarding causes of global warming were further illustrated in the data when some respondents sustained the 'holes in the sky' theory by attributing two more explanations. First, wars in different parts of the worlds; and second, use of nuclear technologies (e.g., nuclear power plants and atomic bombs). One shopkeeper, for example, believed climate was changing and had become more violent and unpredictable, a change he attributed to wars in Iraq and Afghanistan. He went on explaining:

> "I have my personal explanation. I don't know, I have always felt that when America and England use lots of bombs in war, like in Iraq or in Afghanistan and other countries, it had a very bad impact on our environment, I mean climate." *(Shahidul Islam, M, 40, shop-keeper)*

A daily-labourer perceived causes of climate change similarly and when insisted why did he thought wars and climate change were linked, the response was:

> "Have you seen how the bombs were blasted? I saw them on the TV. They were huge. And, where do all the fumes and parts of the bombs go after they are exploded? They are mixed in the atmosphere and create the holes." *(Amzad Hossain, M, 42, day-labourer)*

Nuclear weapons and technologies were also referred as possible causes of 'atmospheric holes', and thereafter, global warming led climate change. A female respondent, for example, described:

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[17] The concepts of 'greenhouse effect' and 'ozone depletion' are widely interrelated although mechanisms behind these two atmospheric processes are different and they are neither connected nor influenced by one another.

> "I heard that one or two atomic bombs could destroy the whole world. They are so dangerous. Rich countries are making those bombs and this may also contribute to climate change." *(Jaheda Akhtar, 40, F, housewife)*

In describing global warming process, another respondent referred to the 2011 tsunami in Japan and the nuclear power plant accident thereafter. He argued that tsunami might be linked to nuclear power plant. Similar perceptual construct was prevalent among the respondents, who were comparatively well educated. One school-teacher, for example, asserted:

> "Atomic bombs and factory wastages in the developed countries are mixed in the air. And, you know they are also working on new technologies and using a lot of chemicals for the experiments. This is another reason [of climate change]." *(Abul Bashar, M, 36, school-teacher)*

As noted, respondents frequently cited terms such as 'greenhouse', 'greenhouse gases' and 'greenhouse effect' as causes of global warming-led climate change during the interviews. This illustrated respondents' general awareness of climate change topics. But, misconceptions emerged once they attempted to give detailed description of the process of global warming. In the data, we found a recurrent tendency to make literal translation of the climate change related terms. For example, 'greenhouse' was often interpreted as *sabuj ghor*[18]. A female respondent made the following assertion while describing links between greenhouse effect and global warming:

> "…if you ask greenhouse effect, I think it's something like a house. I heard something like in the developed countries; you know there are winters all time and they use glasshouses to produce vegetables and other crops. These houses release heat in the air, like gases. They are called greenhouse gases. Right? These gases are very hot, and

[18] In Bangla, the term greenhouse literally means "*sobuj ghor*".

> when they are released they can harm the environment and make it warmer." *(Sharbanu Khatun, F, 30, housewife/day labourer)*

A number of respondents even specified that 'greenhouses' in the United States and in many European countries were mainly responsible for global warming. Consider the description of a shrimp farmer:

> "My understanding of temperature increase is, it's something related to greenhouses in America and also in Europe. Inside a greenhouse, I actually don't know why do they call them greenhouse instead of glasshouse? These houses are made of glasses so that rain and snow can't damage their crops. And, this is not good for nature. Because, to me, perhaps these houses are releasing poisonous gases and you know gases can fly from one place to another and they can reach to us easily." *(Ashish Kumar Mondol, M, 48, shrimp farmer)*

Literal interpretations of the terms continued in the following assertion:

> "Well, it's something like… the earth is like a house and it was green because there were lots of trees. And, now the balance is not like as it was in the past. We don't have enough tree in the world." (*Avinash Mondol, M, 42, shrimp-farmer*)

In general, emissions of greenhouse gases from fossil fuels support the physical mechanism of global warming and the possibility of climate change. But, respondents' literal interpretations of 'greenhouses' and identifying these glass-made houses in snowy countries as sources of greenhouse gases do not comply with the scientific conceptualisation of global warming. This could be argued that the metaphorical term 'greenhouse effect' was developed in the Northern hemisphere. It was easier for people in that region to understand because they already had cultural knowledge about it. But, for people in the current study, mediated

images or metaphors of greenhouses created misleading meanings because they were not culturally familiar with those metaphors.

4.2.2 'Climate change is caused by environmental pollution'

The second set of responses illustrated lay people's widely held view that global warming and climate change were linked to environmental pollution. In particular, respondents frequently attributed 'air pollution' as main contributor to global warming led climate change. 'Water pollution' and 'excessive use of fertiliser and insecticides' were other main concepts that emerged from the interviews as possible causes of climate change. All these categories of causes were grouped into the category of "environmental pollution as the cause of climate change". It was important to see in the data that many respondents used the term 'environment' and 'climate' interchangeably. The pre-existing concept of environment was embedded in explaining the newly acquired concept of climate change. During the interview session, it was also observed that some respondents after being uncomfortable to talk about climate change because of its scientific complexity, and lack of confidence in their self-reported knowledge, quickly switched to describe human contribution in polluting environment and described how the pollution was resulting in climate change. One boatman[19], for example, said:

> "I can't explain it [climate change] properly, but I feel it's something about the environment. Nowadays the level of pollution has been increased both in cities and villages. Air is polluted, water is polluted and even the soil is contaminated with salts. I think these are climate problem." *(Shomsher Ali, M, 33, boat-man)*

[19] A person who rows boat to ferry people across the river.

Similarly, other respondents attributed pollution as one of the main reasons for climate change.

> "I heard that greenhouse gases are affecting us; our environment and weather. Factories are also polluting environment; brickfields, for example. And, you know there are more chemicals in the water now because of excessive use of fertilisers." *(Sharbanu Khatun, F, 30, house-wife)*

As illustrated in this assertion, the lay people tended to bring environmental pollution and climate change problems together; and often used the terms interchangeably. They perceived climate change as part of the environmental pollution. Consider the following statement:

> "Climate change means pollution of air and also …hmmm… how to say? Yes, it is mainly about environment and balance of nature. By climate change, I also understand … I don't know much about it, to be honest. The only thing that comes to my mind is, it's something related to the environment." *(Avinash Mondol, M, 42, shrimp-farmer)*

A farmer responded in the similar fashion emphasising the process of air pollution.

> "There is carbon in the air. What else? I think too much carbon in the air is not good, and there are other gases and factory wastages. You know all these gases and chemicals are not good for environment. So, what I wanted to tell you is if people continue to pollute environment there will be a lot of adverse impacts. I think climate change is one of them." *(SM Yunus Ali, M, 55, Shrimp farmer)*

In the previous section, it was demonstrated that some respondents explicitly referred to factory emissions of 'greenhouse gases' as the main reason for global warming. This was consistent with the scientific conceptualisation that argued increased concentration of greenhouse gases in the atmosphere would lead to global warming by trapping radiated heat of the sun. But, as the respondents made detailed comments on the process

it was found that they could hardly differentiate between emissions of greenhouse and other gases from factories, automobiles and other kinds of fossil fuel burning. In most cases, respondents constructed their perceptions of global warming and climate change within the concept of pollution when industrial wastages and pollutants were frequently referred as possible causes. A school teacher, for example, described links between factory emissions and climate change in the following:

> "Well, as I said it [climate change] is mainly by industrial pollutants, such as carbon dioxide, black smog in the air and other chemicals. There are lots of other pollutants that I even don't know their names. You know factories are releasing chemicals not only in the air but also in the rivers. You see rivers are polluted now. Who is responsible for this? Of course the factories." *(Abdul Hannan, 31, M, school-teacher)*

This respondent indicated to an important insight of climate change perception – his personal observation of pollution in the locality. A similar trend in other respondents' assertions was also noticeable when lay people's knowledge about issues and events of local hazards (e.g., air and water pollution) were embedded in the concept of climate change. Accordingly, personal observation of pollution at the surroundings emerged as a frequent concept in the data to explain individuals' perception of climate change risks. Clearly, we could see a tendency of merging local knowledge of hazards with newly acquired knowledge of climate change. As the interview data indicated, personal observation of environmental degradation in the locality was one of the main factors that forced respondents to link climate change and environmental pollution together. For respondents, it was easy to see and observe the environmental pollution in their surroundings rather than conceptualising the abstract and more complicated atmospheric process of global warming. Thus, it was not

particularly the greenhouse gases, but also black smog and chemical particles came to respondents' minds as causes of global warming.

On the other hand, this could be argued that respondents perceived both greenhouse gas emissions and air pollution as problems occur and related to the atmosphere. Thus, these two distinct phenomena – air pollution and global warming – are linked together and lay people imposed their knowledge of environmental pollution from their surroundings and formal communication sources to describe causes of climate change. The emerging hypothesis about 'climate change as pollution' grew further when a number of respondents indicated to excessive use of chemical fertilisers and insecticides for agricultural purposes in the area as reasons for climate change.

> "Use of insecticides and stuff like that. We are using more fertiliser now than before. This is causing problems in our environment. Now, it is not like the past when we didn't need to use chemicals and fertiliser for agriculture." *(Abul Hossain Mollah, 70, M, retired)*

Some respondents even referred to environmental pollution in big cities in Bangladesh that they perceived as causes of climate change. Consider the following assertion:

> "People are polluting the environment. You see there is *zinc* in the air and many more other poisonous elements. I even don't know their names. The air has become poisonous. It was in the TV news that Dhaka is the most polluted city in the world." *(Mohaseikh Sardar, 44, M, farmer)*

Such a link between environmental pollution and global warming also led respondents to perceive the issue within the broader debate of human's relations with nature. As one respondent described:

> "There might be different reasons for climate change. But, for me humans are responsible. We are actually destroying

earth's natural balance through pollution." *(Avinash Mondol, M, 42, shrimp-farmer)*

This was clear in the data that respondents perceived climate change as a result of industrial pollution. They also indicated to see the problem linked to humankind's relationship with nature. As such, environmental pollution and unsustainable livelihood practices emerged as important perceptual constructs among the respondents as causes of climate change. This was further explicated when respondents described the role of deforestation in creating climate change problem.

4.2.3 'Climate change is caused by deforestation'

This pattern was similar to the perceptual construct of 'environmental pollution'. In the data, there was a recurrent trend to identify deforestation as an important cause of climate change. The strong association between deforestation and climate change was based on the premise that trees were the most important elements for natural balance. Some respondents even described how trees keep the natural balance by providing oxygen, consuming carbon dioxide and shading the earth from scorching sunlight. Certainly, deforestation is an important factor in global warming and climate change process. Trees work as storehouses by consuming carbon dioxide and releasing oxygen into the atmosphere. Increased deforestation naturally means increased carbon dioxide in the atmosphere. In the interviews, it was found that a number of respondents were familiar with the concept of *photosynthesis*[20] when they described how trees kept the balance of oxygen and carbon dioxide in the atmosphere. One respondent, for example, described:

[20] Photosynthesis is the process by which plants use energy from the sun to convert carbon dioxide and water into sugar and oxygen.

> "Of course, trees are important for natural balance. Trees give us oxygen and take carbon dioxide. This carbon dioxide is poisonous for us. That means trees are saving our lives by consuming poisonous carbon dioxide. Now, see if there are not enough trees, then there will be more carbon dioxide. This will definitely have impacts on the environment." *(Amzad Hossain, 42, M, day labourer)*

However, this was important to note in the data that respondents' perception of deforestation as an important cause of climate change was constructed mainly through local observation of declining number of trees and illegal logging in the nearby forest – the *Sundarbans*. Consider the following assertions:

> "You see there is no tree, no shade from the burning sun. This is making the earth warmer. You know, during the month of *Chaitra* [Bengali month of summer] it is very difficult even to stay inside the home". *(Abul Hossain Mollah, 70, M, retired)*

> "Climate [change] is increasing because we don't have enough trees in our country. I heard in a radio programme that there should be at least 25 per cent forestland in a country. But, we have only 10 to 12 per cent." *(Moksed Ali, 34, M, unemployed)*

The general trend of respondents' perception was that people were mainly responsible for deforestation, and thus impacting the climate. They constructed a clear relation between sustainable livelihood and the risks of climate change. On this note, this could be argued that people living in the coastal region might have limited knowledge about the complex scientific conceptualisation of global warming and climate change. But, they carried valuable local knowledge about the importance of natural balance for sustainable livelihood. Consider the assertion of a shrimp farmer:

> "There might be different reasons, but to my understanding disturbance of natural balance is the main thing. It's a very important reason [for climate change]." *(Ashish Kumar Mondol, 48, M, shrimp-farmer)*

When asked to elaborate, his response was:

> "At present, we don't have enough trees as we had in the past. Now these trees cannot produce enough oxygen. How could we survive if we keep continuing to destroy trees? " *(Ashish Kumar Mondol, 48, M, shrimp farmer)*

This shrimp farmer clearly referred to the local aspect of deforestation and this was further manifested when others described that population growth forced many people to clear forestland and create new livelihoods in the coastal regions. A local Union Council member, for example, said:

> "We have a huge population. These people need home, they need food and other things. People are destroying trees for their needs. What will they do otherwise?" *(GM Rafiqul Islam, 41, M, UP member and farmer)*

An elderly respondent supported this and described how his ancestors settled in the region after clearing the forestland.

> "All these villages were once part of the *Sundarbans* [mangrove forest]. Our grandfathers came and cleared them for croplands." *(Abul Hossain Mollah, 70, M, retired)*

His description continued making detailed accounts on the trends of settlement in the region. It was learnt from the respondents that most people living there started settlement during the British colonial period (1858-1947) when the then administration took a policy of claiming more arable lands by deforesting the *Sundarbans* and building dikes to prevent intrusion of saline water.

> "Our grandfather and grand-grandfathers were brought here by the *Zaminders* [landlords] to clear the forest and claim lands from water. Now we know how important the trees are for the environment. Destroying them must have some impact on the climate." *(Abul Hossain Mollah, 70, M, retired)*

As indicated in the data, the most important feature of respondents' perception of deforestation and climate change was centred on their surroundings and impacts at the local level. The lay people hardly referred to the global deforestation problem. This implied that respondents' perceptions of deforestation and climate change were constructed on personal observations at the local level.

4.2.4 'Climate change is caused by rich countries'

Although respondents to a large extent demonstrated uncertainty of their knowledge concerning physical mechanism of climate change, almost all of them categorically recognized developed countries as responsible for creating the problem. There was a common phenomenon among the respondents to identify themselves as 'victims' of wrongdoings of people in some rich countries. In the data, we found a clear dichotomy of "we" as victims and "they" as wrongdoers. One female respondent, for example, described:

> "What I have heard is that some rich countries are causing climate change. I think this is true. They are the people who consume more and contribute more to pollution and global warming. I can say for sure Bangladesh is not responsible for climate change problem." *(Hajera Akhter, 50, F, housewife)*

Similar was the view of another female respondent, who received training in disaster management by an NGO.

> "…see this saline water, why is it here? Who are responsible for this? These are the questions that come to our minds. Now, we know from organisation people that why there is a lot of salinity in our area. People in rich countries are responsible for this, for climate change and saline water. We know it now. They are harming us; their factories, their cars. They are responsible for our plights." *(Sharbanu Khatun, 30, F, house-wife)*

A shrimp farmer referred to industrial emissions and described developed countries' contribution to climate change in the following:

> "Our country is responsible for a very small amount of air pollution. It's the foreign countries whose factories are emitting poisonous gases in the air." *(Borhand Uddin, 31, M, shrimp-farmer)*

As the respondent was asked to name the countries responsible for creating climate change problem, his response was:

> "Yes, I can name those countries. Well, you see London, America, they are the main." *(Borhand Uddin, 31, M, shrimp-farmer)*

As the interview data indicated, lay people's overall perception was consistent with scientific and policy debates on the issue when it was widely acknowledged that increased greenhouse gas emissions in developed countries were the primary cause of anthropogenic climate change. Yet, it is developing countries, whose weak economic and environmental conditions generally make their populations more vulnerable to the risks of climate change. In the data, we found respondents' awareness of this inequality and many held the view that rich countries had a moral obligation to help the affected countries in dealing with climate change impacts. Interestingly, this research did not find any attribution to emerging economies, for example, China and India responsible for global warming although these countries were proportionally responsible for greenhouse gas emissions in recent years.

In the data as well as during data collection, it was observed that respondents found themselves more comfortable in discussing 'who are causing global warming' than to talk about 'what is causing global warming'. There is a clear distinction between these two questions. First, 'what is causing global warming' is more embedded in scientific aspects of

the issue. That is, discussing the scientific conceptualisation of global warming and thereafter, climate change. Most misconceptions in the lay people's minds emerged on this scientific explanation of global warming. On the other hand, the question 'who are causing climate change' is more embedded in a political tone, and respondents found themselves in ease to identify the actors and countries behind the global warming problems. One reason for such a perception might be the influence of media and interest groups' overwhelming framing of the political aspect of climate change. Respondents thought they were more informed about 'who' were causing than 'what' was causing global warming.

On the other hand, as the later analysis would illustrate, public perception of climate change was substantially influenced by sources of their knowledge. Consider the following assertions:

> "To be frank with you, I didn't have any idea about climate change in the past. Recently, I was in meetings of an organisation [NGO] after *Aila*. This is because of factories, cars and, yes, greenhouses. Rich countries having factories and industries, having war, weapons, they are releasing gases." *(Gazi Nur Uddin, M, 45, fishing and forestry)*

> "I watched it on the TV. They talked about factories in foreign countries, gases and other stuff. I couldn't get through this exactly, but it seemed to me that factories in some rich countries are responsible." *(Nurul Alam, 42, M, shrimp-farmer)*

These assertions clearly indicated to the transfer of 'frames' from media and advocacy programmes of NGOs to the lay people. This research would reflect more on this aspect while describing the role of communication in constructing public perceptions of climate change risks in Chapter 5.

4.3 PERCEIVED IMPACTS OF CLIMATE CHANGE

Two major patterns emerged from the interviews that largely illustrated respondents' self described knowledge of climate change impacts. First, *'the regional (geo)-hazard pattern'* explained lay people's understanding of climate change impacts within the context of local hazards – both human-induced and natural. Second, *'the weather and seasonal variances pattern'* described how the respondents attributed personal experiences of changes in local weather and seasonal patterns as evidences of climate change. In both patterns, lay people embedded identical meanings to climate change impacts and these meanings were mainly originated from '*local hazard culture*'. Lay people's perceived understandings of climate change impacts within its localisation were integrated in the emerging grounded theory of 'embedding cultural meanings to climate change knowledge.' Theoretical abstraction from data about perceived impacts of climate change is illustrated in Figure 4.2.

4.3.1 Climate change as (geo) - hazards

All respondents unequivocally drew a catastrophic image of climate change by linking it to local hazards – be it natural or human-induced. Two sets of hazards were identical in respondents' descriptions and both sets were perceived as linked to climate change. Origin of the first set of hazards was *natural* and respondents were exposed to them mainly because of geographical proximity. Regional geo-hazards, such as storms, tidal surges, floods, siltation and salinity in water and soil were the most frequently cited impacts of climate change by the respondents. A number of other local hazards, mainly caused by unsustainable agriculture and unplanned water management in the region, were also attributed to climate change impacts. Increased salinity in water and soil, deforestation, crisis

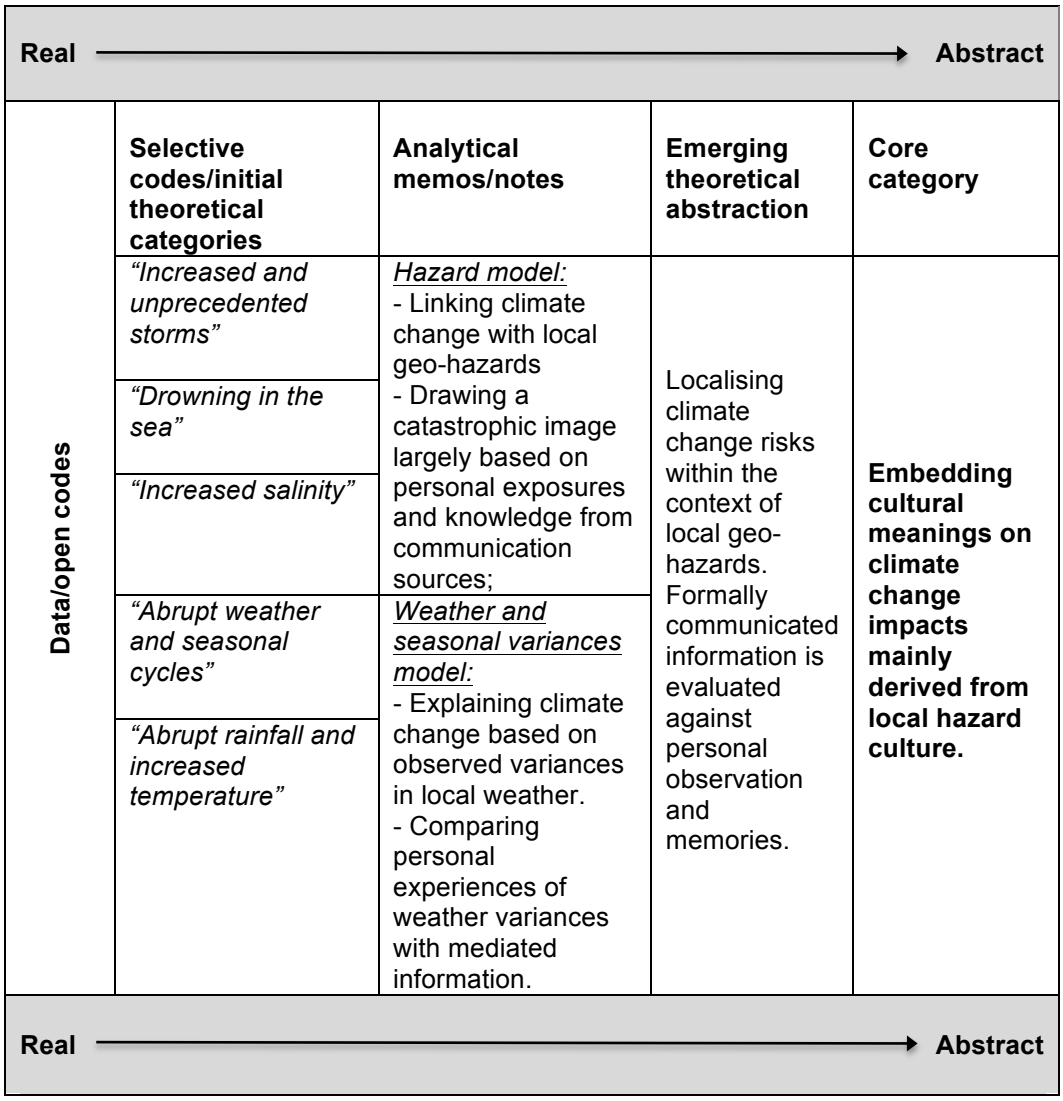

Figure 4.2: Perceived impacts of climate change (theoretical abstraction from data).

of safe water, and reduced land fertility were the second set of perceived impacts of climate change at the local level. Although there might be some links between these hazards and climate change, a close look into respondents' descriptions revealed that these hazards were intensified in the area because of some local unsustainable development interventions. For example, coastal region of Bangladesh is naturally susceptible to salinity problem due to its location and natural seawater intrusion. But, the problem has been intensified in recent years because of increased phenomena of

saline-water shrimp farming and diversion of fresh water for irrigation by building unplanned embankments. As for hazard model of climate change impacts, this research found three distinct perceptual constructs of the lay people. They were: 'climate change as increased and unprecedented storms,' 'climate change as drowning in the sea', and 'climate change means increased salinity.'

4.3.1.1 'Climate change as increased and unprecedented storms'

The most common image that came to respondents' minds as impacts of climate change was storm – a common regional geo-hazard in the coastal region of Bangladesh during the pre- and post-monsoon seasons. There was a general believe among the respondents that recent events of storms and tidal floods in the region were caused by climate change; and similar events would continue to increase in future. Respondents drew a causal link between storms and climate change although such a link is still uncertain in the scientific arena. Scientific uncertainty, however, didn't prevent the lay people to draw the dreadful image of climate change. A female respondent, for example asserted:

> "Climate change means to me storms. I also heard about floods, rain, water and other disasters. But, storms are the main." *(Jaheda Akhter, 40, F, housewife)*

There was a common trend to view climate change as 'dreadful' among other respondents. A farmer was more confident in certainty of climate change and its impacts in the region:

> "Of course climate change is real. The reason I am saying this, actually we can see it by ourselves. It is already a reality for us. We are going through more storms and more [tidal] surges." *(SM Yunus Ali, 55, M, shrimp-farmer)*

Similarly, an NGO activist supported the link between climate change and storms:

> "It's the storm that comes to my mind. There are other disasters, but storms are most important. I think other people have the same idea and they know it now that storms are results of climate change." *(Shahida Begum, 35, F, NGO worker)*

Linking climate change and storms was so apparent that a number of respondents used the terms 'climate' and 'storms' synonymously while describing consequences of climate change. This illustrated how strongly the natural hazard aspect of climate change was embedded in respondents' minds. One explanation for drawing such a dreadful image of climate change could be respondents' spatial closeness or physical proximity to the events of storms. Consider the following assertion:

> "Climate has been increased in recent years because of temperature rise. You can see it here. We didn't have such harsh climates in the past, but in recent time it has been increased. I mean the storms." *(Gazi Mohammad Ayub, 32, M, unemployed)*

The perceived link between climate change and storm was further demonstrated when some respondents described that it was only the recent events of storms and tidal floods that made it clear to them how 'dreadful' would be the impacts of climate change. Thus, this research found a temporal proximity to the risks of climate change as described by the respondents. Consider the following assertion:

> "Honestly, it was not very clear to me when people talked about climate change. But, after the cyclone *Aila* now I can understand what it would like to be. *Aila* actually brought it [climate change] to us." *(Maloti Mondol, 42, F, housewife/crab farmer)*

As the respondents were blaming climate change for storms in the region, a related prompt was asked about geographical location of the area that made it susceptible to storms and tidal floods. Most respondents agreed, but indicated to 'unprecedented' nature of recent storms; and their 'increased frequencies' that compelled them to believe that recent storms were linked to climate change. As such, one elderly respondent described:

> "Of course you can say that. Storms have always been part of our life. But, nature of storms must have been changed. I have never experienced this kind of storm in my lifetime". *(Moksed Ali, 64, M, unemployed)*

A woman respondent gave detailed description in support of her claim how climate change had affected the nature of storms:

> "You know what happened in *Aila*? There was neither strong wind nor any indication of a strong storm. The heightened tidal surges attacked us all of a sudden. We were flooded and flashed away in a moment when parts of the dikes collapsed and water intruded." *(Khadiza Banu, 45, F, housewife)*

Other respondents referred to changing patterns of storms as evidence of climate change impacts. An elderly respondent, for example, said:

> "Now they [storms] come without any sign. It's very difficult to predict nowadays." *(Abul Hossain Mollah, 70, M, retired)*

Another trend was attributing to increased number of storms or frequency that respondents justified as effect of climate change.

> "We didn't experience storm so frequently in the past. It's happening now what we heard about impacts of climate change. Climate change is bringing more storms and disasters in Bangladesh. You see, we had *Sidr*, and then came *Aila*." *(Mohasheikh Sardar, 44, M, shrimp-framing and agriculture)*

It was clearly indicated in the data that while storms had always impacted coastal people long before the debate on anthropogenic climate change, the rate and intensity of storms had recently begun to increase. Accordingly, this research found that 'increased frequency of storm' and their so-called 'unprecedented nature' were two important concepts that emerged from the interviews as evidences of climate change at local level. Persistent existence of storms in local hazard culture was the main driver to draw such perceptual constructs when respondents tended to view impacts of global climate change through the lenses of regional geo-hazards.

4.3.1.2 'Climate change means drowning in the sea'

After the storm, 'drowning in the sea' was the most widely held perception of climate change impact. Most respondents perceived that the global warming induced sea level rise would inundate a large part Bangladesh's low-lying coastal areas. They often equated natural tidal surges in the region with 'sea level rise' and provided a number of observed changes in local tidal surges that they believed were caused by climate change. Some respondents, however, referred to increased deposition of sediments, unplanned water management and dying of rivers as causes of heightened water in the rivers and consequent tidal flooding. This indicated events of some local interventions in originating hazards. Yet, increased height of water levels in the rivers was a common point of reference to sustain claims of sea level rise. The following statement illustrated respondents' views about water level rise and climate change.

> "I don't remember all, but it's mainly about what will happen in Bangladesh. Right? I heard that the coastal region of Bangladesh including our area would be drowned in the sea because of climate change." *(Abdus Samad Azad, 39, M, chowkidar/ farmer)*

Some respondents' gave detailed notes on how melting ice in the poles would affect countries like Bangladesh. Their general perception was that increased temperature was causing ice melting in the poles and mountains; and those increased water were posing threats of floods in low-lying areas. A shrimp farmer, for example, attributed relations between global warming and ice melting in the following:

> "We are living very close to water. I heard that ice is being melted because of rising temperature. Now, all the water from the melted ice is flowing downstream and flooding us." *(Ashish Kumar Mondol, 48, M, shrimp farmer)*

It was important to observe that respondents obtained knowledge of 'increased temperature', 'ice-melting', and 'sea-level rise' mainly from a number of societal communication sources, such as media, NGOs, and local opinion leaders. Thereafter, obtained knowledge was reconstructed through personal observation and experiences of geo-hazards at local level. Thus, localisation of climate change impacts emerged as a core category in the emerging grounded theory of climate change risk perception. Localising impacts of global climate change was further illustrated in the following assertion:

> "Let me give you an example. There are *chars*[21] near the *Sundarbans*. We have seen in the past that these *chars* didn't drown in high tides. But, now they are totally disappeared even in winter when the tides are not very high. These *chars* were above the water only around eight to ten years ago. I can still remember this. What does it mean? Of course, the height of water has been increased." *(GM Rafiqul Islam, 41, M, UP member and shrimp farmer)*

Similarly, a shrimp farmer attributed 'heightened water' as evidence of climate change impacts in the region:

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[21] *Chars* are newly emerged lands in rivers mainly through siltation.

> "Height of the tides has been increased that's what I've observed as impact of climate change. You see that dike? It was not very high during my childhood. It was only around 4 to 5 feet in height. Now it has been increased to 13 to 15 feet. Still we are living with the threat of tidal surges overflowing the dike." *(SM Yunus Ali, 55, M, shrimp farmer)*

The perceptual construct of 'heightened water as impact of climate change', however, was not prevalent in all respondents' descriptions. As the interviews progressed, this research noticed another important concept that prevailed in respondents' minds as important cause of tidal flooding. Apart from global warming effects, unplanned water management at local and regional level were cited by a number of respondents as major causes of floods in the area. For example, shortly after making attribution of global warming induced tidal surges, an elderly respondent came up with his own idea:

> "And, I think some unplanned dikes and dams are also contributing in rising water. They have filled the riverbeds." *(Abul Hossain Mollah, 70, M, retired)*

A related prompt asked the respondent to elaborate, and the response was:

> "This is my personal observation. In the last decades, a number of dikes and barrages have been built. These dikes have hampered the natural flow of rivers and created *chars* with increased siltation. There are also other reasons. Let's say, we are responsible for killing a number of rivers and their branches by encroaching and building houses, shops and other establishments. How can the water flow to the sea when the rivers are filled up? Right? You see there is not enough space in the rivers to accommodate additional water." *(Abul Hossain Mollah, 70, M, retired)*

The respondent then referred to the fight between fresh and seawater, and how the seawater was winning lately to intrude more inside the country.

> "In the past, the strength of the current in rivers was stronger than the high tides from the sea. That is, currents of the rivers could easily carry the sediments to the sea. Now, the situation is opposite. Strength of the high tides from the sea is winning against the current of river water because rivers do not have strong currents. As a result, sea water is coming more inside the lands." *(Abul Hossain Mollah, 70, M, retired)*

This respondent's observation gave an important insight as causes of rising water in the rivers. In the subsequent interviews this research intended to see whether others held the similar perception. Interestingly, it was found that increased siltation in riverbeds because of unplanned water management at the local level was a common theme that most respondents perceived as an important reason of heightened tidal surges. A female NGO worker gave more insights into this 'unplanned water management' issue:

> "There was something like green revolution in the '86-87 for creating more croplands and irrigation. A lot of sluice gates were made at that time and a lot dikes to divert and manage river water for irrigation. They actually halted the natural flow of water. Because of these dikes and sluice gates, sediments cannot flow to the sea. They are being deposited in the riverbeds. The water and sediment carrying capacity of rivers is decreasing." *(Shaheena Akhter, 38, F, NGO worker)*

Accordingly, 'unplanned water management' induced siltation emerged as an important hazard from respondents' descriptions. However, this sort of perception did not overrule the climate change induced sea level rise. Rather, respondents perceived that unplanned water management at local level and filling up the riverbeds were escalating the tidal flooding hazard for which climate change was equally blamed. A fisherman, for example, asserted:

> "You can say both – climate change and the unplanned dikes are causing floods." *(Golam Mustafa Gazi, 53, M, Fisherman)*

From a geo-hazard perspective, tidal surges are common phenomena in the coastal regions of Bangladesh. Many of the areas were formerly mangrove forests that were cleared to begin settlements. Other areas of the coastal region were newly emerged islands in the sea, which were created through siltation. An elderly respondent, for example, described human settlement in the region in the following:

> "It's not long ago. I heard that my grandfathers were recruited by *Zamindars* to clear the forest for rice cultivation. This area was always very low and they erected mud-built dikes to prevent saline water intrusion during the high tides and to claim lands for cultivation." *(Abul Hossain Mollah, 70, M, retired)*

Accordingly, this research found two different, yet interlinked perceptions prevailed among the lay people about heightened water in the rivers. One was based on their newly acquired knowledge of climate change impacts that they believed water had raised because of ice melting in the poles and Himalayan mountains. This additional water was flooding low-lying countries like Bangladesh. The second set of perceptions was originated from respondents' personal observation of local water management and sediment deposition in the riverbeds that they believed were not sustainable. On the other hand, it was found that respondents were more confident in describing personal observations of local unsustainable development activities (e.g., unplanned dikes) as compared to acquired knowledge of climate change impacts from different formal communication sources.

4.3.1.3 'Climate change as increased salinity'

Salinity in water and soil is a common geo-hazard in the region primarily because of geographical location. Seawater intrudes the locality

daily in the forms of tidal surges either through the rivers or by breaching the mud-built dikes. The entire region is also on the threat of intrusion of seawater because of storm surges. Despite this natural susceptibility to salinity hazard, most respondents perceived climate change as the reason of salinity problem. A shrimp-farmer, for example, said:

> "Salinity in water and soil has been increased after the [cyclone] Aila. The environment is much warmer now. All these are because of climate change that we know." *(Nurul Alam, 42, M, shrimp farmer)*

Similar was the perception of a female respondent:

> "We had saline water in this region and we were used to live with it. But, it seems level of salinity both in water and you know … in the soil has been increased in recent years. This might be because of climate change." *(Khadiza Banu, 45, F, housewife)*

A couple of respondents even described the process of water evaporation and explained how rising temperature could evaporate water and leave salts. A local school teacher described:

> "I have observed that when the temperature is increased during the dry season the level of salinity in water also increases. This is because water vapours in the air leaving behind the salts. For example, water from the ponds; increased temperature vapours the water and leaves salts. So, if the global temperature increases, I think it will also increase the level of salinity in water." *(M Abul Bashar, 36, M, school teacher)*

Respondents' emphasis on salinity as impact of climate change was understandable if one considered the region's susceptibility to salinity hazard. But, it required a contextual analysis of local geo-hazards to understand how this common and natural local hazard was embedded in climate change discourses. The Bay of Bengal is the source of salinity in the coastal estuaries in Bangladesh. During every high tide the seawater

enters the estuaries and flows up to 100 kilometres inside the mainland through different rivers and tributaries. In this process, seawater mixes up with fresh water of downstream rivers of the Himalayas. The strength of tides from the sea and the current of downstream rivers play important roles in determining the level of salinity of water in the coastal region of Bangladesh. Tidal surges of the sea win the race if currents of the rivers are slow. This natural process of creating salinity problem in the region was clear to the respondents. But, they were exposed to climate change discourses lately through a number of communication sources, for example, media and NGOs. Salinity and sea level rise were frequently discussed as local impacts of climate change in these communication platforms. This proposition grew further when respondents attributed media and NGOs as main formal sources of their climate change knowledge. As for communicating climate change to the lay people, an NGO activist described:

> "We had some awareness programmes on coastal livelihood; we gave training to the villagers on how to survive in extreme saline condition. For example, cultivating saline tolerant crops and vegetables. Climate change was a topic in those meetings as this was the main reason for increased salinity in *Gabura* and other villages. I met many people and they now understand the real cause of salinity – it's the global warming that brings saline water in this region." *(Mohsin Alam, 31, M, NGO worker)*

Influence of such awareness programmes was apparent in many respondents' views. A female respondent made the following assertion:

> "Saline water is increasing because of climate change that is what I heard from the organisation [NGOs] people." *(Sabina Akhter, 25, F, housewife)*

Respondents' discussion on salinity hazards expanded to other implications that they thought could be linked to climate change. For

example, crisis of drinking water was referred as a consequence of increased salinity. One female respondent described:

> "At the moment, crisis of fresh water is the main problem. The only source of fresh water is now rain. All others are contaminated with salts. We need to wait for the rainy season to get fresh water." *(Momtaj Begum, 30, F, housewife and fishing)*

Another respondent carried similar view, and a related prompt reminded him about susceptibility to salinity because of geographical location. His response was:

> "I understand salinity is not a new problem for us. But, the problem is being intensified. In the past, we could pump out fresh water from tube wells, but now all these wells are contaminated. Whom to blame for this? Climate change might be the reason. Particularly the organisation people are telling us that climate change is the main reason for salinity." *(Nipendranath Mondol, 45, M, crab trader)*

Some respondents identified reduced land fertility as another implication of salinity in the region restricting crop production. As a consequence, most people switched to saline tolerant shrimp farming and transformed most of the former croplands into shrimp enclosures. A shift from crop cultivation to shrimp farming gave an important insight regarding perceived causes of increased salinity in the region. A number of respondents were not convinced that climate change was the main reason for salinity hazard in the region. Instead, they referred to unsustainable economic activity, for example, saline water shrimp farming as the root cause of increased salinity. This again indicated that obtained knowledge about negative impacts of climate change from different communication sources was not taken at face value. Rather, knowledge was reconstructed in individuals' minds on the basis of their personal observations and experiences. One respondent described:

> "We should not always blame others for the problem. From my personal experience, shrimp enclosures are mainly contributing to the salinity problem." *(Golam Mustafa Gazi, 53, M, honey hunter)*

Shrimp farming was a recent economic activity in the region that began in the early 1980s. People in the region mainly depended on rice cultivation, fishing, and resources of the nearby mangrove forest for livelihood supports. But, in recent years the availability of fishes in the rivers was decreasing while the forest has become a risky endeavour not only because of man-eating tigers but also because of increased phenomena of piracy. On the other hand, shrimp farming appeared to be much more profitable that cultivating rice. Most people quickly shifted to saline water shrimp farming in the former paddy lands. This happened at the huge cost of local environment. People drained in saline water from nearby rivers for shrimp enclosures with long-term consequences, which included increased salinity in surface and ground water as well as in the soil. This observation was supported in the interview data. An elderly respondent, for example, asserted:

> "I think people are equally responsible for creating the salinity problem. Owners of the *ghers* [shrimp enclosures] have brought saline water from the rivers. To me, this is the main reason. Everything is salty now. We used to use pond water in the past. Now it's no longer possible. You see the *ghers*! Once all of them were croplands. We had rice, vegetables, but you can no longer do that because of salinity." *(Abul Hossain Mollah, 70, M, retired)*

This respondent clearly indicated to adverse impacts of shrimp farming that he believed brought economic prosperity for some people, but at the huge environmental cost. However, not all respondents held the similar view. Some interviewees described both negative and positive

aspects of cultivating saline water shrimps. A shrimp farmer, for example, described:

> "Yes, it's a threat to us. But at the same time, we can't survive without saline water. This is the source of our income. Our livelihood has become so much dependent on saline water shrimps." *(Mohasheikh Sardar, 44, M, shrimp farming and agriculture)*

Similar perceptual construct was found in a shopkeeper's description:

> "This is true that we are harming the environment through shrimp enclosures, and creating problems like salinity and crisis of water. But, we are somehow trapped. I mean what else can we do? We can't produce rice anymore because of the salt. How can we survive? We must need to continue shrimp farming although we know this not good for future." *(Shahidul Islam, 40, M, shop-keeper)*

This respondent's assertion indicated to the gap between perceived awareness of a hazard and limited behavioural actions. The respondent was aware that shrimp farming was harming local environment, yet he was reluctant to refrain from it because of economic benefits. In general, we found in the data that lay people initially referred to climate change as the main cause of salinity hazard. However, their detailed descriptions clearly indicated to geographical proximity and some local economic and development activities (e.g., shrimp farming and unplanned dikes), which were equally blamed for creating and escalating the salinity hazard. On top of these varied perceptions, we could see local issues of geo-hazards mainly grabbed respondents' attention while describing impacts of climate change.

4.3.2 Climate change impacts: the weather and seasonal variances pattern

The lay people made categorical assertions that climate change impacts were resulting in 'abrupt weather' and 'seasonal variances' that

they widely attributed as evidence of changing climate. In the data, a general trend was found among the respondents that the natural cycle of six seasons[22] in Bangladesh had been changed because of climate change. They provided evidence of changing climate through personally observed changes in seasonal patterns. In addition, personally observed temperature variances were important perceptual constructs of the lay people as for climate change impacts.

4.3.2.1 'Climate change as abrupt seasonal cycles'

Respondents overwhelmingly perceived that seasons were more abrupt and unexpected in recent years as compared to their past characteristics. Their self-reported observations of seasonal patterns were equated as directly linked to climate change. For example, one respondent defined climate change in the following:

> "To me, climate change means season change. Something that is not normal. It says change and change of something. Right? Something is not like before. I can see seasons are not like they were in the past." *(Jeher Ali Mirza, 55, M, crab trader)*

In the data, it was frequently cited that usual six seasons of Bangladesh had been shrunken and overlapped because of climate change. Consider the assertion of a school teacher:

> "We used to have six seasons. But you will find them only in the books. In reality, there are two or three. Others are difficult to distinguish. But, this was not the case; we were known as the country of six seasons." *(Abdul Hannan, 31, M, school teacher)*

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[22] Although it is dubbed as a six-season country, but main seasons in Bangladesh are: summer (March-May); rainy season (June-September), Autumn (October-November), and Winter (December-February).

Similarly, another respondent relied on 'past' or 'childhood' as point of reference to describe changing seasonal patterns what he believed was a consequence of global climate change.

> "We hardly get adequate rain during the monsoon. Summer is extremely hot and you will see changes in winter season as well. These things are different than they used to in the past." *(GM Rafiqul Islam, 41, M, UP member and shrimp farmer)*

Two salient features emerged in respondents' descriptions regarding the link between seasonal changes and climate change. First, lay people held the perception that the natural six seasons of Bangladesh had been shrunk to two or three main seasons; and secondly, there were trends of uncertainty and abnormal behaviour in different seasons. Thus, uncertainty and abrupt nature of local seasons were major themes among the study participants. Importantly, respondents relied heavily on personal observations and memories to bring evidences of climate change at the local level.

4.3.2.2 'Climate change as rainfall and temperature anomalies'

Erratic rainfall was a salient feature in respondents' description of climate change impact at the local level. Often they used terms such as "more erratic" or "more unpredictable" and "too early" or "delayed" in describing temporal variations of rainfalls. Some respondents were so confident about the link between erratic rainfall and climate change that they recognised it as one of the most important evidences of climate change. Again, respondent frequently cited observations and experiences of their childhood or in the past to sustain the claims of erratic rainfall. In responding to a question about impacts of climate change, a boatman said:

> "When it rains it pours endlessly for days incessantly. And when it doesn't rain, everything is dry. The problem is we don't get rain when we need, and we get it when actually we don't need. I have heard this might be because of climate change. I am not sure though. But it seems to me true." *(Shomsher Ali, 33, M, boatman)*

While a housewife defined climate change in the following:

> "Well, climate change means … I think the weather is not the same as it was in the past. There are some visible changes in the weather pattern. To me, the rainy season has changed a lot." *(Rashida Begum, 50, F, housewife)*

Similarly, other respondents took monsoon or rainy season as a point of reference in emphasising links between erratic rainfall and climate change:

> "We all knew that it would rain during the months of *Ashar* and *Shrabon* [Bengali months of the rainy season] and the month of *Chaitra* should be dry. That was the seasonal cycle. But, now all has been changed. It's very much uncertain nowadays." *(Moksed Ali, 64, M, unemployed)*

It was clear in the data that rainfall was erratic not only in terms of its amount, but time of rain had been changed as well. A shrimp farmer, for example, described:

> "When I was young, rain used to start in the month of *Ashar* [first month of the monsoon]. Now, it is too delayed sometimes. If it [climate change] means change then the most visible change is in the rainfall pattern." *(Mohasheikh Sardar, 44, M, shrimp farmer and agriculture)*

Other respondents described the importance of timely and adequate monsoon rain in their livelihood patterns when rainwater was not only used for irrigation but also one of the main sources of fresh water in the region.

In the data, it was found that respondents overwhelmingly referred to observed 'temperature rise' in the region as one of the main evidences of climate change. Again, the data indicated respondents' personal observations and experiences of weather variances of the region on which

they constructed perceptions of climate change risks. A school teacher, for example, described:

> "We have been witnessing gradual temperature rise. It's too hot now. For example, my father built this house around 15 years ago. At that time, it was possible to stay inside the house during summer times. But, now, in the month of *Chaitra* (Bangla month of summer) it is too hot to in this house. It feels like a hell. Extremely hot! Then, we had to build this thatched house with *golpata*[23]. It's better than the corrugated-tin roof house." *(Abul Bashar, 36, M, school teacher)*

Similar trends were found in other respondents' descriptions, which led to the argument that most people attempted to 'personalise' and 'localise' effects of global climate change. Accordingly, localisation of climate change risks was integrated as an emerging theoretical category to explain lay people's perceived knowledge of climate change impacts.

4.4 PERCEIVED SOLUTIONS TO CLIMATE CHANGE

This section reports lay people's perceived knowledge about solutions to climate change. In general, two types of solutions are discussed in scientific and policy debates - 'mitigation' and 'adaptation'. Mitigation refers to interventions to reduce emissions of greenhouse gases. On the other hand, adaptation asks for taking measures to adapt to changing climatic conditions by reducing vulnerability and risks. Early policy debates tended to emphasise 'mitigation' as principle solution to climate change risks. However, the concept of 'adaptation' has gained prominence in recent years particularly for the countries, which are dubbed as more vulnerable to climate change impacts and have a little contribution to greenhouse gas emissions (IPCC, 2007). Bangladesh's national policy

[23] *Golpata* is commonly known as the nipa palm. This is a species of palm native to the mangrove forest *Sundarbans*.

documents (MoEF, 2009) have also emphasised on adaptation as the main strategy to deal with climate change risks.

As 'adaptation' is the main concern for the solution to climate change problem in Bangladesh, this research gave particular emphasis on how the lay people defined and perceived strategies for climate change adaptation. In general, adaptation is defined as a set of actions and decisions making processes (Nelson, Adger, & Brown, 2007). There are different levels of adaptation. For example, adaptation policy may be implemented nationally or regionally when authorities take certain actions to reduce vulnerability to climate change risks. Examples include building cyclone shelters and dikes in the cyclone-prone areas. On the other hand, adaptation may also be implemented at individual and community levels. This type of adaptation may include a community's or its members' response to minimise certain risks that they believe are impacts of climate change. In the current research, it was aimed at understanding adaptation at the individual or community level. This aim was motivated by the notion that understanding individual-level adaptation knowledge could help policy makers and hazard managers to draft more effective adaptation strategies at national and regional levels as well as finding ways to communicate those strategies to the affected people. In the literature, it is argued that a community with high adaptive capacity will be less vulnerable than other communities on the potentially detrimental effects of climate change on their landscape and lives (Pelling, High, Dearing, & Smith, 2008; Roncoli, 2006).

During the interviews, some general questions were asked to understand respondents' views on solutions to the climate change problems, how to adapt and the ways they dealt with different risks, which

were identified as impacts of climate change in the locality. In the beginning, many respondents found the term "adaptation" difficult to understand. It had been observed that "*Ovijojon*" (the Bengali word for 'adaptation') was a formal term, which was not used in colloquial language. While its synonym "*khap khaoyano*" (making adjustment) was comparatively easy for respondents to follow. Accordingly, we avoided the term *"Ovijojon"* for 'adaptation', and instead used *"khap khaoyano"* during the later interviews. This indicates to an important implication for

<table>
<tr><td colspan="5">Real → Abstract</td></tr>
<tr><td rowspan="3">Data/open codes</td><td>Selective codes/initial theoretical categories</td><td>Analytical memos/notes</td><td>Emerging theoretical abstraction</td><td>Core category</td></tr>
<tr><td>Traditional knowledge of adaptation</td><td>- Solution practices are inherited and practiced culturally. That is, solutions to geo-hazards are rooted in cultural practices.
- Adaptation is continuous, but limited.</td><td rowspan="2">Patterns of traditional knowledge to adaptation are rooted in local hazard culture while newly introduced knowledge is infused through a number 'external' communication channels.</td><td rowspan="2">Adaptation is a continuous process rooted in local hazard culture.</td></tr>
<tr><td>Newly acquired knowledge of adaptation</td><td>- Emphasizing on scientific knowledge transfer.</td></tr>
<tr><td colspan="5">Real → Abstract</td></tr>
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Figure 4.3: Perceived knowledge about adaptation to climate change (theoretical abstraction from data).

public communication of climate change. Any attempt to engage people and make the message easily understandable to the target audience needs to understand contextual and linguistic perspectives of the audience.

As the data analysis progressed, two distinct patterns of respondents' perceived knowledge of climate change adaptation emerged (*see Figure 4.3*). The first pattern described lay people's "traditional adaptation knowledge" while the second pattern dealt with "newly acquired adaptation knowledge." Traditional adaptation knowledge included techniques and skills, which were inherited and practiced culturally in the region. People acquired such knowledge through regular interactions with local geo-hazards and other livelihood conditions. While respondents' newly acquired adaptation knowledge emphasised scientific knowledge transfer for livelihood supports so that affected people could survive in changing climatic conditions. As found in the data, this type of adaptation knowledge was communicated to the lay people through a number of communication channels, which included news media and advocacy programmes of different government and non-government organisations. It was also observed in the data that traditional adaptation knowledge was rooted in cultural practices while newly acquired adaptation knowledge attempted to infuse scientific knowledge of adaptation to the affected people. These two patterns of adaptation knowledge were distinctive at the analytical level. In practice, both patterns overlapped in integrative ways when scientific knowledge attempted to supplement traditional ways of adaptation. On the other hand, "traditional" and "newly acquired" knowledge of adaptation were significantly linked to the events of local hazards and hazard culture.

4.4.1 Traditional adaptation knowledge to climate change

As for traditional adaptation knowledge, this research categorised the techniques that lay people developed over the years in specific climatic conditions. Such knowledge was developed through accumulative experiences of community members, relationships between society and nature, socio-cultural practices, and most importantly continuous transfer of this knowledge to next generations. During the data analysis initial codes were merged into categories and the process revealed the following: "structural design and materials of houses", "close observation of weather patterns", "adaptation as a continuous process", "community bonding", "dike culture", "migration", and "rainwater harvesting", among others. All these major codes were merged into the conceptual category of "traditional knowledge of adaptation to climate change impacts".

An important feature of respondents' understanding of climate change adaptation was that they perceived it as a continuous process and integral part of their survival in the region. It was the struggle against nature's extreme behaviour that determined the ways people lived in the coastal region in Bangladesh. As a result, the term 'adaptation' might be new or confusing to them as a topic within the broader climate change discourse. But, most people could clearly identify adaptive practices that they learnt traditionally to sustain their livelihood against the extreme climatic conditions. One elderly respondent, for example, described:

> "I know what you mean. Isn't it apparent that you need to adjust in the conditions where you live? It's same for us. This is natural. We have developed certain techniques to adjust to the natural conditions here. Let me give an example. Will you be able to collect honey from the forest? No, but we know how to get honey. We learnt it from our forefathers." *(Abul Hossain Mollah, 70, M, retired)*

Similarly, a schoolteacher gave detailed account of traditional adaptation techniques in the region with a clear indication that adaptations were essential tactics of their living in the region:

> "Well, climate change, global warming; all these are new terms for us. Nowadays, a lot of people, mainly the NGO people are talking about adaptation. Many people even don't know what does adaptation mean. But, if you give a closer look you will see people are practicing adaptation techniques all the time. You see the houses, their structures, building materials, boats, their designs, and most importantly professions of the people, these all are adaptive techniques." *(Abdul Hannan, 31, M, school teacher)*

A shrimp farmer defined adaptation in the same way, and said:

> "If it means an adjustment in the climatic conditions, then I would say it's a continuous process. It's not a choice, but a necessity for us. For example, we need to observe natural conditions, weather. I have learnt it from my parents, *murubbi* (elderly people), and now my children are learning from us." *(Nurul Alam, 32, M, shrimp farmer)*

Such assertions clearly indicated that adaptation strategies were rooted in the local culture and these strategies were transferred from one generation to other. People developed certain indigenous knowledge to minimise risks of extreme climatic conditions as a constant process. For example, in the data, we found "close observation of weather patterns" as a recurrent technique to minimise risks of geo-hazards. This traditional knowledge was practiced both in normal and extreme conditions for generations. Observing wind and cloud directions, locations of the stars, and behaviours of different animals (e.g., ants, bees and dolphins) were few examples of close observations that were cited by the respondents. These practices could be labelled as indigenous knowledge of early warning of geo-hazards. One honey-collector described:

> "We take notice of movement of ants and bees in the forest to make sense of any ensuing storm." *(Golam Mustafa Gazi, 53, M, honey hunter)*

However, the level of knowledge about these indicators varied from generation to generation. While elderly respondents tended to apply them, comparatively young respondents perceived them as "old-fashioned", which had been superseded by the modern early warning systems.

> "We heard elderly people saying the movement of ants to higher places was a sign of storm surges. But now we give more importance on modern warning systems. There are radios, warning flags, loudspeakers, and most importantly mobile phones." *(Jasim Uddin, 24, M, unemployed)*

"Structural design" of houses and "materials" to build them were other practices of traditional adaptation against regional geo-hazards. As observed during the field visits, most of the houses were built with sidewalls made of muds, and roofs either with corrugated tins or thatches collected from nearby mangrove forest. The obvious objective was to keep the houses cool against the scorching heat during the summer as well as to minimise damages in storms.

> "We use *golpata* for roofs of our houses. They are very cheap and available in the Sundarbans. You will see a lot of mud-walls. They keep the houses cold." *(Moksed Ali, 64, M, unemployed)*

Another respondent referred to owning boats and rafts at almost every household and described them as most important adaptive vehicles both in normal and crisis time.

> "You will see boats in almost every households here. These are used to catch fishes, shrimp fries and crabs in the rivers. During the crisis time, for example in storms and floods, people use boats to go to a safer place." *(Avinash Mondol, 42, M, shrimp farmer)*

"Community bonding" was identified as important adaptation technique that helped people both in normal and crisis times to minimise risks of extreme weather conditions. It was found in the interviews that neighbours and relatives were the first rescue operators in the absence of any formal rescue operations during the crisis time. Not only during the time of crisis, 'community bonding' was an important element of rural life since villagers were involved in formal and informal ties with each other. An elderly respondent in his 70s described the phenomena of volunteer collective action by local people to assist in moving valuables and livestock to safe place during the time of storms. This was also reflected in the description of a female respondent:

> "My husband was not at home when the cyclone hit us in the morning. He went out to take care of the *gher* (shrimp enclosure). I was so worried about four children and livestock as there was water already near the base of our house. Water was rising quickly and within an hour, this house was flooded. It was already knee-high water inside the house. We took shelter on the roof, and then some people from our village came to rescue us with a boat. We were shifted to the school building along with other people." *(Khadiza Banu, 45, F, housewife)*

Apart from collective volunteer action, this woman's assertion indicated to two important insights in the overall hazard management process. First, the vulnerability of women in absence of male partners at home at times of natural hazards. Second, women's important roles in managing hazards at their households as being responsible for taking care of domestic burdens. Terry Cannon, in his study of gender and climate hazards in Bangladesh, made similar arguments. As Cannon (2002) pointed out that at times of crisis (e.g., cyclones) women were reluctant to go to public cyclone shelters because of perceived shame to leave the house, and

going to public along with other men. This was, however, contradicted by a study of the German Red Cross on disaster preparedness in Bangladesh and India. The German Red Cross (1999) study found that the "purdah system[24]" has been transformed and the study emphasised important roles of NGOs to increase public awareness about risks of natural hazards, even among the women. Yet, validity of Cannon's argument with regard to increased vulnerability of women during the crisis period exists because of their responsibility in managing hazards at household levels. In particular, women's clothing (i.e., *Sarees*) and responsibility for their children restrict their mobility in times of crisis, such as floods and storms surges (Cannon, 2002). This indicates that women's vulnerability is still rooted in 'built-in' social norms by restricting their mobility in one hand, and defining sole responsibility to manage household chores and children, on the other. The current research also found a transforming 'cultural norm' where many women left their houses to safer places during the Cyclone *Aila*. Most female respondents made assertions that this was more or less culturally accepted now for women to move out of the houses during the time of crisis.

"Living inside the dike" was another important phenomenon that substantially determined the way people perceived risks of climate change impacts in the forms of geo-hazards. This was evident in the data that people living in the villages developed a specific type of "dike culture" that provided them a feeling of protection from the surges of saline water both at normal and crisis times. The government initiative to protect coastal population from tidal surges and increase crop production began in the

[24] Literally 'purdah' means veil or curtain. But, 'purdah system' describes socially accepted proper space of women. It limits women's mobility within the boundaries of their home, and interactions with male persons who are not from the same family.

1960s. Thousands of kilometres (approximately 6,000 km) of embankments were constructed along the coastline, banks of the rivers, and coastal estuaries to polder[25] the areas to protect coastal population and their crops against flooding from high tides (Momtaz & Shameem, 2015, p. 50). Currently there are 139 polders across the coastal zone of Bangladesh. Accordingly, an important aspect of traditional adaptation knowledge with regard to climate change risks was centred on dike culture. Respondents described dikes as 'point of reference' on which their 'sense of being safe' was built. "Strong and heightened" dikes to prevent saline water intrusion appeared as one of the most prevalent solutions to the impacts of climate change in the interviews. Consider the following assertion:

> "Heightening the dike and making it stronger to prevent saline water could be most urgent solution option. It will prevent our *ghers*, crop lands and most importantly our houses from the intrusion of saline water." *(GM Rafiqul Islam, 41, M, UP member and shrimp farmer)*

Migration or dislocation might be sound a recent phenomenon against nature's threat or as it is often framed as "climate refugees" in the advocacy and media discourses. But, in the data, we found that people perceived migration or relocation as a natural way to adapt in changing situation. There was a trend of economic or seasonal migration when many people were forced to move to nearby cities in search of jobs in the aftermath of the cyclone *Aila* in 2009. An NGO worker described the phenomena in the following:

> "You will see a lot of people are now migrating to cities in search of works. People migrate a lot during the lean seasons when there is crisis of job here. But, what I can say

[25] The Dutch term "polder" is used in Bangladesh to designate areas that are surrounded by dikes or embankments, separating them hydrologically from the main river system and offering protection against tidal floods, salinity intrusion and sedimentation (Islam, 2006).

> the magnitude of the trend has been increased after the cyclone because there is virtually no job for the people." *(Mohsin Alam, 31, M, NGO worker)*

However, it was found during the third field visit that many of the people who were migrated to nearby cities and town had returned to their locality once the *ghers* began to firm shrimps creating jobs for the local people. This indicated that most people's migration was for economic reasons.

4.4.2 Newly acquired knowledge of adaptation

"Newly acquired adaptation knowledge" was categorised with codes that described the introduction of scientific adaptation strategies to the lay people by some external actors to minimise climate change risks. Mass media, and different government and non-government organisations were the main societal channels involved in bringing a number of new adaptation knowledge to the lay people. The main categories of newly obtained adaptation knowledge included "creating alternative livelihood opportunities", "financial and technical supports", "community-based adaptation", "reforestation", "rich countries' liabilities", "rainwater harvesting", and "capacity building".

During the interviews, respondents made detailed accounts about adaptation strategies that they had taken in recent years. In the past, the livelihoods of the villagers were based on agriculture and resources generated from the *Sundarbans*. Since 1980s, shrimp cultivation became popular in the locality and the importance of farm-based agriculture diminished. Shrimp cultivation was less labour-intensive as compared to paddy cultivation that resulted in job crisis. On the other hand, various restrictions were imposed on gathering resources from the *Sundarbans*. One farmer described the situation in the following:

> "We used to work in the paddy fields. There were various types of works there. Many people didn't have their own lands, but they could survive working in others' lands to cultivate paddy or leased them on the basis of crop sharing. But, most of us lost these jobs once land owners transformed the lands into shrimp enclosures which do not require many labourers." *(Mohasheikh Sardar, 44, M, shrimp framing and agriculture)*

In the data, it was apparent that NGOs were the main drivers of transmitting "new adaptation knowledge" to the lay people through a number of development and rehabilitation programmes. Most NGOs developed the "community-based adaptation" strategies for creating sustainable livelihoods for the people. Crab farming and cultivation of saline-tolerant crops were examples of two newly introduced adaptation strategies in the villages. A female respondent said:

> "I took part training on crab farming in small ponds. They call it crab fattening. I bought small crabs and then farm them the pond." *(Maloti Mondol, 42, F, crab farming)*

While a farmer described how he came to know about saline tolerant paddy seeds from an NGO worker and motivated to produce rice again. He said:

> "Level of salinity in the lands is very high because of years of shrimp cultivation. Now, it's no longer possible to cultivate rice in these fields. I got information about saline tolerant paddy seeds from an organisation. I'm still waiting to see its production." *(Mohasheikh Sardar, 44, M, shrimp farmer and agriculture)*

Other NGO initiatives to transfer climate change adaptation knowledge included harvesting rainwater to provide safe water to the villagers. Rainwater harvesting was a traditional way to preserve monsoon rains in clay jars, locally known as *motki*. These small clay jars could meet demands of a family only for a couple of days. A female respondent, for example, described crisis of fresh water in the following:

> "Crisis of safe water is the most important problem nowadays. We can't use the water from ponds and rivers because there are contaminated with saline water. Every day, I need to spend two to three hours to collect fresh water from other villages." *(Sharbanu Khatun, 33, F, day labourer)*

The problem was slightly lessened when some NGOs came up with the idea of harvesting rainwater for the community use. They helped to build large tanks to preserve rainwater for drinking and other household purposes (*see Figure 4.4*). NGOs also distributed smaller size tanks to families for the preservation of rainwater. In addition, many of the local community members received training on improved rainwater harvesting, its cleanliness and maintenance of the system. One female respondent who participated in such a training programme, described:

> "We used to preserve rainwater. But, after the training, we are more knowledgeable about optimal use of rainwater." *(Lutfunnesa, 35, F, housewife)*

> While her neighbour made the following assertion:
> "NGOs provided us a water tank. Some families got *motki* and some big tanks. I would not say that the problem of drinking water is entirely solved. But, the situation is slightly better than before." *(Jaheda Akhter, 40, F, housewife)*

Drawing from the interview data, "financial help from rich countries" appeared as a recurrent category with regard to the solution to climate change problem. Respondents found it as "ethical liability" of the rich countries, which contributed to creating the climate change problem, to provide financial and technical supports to the affecting countries for adaptation. One respondent described:

> "We have little capacity to adjust in this situation. We can't stop climate change. I believe the rich countries should come forward and help us. They cam create jobs, build dikes and provide safe water." *(Mohammad Fuad, 35, M, day labourer)*.

Figure 4.4: NGOs provide water tanks and solar panels to the villagers (researcher's own photo).

Similarly, an NGO worker pointed out to the "ethical liability" of the developed world to provide financial assistance to the climate change affected people.

> "It's very simple. The rich countries can't avoid their liability. As we all know the problem is created by them, they should take the responsibility to solve it." *(Shahida Begum, 35, F, NGO worker)*

Similar was the view of a shrimp farmer who emphasised global initiative to help countries like Bangladesh in adaptation to climate change risks. He described increased phenomena of storms and tidal surges and asked the 'rich countries' to provide financial supports to build heightened and stronger dikes.

> "Dikes are the main solution to protect from storms and surges. But, as we are a poor country we cannot build strong dikes. We need more money. Rich countries, England, America, Japan can help to build such dikes." *(SM Yunus Ali, 55, M, shrimp farmer)*

Another shrimp-farmer was more categorical to blame developed nations for creating the climate change problem and said:

> "People who have created the problem should take responsibility of the plights of those who are affected." *(Avinash Mondol, 42, M, shrimp-farmer)*

In the data, there were some assertions emphasising the role of Bangladeshi government in managing climate change risks. But, respondents in general perceived that main responsibility for tackling climate change should be placed at international level.

At the same time, there was evidence that the respondents had limited interests to take actions. People tended to react to risks, which were more 'obvious' as compared to risks, which were dubbed 'obscure'. Climate change appeared to some people as obscure risks considering its abstract nature. While livelihood supports, finding jobs, education and health facilities were described as imminent are pressing issues. For most respondents, climate change was not a priority risk to discuss, to think and to take actions.

> "Actually, we know climate change is a bad thing. But we don't have time to think about it. We have other issues to deal regularly. Climate thing is happening once a year or in two, three years. But we need to feed our kids, manage education for them. These are more important issues." *(Liakot Gazi, 38, M, shop-keeper)*

This illustrated that even awareness was not adequate to motivate people to take adaptive measures against the adverse impacts of climate change. Instead, there existed a sense of inevitability in many respondents' minds with regard to dealing with natural hazards what they attributed as consequences of climate change.

4.5 CHAPTER SUMMARY

This Chapter described study findings concerning public perceptions of causes, impacts and solutions to climate change risks. A clear gap between "awareness" and "knowledge" of climate change was noticed in the data when almost all respondents demonstrated a high level of familiarity with climate change and related issues. However, high proportionate of awareness about the basic topics of climate change did not translate into knowledge about them. The interview data revealed that the lay people were largely confused and held some identical misconceptions about scientific concepts of global warming and climate change. The political aspect of the issue was more clearly understood by the lay people than its scientific conceptualisation. Respondents categorically identified "rich and developed" countries for creating the problem. Most importantly, this study found the important role of local hazard culture in perceiving risks of climate change. There was a trend of culturally shared knowledge of climate change when the issue was filtered through local geo-hazards. Findings of this Chapter also indicated to important roles of different communication sources in creating awareness and shaping public understanding of climate change.

Chapter 5

Findings: Communicating Climate Change

5.1 INTRODUCTION

In the previous chapter, study findings concerning lay people's perceived knowledge of the causes, impacts and solutions to climate change risks were presented. One salient feature of public perception was the localisation of climate change risks within the contexts of local geo-hazards. Lay people's personal exposures to local extreme weather events, and experiences of weather and seasonal variances played important roles in constructing climate change perception. This was indicated in the interview data that risks of local geo-hazards were readily available as prior constructs in respondents' minds and they were further intensified with newly acquired knowledge of climate change from different communication sources. Accordingly, the emerging grounded theory to explain lay people's understandings of climate change risks led this research to investigate respondents' sources of climate change knowledge. In other words, this research investigated mutual relations between communication and construction of climate change perceptions. This research asked – first, how the issues of climate change were communicated to the lay people? Second, how the lay people communicated the issues among themselves at the community level? In one hand, attempts were taken to identify important sources and actors of climate change information flow; and on the other, to identify the structural process of this communication. Taken together – sources and processes of climate change information flow – led this research to draw a structural

Mode of communication	Communication sources	Major functions
Formal	Mass media: mainly television and radio; limited access to newspapers.	Issue generation and agenda setting functions.
	Advocacy programmes of interest groups, notably NGOs and govt. organizations.	Issue advocates; politicisation of the issue.
Informal	Social contacts and networks (friends, neighbours, families); opinion leaders.	A strong influence on attitude towards climate change and behavioural responses.
	Personal experience, observation and memory of hazards.	Evaluation of formally and informally communicated knowledge.

Table 5.1: Formal and informal communication sources, and their respective roles in the communication repertoires of climate change.

model of climate change communication at the community level. This was labelled as 'the communication repertoires of climate change' [26]. Respondents' cultural constructs of climate change risks; communication patterns (e.g., general media environment and media use) as well as formal and informal social contacts were integrated into the communication repertoire. The communication repertoire illustrated that construction of knowledge in individuals' minds was a complex and evolving process in which local hazard culture, social interactions, mediated knowledge,

[26] This should not be misinterpreted with the concept media repertoires (Hasebrink & Popp, 2006; Hasebrink & Domeyer, 2012). Although conceptually similar, the communication repertoires that had been developed in this research took a more comprehensive approach to identify different sources and channels (both mediated and non-mediated) of climate change communication at a community level. While, media repertoires explained how people interact with different types of media in their daily life.

personal experiences, and memories of hazards played different, but integrated roles.

The analysis of the interview data revealed that lay people obtained climate change information from a number of formal and informal communication sources (*see Table 5.1*). Mass media and advocacy programmes of different interest groups (e.g., NGOs) were the two main types of formal communication sources of climate change. However, information obtained from formal sources was not perceived at face values. Rather, there was a general tendency to reconstruct formally communicated climate change information by embedding individual and cultural meanings. This process of embedding 'meanings' involved different types of informal communication. In the data, two types of informal communication sources were recognised as important determinants of public perception of climate change. They were: social contacts and networks; and personal experiences, memories and observation. This was important to note that communication sources in the repertoire were identified on the basis of respondents' descriptions (reconstruction of individual practices) and the researcher's observation of the field and study participants.

The conceptual basis of 'communication repertoires' as developed in this research was comparable to the concept of media repertoires (Hasebrink & Popp, 2006; Hasebrink & Domeyer, 2012), which referred to the entirety of media that people regularly use. Although conceptually similar, communication repertoires bring distinctive characteristics by extending the dimensions from entirety of media to the entirety of communication. Media repertoires approach, as argued by Hasebrink and Popp (2006), emphasised to get the full picture of trans-media practices by

audiences instead of the narrow approach of audience research on single media uses. Taking a similar approach, this research attempted to go beyond individuals' media experiences and looked for various communication actions at the community level. Mediated climate change communication was a part of the communication repertoires, which also included different types of intra- and interpersonal, and group communication (*see Figure 5.1*). This research posits the notion that exploring public perceptions of climate change only on the basis of respondents' media use is problematic because a major part of public perceptions are constructed in their non-mediated communication experiences.

This could be also argued that the theoretical proposition of media repertoires might reveal only the partial picture of the construction of public perception, particularly in traditional societies, where much of the communication still occurs beyond the mediated world. Yet, "the communication repertoires" of this research is comparable with the concept of "media repertoires" on the grounds that both take a user-centred perspective and attempt to understand the entirety of individuals' media and communication experiences. Like the "media repertoires" approach, the "communication repertoires" of climate change explains the inner structure and process of communication. As the model (*Figure 5.1*) illustrates, mediated communication of climate change is structured vertically. On the other hand, non-mediated climate change communication is dialogically structured with interactive flows of information among the people. Different elements of the communication repertoires of climate change risk communication and their respective roles as found in this research were described in the following sections.

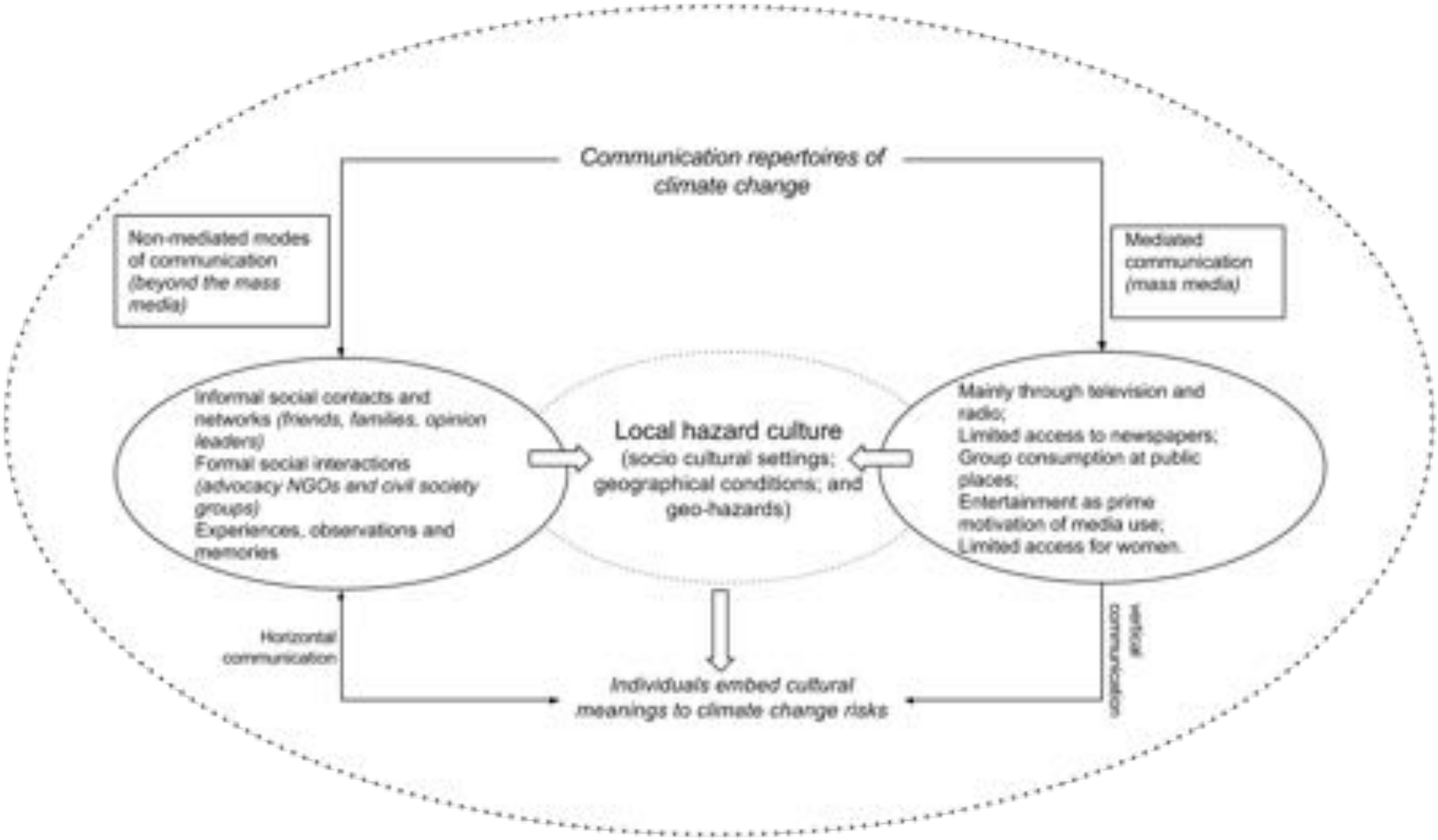

Figure 5.1: The communication repertoires of climate change *(researcher's own model based on the study findings)*.

5.2 FORMAL SOURCES OF CLIMATE CHANGE KNOWLEDGE

5.2.1 Mass media – "creating awareness and setting the agenda"

In the data, mass media appeared as most common sources of climate change knowledge for the lay people. News reports, documentaries and discussion programmes in radio and television made climate change topics familiar to them. "*It was on the television*"; "*I heard it on radio*"; "*there was a programme on television*"; and "*mainly from television and radio news*" were the sorts of assertions that respondents made frequently while describing sources of climate change knowledge.

Drawing on the interview data, two important aspects of media's role in informing and constructing public perceptions of climate change were identified. First, media made climate change issues familiar to the lay people. That is, people became aware of the issue through mediated information. This was categorised as the "issue generating" function of media. Second, respondents generally described that their perceptions of climate change were considerably shaped by information getting from media. There was a recurrent tendency to retrieve mediated images of climate change while divulging their knowledge, for example, drawing a catastrophic image (i.e., storms, floods) of climate change. Accordingly, the interview data indicated that media were able to transfer some specific attributes of climate change (e.g., its catastrophic image) to the public apart from making it an occasional topic for discussion among the study participants. This clearly indicated an "agenda setting" function of mass media in the process of communicating climate change to the public. Taken together, this could be argued that media were not only raising awareness of climate change, but also bringing it to the public emphasising certain features of the issue. An overview of local media environment is necessary

to understand media's "issue generation" and "agenda-setting" functions with regard to climate change communication. As for local media environment, a critical analysis of media types, access and usage patterns, is demanding to contextualise media's relative importance in communicating climate change.

As far as mediated climate change knowledge was concerned, this research didn't find many variations of media types in the communication repertoires. It was either radio or television that most respondents referred to as primary sources of their mediated knowledge of climate change. Consider the following assertions:

> "I heard about it [climate change] from the radio. It's a serious issue, very dangerous. Television also had some programmes on climate, but mainly radio. Nowadays, radio gives more importance on climate change." *(Abul Hossain Mollah, 70, M, retired)*

> "Well, it … I mean about climate change, I probably watched it on television news. You could find it almost every day at that time. Our prime minister was in a meeting [referring to COP15 in Copenhagen] and it was a very big one on climate." *(GM Rafiqul Islam, 41, M, UP member and shrimp farmer)*

In the interview data, only three respondents, one school teacher and two NGO field workers, cited newspaper reports that had enhanced their knowledge of climate change. The Internet and online-based social media were not a topic of discussion during the interviews because of their complete absence regarding climate change communication in the study location. Such a media environment of climate change information was consistent with general media uses and access in the area. People didn't have regular access to newspapers in the study locations mainly because of limited purchase capacity and limited literacy. Geographical location, as

the villages were separated from the mainland by rivers, also made it difficult to deliver newspapers. A school teacher illustrated the situation in the following:

> "Newspapers? You will not find them here. Sometimes people bring newspapers from *Shyamnagar* [nearest semi-urban Upazila headquarter]. Let's say, if I go to *Shyamnagar* for any official purpose, then I bring a newspaper. Similar is the case with my colleagues at the school. Sometimes they also bring newspapers from *Satkhira* or *Shyamnagar*. Then, we all share the paper in the school. And, the other thing is, this is not possible to get newspapers here daily. They are not delivered here." *(Abul Bashar, M, 36, school-teacher)*

Another respondent, who worked as an NGO field worker, also reflected on limited access to newspapers.

> "I do read newspapers while in the office in *Shyamnagar*. But, getting newspapers in *Gabura* [study location] is unimaginable. You know, most people are poor and illiterate here. There is no demand for newspaper. Who will read? Nowadays, television is the most popular, and the mobile phone." *(Khairul Alam, 36, M, NGO worker)*

Some respondents had a general feeling that newspaper was a commodity only for educated and financially capable 'elites'. An elderly male respondent, for example, described:

> "Nowadays, we are getting most news in television channels. And, there is BBC and other radio stations. Why should we buy newspapers? This is costly. For me, buying newspapers is something like throwing around money every day. I can't afford it." *(Jeher Ali Mirza, 55, M, crab trader)*

In the absence of newspapers, radio and television became most popular media for public information and entertainment. But, every family didn't have the financial capacity to own a television set. Only the rich and middle class people in the community could afford television sets at home. Relatives, neighbours and friends often gathered there in the evening to watch prime time news bulletins or entertainment programmes, such as

musical shows, soap operas and movies. Accordingly, "watching at neighbour's home" appeared as one of the important places for accessing television programmes both for male and female respondents. One female respondent asserted:

> "We can't afford a television. Sometimes I go to neighbour's home to watch it. I like to watch drama and movies. But, it's not a daily activity."*(Lutfunnesa, 35, F, housewife)*

The state-owned terrestrial channel Bangladesh Television (BTV) was the only choice for the people to watch. In the villages, there was no satellite or cable television network. BTV broadcasts entertainment and current affairs programmes daily from late afternoon to late evening. Some people go to local bazaars (marketplaces) across the river to watch satellite television channels. As being a borderline area with India, some households had access to Indian terrestrial television channel *Doordarshan*. Access to television was also restricted because of limited access to electricity in the area. As the study location was not connected to the national power grid line, people largely relied on solar cell powered batteries to run television and electric bulbs in the evening. One shrimp farmer described:

> "We watch news bulletins and dramas in the evening for one to two hours. But, it's not daily. It's not possible to run television all the time because we don't have mainland electricity here. If the weather is better and sunny, then the battery is charged during the day and we can watch television for a couple of hours." *(Nurul Alam, 42, M, shrimp-farmer)*

Similar was the view of another respondent, who worked as a fisherman:

> "We can't run the television all the time even if we want to. It is costly and in the evening, we also need to light the houses with charged batteries." *(Gazi Nur Uddin, 45, M, fishing and forestry)*

"Public places" (*see Figure 5.2*) appeared as the other important site for media consumption for the local people, after "one's own home" and "neighbours' place". A significant number of male respondents described that they watched television, listened to radio, and very occasionally read newspapers in public places. Tea stalls at local *bazaars* (marketplaces) and ferry *ghats* (places to ferry people across the river) were most common places of community access to media. These places appeared as important centres of not only consuming media contents but also communicating local socio-political and livelihood issues. After finishing day's works, mainly male members of the community, gathered in these places to meet others, to buy commodities and consume media programmes. One shrimp farmer, for example, said:

> "Sometimes I go to *bazaar* across the river in the late afternoon and spend the evening to meet others. We usually sit outside a tea stall, chat and watch television. I like the evening news bulletins of Bangla TV". *(Jeher Ali Mirza, 55, M, crab trader)*

As the data analysis proceeded, this research noticed a clear "gender gap" in accessing and consuming media contents. A comparison of male and female respondents' sources of climate change knowledge suggested that male respondents emphasised more on mediated information that shaped their understanding of climate change. On the contrary, female respondents hardly referred to media as sources of their climate change knowledge. Instead, activism and advocacy programmes of different NGOs and informal social contacts among the women appeared as most common sources of climate change knowledge for female respondents. This variation suggested two possibilities – first, women had a lack of interest

about the issue in media; and second, they had limited access to mediated climate change information. The second reason fits more appropriately with the data. Largely as a patriarchal society, males being the heads of families usually controlled when to turn on the television sets and which programmes to be watched. Female members took the charge only when their male partners were not at home. Only a few female respondents described that they sometimes visited neighbours' homes to watch television programmes in the evening. A middle-aged housewife described:

> "It's not regular. Sometimes I go to my neighbour's home [to watch television] on Fridays to watch Bangla movies." *(Jaheda Akhtar, 40, F, housewife)*

Figure 5.2: People gather in front of a local grocery shop cum tea-stall to watch television (researcher's own photo).

Importantly, women's access to media at public places was restricted by the patriarchal order of the society and '*purdah system*'. The interview data, as well as researcher's field observations suggested that

public places of media consumption were entirely males' domains. Asked about it, one female respondent indicated to social values and replied:

> "We don't go there [market places]. It's not permitted in our family." *(Khadiza Banu, 45, F, housewife)*

Similarly, another female respondent asserted that it was simply 'unimaginable' for them to go out of the home in the evening and watch television at market places or tea-stalls with other males. This clearly reflected existing social norms and position of women in the society, which was largely structured in a '*purdah system*'. The literal meaning of *purdah* is veil or curtain. But, Oommen (2005) described it as "a socially accepted proper space for women" when the intention was to limit women's mobility within the boundaries of their homes. The purdah system also limits interactions between male and female persons if they are not from the same family (Amin, Becker, & Bayes, 1998). As such, women are usually relegated to domestic matters and men are given charge of all matters outside the house in rural Bangladesh (Kibria, 1995). Based on this, Khosla (2009) rightly argues that *purdah* is not merely a dress code for women, but a powerful source of exclusion since it serves to isolate women and defines their socially acceptable behaviour. Accordingly, women's participation in public viewing of television at local public spaces was restricted. Yet, this research observed a slow but gradual transformation of women's position in rural Bangladesh. There was an increasing trend of women's participation in economic and social activities. In particular, NGOs worked closely with women in different livelihood support programmes to bring them out of the restricted domains. During the field study, many poor women were seen working alongside their male partners, for example, in

mud works or fishing. A female NGO worker, who had been working in the area for around four years, described the situation in the following:

> "You will now see a lot of poor women are working in the fields as agricultural workers or in the rivers to catch fishes. Many women are now organised and become more empowered after their engagement in development projects [of NGOs]. Yet, we can't imagine women are watching television at a tea stall in the evening." *(Shaheena Akhter, 38, F, NGO field-worker)*

Like the television, listening to the radio was also dominated by men, and often described as a recreational activity. One female respondent described:

> "I don't get time to listen to the radio. My husband listens to it. He finishes works by the evening and then sits with the radio set. But for me, it's a round the clock work. You can say from waking up in the early morning till going to bed at night. I still need to take care of families in the evening. To be frank, I don't get time." *(Rashida Begum, 50, F, housewife)*

Similar was the view of another woman:

> "Often we need to work at the fields or *ghers*; sometimes to catch shrimp fries in the rivers. We have chores of works at home too. It's very difficult to mange time to listen to the radio. Sometimes, I watch television at my neighbour's home in the afternoon, but not daily." *(Maloti Mondol, 42, F, housewife/crab farmer)*

In the data, it was found that popularity of the state-run radio stations were declining because of 'poor and monotonous programmes'. In contrast, Bangla news bulletins of different foreign radio stations, such as BBC (British Broadcasting Corporations), DW (Deutsche Welle), VOA (Voice of America), and Radio Tehran, were comparatively popular among the male respondents who usually tuned to those stations to get current news. One elderly respondent asserted:

> "I don't watch television. You can say I am mainly a radio listener. It's a long time habit. I listen to Bangladeshi radio (stations) sometimes, but mainly BBC, Tehran, Voice of America, and sometimes *Akashvani* [Indian radio station]. It's not fixed. I just keep tuning in the evening." *(Abul Hossain Mollah, 70, M, retired)*

The only communication channel in which both men and women had unhindered access was mobile phones. It grew rapidly in the last decade, brought people to a digital network, and substantially reduced the communication gap. A female NGO worker described:

> "Nowadays everyone has mobile phones. It's now easier to contact others." *(Shahida Begum, 35, F, NGO worker)*

The Grameen Bank's *Village Phone* programme was a pioneering initiative started in 1997 to empower rural women through mobile services. As of December 2009, there were around 365, 000 village phones in operation in more than 55,000 villages across the country. Most of the mobile phone operators under the *Village Phone Programme* were women who got the phones on small credit and used them as public call centres for commercial purposes. Since the mid- 2000s, the mobile phone penetration swiftly spread to most parts of the country with substantial fall of both mobile handset prices and airtime costs. By this time, the village phone programme also lost its necessity when mobile phone operators started to bring telecommunication services to the rural people at affordable and competitive prices (*see Figure 5.3*). Yet, the village phone programme initiated by the Grameen Bank is credited for creating a "phone culture" among rural women by enabling their access to communication tools from which they might otherwise be excluded (Bairagi, Roy, & Polin, 2011).

As the data analysis progressed regarding media's roles in the climate change communication repertoires, "motivation of media uses" emerged as an important conceptual category. This category largely

explained respondents' general interest in mediated climate change information. In most cases, media appeared as "passive source" of climate change knowledge. This indicated that it was not the people who were motivated to seek out climate change information from the media. Rather, many people were exposed to the mediated climate change information by "chance". Consider the following assertions:

> "It's not that I am very much interested about climate change and seek out there [in TV or radio]. I mainly listen to news, whatever it is, and find it [climate change] there". *(Mohasheikh Sardar, 44, M, shrimp-framing and agriculture)*

> "I see it [climate change] in the TV. But, [I] don't understand quite well. It seems to me very complicated; not a matter of common people. Actually, it's not very interesting to me." *(Mohammad Fuad, 35, M, day labourer)*

Figure 5.3: This photo illustrates advertisement banners of mobile operating companies in the village near a damaged bridge over the canal. The blue building on the other side of the canal is the local mosque for Muslim people to pray (researcher's own photo).

As the respondent described, there was a common acknowledgement by many respondents that climate change as a mediated issue was either "too complicated" or "too boring". A day-labourer said:

> "I have seen it on television. But, to be frank with you, I didn't get much of it. Only the storm part that I am familiar with." *(Amzad Hossain, M, 42, day-labourer)*

While a school-teacher explained the scenario in the following:

> "There might be something on the TV, but I don't think people are interested in them. They want to be entertained, not to be bored." *(Abdul Hannan, 31, M, school-teacher)*

As the respondent indicated, entertainment was the main purpose of using media. Only a handful number of male respondents described that they watched television or listened to radio news to be updated on contemporary national and global issues.

> "No, I didn't watch TV to know more about climate change. It was out there in the news". *(Nipendranath Mondol, 45, M, crab trader)*

Drawing on interview data, this was also found that respondents showed a "temporal interest" to climate change issues that was significantly influenced by media coverage. Public concern and interests to climate change were comparatively higher when the issues received much media coverage and it faded away once media switched to other issues. Consider the description of a female respondent, who worked as an NGO worker:

> "It was on the TV for days after the [cyclone] *Aila* and then came the conference [the COP15 in Copenhagen]. Everyone was talking about climate change. Prime Minister was there. It was reported on TV that more storms would hit our area because of warming and climate. And, you know, climate change was all around here as a topic. Then, election came and we didn't see anything on climate change. By this time,

> people also forgot to think about it." *(Shaheena Akhter, 38, F, NGO field worker)*

This clearly indicated a temporal dimension of public attention to climate change when some critical issues and events determined the amount of media coverage, and consequently, people's interest. Global level climate summit such as COP15 or devastating local storm named *Aila* were two such critical events that respondents believed influenced increased media coverage of climate change. However, such media coverage of climate change did not continue for a long time. As the time passed on, new events grabbed media attention and ultimately affected topics for public discussion. Consider the following statement from an interview conducted during the first phase of data collection:

> "Well, it was on TV. Prime Minister was in a meeting abroad and they talked about Aila and climate." *(Yunus Ali, M, 55, Shrimp farmer)*

On the contrary, a respondent during the second phase of data collection reported:

> "Now, I think there is little of the issue in TV. They are busy with other topics, for now it is politics." *(Shahidul Islam, M, 40, shop-keeper)*

Despite temporal differences of media coverage, this research found important media influence on lay people's perceptions of climate change risks. In certain cases, respondents tended to describe climate change through the mediated attributes that they constructed in their minds. "Localising climate change risks", "perceiving climate change as synonymous to geo-hazards", "rich countries' responsibility", "frequent storms", and "drowning in the sea" were some the constructs, largely shaped and reinforced in lay people's minds with information obtained from media. In general, people constructed a negative attitude about

climate change and framed it within the discourse of existing natural hazards. Consider the following assertions:

> "I know it from television that rich countries are poisoning the environment, air and water." *(Mohammad Fuad, 35, M, day labourer)*

> "A large part of Bangladesh will be drowned in the sea, the coastal area. I saw it on television." *(Gazi Mohammad Ayub, 32, M, unemployed)*

Apart from drawing a catastrophic image, respondents also attributed media sources while depicting themselves as victims of global climate change. As the following interviewee described:

> "We are the victims of climate [change], storms, and; you know, climate change, pollution from factories and others. Rich countries are doing this. They are changing the climate and affecting us." *(Borhand Uddin, 31, M, shrimp-farmer)*

In response to his sources of this knowledge, the respondent said:

> "It was on TV, and organisation people also tell us. We also discuss sometimes among ourselves. Everyone knows about it now." *(Borhand Uddin, 31, M, shrimp farmer)*

Localisation of climate change impacts was also illustrated in a fisherman's assertion with a clear indication that he learnt it from radio:

> "We will be affected…badly affected that I have learnt from radio." *(Gazi Nur Uddin, 45, M, fishing and forestry)*

In the data, it was found that climate change was not a daily topic for respondents to think and discuss. Rather, it was an agenda for occasional discussion, often triggered by media coverage. One elderly respondent described:

> "Well, the truth is we don't discuss climate change regularly. It is not a daily topic. If something is shown on the TV then people discuss it. We give our opinions. Different people give different opinions. For example, is it really true that Bangladesh will be drowned in the sea? When will it happen? We also talk about disasters. Why

> there are so many storms? What will happen in future? You know, these are some leisurely talks. It happens all the time in bazaars when people watch television together." *(Moksed Ali, 64, M, unemployed)*

This respondent indicated to an important role of media in influencing topic of public discussion when people took issues from the media to discuss among themselves. This function of media would be elaborated further in this research while discussing role of public spaces in communicating climate change. For now, this could be argued that media had influence in setting the discussion topic, but not the quality of discussion. For example, a number of respondents were sceptical about media reports on climate change impacts in their locality and contradicted them with evidence brought from their personal observations and memories of geo-hazards.

5.2.2 Role of NGOs – "the issue advocates"

After mass media, advocacy programmes of NGOs in the forms of interpersonal and group communication emerged as important channels in the communication repertoire of climate change. NGOs were also able to transfer some salient features of the issue to the public's minds, which included localisation and politicisation of climate change risks. Respondents also described NGOs as major sources of climate change adaptation knowledge.

After identifying the open codes of NGOs' roles in public perceptions of climate change, this research compared them with each other and categorised them into related themes. The process resulted in the following substantial themes: "knowing from NGOs", "localising effects", "making links with local hazards", "rich countries' responsibility", "seeking financial assistance", "identifying opinion leaders", "emphasis on

women for awareness building", "dialogic communication", and "communicating adaptive measures". These themes were merged into a more abstract theoretical concept and "advocacy" emerged as the recurrent approach in NGOs' communication of climate change. Accordingly, the theoretical concept was phrased as "NGOs as the issue advocates" of climate change.

Role and scope of NGOs in communicating climate change information to the lay people could not be fully understood without an understanding of these organisations' influence on lives and livelihood in rural areas. Living in the rural and some parts of the urban areas in Bangladesh without the influence of NGOs is nearly unimaginable. NGOs' contribution to poverty alleviation, expanding education, women empowerment, fighting for human rights and disaster management is recognised in the literature (Rahman, 2006; Amin, Becker, & Bayes, 1998; Mercer, Khan, Daulatuzzaman, & Reid, 2004). Over the years, these organisations emerged as important agents of socio-economic development with a particular focus of their activities among the rural poor. One of the main reasons of NGOs' success lies in reaching the extreme remote of the country where government mechanism has largely failed to distribute resources and mobilise people. Increasingly, NGOs took responsibility of the activities, which had traditionally been in the domain of government agencies (Zohir, 2004). On a critical note, it was also the failure and corruption of the government agencies that prompted international donor agencies to route funds through NGOs. Decades of works in different socio-economic issues have created a strong presence of NGOs in the rural areas. Thus, it was easier for these organisations to raise awareness about climate change and natural hazards with the help of their already

established networks in the communities. In the study locations of this research, more than 250 NGOs and civil society groups were listed at the local government office which were involved on projects from micro-credit to rural livelihood development, emergency supports to the victims of cyclone, climate change adaptation, food security, mass education, forestation, and financing in alternative livelihood. Most of these organisations were funded either by their parent organisations in the country or received foreign aid through their global coalition partners.

At the national level, the Oxfam-led Campaign for Sustainable Rural Livelihood (CSRL) was a network of around 250 member organisations. Major working areas of the CSRL, as for climate change campaign, were campaigning for national climate change plans, empowering communities to raise their voices for local adaptation, compensation, and responses. The other influential network of NGOs working on climate change issues in Bangladesh was the Equity and Justice Working Group (EquityBd) with around 24 member organisations. Both CSRL and EquityBD groups were involved in global climate justice movement as well as international climate negotiations and politics. Members of these two groups were also involved in a number of climate change related campaign programmes in the study areas of this research. These organisations were involved in programmes, such as poverty alleviation, livelihood supports, microcredit, and disaster management, for long a time. Lately, many NGOs either integrated climate change component in their existing projects or taken separate programmes to sensitise climate change issues. For example, a field worker of a local NGO described:

> "Climate change is now a priority focus of our existing programmes. We are working on mainstreaming climate change issues in providing livelihood supports and disaster management." *(Mohsin Alam, M, 31, NGO field worker)*

While a shopkeeper said:

> "It's [climate change] a hot topic now. Everyone is talking about climate change. Organisation [NGO] people are very active." *(Shahidul Islam, M, 40, shop-keeper)*

In such circumstances, it was no wonder that NGOs were major sources of climate change issues for the lay people. Consider the following assertion of a female respondent.

> "We didn't know too much about it [climate change] before the organisation [NGO] people started to tell us. We had meetings and workshops on climate. Now, you can say people have some ideas about reasons of storms, salinity …" *(Momtaj Begum, 30, F, housewife and fishing)*

With a strong presence of NGOs in the locality and their policy interest to mainstream climate change, "knowing from NGOs" emerged as one of the most recurrent patterns as for communicating climate change. This was also important to notice in the data that NGOs were not only created awareness of climate change but also transferred some salient features of the issue. In particular, "localising the effects" of global climate change within the context of local hazard was significantly constructed in the lay people's minds with knowledge obtaining from field workers of different NGOs. In the previous section, this research found that respondents overwhelmingly made categorical linkages between global climate change and events of local geo-hazards (e.g., storms, sea-level rise and salinity). That is, the lay people increasingly attributed human-induced climate change as causes to natural hazards while the previous ideas were centred on "Acts of Nature" and "Acts of God" (Ensor & Berger, 2009). In this transforming public perception, NGOs were largely identified by the

lay people as sources from where they received a number of salient features of climate change risks. Consider the following assertion:

> "In the past, we didn't know reasons of storms and rising water. Now, we know; organisation people told us it is because of climate change. Rich countries are liable for this." *(Yunus Ali, M, 55, Shrimp farmer)*

Similar was the view of a female respondent, who was involved with an NGO's micro-credit programme for livelihood development:

> "To me climate change means something is changing, and also storms. Black smog is creating the storm that's what I know. We are the victims of this as being people of low-lying areas. We are experiencing floods, saline water…many other things that I even don't remember." *(Sharbanu Khatun, F, 30, housewife/day labourer)*

As the respondent was reminded of geographical proximity of natural hazards in the region, her response was:

> "I know we are living very close to water. Water, storms are parts of our lives. But, you see there are some changing trends of storms and the way water in the rivers are rising. NGO field workers are right. We can now see it. We are victims of climate change, directly victims. Rich nations are causing this." *(Sharbanu Khatun, F, 30, housewife/day labourer)*

Another respondent emphasised the "financial compensation" from rich countries for their livelihood supports, which he believed was shattered by the impacts of global climate change. This respondent attributed to a local NGO from where he learnt about climate change and the countries responsible for creating the problem. Similar perceptual constructs were prevalent among many respondents. In particular, respondents who were involved with NGOs discussed political aspect of climate change and showed confidence in depicting a dichotomy of "we" as victims and "they" as responsible. In the interviews, respondents overwhelmingly made

assertions such as “victims of rich countries”, “wrongdoings of some rich countries”, and “climate refugees”. It was clear in the data that information campaigns by the NGOs influenced the way the lay people perceived causes of regional geo-hazards. Most people framed events of regional geo-hazards as impacts of global climate change for what developed countries were responsible. This indicated to a trend of public perception, which tended to localise impacts of global climate change. In this perceptual construct, the origin of regional geo-hazards was transferred from the local (i.e., local geographical conditions) to the global level (i.e., global climate change). Accordingly, global support appeared predominantly in respondents’ minds as a solution to the problem at the local level.

This research also found that women were in general excluded from mediated climate change knowledge because of limited access to media both at homes and public places. However, we did not find significant differences on the level of climate change knowledge between male and female respondents. In the data, it was clearly indicated that NGOs played the crucial role to minimise climate change information gaps between men and women. In Bangladesh, women are the main target group of beneficiaries of NGO-initiated development projects, such as poverty alleviation, literacy, and empowerment of rural women. Both formal and informal women’s networks have played a significant role in bringing positive social change in recent years, most importantly in economic empowerment of women. Most NGOs deliver their services to women in the villages after forming women groups. These groups meet regularly to discuss issues related to their livelihood challenges (*see Figure 5.4*). Usually, field workers of the NGOs deliver advocacy messages to the groups, which are then handed down to other members of the community

through informal networks. In this way, although women in general were excluded from the mediated climate change communication, they were part of a vibrant network in the community to receive and share socio-economic information. A field worker of an NGO, for example, described her ways of work:

> "We need to organise monthly meetings with other members, other women in the village. Sometimes, we also talk about climate change when talking about disasters." *(Shahida Begum, 35, F, NGO worker)*

In a related probe question, she replied:

> "Normally, we meet one of the member's *uthan* (courtyard) and it rotates among us." *(Shahida Begum, 35, F, NGO worker)*

This respondent and other female respondents also described that sometimes NGO field workers joined their meetings to provide information about alternative livelihood options, health and education services, and how to take precautionary measures against natural hazards. This illustrated that field workers of NGOs were important actors of information not only about climate change but also about other socio-economic issues. These included expectant mothers' care, contraceptives for birth control, and illness of children. As for climate change, a number of male respondents described that they sought information for saline tolerant seeds to field workers of NGOs. This was illustrated in the following assertion:

> "I got some information from a field worker about saline tolerant crops and cultivated them. I need to wait a couple of months more to see their success." *(Mohasheikh Sardar, 44, M, shrimp-framing and agriculture)*

Figure 5.4: Female members of an NGO-initiated poverty alleviation project take part in a group meeting (source: www.wfp.org).

This indicated to important roles of NGOs in bringing knowledge about climate change adaptive measures. Similar was the view of another respondent who received small credit and training on farming crabs in the ponds. One salient impact of such programmes was that positive experiences of women who had received loans from NGOs influences other women to explore these avenues for social change. Accordingly, examples of a neighbour's saline-tolerant crop cultivation or crab farming inspired and motivated others to seek similar supports from NGOs.

Respondents also described that NGOs were largely participatory in their approach and engaged people in different socio-economic issues. Such a participatory approach enabled NGOs to deliver services to the target people more effectively as compared to government agencies. This also indicated reasons behind the success of NGOs' approaches to sensitise the issue at the community level. Accordingly, social intermediation and integration of women appeared as important functions of NGO-led climate

change communication. In particular, the focus on women, group formation and identifying opinion leaders in the community bear important implications for climate change communication by the NGOs. For example, an NGO field worker described the importance of women in communicating their issues to the community.

> "Our target beneficiaries are women. We give them loans. As part of it, they have to be members of a community group formed by us. We also provide training on health, family planning, disaster management, and alternative livelihood. Climate change has been included in our training programmes recently because it is badly affecting people's lives." *(Mohsin Alam, M, 31, NGO field worker)*

Another field worker of an NGO described role of women in hazard management in the following:

> "We have seen some important positive results of targeting women as the focus of disaster management programmes. You now, women are the main managers at home although their contributions are hardly recognised. Even during the crisis time, for example, when a storm approaches women begin the precautionary measures to minimise risks and losses at homes." *(Khairul Alam, 36, M, NGO worker)*

In most cases, it was training programmes on disaster management that many NGOs used to deliver climate change information to the lay people. In other cases, some organisations organised theatre and musical programmes to raise awareness about disaster management where climate change was a point of reference. One NGO activist who had been working in the study location for about three years on disaster rehabilitation and management programmes described their strategies to aware people about climate change:

> "We work at the community level. We need to hold regular meetings with community members and find out the important persons in a community. *Imams* of local mosques, school teachers and UP members, for example. We also

> identify some women from the villages. We talk with them, organise meeting and listen to them. We try to provide some information for the community through these persons. You know, it's not possible to invite all members of the community and talk to them. We try to utilise the influence and network of these influential persons." *(Shaheena Akhter, 38, F, NGO field-worker)*

This was reflected in a female respondent's description:

> "I heard it [climate change] from the organisation [NGO] people. I was in a disaster management meeting, which was mainly to discuss precautionary measures of storms and floods. I can still remember it. The organisation people told us about climate change in the meeting. It was in the school premises. I don't recall in details, but there were something about climate, storms and warming, you know global warming. They showed us some pictures of factories, smog in rich countries - Europe, America. And, they are polluting the environment. I don't remember them all. It was more than a year ago, but I guess they also talked about storms." *(Sharbanu Khatun, 30, F, housewife/day labourer)*

As compared to news media, respondents described climate change communication by NGO field workers as easier to understand. The proportion was higher among the women – who were direct beneficiaries of different organisations. One female respondent, for example, described:

> "I would say it is easier to understand messages that we receive from field workers [of NGOs] than TV and radio. We can ask questions and they also give us examples." *(Sabina Akhter, 25, F, housewife)*

Another female respondent made a detailed description about getting climate change knowledge from NGO and how she transferred obtained knowledge to others in the community as being the local opinion leader.

> "I learnt it from the organisation people. Let me tell you in detail. I am involved with an organisation [NGO] and we have a village committee to organise women for providing supports after the cyclone Aila. We meet every month to discuss our programme. Two days prior to the monthly

> meeting, our field officer sir called me and said there would be a discussion on climate change. He asked me to inform all women members to attend the meeting. To be honest, I didn't know what is climate change and it was also difficult to convince other women to attend the meeting. But, like me, they were also curious. We also discussed ourselves what it could be. We knew for sure it would be something on weather, environment and you know climate. Then, on the meeting day some officials from Satkhira, Jessore came and told us how the climate change was affecting our lives. For example, we learnt that cyclone Aila was because of climate change. I didn't pay attention to it before. But, it is clear to me now." *(Jaheda Akhtar, 40, F, housewife)*

As the respondent described, much of NGOs' success in communicating climate change was rooted in their participatory and dialogic approach of communication where the emphasis was given on identifying local opinion leaders, including women.

5.2.3 Social relations and networks – "the power of community"

Informal social contacts and networks emerged as important component of the communication repertoires of climate change. Many respondents identified friends, neighbours, and some local opinion leaders as sources from where either they learnt about climate change or enhanced their already obtained knowledge from formal communication sources. For example, a shrimp farmer said:

> "I came to know about climate [change] from television. But, it was also discussed in our group while chatting in the evening. It's very informal. I mean, I don't remember what exactly we discussed, but some of us talked about it. I also took part. You know what happens in such gatherings." *(Yunus Ali, M, 55, Shrimp farmer)*

While a female respondent asserted:

> "After attending the meeting on disaster management, I discussed it with my neighbours. You know women in the villages gather in the afternoon with other women and we talk many issues. I wouldn't say it's regular. But, sometimes

> we talk about our future, storms, like climate change, and many other things." *(Sharbanu Khatun, 30, F, housewife/day labourer)*

A shrimp farmer explained that he inquired his brother to learn more about climate change after he came to know about the issue in a radio programme.

> "Other day, I asked my brother about climate change. He is studying at a local college and explained to me that half of Bangladesh might be drowned in seawater because of sea level rise. This is happening because of developed countries. They are damaging the environment. It is very freighting." *(Ashish Kumar Mondol, M, 48, shrimp farmer)*

This clearly illustrated that lay people occasionally interacted about climate change risks with friends, families and neighbours especially at times when the topic was triggered by other communication sources (e.g., media and advocacy programmes of NGOs). This implied that such interactions resulted in reconstruction of already obtained knowledge and helped individuals to form perceptions and attitude towards climate change risks. As one respondent described:

> "I don't discuss it with others daily. But, sometimes we do. There were some discussions after the [Cyclone] *Aila* when people were asking reasons of storms. Then, television news also talked about climate change. So, you can say sometimes we do discuss among ourselves. Many things actually appear…some people also raise the climate change topic after watching it on TV. They ask me for details. We actually share our opinions." *(Abul Bashar, M, 36, school-teacher)*

Another respondent described how he inquired a shopkeeper for further knowledge about climate change after watching television news:

> "I heard it while watching TV at a tea-stall. There was a news report and it talked about climate change impacts in Bangladesh. But, I didn't get it. Then, I asked the shopkeeper to explain. He tried to explain it with examples like storms, saline water and so on. Other people at the place

> also tried to explain. Yet, it is not very clear to me. But I know climate change is a very bad thing for Bangladesh." *(Mohammad Fuad, 35, M, day labourer)*

As the data gave a strong indication to the important role of informal social contacts and networks, this research looked for some of their characteristics. The interview data and the researcher's observation revealed a number of features of informal social contacts and communication. The structure of social contacts and communication was fairly flat and fluid. People met spontaneously often without any specific objective. They were not a goal-oriented communication. Interactivity was the main feature of social contacts with active participation of its members. People communicated with each other in a dynamic and dialogical way. The flow of information was almost unrestricted and responses were immediate. On the other hand, there was a clear distinction between male and female groups' informal meeting. Mixed gender informal talks were very rare if the participants were not from the same family or close relatives. In general, males and females met their respective friends and neighbours in separate space-specific gathering. Topics of such meetings were not scheduled and switch from one issue to another very quickly. A local community leader described:

> "Many things are discussed there. I can't remember everything. People get together at bazar and watch television news, films, talk shows, and you know many things appear as discussion topics. Politics is in number one; national politics, local politics. Sometimes, even international issues, Iraq war, Afghanistan. You can say it's a kind of entertainment for people to talk about politics." *(Rafiqul Islam, 41, M, farmer and UP member)*

As the data analysis progressed, two important insights were noticed in the data – first, the importance of community places, and second, the role of opinion leaders in informal social communication. These two

features explained the vibrancy of the informal social communication, and its importance in communicating climate change.

Figure 5.5: People gather in front of a grocery shop/tea-stall in the evening (researcher's own photo).

Most of the social contacts in rural life occurred in some public places where people met either for business purposes or to spend free times. These spaces included local marketplaces (bazaars), *ferry ghat*, Union Council office, and the tiny tea stalls or grocery shops in the villages. Observational data of this research suggested that these community places reflected vibrancy of local lives and played the role of "communication hub" for the community with internal and external flows of information on various issues. People gathered at these places for a number of reasons. Sometimes for business purposes – to buy or sell something, and sometimes to watch television, listen to the radio, and meet friends. In the late afternoon and evening, these public places were full

with people from all walks of lives, *albeit* mostly the men. They sat together, sip in the cup of tea, played card or board games, watched television news or some old Bengali movie, and most importantly they discussed. One of the most important functions of these places was to provide access to media for community members many of whom couldn't afford them at home. Tea-stalls were often equipped with small television sets.

As already noted, some members of the community appeared as "local opinion leaders" to mediate climate change knowledge between formal communication sources and the lay people. Local school teachers, NGO workers, and shop-keepers were few to names who often acted as opinion leaders on local socio-political issues. Some elderly people with rich knowledge of local ecology were also viewed as relevant experts on different issues. In addition, people who were involved in NGO-initiated hazard management programmes, particularly women, were found important agents of bringing climate change and other social issues to other women in the community. These opinion leaders usually received knowledge from mass media or advocacy groups, and then handed down them to the community members. One female respondent described:

> "Well, I would not say that we talk about climate change regularly. But, sometimes it comes as a topic of our discussion among the women. People were interested to talk about climate after *Aila*. I received training on storms, climate, cultivating saline tolerant vegetables and so on. I discuss it; mainly I try to tell others what I learnt from the training." *(Rashida Begum, 50, F, housewife)*

As this respondent described, a number of women, particularly who took disaster management training of NGOs, worked as information brokers within the women's network. This indicated to important roles of

some women as opinion leaders in the community in communicating risks of climate change and taking adaptive measures. A number of female respondents described that their knowledge and attitude towards climate change were enhanced after informal talks with other women. Importantly, this research found that opinion leadership in the community was not entirely dominated by men but also by women. Women who had increased access to formal communication sources through advocacy programmes of NGOs acted as opinion leaders for female members in their community. These community opinion leaders also expressed more concern about climate change and were the early adopters of newly introduced adaptation strategies as compared to general members of the community.

5.2.4 Experience, observation and memory

Findings of this research already indicated that both formally and informally communicated climate change information was interpreted against respondents' direct experiences, observations and memories of climatic conditions and extreme weather events. Accordingly, respondents' experiences, observation and memories appeared as important filters for mediated and non-mediated climate change information. In particular, the lay people largely depended on "direct sensory experience" of what they described "unusual weather" to legitimise climate change and associated risks. Indeed, all respondents attributed that climate change theory was true as they were already experiencing the adverse impacts of it. Their descriptions of "already changing climate" included assertions such as "unusual rainfall", "delayed monsoon", "increased salinity", "frequent storms", "sea level rise", "dying trees", and "extreme heat waves".

In the literature of risk perception, it was argued that perceived likelihood of risks increased if they were experienced or readily imagined by the people. This implies that recent experiences of natural disasters or heavy media coverage [of climate change or extreme weather events] are likely to influence individuals' perceptions of risk (Slovic, 1987; Tversky & Kahneman, 1974). Findings of this research supported this theoretical argument when respondents' overwhelmingly attributed evidence from direct sources (i.e., personal experiences and observations) to evaluate climate change knowledge from secondary sources (i.e., radio and television). One shrimp farmer, for example, justified his assertion of "already changing climate" in the region with evidence from his personal observation.

> "…you can see changes in the monsoon pattern. It has been almost dry for the last couple of years. Normally, we have heavy rains during the months of *Ashar* and *Shrabon* (Bengali months of the rainy season), but you see all dry here. This is a huge problem as most of us depended on rainwater from irrigation to daily needs. I think this is an evidence of climate change; weather and seasonal patterns have been changed drastically." *(Yunus Ali, M, 55, Shrimp farmer)*

Similarly, another respondent relied on personal observation of temperature rise that he believed was related to climate change.

> "It's too hot to survive. You know, last year even it was very difficult to stay inside the houses during the month of *Chaitra* (one of the Bengali months of summer). This means the global temperature is increasing. We are also experiencing this." *(Abul Bashar, M, 36, school-teacher)*

Other respondents referred to the events of local geo-hazards to sustain their belief of changing climate. For example, a female respondent, who was involved in a local hazard management awareness project, described:

> "I think climate change is true and we are badly affected by this. Salinity is a major problem caused by climate change. We didn't have such saline water in the rivers. Now, everything is salty." *(Khadiza Banu, 45, F, housewife)*

Similarly, a shrimp farmer shared his experiences of recent storm and attributed it as a consequence of global climate change.

> "If you see [cyclone] *Aila*, I think it is linked to climate change. We had [cyclone] *Sidr* too. These are happening so frequently." *(Ashish Kumar Mondol, M, 48, shrimp farmer)*

However, mediated and NGO-communicated local impacts of climate change also created reasonable doubt among a number of respondents. They evaluated a number of highly publicised climate change impacts, such as sea level rise and increased salinity, through personal observation and were sceptical about the link between climate change and local geo-hazards. For example, an elderly respondent described his doubt about the validity of risk of "drowning in the sea" as a climate change impact in the region:

> "I am not sure whether this region would be drowned in the sea because of rising water. We have been hearing this sort of thing in radio and television for a long time that part of Bangladesh, its coastal region would be drowned in the sea. I am not sure, but if you observe carefully new lands are emerging in the rivers because of siltation. This is a regular phenomenon here. I don't think that climate change is raising the water. Well, I'm not sure. This might be true." *(Abul Hossain Mollah, 70, M, retired)*

A similar trend was found in another respondent's description, who was sceptical about claims of NGOs that salinity hazards were directly linked to climate change. Instead, he emphasised the local unsustainable economic activity as the main reason of increased salinity problem, and said:

> "I don't think that salinity problem fits with climate change impacts. It has been a constant problem for this region since

> my childhood. In recent years, the level of salinity has been increased mainly because of shrimp farming. Shrimp farmers have drained in saline water from rivers and they have contaminated ponds of fresh water." *(Golam Mustafa Gazi, 53, M, fisherman)*

An elderly respondent carried the similar view although he believed in climate change impacts in the region and referred to weather and seasonal variances as evidence.

> "Climate change is happening. I can observe changes in weather, rainfall and also increased temperature. But, I don't think that climate change is bringing more saline water. Some organisation people are saying this. But, I feel personally that shrimp enclosures are the main reason. We can see it before eyes." *(Moksed Ali, 64, M, unemployed)*

This implied that respondents' sensory evidence or observation appeared as credible filters against the information they received from secondary sources (e.g., media and NGOs). As such, this research found a mutual relation between individuals' personal observations, in one hand, and mediated and non-mediated communication of climate change, on the other. We can argue that respondents constructed perceptions of climate change risks through the lenses of media and other formal communication sources and depicted a catastrophic image. This indicated a substantial influence of formal communication in the way people perceived climate change and associated risks. However, the second level influence was more important. In this level, respondents reconstructed knowledge from formal communication sources through the filters of their personal observation of local weather and events of geo-hazards. In general, people tended to trust the information, which didn't contradict with their personal observation and experience.

In the data, we also found a temporal aspect of lay people's personal experiences of abrupt weather and geo-hazard events. It was not

only recent personal experiences or observation of changes in weather that determined the way people perceived risks of climate change. Interview data in this research indicated another subtle, but important determinant of climate change risk perception. Many respondents evaluated risks of climate change with their "cultural memory" that was predominantly based on local geo-hazards (e.g., storms, salinity, and tidal surges). In the data, it was observed that there was a general tendency to perceive risks of climate change with categorical references to the past hazard events. Thus, cultural memory of hazards, both in individual and social levels, appeared as an important category to explain perception of climate change risks. It was found that memories of geo-hazards were constant in respondents' minds while "climate change" appeared as a new discourse to reconstruct those memories. A female respondent, for example, described:

> "We had a lot of storms in the past. We know we get affected by storm and saline water and if there is, you know, if there is climate change we would be worst affected." *(Sonaban, 25, F, housewife)*

As the assertion indicated, memories of geo-hazards were stabilised over the years and people developed certain ways to deal and live with those hazards. Our data also suggested that many of these specific ways of dealing with geo-hazards were stored and sustained through cultural practices. Local housing structures and materials as well as occupational techniques are part of cultural practices. As such, many respondents had indicated that risks of geo-hazards were parts of their life and until recent past climate change was not a discourse in their culture of hazards. The lay people used to consider events of geo-hazards either as natural because of geographical location or as "acts of God". Then, climate change entered into the existing "hazard culture" of the community through formal

communication campaigns. Events of geo-hazards as impacts of climate change were central to these communication campaigns and the lay people found it easier to draw a catastrophic image linking geo-hazards and climate change together. Consider the assertion of a female respondent:

> "I heard it in the past from some organisation people. But, I didn't get it. Now, I can understand how climate change would look like after the cyclone Aila. Now, I can understand why there is so much salt in the water. This is because of climate change and temperature rise." *(Sharbanu Khatun, F, 30, housewife/day labourer)*

5.3 CHAPTER SUMMARY

The main finding of this Chapter was the communication repertoire of climate change at the community level. Both formal and informal communication sources had different, but overlapping roles in the process of "creating awareness" and "constructing perceptions" about climate change risks. In particular, we found integrated roles of different levels of communication – intra, interpersonal and mass communication – in the communication repertoires of climate change. For example, mass media and NGOs might be the most important sources to sensitise and create awareness about the issue, but it was individuals' personal experiences and observations of local climatic conditions that largely influenced their attitude, perception and response to climate change. Hence, this would be ingenuous to identify one or two communication channels as more important than others in any attempt to effectively communicate risks of climate change. Rather, this research argued that different communication channels and actors worked together influencing each other in an integrated communication repertoire.

Chapter 6

Discussion: Interpretations of the Findings

6.1 INTRODUCTION

In this Chapter, key findings of the current study are to be summarised and compared to related research about climate change risk perception and communication. The aim is to identify and locate significance of the current study findings by placing them within the context of existing pool of knowledge. This serves two purposes. First, it helps to understand how the current research has made contributions to the field of risk perception and communication. Second, patterns of public perceptions of climate change risks, and factors involved in constructing those perceptions would help to design appropriate communication strategies, particularly in a non-western case, which is vulnerable to geo-hazards. As this research interprets findings concerning public perceptions of climate change risks, two sets of incongruousness or gaps are clearly recognisable in the data – the gap between 'awareness' and 'knowledge'; and the gap between 'increased concern' and 'limited behavioural response'. As for communicating climate change, findings of this research emphasises the comprehensive communication approach with recognition of 'hazard culture' of a region as public perceptions are significantly formed on pre-existing knowledge of geo-hazards. Such a communication approach should also recognise relative importance of different channels and actors in the communication repertoire of climate change. Finally, integration of public perception and communication of climate change risks as found in this research leads to the grounded theory, which argues that

people embed meanings, mainly derived from hazard culture, in perceiving climate change risks from different communication sources.

6.2 INTERPRETATION OF STUDY FINDINGS: PUBLIC PERCEPTIONS OF CLIMATE CHANGE

6.2.1 Climate change risks – "the gap between awareness and knowledge"

Creating awareness is recognised as an important first step in risk communication research so that people can make informed decisions to minimise risks (Bord *et al*., 2000). This study found widespread awareness of climate change and related terms among the respondents. However, general familiarity or awareness of climate change topics did not translate into knowledge about them. A clear gap between "awareness" and "knowledge" was distinctive among the respondents when respondents gave detailed descriptions of their perceptions about causes, impacts and solutions to climate change risks. It was also revealed in the data that people's awareness and basic understanding of climate change, particularly its causes, coexisted with a number of commonly shared misconceptions. Perceived misconceptions about causes of climate change as found in this research are comparable with other studies (e.g., Kempton, 1997; Bord *et al*., 1998; Lorenzoni & Pidgeon, 2006; Leiserowitz, 2007), which have also identified lay people's limited knowledge about scientific conceptualization of global warming and climate change despite large-scale awareness of the topics. However, lay people's misconceptions, as found in this research, should not be interpreted indiscriminately because in many cases (e.g., political aspect of climate change), respondents' perceptions did not differ to a large extent with experts' knowledge.

As this research interprets the findings concerning public perception of climate change, three distinct patterns are recognisable. These patterns explain how the lay people in the coastal region of Bangladesh perceive causes, impacts and solutions to climate change risk. First, lay people perceive climate change as a scientific and environmental issue while describing their knowledge about its causes. Second, events of local geo-hazards are important filters in perceiving impacts of climate change, that is, climate change is perceived as a hazard issue. Third, solution to climate change problem is understood within the political debate of developed countries' responsibility, and as such, climate change is perceived as a political issue.

6.2.1.1 Climate change as a scientific and environmental issue

Global warming and climate change are complex scientific issues, which are not easy for the lay people to understand properly. This has been reflected in the findings of this research when most people demonstrated erroneous perceptions in describing causal links between greenhouse gas emissions and global warming. Respondents' limited education and limited access to climate change information mainly led to erroneous perceptions. However, erroneous public understanding of climate change is prevalent in other studies as well which are conducted in many developed countries. In particular, respondents' perceptual constructs of "atmospheric holes" and "environmental pollution" as causes of climate change are comparable with studies examining public perceptions in the United States (Kempton, 1991; Bostrom *et al*., 1994; Read *et al*., 1994; Reynolds *et al*., 2010), in the United Kingdom (Whitmarsh, 2008a), and in Sweden (Löfstedt, 1991).

In this research, respondents did not make any explicit reference to the term "ozone lay depletion" while describing perceived knowledge of global warming and climate change. Yet, detailed descriptions of "atmospheric holes" clearly indicate to the widely held perception that global warming and climate change are linked to ozone layer depletion (Kempton, 1991, 1997; Leiserowitz, 2006; Bostrom *et al*., 1994; Read *et al*., 1994; Lorenzoni *et al*., 2006). Some recent studies, however, claimed that the perceptual construct of ozone holes became less prevalent in recent time as the issue receded from media and public attention (Weber & Stern, 2011). This is, however, contradicted by Giorgi and colleagues (2009) who pointed out to methodological deficiencies in understanding public's erroneous causal association between climate change and ozone depletion. They argued that the ozone layer frame of reference in the public minds had not been replaced yet, but emerged when respondents were asked for a detailed causal explanation of climate change (Georgi *et al*., 2009, cited in Whitmarsh and Upham, 2013, p. 16). This research has found similar trend of public perception regarding causes of climate change. Respondents' initial descriptions referred to carbon dioxide emission as main cause of global warming. But, as they gave detailed descriptions, most respondents made erroneous causal links between climate change and "holes in the sky." In the process, lay people relied on the pre-existing concept of "atmospheric holes" which they came to know from media and other communication sources. Similar to the public understanding of climate change in many developed countries, the coastal people of Bangladesh were confused between two distinct atmospheric phenomena – greenhouse effect and ozone layer depletion. The confusion was also created by 'embedded science' and 'scientific complexity' of climate change that

made it very difficult for the lay people to understand the physical mechanism of global warming. The lay people found "holes in the atmosphere" as relatively more self-explanatory than understanding the complex process of greenhouse gases concentration in the atmosphere and their roles in trapping temperature.

The perceptual construct of 'environmental pollution as a cause of climate change' is also comparable to other studies (e.g., Lorenzoni et al., 2006; Whitmarsh, 2009). Pollution can be partly attributed as contributing factor to global warming. However, it differs from the physical mechanism of global warming because all pollutants are not responsible for concentration of greenhouse gases in the atmosphere. Respondents in this study relied on availability heuristic in describing the process of global warming. They found environmental pollution more visible in their surroundings than the abstract nature of greenhouse effects. Kempton (1991, 1997) found similar perception among the lay people who even attributed traditional pollution control as the solution to global warming problem. Reflecting on this aspect, Reynolds *et al*. (2010) argued that communication initiatives to explain the science of climate change to the lay people were largely unsuccessful as confusion of the causes of climate change with "stratospheric holes" and "pollution" remained persistent in public understanding.

This is also evidenced in this research that respondents' confusion and erroneous perception of the physical mechanism of climate change is rooted in the inherent scientific complexity and scientific uncertainty of climate change. As already noted, there was a general tendency to see climate change as a topic of science, and thus, beyond the capacity of the lay people to understand it properly. This was demonstrated when many

respondents expressed doubt of their reported knowledge of climate change science. Respondents' lack of interest about climate change was also rooted in its scientific complexity. Yet, it was important to observe in the findings that most people attempted to draw a self-explanatory theory of climate change mainly relying on pre-existing mental constructs and information receiving from different communication sources. This process is comparable to the theory of cognitive constructivism as proposed by Richard Grandy. The theory of cognitive constructivism proposes that individuals' cognitive agents use pre-existing mental representations to understand the world (Grandy, 1998, p. 114). Similarly, lay people's perceptions of causes of climate change in this study were constructed around the pre-existing mental constructs of pollution, deforestation, scientific complexity, and atmospheric holes.

6.2.1.2 Climate change as a hazard issue

In describing effects of climate change, respondents demonstrated a considerable level of confidence even without any prompt or cue. Existing risks of local geo-hazards were readily available in their minds as prior constructs. These mental constructs were further intensified with newly acquired knowledge of climate change from different communication sources. Accordingly, climate change effects were widely viewed as events of local geo-hazards. In addition, respondents described climate change risks both temporally (i.e., happening now) and spatially (i.e., happening here) close to them. Spatial and temporal proximity of climate change risks have eventually led people to personalise and localise their impacts.

This finding differs to a large extent with public perceptions of climate change effects in many developed countries, for example in the

United States (Bord et al., 2000), in the United Kingdom (Whitmarsh, 2006) and in the United States and Europe (Lorenzoni & Pidgeon, 2006) where climate change is generally viewed as a distant and future risk. In the United States, Bord *et al*. (2000) found that only a small portion of the public believed climate change to be a personal threat. Lorenzoni and Pidgeon (2006) studied public views on climate change in Europe and the United States, and one of the main findings was that people across the Atlantic understood climate change as a psychologically, temporally and spatially distant risk. Other studies also reflected on this and found that people in general viewed climate change as a risk, which might affect future generations and geographically distant countries (e.g., Whitmarsh & Upham, 2013, p. 19; Ockwell, Whitmarsh, & O'Neill, 2009) like Bangladesh and Maldives.

In a clear contrast to these findings, respondents in this study emphasised the links between regional geo-hazards and climate change. Such a public construct is understandable if one considers records of natural hazards in the region and respondents' exposure to them. Indeed, personal experience is considered a key driver of risk perception since perceived likelihood of a risk is increased if it is recently experienced or if it can be readily imagined (Spence *et al*., 2011). Respondents in this study had direct experiences of storms and tidal surges in recent years. In addition, they were constantly exposed to the risk of salinity. We found impacts of these local hazards in the perceptual constructs of the lay people when they described climate change impacts as too close and more tangible to their livelihood. This clearly implies that lay people's perceptual construct of climate change impacts in the coastal region of Bangladesh is

constructed on the basis of place identity in one hand, and availability heuristics, on the other.

People in the coastal regions of Bangladesh are vulnerable to regional geo-hazards, such as storms, tidal surges and salinity. Media and different interest groups lately linked these events as possible impacts of climate change. Accordingly, the coastal people constructed the perception that they lived close to climate change impacts. Such a catastrophic perceptual construct enhanced further when the coastal people were personally exposed to a series of extreme weather events (e.g., storms and floods).

On this note, the lay people's perception of climate change as hazards could be explained with the concept of availability heuristic – an important factor in evaluating risk. As described in Chapter 2, availability heuristics is a psychological concept developed primarily by social psychologists and behavioural scientists to explain individuals' risk perception. This concept infers that "a risk issue is likely to become powerful and capture the public's imagination if the cause, effect and victim are clearly identifiable…" (Slovic, Fischhoff, & Lichtenstein, 1980, cited in Whitmarsh, 2005), experienced or can be readily imagined (Kahneman, Slovic & Tversky, 1982). That is, a recent personal experience of a disaster event (e.g., storms or tidal surges) or increased media coverage of climate change are likely to influence people to consider climate change as a serious threat because they are readily available in their imagination. Accordingly, public perception of climate change as hazards become more readily available with increased media coverage and personal experiences of natural hazards. As for respondents of this study, it was easier to draw a catastrophic image of climate change because of constant availability of

geo-hazards in the region. On the other hand, it was found that public concern reduced over time if they were not exposed to extreme weather events for a certain period of time. Based on this finding, we can argue that individuals' recent and past experiences of extreme weather events were important determinants in shaping public perception of climate change impacts. In other words, a region's hazard culture and its particular characteristics determine the way people perceive risks of climate change. We can compare this finding with Ratter, Phillip, and von Storch's (2012) study when respondents in Hamburg (Germany) considered storm surges as the most serious threat to the city. This implies that public understanding of the threat or impacts of climate change was mainly derived from the vulnerability of regional geo-hazards. As such, place identity plays the important role in perceiving risks of climate change. Risk perception literature supports this argument since people living physically close to natural hazards are tended to believe more in the certainty of climate change (Brody, Zahran, Vedlitz, & Grover, 2007). One important aspect of findings of this research indicated to different levels of place identities in perceiving risks of climate change. That is, people may have different levels of concerns to climate change although they live in the same geographical conditions. For example, people living in comparatively strong houses, built with concrete and bricks, expressed less concern about climate change risk than people living in vulnerable houses. This implies that public concern of climate change is also determined by their feelings of safety.

Findings of this research are also comparable to other studies on the ground that like people in many developed countries, coastal people in Bangladesh have failed to make a distinction between the concepts of

'climate' and 'weather' while attributing evidence of climate change. They frequently cited experiences of 'abrupt weather' and 'seasonal variances' to support their views that human-induced climate change was already taking place. This is supported by works of Bostrom *et al*. (1994), Goebbert *et al*. (2012), Capstick & Pidgeon (2014) and Taylor, de Bruin, & Dessai (2014) when lay people, in general, failed to make a distinction between weather and climate. This phenomenon in the public minds is called as 'prisoners of weather'. Kempton (1997), for example, found that people relied heavily on their immediate observation of weather to describe climate change. Lay people both in the United States and the United Kingdom most commonly referred to their short-term experiences of weather variances, such as increased temperature and low or heavy rainfall as effects of climate change (Dunlap, 1998; Kempton, 1997; Whitmarsh, 2009; Akerlof *et al*., 2013).

6.2.1.3 Climate change as a political issue

This study finds that respondents' knowledge about the solution to climate change problem was centred on its political aspect. It is widely discussed that climate change is a multi-faceted issue, which is originated in science and then transforms as socio-political, economic, and risk issues through different communication channels (Neverla & Schäfer, 2012). As for the current study, people could generally identify the actors and countries, which were generally discussed in scientific and policy debates of global warming-led climate change as responsible for creating climate change risks. Respondents also described how the globally created risks of climate change posed a serious threat at the local level and asked for a global initiative to solve the problem. The interviewees clearly identified

them as “victims” of wrongdoings by “rich countries”. Accordingly, they believed that industrialised nations bear a moral responsibility as being the emitters not only in reducing global warming but also providing financial assistance to the affected countries. Interestingly, none of the respondents referred to emerging economies such as China and India as responsible for global warming problem. This indicates that the political debate of climate change risk is more aligned to the dichotomies of “rich-poor” or “developed-underdeveloped”. The lay people largely see climate change as an injustice on them inflicted by rich countries. Such a perceptual construct also shapes the way people understand to minimise the risks of climate change. Mitigation of greenhouse gas emissions received much attention to respondents’ minds than adaption although the latter is more appropriate for the people living in Bangladesh’s coastline. Respondents are found more comfortable in describing the process of mitigation as compared to the strategies of adaptation. It has been also observed in the data that both media and NGOs as being the main formal sources of climate change knowledge contributed in constructing political aspect too salient in the respondents’ minds and emphasised more on mitigation of greenhouse gas emissions.

On the other hand, people felt that they were more clearly communicated about the political aspect of climate change than its scientific conceptualisation. Alternatively, one can argue that people found it easier to grasp the politics of climate change than the science of climate change. As such, people did not feel directly involved with the science of climate change, but with the politics of climate change. Wolf and Moser (2011) argued in the similar fashion with the notion that people feel alienated if climate change is framed as a scientific issue since science falls

under the purview of experts. However, this view slightly contradicted in the literature of science communication when it has been argued that if the risks associated with science are localised people feel more directly involved. This is also supported in the scholarly discussions of the public understanding of science (PES) and the public engagement of science (PES) (e.g., Bauer, 2009; Neverla, Lüthje, & Mahmud, 2012). It is argued that in general people may have limited interest in science, but public interest to science increased once it contains personal risks (Kitzinger, 1999). In this study, people identified themselves as personally threatened by the risks of climate change but showed little interest to know more about them either from formal or informal communication sources. This inconsistency in seeking out climate change information could be explained with the argument that effects of climate change were not 'dreadful' to the respondents as they were culturally exposed to them.

6.2.2 Climate change risks: gap between 'increased concern' and 'limited behavioural response'

In recent years, public concern for climate change has witnessed a declining trend in many countries, notably in the United States and some European countries (e.g., Scruggs & Benegal, 2012, Weber & Stern, 2011, McCright & Dunlap, 2011b; Ratter, Phillip & Storch, 2012; Brulle, Carmichael, & Jenkins, 2012). In Germany, Ratter, Philipp and von Storch's (2012) study examining perceptions about climate change concerns in Hamburg found considerable decline in public concern for climate change risk between 2008 and 2011. They found that 17 per cent of respondents considered climate change a very serious threat in 2009 and it dropped to 9 per cent in 2011. As for temporal aspect of the impacts of climate change, Ratter and colleagues (2012) found that the impacts were

seen as "immediate threat" by 44 per cent respondents in 2008 and it reduced to 36 per cent in 2011. Other studies also show that an increasing number of people have questioned about scientific certainty climate change and perceived it as an uncertain threat of future. McCright and Dunlop (2011b) identified interest groups' campaigns depicting climate change as a partisan political issue as one of the main reasons for creating confusion in the public's minds. While Leiserowitz and colleagues (Leiserowitz, Maibach, Roser-Renouf, Smith, & Dawson, 2013) work emphasised on the so-called "climategate scandal"[27] and its widespread media coverage for public uncertainty of climate change. Other works indicated to individuals' personal experience of weather conditions with the assumption that cooler short-term seasonal temperatures in recent years led people to believe that global warming trends might have stopped or reversed (Schwartz, 2010). On the other hand, Scruggs & Benegal (2012) found the economic recession since 2008 in Europe and the United States as main reason for declining public concern about climate change.

In a clear contrast to the declining concern for climate change in many developed countries, respondents in this study demonstrated a high level of concern and almost universally framed climate change as threats to their life and livelihood. They also identified threats of climate change as human-induced. However, such high level of concern did not result in their behavioural action or intention to take adaptive measures. This is similar to trends of public perceptions in developed countries where gap between

[27] Just a few weeks before the COP15 in 2009, hackers leaked personal emails and other documents from the server of the Climate Research Unit (CRU) at the University of East Anglia. The leaked documents highlighted some exchanges that were later referred by climate change skeptics as evidence that climate change alarmists exaggerated scientific findings. The event shortly labeled as "climategate" scandal by global media with an oblique reference of the 'watergate scandal' of the 1970s that forced the then US President to step down from his office (Hollar, 2010).

increased awareness and limited behavioural actions are the complex area to understand (Neverla & Taddicken, 2011). Similar to the findings of the studies of Lorenzoni *et al*. (2007) and Semenza *et al*. (2008), people in this case study are largely confused about the ways to tackle risks of climate change. Based on the extant literature, one could argue that people who have direct experiences of extreme weather events are likely to respond and take protective measures against climate change. This research, however, did not find such an indication in public perception although all the respondents had numerous experiences of natural hazards.

It was not the case that they were not interested to change livelihood behaviour to tackle the risks of climate change, but in general, they were confused about how to deal with those risks. Findings of this research have indicated that the lay people are baffled about the newly acquired knowledge of "climate change adaptation" while there are trends of accepting natural disasters as inevitable. That is, living within a culture of hazards where geo-hazards are constant, people have accepted the risks of natural hazards. This indicates to a gap between public's reported concern of climate change and actual behavioural action or intention. In addition, climate change was not described as the most important concern for public when it was compared to other personal, social and economic risks. Rather, this research has found a clear distinction between imminent and obscure risks as described by the respondents. Acute lack of basic needs, for example, housing, findings jobs, education and health facilities, were regarded as "immediate risks" by the respondents while "climate change" and "natural disasters" were considered "obscure risks". In the literature, we can see similar trend when people in general prioritise health, security and social risks as compared to their concerns for environmental

issues (Poortinga & Pidgeon, 2003; Bord *et al.,* 2000). Accordingly, we can see an important incongruous between perceived high concern for climate change in one hand and limited interest to take adaptive measures, on the other. Such incongruousness is also demonstrated in respondents' limited interest to seek out climate change knowledge either from formal or informal sources.

6.3 THE COMMUNCIATION REPERTOIRE OF CLIMATE CHANGE

6.3.1 Communicating climate change through mass media

Despite all the limitations in terms of getting access, mass media appeared as one of the primary sources of climate change knowledge for the respondents. It was either television or radio from where most of the respondents were "informed" and initially "constructed perceptions" about the risks of climate change. Such an important role of media in bringing climate change issues from the domains of science and politics to the public is also found in other studies (e.g, Cabecinhas, Lázaro, & Carvalho, 2008; Kirilenko, Molodtsova, & Stepchenkova, 2015; Nisbet, 2009; Sampei & Aoyagi-Usui, 2009; Weingart, Engels, & Pansegrau, 2000). Media were important tools for widening public awareness of environmental issues (Schoenfeld, Meier, & Griffin, 1979; Slovic, 2000). In particular, Hargreaves, Lewis, and Speers (2003), and Sampei & Aoyagi-Usui (2009) find television and daily newspapers as main sources for environmental and climate change topics for the lay people. However, unlike other studies the current research didn't find any important role of print media in the communication repertoire of climate change in the coastal regions of Bangladesh. Low literacy rates, economic hardship and geographical location have reduced public access to newspapers

considerably. This implies that local media environment and access to different types of media are important in communicating climate change to the public. Accordingly, television and radio appeared most important channels in the communication repertoires of climate change.

As our findings demonstrate, climate change as a mediated topic is not very popular among the respondents. In one hand, respondents hold the view that climate change has been affecting them badly, on the other, they pay little interest to seek out climate change knowledge from media. Most people are exposed to mediated information of climate change by chance or as they do not have other options of selecting media. In the study location, the state-owned national television channel was the only option for viewing television as in general they are not connected to the satellite or cable television channels. Respondents' general media use habits may partly explain this inconsistency between perceived high concern and limited behavioural action to minimise risks. This study finds that it is "to entertain" that motivates most people to consume television and radio contents while climate change issues are generally perceived as either "too boring" or "too complicated" to grasp a clear understanding. In rural areas of Bangladesh, watching television programmes or listening to radio are largely regarded as synonymous to leisure time recreation. Rural people are already struggled with a number of hardships and there are very limited options for entertainment. They are reluctant to see plights and troubles of their daily lives in the media again. Rather, people seek entertainment from media to escape from daily troubles. In media uses and gratifications theory, this has been described as escapist purpose of media use (Blumler & Katz, 1974; Katz, Blumler, & Gurevitch, 1974; Stone & Stone, 1990). This theory posits the notion that media uses, particularly television

viewing, are mainly motivated to pass time (Barwise, Ehrenberg & Goodhardt, 1982; Kubey, 1986). McQuail, Blumer and Brown (1972) made similar arguments with an assertion that television viewing to a large extent is a time-filling behaviour of the audiences. On this note, this could be inferred that respondents in this research are selective to particular genres of media contents (i.e., entertainment) mainly to gratify their affective and escapist needs. This sort of media viewing indicates to the importance of producing "infotainment" programmes on climate change issues to attain lay people's attention.

Despite the lack of interest about climate change issues in media, this research finds strong media influence in transferring some salient features of climate change to the public and setting public agenda. With increased coverage during critical climate change discourse periods, media were successful to make climate change issue salient and transfer certain attributes of the issue, particularly among the male respondents. Media influences are reflected in respondents' framing of the climate change as hazard, environmental, political and science issue. That is, media conveyed some cues to the audiences through which respondents partially construct their perceptions. Trumbo (1996) argues in similar way as media have been also recognised as determining factors, which could define socio-political significance of climate change. On the other hand, like other studies (e.g., Trumbo, 1995), our respondents reported that variations in the frequency of media coverage were associated with increases and decreases in public concern (Trumbo, 1995, Brulle *et al*., 2012; McDonald, 2009).

Works of Trumbo (1996) and Carvalho & Burgess (2005) found the similar results. They argued that it was not consistent and regular coverage of the media that grabbed public attention to climate change risks. Rather

some critical discourse moments such as extreme weather events, important global negotiations or conferences of climate change helped increased media attention. While public interest declines once the issue fades out from media. News media's internal logic of operationalization makes it difficult for a continuous coverage of climate change. Hansen (1991), for example, argued that chances are less to manifest climate change issues with the production cycles of media as a long-term and continuous discourse because journalists are more concerned with news of the day.

6.3.2 Communicating climate change beyond the mass media

Identifying important role of interest groups, most notably NGOs, in the communication repertoires of climate change is one of the significant contributions of this research. Respondents' framing of climate change as linked to local geo-hazards and politicisation of the issue were partly constructed with information from the NGOs. Role of NGOs in politicisation of climate change at the global climate change debate has received scholarly attention in recent years with a recognition of NGOs as important actors in mediating the issue to the public, policy makers and other stakeholders (e.g., Corell & Betsill, 2001; Doyle, 2009; Gough & Shackley, 2001; Newell, 2008; Schroeder, 2008). However, NGOs' contribution in communicating climate change at the grassroots level so far has been ignored in scientific literature.

This study finds that NGOs are particularly successful in communicating the issue to the public employing a participatory approach. NGOs were also successful in creating some opinion leaders in the communities. These opinion leaders could be dubbed as 'change agents' while mediating different development knowledge between formal

communication sources and the lay people. In particular, NGOs were able to create awareness of climate change risks among the women, who were generally excluded from getting access to mediated knowledge. As representatives of civil society, NGOs seek to influence governmental policies and institutional practices and to transform social values in order to inspire behavioural changes (Wapner, 1996; Elliot, 2004). In Bangladesh, most NGOs are foreign funded and work together in a global coalition. Thus brings the global values to the grassroots level. In campaigning, they illustrate the values and policies of their global partners. Thus, mitigation is highlighted in their campaigns while illustrating the local people as victims of rich countries.

NGOs took a strong political approach in communicating risks of climate change and presented the issue within the discourse of global inequality of production and distribution. Respondents' perception of "us" and "them" is largely attributed to knowledge getting from interest groups. Politicising of climate science is also evidenced in the literature. Although scientists first detected climate change (Weart, 2003), environmental NGOs have been central to its politicisation, providing interpretative frameworks to help make sense of this issue (Mormont & Dasnoy, 1995; Doyle 2007; Betsill & Corell, 2001). Mormont and Dasnoy (1995) argued in the similar fashion with an assertion that along with scientists, environmental NGOs are major actors "who act as sources for mediatisation of climate change" (p. 59).

6.3.3 Opinion leaders: important channels between formal and informal communication

This study finds important roles of local opinion leaders as necessary mediators of climate change knowledge between formal

communication sources and the lay people. These community opinion leaders, in general, with more access to politics, resources, media and education have the ability to control climate change risk information, define and embed meanings, and ultimately influence lay people's understanding. However, we have found people with limited resources and social status (e.g., women) also worked as opinion leaders. The role of opinion leaders in the communication repertoire of climate change could be compared to the two-step flow theory, which was developed in the 1940s in the United States. Paul Lazarsfeld, Elihu Katz, and colleagues (1948) observed important roles of some individuals within local communities "who paid close attention to an issue, frequently discussed the issue and considered themselves more persuasive in convincing others to adopt an opinion" (cited in Nisbet, 2009). According to the two-step flow of information, mediated information is first delivered to opinion leaders and then they communicate those messages to the community members through social networks. In the process, opinion leaders play a strong influence in shaping the opinion of a community. In the modernising world, the influence of original two-step flow theory might be declining because of individuals' increased access to first-hand information through traditional and social media. But, in traditional societies, opinion leaders still hold a strong position where people have either limited access to mediated information or limited interest about the topic.

This study has found both formal and informal positions of opinion leaders in the communities. For example, we found persons with positions in the local government bodies (i.e., Union Council), school teachers and NGO field workers as important members of the opinion leaders. These people were described as vital sources of climate change knowledge for the

lay people. In particular, NGOs played important roles in creating opinion leaders in the rural areas exploiting their already established networks of community members. Importantly, a number of women acted as opinion leaders for other women in the community. Many women received technical and financial supports from NGOs and adopted alternative livelihood practices (e.g., crab farming). This knowledge was handed down to others in the community through formal and informal interactions. Taking this into consideration, this research finds informal positions of opinion leaders in the community. This is contradictory to Nisbet and Kotcher's (2009) idea of opinion leaders when they defined opinion leaders as persons with "better education" and "affluent" than average people. This research finds that even members of the marginal groups in the community may act as opinion leaders on issues like hazard management and climate change adaptation.

On the other hand, traditional male opinion leaders were active media users who often explained the meaning of media contents and other communication sources for lower-end media users (i.e., lay people). In many cases, individuals described that they inquired others in the community to know more about climate change issues while getting primary knowledge from media. This research finds that opinion leaders (e.g., school teachers, NGO field workers and beneficiaries) are strongly connected to a large number of community members and appeared as the persuasive agents of behavioural change. Seeking information about saline tolerant crops, farming crabs as alternative livelihood supports and preserving rainwater are few examples when individuals were motivated by some early adopters of these adaptive strategies. In particular, opinion leaders gave interpretations of mediated climate change knowledge when

people consumed media contents in groups at local public places. Therefore, we can argue that role of opinion leaders bear special importance in a media environment where people have limited access to media information and where most people use media for entertainment purposes. In such a media environment, chances are very high that climate change related contents are either ignored or avoided by the lay people because of inherent scientific complexity. Opinion leaders can break this communication gridlock by increasing lay people knowledge of climate change, and promoting public participation in adaptation programmes. In addition, local opinion leaders are enriched not only with formally communicated climate change knowledge but also with local knowledge rooted in local hazard culture. Thus, any attempt to communicate climate change effectively needs to identify local opinion leaders and their roles to reach their followers.

6.3.4 Public spaces: the local public spheres

This study has found some community places (e.g., bazaars, tea stalls, *uthan*, and local government offices) as important communication hubs where community members exchange views. Informal talks in these places help to form shared understanding about contemporary community issues. To some extent, these community places could be compared to Habermas's idea of public sphere (Habermas, 1991; Thompson, 1993). According to Habermas (1991), public sphere is defined as "a network of communicating information and points of view" which is reproduced through communicative action. Like the Habermasian idea of public spheres in the 17th and 18th centuries Europe, community places in our case study serve as places of communicative action where people (although mainly men) gather and exchange views. Local opinion leaders and media

(i.e., television and radio) usually set the issues to be discussed in these public places. One of the main characteristics of public spheres as described by Habermas is grounded in the development of rational-critical discourses. In such a public sphere, everyone is treated as equal participant and communication skills are the power of argument (Calhoun, 1992; Garnham, 2007). Public spheres began to emerge in Europe in the 18th in coffee houses, literary clubs, and with the growth of the newspapers. In modern day, news media have grabbed the place of public sphere to some extent. However, there was a widespread criticism that the ideal of public sphere was normative and it was never been fully achieved by most accounts. With this criticism in mind, we can see in the data of the current study that not all members in the community have equal participation in the community public spheres. Some community members with increased access to education, social class, age, media and resources emerged as local opinion leaders and dominate the flow of discussion. On the other hand, nature of such discussions is not rationally structured, but informal social discussions when agenda switches from one to another. Climate change is not a regular issue for discussion in these community places. But, there were some instances when local people discussed it among themselves. For example, after consuming a media report on climate change. This implies that media has a strong influence in determining what to discuss in these places.

However, not all members of the community are equally included in the local community public spheres. Habermas's theory also recognises that the coffee houses and the like "preserved a kind of social intercourse that, far from presupposing the equality of status, disregarded status altogether" (1991, p. 37) when social position based on political influence

and economic power substantially determine participants' positions in public sphere. As for our findings, we see that women are largely excluded from these community public spheres mainly for cultural and religious reasons. As such, it does not comply with Habermas's "the principle of universal access" (1991, p. 85). Interestingly, women's access in the Habermas's description of the 17th and 18th century public spheres was also restricted. Habermas was criticised for exclusion of women from the public sphere when it was evident that the bourgeois public sphere was predominately male (see Fraser, 1990; Francus, 2012; Allen, 2012). Interestingly, in our case study we see women have separate spheres to meet and exchange views. Such places are mostly courtyards of homes where they meet formally and informally to discuss scheduled and unscheduled issues. NGOs helped many women to organise local associations that need to hold regular "courtyard meetings" to discuss projects and strategies on different livelihood issues. On the other hand, women often meet other women at the *uthans* (courtyards) to pass leisure time. These spaces, both public community places of men and "courtyards of women" are important centres of communication of local interests, which occasionally discuss climate change risks.

6.4 TOWARDS A GROUNDED THEORY OF CLIMATE CHANGE RISK PERCEPTION AND COMMUNICATION

The purpose of the current study was to develop a substantive theory that could describe and explain how people in a specific coastal region of Bangladesh perceived and communicated risks of climate change. The emergent theory identified two core categories – "local hazard culture" and "local communication repertoire". Integration of these core categories revealed that people embedded meanings, mainly derived from local hazard

culture, in perceiving risks of climate change from different communication sources. This suggests that lay people are exposed to climate change risk information through different societal fields of communication, including mass media, NGOs and social contacts. However, obtained knowledge of climate change risks is not perceived at its face value. Rather, they are understood within a specific cultural framework or more precisely through the culture of hazards. Local events of geo-hazards, extensive dependence on climatic conditions for lives and livelihood, and traditional coping strategies are important elements of this hazard culture. On the other hand, communication of climate change is also determined by structure and process of local communication repertoire. In this local communication repertoire, roles of formal sources, such as media and information from interest groups, are not deterministic. Rather, information from these sources is filtered through informal social talks (including opinion leaders), experiences of extreme weather incidents, personal and collective memories, and observation of local weather. In the process, local hazard culture appears as the filter through which people interpret discourses of climate change. Taken together, this research posits the notion that both perceptions and communication of climate change are locally constructed with a clear indication to localisation of a global risk. In the next, we will discuss mutual relations between local hazard culture and local communication repertoire (*see Figure 6.1)*.

As demonstrated in this research, hazard culture is originated in a specific region with repeated experiences of natural hazards. This is also found that lay people's lives are determined by a unique landscape and particular climatic conditions. This part of the coastal region of Bangladesh is situated on the marshland of the mangrove forest and became the site for

settlements and agriculture only after people had begun to build dikes thus preventing intrusion of saline water and reclaiming lands from the water. Wind and water are the two basic features of daily life for people in the area, which often turn into the forms of storms and surges of saline water. The threat of saline water intrusion in the locality is a constant hazard for people since the beginning of their settlement – be it as storm surge or regular tidal floods. Water poses threats from the other side as well. Rivers and tributaries of the Ganges river system are a constant threat of flooding for people living in the lower part of the Delta. Living in such a climatic circumstances, people identify major risks of natural hazards and attempt to develop some strategies and techniques to minimise the risks and adapt to existing climatic conditions.

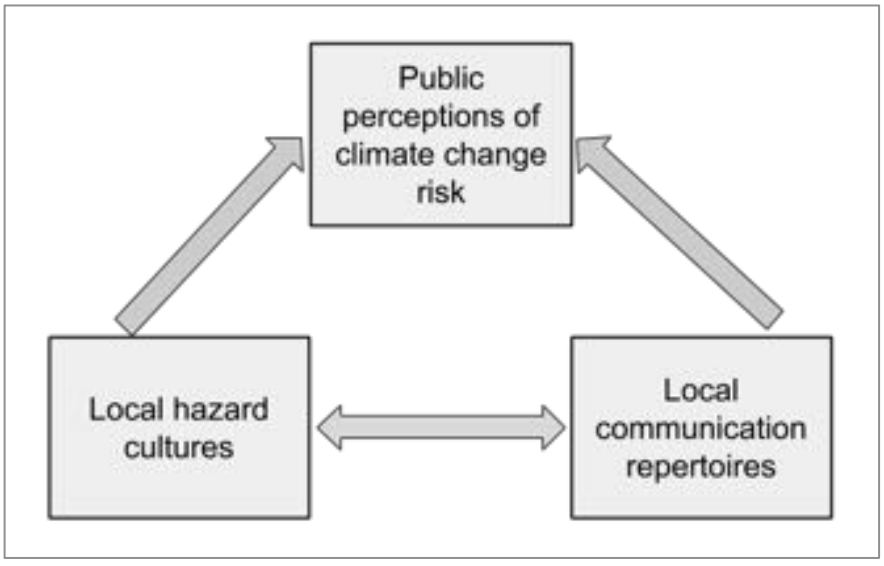

Figure 6.1: The grounded theory of public perception and communication of climate change risks. This theory explains relations between local hazard culture and local communication repertoires in shaping public perceptions and responses to climate change risks (researcher's own model).

Accordingly, certain hazard culture has been developed which is specific to that region and predominantly shaped by characteristics of local geo-hazards. Frequent storms, tidal surges and salinity in water are few characteristics of geo-hazards in the study location of the current research. In the past, these were generally perceived accepted aspects of daily life for people living in hazard-prone areas what Bankoff (2009) described as "frequent life experience". With this in mind, one could argue that geo-hazards and natural disasters are not abnormal occurrences, but part of lives and livelihood for people living in vulnerable areas. Such acceptability may lead to perceiving the origin of geo-hazards as natural. The second prevalent construct of origin of natural hazards and disasters were influenced by religious beliefs of the people when the events were perceived as "acts of God". Ensor and Berger's (2009) work on climate change adaptation in Bangladesh find effects of religious beliefs in people's perception and response to natural hazards. In this research, we also found that a small number of respondents attributed weather variations and extreme weather incidents to 'God's punishment'. But, general findings indicated to a clear transformation of public perception of the causes of hazard events from its 'natural origin' and 'acts of God' towards activities of human beings, that is, climate change. Eventually, respondents framed origin of local hazards at the global level.

In this changing public perception, communication played the crucial roles. As people are exposed to discourses of climate change, causes of geo-hazards in people's minds began to transform. They found a strong correlation between events of local extreme weather events and global climate change. Both mediated and non-mediated communication influenced them to draw a catastrophic image of climate change with pre-

existing knowledge of geo-hazards of the region. From a theoretical perspective, this finding of public perceptions of climate change in general supports the "constructivist school of thought", that is, reality (or the so-called objective risks) is constructed in the individuals' minds through constant negotiations with 'bits of information' from different communicative sources in certain socio-cultural contexts. Here, public perceptions are not static but evolve through continuous negotiation between mediated and non-mediated information, and personal observation, experience and memories. This implies that individuals do not interpret the risk of climate change as it is in 'reality', but after embedding some personal and cultural meanings to the risk.

As for the substantive theory grounded in this study, this clearly indicates to a reconstructed body of climate change knowledge in people's minds, which are formed through interactions between traditional sources of cultural knowledge of hazards and newly acquired knowledge of climate change from formal communication sources. This construction is rooted in the "local" in contrast to "objective" scientific conception of climate science. Thus, communication initiative of a universal goal might be misleading if it fails to understand local knowledge of the people. The lay people's perception of 'adaptation' could be a point of reference to understand how deeply their understanding is rooted in local hazard culture. Respondents, in this research, have widely described adaptation as a continual process, which is reflected in their livelihood and occupational patterns. Structural design and construction materials of houses, agricultural systems, fishing methods, continual relocation of settlements and preserving rainwater are few examples of adaptation that people of the

region have developed and sustained over the years in response to geo-hazards.

After identifying local hazard culture as the important determinant to perceive risks of climate change, this research posits the notion that there might be different vulnerabilities to climate change in a country and people living in different hazard cultures would construct their perceptions and responses accordingly. That is, taking 'nation-state' might be an inadequate category for effective management of risks related to climate change. This is important to identify the regional culture of hazards instead of its national characteristics. Mauelshagen (2007) argued in a similar fashion and demonstrated that German North Sea coast developed its own unique "hydrological culture" in coping with natural hazards over many centuries. Accordingly, hazard culture in different coastal regions of Bangladesh might be unique in accordance with specific hazards and the way people deal to cope with them. Hence, climate change adaptation and communication strategies to bring behavioural changes need to be customised taking into account the regional hazards and risks people are exposed to because of possible climate change.

As for communicating climate change, this research has contributed in two important ways. First, it has identified different societal channels in the climate change communication repertoire, which play various roles in constructing public perceptions and intended behavioural responses. This finding indicates to the importance of a comprehensive communication approach to communicate climate change to the public instead of the existing media-centric communication. This holistic communication approach of climate change is labelled as "the communication repertoire of climate change." In this communication repertoire, it is evidenced that

mass media, notably radio and television, appear as most important sources of climate change knowledge for the lay people creating awareness and transferring certain frames of the issue. However, this is not all-powerful media-centric communication. The communication repertoire illustrates that other forms of communication play equally important roles in sensitising climate change issues in the lay people's minds with clear influence on their perception construction. These forms of communication include interpersonal and group communication of different interest groups (e.g., NGOs) and general social contacts. In addition, individuals' personal observation of local climate, experiences and memories of geo-hazards substantially influence the way they perceive, communicate and intend to respond to risks of climate change.

Second, the communication repertoire of climate change also indicates that a dialogic communication model is more appropriate to effectively communicate climate change issues, which allows perspectives of the lay people in the communication process. Existing communication models of climate change in the developing countries (e.g., MoEF 2009) are largely built on the linear flow of knowledge – from those who know more to those who are perceived to have a deficit. News media are treated as main channels to inform people about risks of climate change. But, communication *per se*, as found in this research, is grounded in dialogical forms. In this case, media are important channels. But, reception of media messages involves complex and dynamic processes where receivers' perceptions are shaped by a number of cognitive and contextual factors. This complex negotiation implies that lay people may have limited understandings of scientific complexities of climate change, but they possess relevant and important knowledge of their own socio-geographic

conditions as well as traditional coping strategies with extreme climatic events. In the following, more insights are given on these two aspects of communicating climate change with reference to existing pool of knowledge in the field.

As already indicated, scope of communication is crucial in transforming public perceptions about geo-hazards and their links to climate change. This research finds that scopes of communication are rooted in their dialogic and participatory models, not in a rationalist instrumental communication. Weingart *et al*. (2000) described the process of the rationalist instrumental model of communication as "scientists discover an environmental problem and identify options for potential solutions; scientists inform politicians of these findings or to the public through media." This model emphasises on more and better information and cognitive learning processes for different parties (including lay people) involved. Bangladesh's national policy to tackle climate change risks has taken a similar strategy in communicating risks of climate change to the public (MoEF, 2009). Similar to the public understanding of science (PUS) model, this linear process of communication considers the lay people as "empty vessel" to be poured with information from policymakers and spheres of science (Whitmarsh, Seyfang, & O'Neill, 2011; Winter, 2004). Particular importance is given to the role of mass media in creating the communication links between the public and policy-science domains with a clear objective to change public's behavioural actions with regard to climate change risks. This is clear that this model of communication is rooted attributing a knowledge deficit to the public and call for knowledge transfer from the top (scientists and policymakers) to the down (lay people) to fill the knowledge gap through media. This is comparable to the Public

Understanding of Science (PUS) model developed in the 1970s to increase public knowledge of science involving media (Bauer, 2009; Sturgis & Allum, 2004).

The "knowledge gap" model wrongly proposes that awareness of the risks will lead people to take precautionary measures. This is based on the assumption that increased information delivery would create awareness and thereafter change people's behaviour to tackle climate change risks. A similar strategy is found in research conducted in many developed nations (Burgess *et al*., 1998; Kollmuss & Agyeman, 2002) to influence environmental behaviour of lay people. The central assumption of this model is that individuals make rational decisions based on available information. But, this rationalist approach has failed to acknowledge salient contextual influences, such as personal values, social identity, norms, and adaptation capacity on behavioural changes. This proceeds to the argument that providing information about climate change to the public and exhorting them to adapt to changing climate ignores the context in which perceptions are formed. This research argues that existing model of climate change communication undermines "active audiences" in one hand and "communication beyond the mass media", on the other. Besides, our findings support Bauer (2009, p. 231) since he argues that the operational axiom of 'the more you know, the more you love it' did not work in all cases. This is demonstrated in the perceived gap between high level of concern about climate change risks and limited behavioural actions of the lay people.

Therefore, the communication repertoires that we found in this study emphasised the necessity to involve and engage lay people in the overall communication process. Mere emphasis on formal communication

channels (e.g., media and interest groups) without proper consideration of other informal forms of communication and local hazard culture may result in erroneous perceptions about climate change risks and the ways to mitigate those risks. In addition, content and characteristics of communication should be grounded in the local hazard culture and different actors in this communications system must be engaged in dialogues in a horizontal network, not in a vertical network, which delivers messages from the top to the down. Thus, this research suggests that mass media may make climate change topics familiar to lay people, but behavioural changes are only be expected when people are engaged in dialogues and relate those risks in their livelihood activities.

By dialogic communication, we mean that it is not a knowledge flow from "experts" to "lay people", but an interactive process of knowledge sharing and communicating this knowledge to the lay people. In this model, the sender and receiver of knowledge interactively construct the reality. This model explicitly recognises the growing importance of interpersonal relationships along with effects of mediated communication because boundaries between mass communication and interpersonal communication have become blurred not only in modern societies but also in traditional ones. In the traditional societies, there might be the absence of new media based social network for social interactions, but social relations are knitted in strong bonds in the forms of different informal social contacts and networks.

6.5 CHAPTER SUMMARY

This Chapter has summarised main findings of the current study and compared them with other research in the literature. This helps to

understand how findings of this research are similar or contrasting to climate change risk perception and communication as found in other studies. This research has found two sets of gaps in lay people's perception of climate change risks. First, there is a gap between 'awareness' and 'knowledge' because widespread familiarity of climate change related topics did not result in adequate knowledge. Similarly, there was a gap between perceived high concern for climate change risks and limited behavioural response. On the other hand, this research has identified "local hazard culture" and "local communication repertoire" as two important factors influencing public perceptions of climate change risks. Local events of geo-hazards, extensive dependence on climatic conditions for lives and livelihood, and traditional coping strategies are important elements of local hazard culture. This is also found that communication of climate change is largely determined by structure and process of local communication repertoire. Importantly, the role of formal sources of climate change knowledge (i.e., media and NGOs), are not deterministic. Rather, information from these sources is filtered through informal social talks, personal and collective memories, and observation of local weather.

Chapter 7

Conclusion

7.1 A RETROSPECTIVE LOOK AT RESEARCH OBJECTIVES AND QUESTIONS

This chapter gives a retrospective look at the research objectives, main findings, and their implications for theory and practice of climate change communication. It also makes notes on some of the limitations of the current study and gives direction to future research.

This research was aimed at exploring public perception and communication of climate change risks in the coastal regions of Bangladesh – an area besieged by a number of regional geo-hazards. It was motivated with an objective to narrow down the gaps in existing literature on two specific grounds. First, previous research in this area was mainly limited to examining cases in developed countries while perceptions of people living close to possible climate change risks were largely unexplored. In other words, most of the previous research investigated perceptions of people whose lives and livelihoods were not that much affected by climatic conditions. For example, people in many developed countries are more resilient to adverse impacts of climatic conditions as compared to the people in developing countries. There were only a handful number of research, which examined relations between experiences of extreme weather events (e.g., flooding, avalanches), and perceptions and responses to climate change risks. Yet, a major omission from previous research was the view of the people who were dubbed as most vulnerable to climate change risks. In addition, most research studied public

perceptions of climate change across a large population (often national surveys) rather than considering experiences of small communities living close to the risk of climate change induced hazards. This research has attempted to address these limitations in the extant knowledge taking a study population who are constantly exposed to extreme weather events, and on the verge of accelerating those risks because of human-induced climate change.

Second, a major volume of research of climate change risk perceptions relied on attitudinal surveys, which were designed mainly following the theoretical formulation of psychometric research and cultural theory to a lesser extent. The pool of knowledge, developed during the last decades, provides a useful indication of public understanding and behaviour towards climate change risks, and scope of communication in the process. However, attitudinal surveys are found limited in exploring the reasons behind different understandings in relation to climate change risks in one hand; and the influence of socio-cultural and contextual factors, on the other. Accordingly, one of the main objectives of this research was to examine public perception and communication of climate change risks adopting a qualitative approach. This approach helped to understand social phenomena from the perspectives of the study population instead of quantifying them with pre-determined theoretical concepts, which were mainly derived in Western socio-cultural contexts.

Grounded on these research objectives, the current study was guided by two primary research questions. First, how do people in the coastal region of Bangladesh perceive and respond to the risks of climate change? Second, how do people describe the roles of different communication sources in communicating climate change risks? A number

of sub-research questions were formulated (see Chapter 1) within these two main research questions to specify research objectives as well as to keep the research goals within the scientific disciplines of risk perception and communication. Limitations of existing theoretical frameworks, special features of socio-demographic, cultural and geographical contexts of the study population, and most importantly, the epistemological logic of the research led to take an inductive approach to realise research objectives. The grounded theory method of qualitative research was found most appropriate to develop a substantial theory, which could explain trends and patterns of lay people's perceptions of climate change risks; and the process of communicating those risks to and among the people.

7.2 SUMMARY OF THE EMPIRICAL FINDINGS

This research found lay people's "universal familiarity", but "occasional interest" of climate change issues. Respondents' general familiarity with climate change topics, however, was marred by a number of erroneous and irrelevant beliefs with regard to causes and impacts of climate change. A clear gap between "awareness" and "knowledge" was identified among the respondents when they had attempted to give detailed descriptions of the causes of climate change. Lay people's similar perceptual construct is found in many developed countries. For example, this research found "atmospheric holes" as an identical perceptual construct as for causes of climate change. Similarly, people in many developed countries viewed climate change risks within the concept of "ozone layer depletion". Respondents in this research largely perceived climate change as a problem linked to air pollution. This was also similar to the trend of public perceptions as found in other studies. In general, respondents'

perceptions of the causes of climate change were drawn from their personal observation of environmental degradation in the surroundings as well as knowledge from formal communication sources.

Although respondents were uncertain about their perceived knowledge concerning the physical mechanism of climate change, almost all of them recognised the role of developed countries in creating the problem. As such, respondents identified themselves 'victims' of wrongdoings of people in some rich countries. This clearly implied a "we" and "they" dichotomy in describing the political aspect of the risk. Such a perceptual construct was consistent with scientific and policy debates on the issue when it was widely acknowledged that people in developing countries were more vulnerable to the risks of climate change which was mainly caused by greenhouse gas emissions in developed countries. This was also illustrated in the findings of this research when respondents identified climate change risks both spatially and temporally close to their lives. This was a clear contrast to the findings in many developed countries when climate change was understood as a threat of future and more important for the people in distant places.

As for impacts of climate change, respondents perceived knowledge focused mainly on the "increased" and "unusual" trends of local natural hazards. They had also drawn examples of personal experiences of natural hazards as well as changes in local weather patterns as evidence of climate change impacts. This was also evidenced in other studies that lay people usually relied on their personal observation of weather variances as attributions to climate variability. Importantly, this research observed that the lay people embedded meanings to the risks of climate change those meanings were mainly derived from local hazard culture. Accordingly,

events of local hazards and their characteristics emerged as important filters to perceive risks of climate change. Traditional knowledge of adaptation is inherited and practiced culturally in the region to deal with regional geo-hazards. This type of knowledge emerged as an important perceptual construct of solutions to climate change risks. There was also recognition of some "newly acquired" knowledge of climate change adaptation in the public perceptions. Newly acquired knowledge of adaptation emphasized on scientific knowledge transfer and mainly communicated to the lay people through a number of communication channels, which included news media and advocacy programmes of different NGOs. This was important to note that local "hazard culture" appeared as the important concept in perceiving solutions to the risks of climate change.

The patterns of public perceptions of climate change risks had indicated important roles of respondents' sources of knowledge. Therefore, this research investigated mutual relations between role of communication and construction of cultural meanings of climate change risks in the individuals' minds. In particular, this research attempted to identify important sources and actors as well as the structural process of climate change communication at the community level. Accordingly, the communication repertoire of climate change was drawn on the basis of respondents' descriptions. This communication repertoire illustrated that construction of knowledge in individuals' minds was a complex and evolving process in which local hazard culture, social interactions, mediated knowledge, personal experiences, and memories of hazards played different, but integrated roles. This led to the grounded theory of the research that people of a certain socio-cultural and geographical settings

attributed specific meanings to climate change risks while interpreting information from different communication sources.

7.3 THEORETICAL IMPLICATIONS OF THE FINDINGS

This study was explicitly designed to bring together two interrelated theoretical concepts in hazard management studies - "risk perception" and "risk communication". Existing literature emphasised importance of these two mutually inclusive concepts in any attempt to understand public risk perception and to design effective hazard management strategies. Yet, the literature has failed to grasp the relations between risk perception and communication at their depth mainly because the concepts were approached narrowly and often emphasis was given either on "perceptions of risks" or on "communication of risk". That is, the extensive range of literature of public risk perception examined mainly nature and trends of risk perception, attitude and behaviour towards climate change risks. They often made passing reference to the role of communication, but hardly studied them at their depth. On the other hand, literature on climate change risk communication mainly examined the role of mass media in influencing individuals' risk perceptions and risk decision. Only a handful number of studies (e.g., Nisbet & Kotcher, 2009) examined risk perception and communication beyond the mass media, and gave emphasis on understanding roles of interpersonal communication. This research was an attempt to narrow down this research gap.

Theoretically, the existing literature on risk perception is dominated by two major approaches. The psychometric paradigm, based on attitudinal surveys, has attempted to identify the cognitive factor affecting one's risk evaluation. In contrast, the cultural theory describes risk perception with an

emphasis on individuals' cultural beliefs and social relations. Both approaches have made significant contributions to understanding and identifying factors affecting one's risk perceptions. Yet, these theoretical approaches contain important limitations and they have failed to produce any integrative theoretical framework to study risk perception and communication taking both cognitive and socio-cultural factors into consideration (*see Chapter 2*). Accordingly, this research has made the arguments that existing theoretical approach of risk research could only reveal part of the reality, particularly in non-western countries. It has been also argued that the study population of this research do not easily fit within predetermined theoretical categories of psychometric and the cultural theory. For this reason, this research took an inductive and holistic approach to explore climate change risk perceptions and the role of communication from the perspectives of the study population. This research did not want to impose any predetermined theoretical concepts and values, many of which were developed in different socio-cultural and demographic conditions. Particularly, we didn't want to impose any Western value based social theory to test the trend of risk perception and the process of risk communication. Instead, our efforts were to develop theoretical concepts, which were indigenous and grounded in the data.

As for theoretical contributions to explain public perception and communication of climate change risks, this study contributes in identifying "local hazard culture" and "local communication repertoire" as two important theoretical concepts. These two concepts largely explain the way people perceive the risks of climate change – its causes, impacts and solutions; and the role of different channels and actors in communicating climate change in the local context. Theoretical abstraction of these two

concepts has led to develop the grounded theory which argues that people embed meanings, mainly derived from hazard culture, in perceiving climate change information from different communication sources. As this theory explains, public perceptions of climate change risks are significantly constructed on pre-existing knowledge of geo-hazards and people filter mediated and non-mediated climate change information through the events of extreme weather. This implies that people obtain climate change information from a number of societal communication sources, but that information are not perceived at their face value. Instead, obtained information is understood within a specific cultural framework of natural hazards. Accordingly, a catastrophic image of climate change grabbed the individuals' imagination as they are regularly exposed to those hazards.

This research finds that communication of climate change is determined by the structure and process of local communication repertoire. Both formal and non-formal communication forms have various roles in the communication repertoires. Again, role of formal communication sources (e.g., media and NGOs) are not deterministic in influencing one's attitude and behaviour towards climate change. Mediated climate change knowledge is filtered trough informal social relations, personal experiences of hazards events, memories and observation of local weather. Taken together, the grounded theory developed in this research infers that both perceptions and communication of climate change are locally constructed when people are tended to localise impacts of a global risk.

In evaluating the grounded theory of this research, cautionary notes should be taken into consideration. Like most other grounded theory studies, this research didn't produce a "grand social theory" to explain public risk perception and communication. Actually, that is not the goal of

conducting a grounded theory study. Rather, the focus was to develop a substantive or mid-range theory from the data to explain the social phenomena. Such mid-range theories are often built on to explain basic social psychological and social structural processes (Morse, 2001, p. 5). This implies that theory or theoretical concepts, developed in this study, are very much contextual. Thus, the developed concepts may fit in similar socio-cultural or geographic contexts. At the same time, it may differ substantially in different socio-cultural and hazard contexts.

7.4 POLICY IMPLICATIONS OF THE FINDINGS

Climate change is a global problem, but its possible impacts are best understood in local or regional contexts. Findings of this research have supported this notion since public perceptions of climate change risks were constructed within the contexts of specific characteristics of regional geo-hazards. On the other hand, communication of climate change risks is processed through local communication repertoires involving both formal and informal modes of communications. This clearly implies that public perception and communication of climate change is largely contextual and locally situated. Likewise, any policy initiative to tackle adverse impacts of climate change, enhance resiliency of vulnerable people, and to communicate the risks effectively needs to address local or regional aspects and the way local people perceive the risks. On this note, this research proposes the following policy considerations:

First, this research has identified a high level of awareness and concerns along with some identical misconceptions about causes, impacts, and solutions to climate change risks. Importantly, findings of this research have demonstrated a wide gap between perceived high level of concern and

limited behavioural responses to minimise climate change induced risks. This gap is not originated in people's lack of interest in changing livelihood behaviours, but more importantly, they are rooted in lay people's confusion and incapability of taking adaptive measures. In many considerations, respondents in this research have felt alienated about adaptation strategies to deal with climate change impacts. This aspect of public of incongruousness could be addressed by taking the lay people as partners with recognition of their local knowledge in any initiative to sensitize adaptive measures for the community. This indicates the necessity of a bottom-up approach for formulating policy strategies with due considerations of the needs and perceived knowledge of vulnerable people. The existing national policy to tackle climate change (MoEF, 2009) has failed to accommodate this need since the approach was top-down and universal. It did not address regional or local perspectives of climate change risks taking perceptions of the local people into considerations. On this note, this could be argued that different coastal communities in Bangladesh might have different perceptions of climate change risks as well as different levels of vulnerability. As such, policies to address risks of climate change should be based on local "hazard cultures" on which much of public perceptions and responses are constructed.

Second, recognition of local hazard culture in formulating climate change policies acknowledges lay people's active participation in minimising the risks. In other words, a participatory policy initiative should recognise lay people's expertise in minimising risks of climate change induced hazards. Solutions to climate change risks, in particular, adaptation strategies, do not fall entirely on the purviews of scientists and experts. Lay people's cultural knowledge to deal with natural hazards, which are

developed and practiced for years, have an important stake in making climate change adaptation sustainable. This indicates to the notion that climate change and its possible solutions are not a mere scientific issue, but intrinsically rooted in socio-political and cultural spheres of the coastal population in Bangladesh. It was important to note in the data that lay people were largely confused about the term 'adaptation' because of its inherent 'formal tones'. However, they were able to identify adaptation practices while making detailed descriptions and defined adaptation as 'natural and continuous process' to make their livelihood sustainable against the extreme climatic conditions. This indicates the importance of lay people's expertise in dealing with the events of geo-hazards. Regrettably, Bangladesh's climate change strategy and action plan did not recognise lay people's expertise and indigenous knowledge of coping strategies. Instead, it has relied heavily on scientific knowledge transfer and has planned to make the people 'educated' about risks and solutions to climate change. Again, such a top-down approach to climate change policy will hardly make any difference if the local perspectives of the problems and solutions are not addressed properly. In other words, this will be difficult to infuse adaptive strategies among the people if the tools and techniques of adaptation are separated from local practices and lifestyles. Therefore, this research recommends formulating adaptation policies to climate change as a collaborative effort between scientists and the lay people. Such a collaborative effort would allow interaction among different stakeholders involved in managing risks of climate change. As such, the approach should emphasise on public engagement in minimising risks of climate change impacts, not merely on increasing public understanding of the risks.

Third, findings of this research bear important implications for formulating climate change communication strategies – both for content development, and processes and structures of communication. As for contents, communicators and educators should take into account what patterns of public perceptions people have in their minds, and what are the possible impacts of climate change in the region. Emphasis on local impacts of climate change is a potential way to bring people in the discourses of climate change and possibly towards intended behavioural changes. This is argued on the premise that local and personal threats are perceived as more salient and of greater urgency than global problems. This has been demonstrated in the data of this research that climate change communicators (both media and NGOs) were successful in depicting a catastrophic image with a particular focus on storm and storm surges. People could clearly identify themselves as victims of storms, which they believed were consequences of climate change. Yet, there remains a danger in this sort of emphasis on extreme weather events. Media and climate change communicators have mainly focused on some occasional events of extreme weather (e.g., storms). As such public concern of climate change recedes once they are not exposed to extreme weather events for a long time. This type of communication approach has failed to address climate change as a continuous and long-lasting risk, which could affect other aspects of the people's livelihood. Accordingly, the wide-ranging effects of climate change in agriculture, environment, human health, biodiversity and other socio-economic and related issues are not included in the discourses of climate change. In particular, food security and attempts to eradicate poverty might be challenged because of adverse effects of climate change in Bangladesh and other developing countries. Therefore, communication

contents of climate change should integrate these potential effects. This will lead people to think climate change as continuous risks and linked to their livelihood, not merely as occasional events of extreme weather. Again, this leads to the argument that communication contents of climate change should be grounded in the "hazard culture" of the region that recognises entirety of hazards, not on particular hazard events.

In addition, climate change communicators should talk clearly and openly about the local hazards, which are not linked to global warming problems. For example, salinity in water and topsoil in the coastal region of Bangladesh is largely originated in some unsustainable development projects and economic practices. Findings of this research have demonstrated that even the lay people could identify how diversion of freshwater in the upstream of the Ganges-Brahmaputra river systems has contributed to salinity problems in the coastal regions of Bangladesh. The salinity problem has even worsened when people turned the rice fields into saline water shrimp firms in the south-western coastal regions of Bangladesh. People have drained in saline waters to the fields for farming shrimps that brought them profits but at the huge environmental damage. Most of these lands have reduced fertility and it has become difficult to grow rice there because of the high level of salinity in topsoil. At the same time, increased salinity has also contaminated natural sources of fresh water in the region (e.g., ponds and the shallow wells). Similarly, unsustainable water management projects, for instance, building dikes and polders to prevent the natural flow of water as well as narrowing down the rivers and canals, have contributed to flooding hazards. This indicates that origins of hazards are to be clearly identified in the communication contents otherwise it will be problematic to find solutions. People are found

to react on solutions of a problem largely on the basis of their perceptions about its causes.

As for the content of climate change communication, this research suggests to tailor messages to the needs of local impacts and solutions. This is, however, not an easy task especially for media in Bangladesh, which are mainly structured nationally. Bangladeshi media, in particular, radio and television approach national audiences leaving limited scope to provide customised contents for specific regions. Non-media communication channels in the communication repertoires of climate change, for instance the NGOs, can fill in this gap with customised and tailored messages targeting particular region and its communities.

This research finds climate change topics communicated through formal and informal channels were not interesting for lay people who found them either 'too complicated' to understand or 'too boring' to their already exhausted rural lives. In other words, people did not have a clear engagement to the communication content of climate change. This sense of apathy is rooted in individuals' media use habits. Most people are tuned to radio or watch television for entertainment in their free times. A promising programme genre in such a media use habit is 'infotainment'. Climate change communicators and educators can push information to the people with a blend of entertainment elements. This may connect people with climate change issues.

As for structures and processes of communication, this research has found media and NGOs as important formal sources of climate change knowledge for the lay people. Media can play significant roles in generating the issue and setting public agenda. On the other hand, NGOs are important agents of advocating and politicising climate change risks

among the lay people. NGOs are largely participatory in their approach to sensitize the issues among their target public. However, formally communicated climate change information is not taken at its face value. Instead, people embed meanings, which come from their interactions in social contacts, personal experiences, observation and memories. This implies the necessity of considering the entirety of one's communication repertoires instead of emphasising only on formal communication channels. This is particularly important for communities dubbed as traditional societies where much of the communications still occur beyond the mediated world. In particular, if a communication initiative attempts to engage public into climate change adaptation and bring behavioural changes it must take individuals' own experiences and their social relations into cognizance. Accordingly, this research proposes to think about "beyond the mediated communication" in any attempt to communicate climate change issues to the people. In addition, this research has emphasised on important scopes of local community spaces, which often act as local public spheres, as being the hubs of public knowledge sharing in rural areas. Climate change communicators and educators should utilise the power of these spaces to bring climate change issues to the lay people. Likewise, this research has found different types of opinion leaders in the communities who work as bridges between formal communication sources and the lay people. This will be interesting to identify these opinion leaders and infuse climate change knowledge to the people, who have limited access to formal communication sources (e.g., access to media) and who find it difficult to understand climate change issues communicate through formal channels. Bangladesh' national policy document to reduce adverse impacts of climate change relies heavily on mass media to communicate

the issues to the grass root people. But, as this research has been identified lay people come to know about climate change and related issues not only from media but also from other communication sources. In short, communication should be based on characteristics of different elements in the local communication repertoires. This research did not find any significance presence of new media (e.g., internet-enabled social media) since they were not available to the lay people. The only new media – mobile phones – are mainly used for personal communications. Yet, this is assumed that public access to the Internet and social media might be increased in near future. As such, future communication policies of climate change risks should explore the way people use these media and how can these media be integrated into the communication repertoires of climate change.

7.5 LIMITATIONS OF THE CURRENT STUDY

While this research makes significant contributions to the fields of climate change risk perception and communication, it also suffers from some "inevitable" limitations of any qualitative research. First, findings and analysis of this research are grounded on a limited number of respondents. The main body of data was derived from interviews of 38 respondents, which was supplemented by observation and field notes. Despite all strengths and qualities of qualitative research, if it is judged against quantitative criteria, study findings are not generalizable across a large population. Actually, it was not the aim of the study to generalise findings across a large population. Rather, the grounded theory methodology was sought to develop a small-scale substantive theory to explain the phenomenon of individuals' perceptions and communication of climate

change risks. Limitations of the grounded theory methodology have been considered and addressed in Chapter 3. Accordingly, it is worth emphasising that the findings and interpretations described in this research might be limited to the specific coastal livelihood in Bangladesh or similar cases elsewhere. Hence, the theoretical concepts regarding risks perception and communication developed in this study should be specific to the particular characteristics as rooted in the region's hazard culture. Similar methodological techniques may result in different levels of public understanding and communication of climate change risks in cases with different socio-economic and hazard culture. This could be an interesting topic for future research to see how findings of this research are fit in or altered in the contexts of different hazard cultures – both in developed or developing countries.

Second, data of this research is derived from attributions made by the respondents. Such data has certain risks to determine whether views described by the research participants were accurate. There might be a difference between participants' 'intended' and 'actual' behavioural practices. This is the gap between what people say they do, and what actually they do. This research has taken a number of measures to minimise social desirability effect in the data. It has also included close observations of the people to supplement the interview data. Yet, there are scopes to make more objective measures of respondents' behavioural practices through objectives measures (e.g., surveys) and experiments in any future attempt to understand public risk perceptions and communication. On the other hand, this study was exploratory in nature mainly because the chosen case was under-researched and there was extremely limited empirical data to understand the case. Accordingly, the research was not designed around

a particular theory or theories. Such a design has its inherited limitations to bring theoretical explanations of the social phenomena, particularly in interpreting the findings. A more theory-driven research approach may improve confidence in interpreting the study results. Accordingly, future research might be built on the findings of this research and may adopt a more theory driven approach taking a large and representative sample of the population.

7.6 DIRECTION OF FUTURE RESEARCH

Findings of this research have revealed important insights about trends and patterns of climate change risk perceptions and communication in the coastal region of Bangladesh. Yet, it has a number of limitations, which could be addressed in future research. On the other hand, findings of this research have indicated to explore other avenues of public risk perceptions and communication.

First, this study has been conducted on a small number of people in a South Western coastal region of Bangladesh who are exposed to different types of geo-hazards. This study finds that local hazard culture, specific to exposure to certain types of geo-hazards, predominantly influences public perceptions and responses to global climate change risks. Methodological techniques and theoretical findings of this research could be applied to other coastal regions of Bangladesh as well as regions in other countries to compare findings. Such a cross-culture comparison may explore factors in differences in climate change risk perceptions and roles of specific hazard culture in the construction of those perceptions. In particular, a comparative case study between developed and non-developed will be an interesting topic of research to see how different socio-cultural and economic

conditions, communication repertoires, and hazard cultures influence public perceptions of climate change risks. For example, findings of the current study could be compared with a similar study in the Northern German coastal region where certain hazard culture has been developed because of specific kinds of geo-hazards.

Second, this research draws a communication repertoire of climate change at the community level and identifies its different elements. There are scopes to conduct in-depth and specific research on each of these elements in the communication repertoire to compare their respective roles. For example, this research finds interest groups, notably NGOs, as important elements in the communication repertoires of climate change, which transfer some salient features of climate change to the public. Future research should focus on in-depth analysis of communication strategies of these organizations and their roles in creating awareness and motivating behavioural changes of lay people. Such research may also analyse the communication tools and contents that are used by the NGOs and examine their effectiveness. Importantly, future research should emphasise on knowledge of NGO field workers who are directly involved at the community level to create awareness of climate change.

Similarly, analysis of contents of news media could be a path to future research direction to understand to what extent those contents are effective to make climate change issues understandable to the lay people. In particular, this research finds importance of infotainment programmes as one way to bring climate change issues more interesting to the people. Future research may analyse tone and genre of climate change contents in the media and measure how much of those information are presented to audiences as info-entertainment programs. In addition, future research may

emphasise on “local community places” and see how people interact in these places to develop shared opinion on local issues. Specific focus on the role of opinion leaders could be another direction of future research. On a more general note, the communication repertoire, which is developed from the data, could be compared and evaluated taking other social issues into considerations.

Finally, this research develops a substantial theory to explain climate change risk perception and communication taking a small sample. There are scopes to conduct explanatory research on the basis of this study finding. Future research may take a more quantitative approach to test and verify the theory. In particular, individuals’ socio-demographic variables and uses of different communication sources could be taken into consideration in quantitative investigation of climate change risk perceptions and behavioural responses.

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Appendix A

Participation consent form

(English translation)

Dear participant,

I am Shameem Mahmud, a PhD student at the Graduate School of Media and Communication, University of Hamburg, Germany. I am working on a research project about "Regional geo-hazards and adaptive hazard management" in the coastal regions of Bangladesh. Your opinions are very important for this research project.

Therefore, you are requested to participate in an interview with me. It may take around one hour and your interview will be recorded. Your identity will be fully confidential and information you would provide would be used for the research purposes only. If you have further questions about this research, please feel free to contact me at the address below.

Thank you very much for your consideration of this research project.

Regards,

Shameem Mahmud, M.A.
Institute of Journalism and Communication Studies/University of Hamburg
Grindelberg 5, 20144 Hamburg
Germany
E-mail: shameem.mahmud@uni-hamburg.de
Telephone: +49 (0) 40 42838 - 8730

Consent agreement:

I understand the nature and extent of my participation in this research as described above. I hereby agree to participate in this research.

Participant's Name:

Signature:

Date:

Appendix B

Interview guides

This appendix contains samples of questions used by the researcher to conduct interviews with study participants. This interview guide has been designed with some 'themes', which are based on a review of literature and research questions of the current study. However, the order of these themes was flexible throughout the process of conducting the interviews when emerging themes from initial interviews were included in subsequent interviews. The interview questions in the guide were organised in a way to gather range and variations of public perceptions and communication of climate change risks. Previous versions of this interview guide were discussed at the research colloquium of the Institute of Journalism and Communication Studies, University of Hamburg on 16 November 2011 and at the doctoral research colloquium at the Graduate School of Media and Communication, University of Hamburg on 29 November 2011. Comments and suggestions of other researchers were received at these colloquiums and incorporated in this version of the interview guide. The original interview guide was drafted in Bangla as the language of conducting the interviews. This is the English translated version of the interview guide. In approaching the potential respondents, the researcher explained the research purpose and confidentiality issues and asked them to sign a consent form (see Appendix A). As many interviewees were illiterate or with little education to read and understand the consent forms, the consent conditions were read our to them and their consents were recorded in a tape recorder. At the end of each interview

session, a demographic data questionnaire sheet (Appendix C) was used for collection of demographic information about the participants.

Guide for conducting in-depth interviews

1. Experience, memory and exposure to geo-hazards:

1.1 Tell me your experiences of cyclone Aila.

[Note: ask the respondent to narrate the event as detailed as possible.]

1.2 How would you describe causes of storms and storm surges in this region?

1.3 How would you describe most serious problems of this region right now?

[Note: Take a note whether the respondent refers to climate change in responding to these questions.]

2. Familiarity with climate change issues:

2.1 Have you heard about "climate change" or "global warming"? Tell me in detail what do you about them?

[Possible prompts: Can you tell me more about this? Can you explain how….?

[Note: Ask this question if the respondent does not refer to climate change or global warming in discussing questions of theme 1 (see above)]

2.2 What pictures come to you mind when you think about climate change? How would you define climate change and global warming?

[Note: Try to understand how respondents' descriptions are linked to general media coverage of climate change]

2.3 Tell me in detail how did you know about climate change issues?

3. Causes of climate change

3.1 How would you describe the factors, which are responsible for climate change problems?

[Possible prompts: why do you think so? Could you please explain?]

4. Impacts of climate change

4.1 How would you describe some possible impacts of climate change?

4.2 How would you describe local impacts of climate change? Do you think that climate change is a serious problem of this region? Why do you think this? Please explain.

[Possible prompt: Any other effect that come to your mind? Can you explain or give an example of climate change impacts?]

5. Solution to climate change

5.1 You described climate change as a problem. How can this problem be solved? What do you think?

[Possible prompt: Ask supplementary questions to know sources of respondents' knowledge.]

5.2 Have you heard about 'adaptation' to climate change? Tell me in details what do you know about climate change adaptation.

[Possible prompts: as supplementary questions about respondents' descriptions of adaptation techniques and sources of knowledge of these techniques.]

6. Media use and communication of climate change

6.1 How did you learn about climate change?

[Possible prompts: look for respondents' sources of knowledge and ask supplementary questions to understand more about these sources.]

6.2 Tell me about your media use habits? What media you use most, and why?

6.3 Have you learnt about climate change issues from newspaper, radio or television? Please describe how did you learn from media?

[Note: ask the respondents whether they learnt climate change issues from other media, for example, the Internet and mobile phones.]

6.4 Do you discuss climate change issues with others, for example, with your friends, neighbours or family members? Please tell me in detail.

6.5 How did you learn about climate change from NGOs? Please describe in detail.

7. Others

7.1 is there anything else that you thought of but didn't get chance to talk about?

Appendix C

Respondent's demographic information form

(to be filled in at the end of the interview)

Disclaimer: All information provided here are subject to use only in the research purposes. None of your information will be made public in any case.

Demographic information of the respondent

Name											
Age											
Gender	Male				Female						
Marital status	Single		Married		Divorced		Widowed				
Occupation											
Average income/yr											
Education											
Religion	Islam		Hindu		Buddhist		Christian		Other		
Address											
Contact											

To be filled in by the interviewer

Respondent's identity code	
Interviewer	
Date of interview	
Place of interview	
Time of interview	
Duration of interview (min)	
Audio file name	
Transcribed by	
Interview settings: write a short note about the settings while conducting the interview.	

Appendix D

Interview transcript and assigned initial codes

This appendix contains an example of coded transcript of the interviews conducted with study participants. The column to the right of the transcript lists the initial codes assigned to the text. This example is an English translation of the original transcript and coding conducted in Bangla. Please see the attached CD for other transcripts.

Text (Interviewee: BD13)	Initial codes
Interviewer: We were talking about hazards such as storms and tidal surges in the area. I will also discuss about this with you. First, tell me about your work?	
Respondent: I do many things. Most recently I did shrimp fry business that was to collect shrimp fries from the people and then selling them to the [shrimp] enclosures' owners. And, I also worked as a carpenter. Actually, carpentering was my main profession. But now I have little to do as a carpenter … who will make furniture now? At present, I do agriculture. I mean, rice cultivation.	DOING MULTIPLE JOBS; COLLECTING SHRIMP FRIES; WORKED AS A CARPENTER; WORKING AS A FARMER;
Interviewer: Well... [*Someone from behind was saying, "He is my mentor; I learnt carpenting from him"*]. Oh...I see, your mentor! Well, I had already talked to some people of this village and they told me that you have cultivated saline-tolerant rice. Right?	
Respondent: Yes. You can see them by yourself. Look, here they are [*showing the paddy field in front of the house*].	
Interviewer: How is it going on?	
Respondent: Yeah, not bad …its showing good sign. I am confident for a good harvest if everything goes well.	SALINE TOLERANT PADDY;
Interviewer: Is it the first time after cyclone Aila that you are cultivating rice?	
Respondent: Yes, first time after *Aila* [storm].	
Interviewer: What about before *Aila*? I mean, did you cultivate rice before Aila?	
Respondent: I actually did… in a small piece of land. But, it	RICE FIELDS DESTROYED IN

was not successful … my paddy field was destroyed in cyclone *Sidr*. That was in 2007. Then I didn't do it. Agriculture has now become a risky business, you know. It's always uncertain. The weather. You don't know what is waiting for you. That means, what nature is bringing for you? And, if there is a flood like Sidr or Aila, all is lost…. [Pause] Many people did agriculture in past, but now it's risky and it's also difficult to grow rice here.

STORM; DESCRIBING AGRICULTURE AS RISKY; UNCERTAIN WEATHER; REFERRING TO LOCAL STORMS; DIFFICULTY IN GROWING RICE;

Interviewer: But, you are doing this again?

Respondent: Yes, after five years.

Interviewer: Others told me that they don't grow rice because salinity of soil is too high. Could you please tell me why are you cultivating rice while others are reluctant? I mean what actually have motivated you?

Respondent: Yes, this is true… there is too much salt in the soil here in Gabura, especially after the cyclone [Aila]. And, we don't have fresh water to irrigate the rice fields. You know, we almost had passed three years since the flood [Aila] and most of us are still jobless. Here, we have very limited scope for livelihood. No job, no business, no income. There were some works of the organisations [NGOs] after the Aila, like relief works and mud works. But now only a few numbers of NGOs are working. So, this year during the monsoon I had planned for rice cultivation and dag a pond [*water reservoir tank*] to reserve some rainwater for irrigation in the fields. Here we don't have underground water. We can't irrigate the fields like other places.

PROBLEM OF SALINITY; CRISIS OF FRESH WATER; CRISIS OF WORK; LIMITED SCOPES OF LIVELIHOOD; NGOS' AID WORKS; PRESERVING RAINWATER; UNDERGROUND WATER CRISIS; IRRIGATION PROBLEM;

Interviewer: Underground water?

Respondent: Yeah.... we don't have underground water in our area... I mean, we can pump out underground water but they are very salty. Saline water. [Water is] too salty to do anything. So, I dag out a pond on another man's land to preserve some rainwater during the monsoon… I am landless. I don't have land of my own. I leased out another one's [land]. I actually cultivated rice in 2007 also, but it was flooded by saline water in [cyclone] Sidr. And, then came Aila in 2009. Again, our paddy fields were lost because of saline water intrusion [Pause]. This year there was a good monsoon and I thought much of the salinity of surface soil was washed away in rainwater. I mean salinity of soil is lesser than the years ago. Then, I got some saline-tolerant paddy seeds from an NGO, and the rest I bought from the market. That is it. Let's see how it ends! But, I am optimistic this time, although I know it's a risky endeavour to do agriculture. You know it always depends on your luck.

SALTY UNDERGROUND WATER; PRESERVING RAINWATER; LANDLESS; EVENTS OF STORMS; LOST CROPS IN SALINE WATER; RAINWATER CAN WASH AWAY SOIL SALINITY; NGOS GIVES SALINE TOLERANT SEEDS; AGRICULTURE IS RISKY;

Interviewer: *Where did* you get information about saline-tolerant paddy seeds?

Respondent: I got some information from a field worker of

NGO FIELD WORKER AS

an organisation [NGO] and cultivated them. I need to wait couple of months more to see their success.

SOURCE OF ADAPTATION KNOWLEDGE;

Interviewer: Can you tell me in details?

Respondent: This is called 47 [BIRRI rice 47]. They call it saline tolerant seeds. They told me some government research institute[28] has invented them. [I] Don't know which one or what is its name. The organization [NGO] people gave seeds to six or seven people in our union. But, none of them, except mine and another one in our village, could survive. Others lost their paddy fields.

SCIENTIFIC ORGANISATION INVENTS SALINE TOLERANT CROPS;

Interviewer: Do you have any idea why others' efforts to grow rice didn't succeed?

Respondent: I don't know exactly why others' paddy seeds did not survive. I guess they did not use fertilizer properly or they did not pay heed to the suggestions of the organization (NGO) people. Actually, they did not spend money. I had to spend a lot of money. I used different types of fertilizers, like gyp (gypsum) fertilizer, organic fertilizer and others. I grew the seeds as suggested by the organization's people. You know its not that easy to produce rice in this kind of soil which was submerged in salt water for long days … to be specific one and half year.

FERTILISER USE FOR SUCCESS OF CROPS; NGOS GIVE SUGGESTIONS ON ADAPTIVE AGRICULTURE;

FOLLOWED NGO SUGGESTIONS; DOING AGRICULTURE IS NOT EASY

Interviewer: Did you go to the NGO people for information about saline tolerant paddy seeds?

Respondent: They [NGOs] came here. I was preparing to cultivate rice and one day I found some people from the NGO who wanted to provide free paddy seeds to the farmers. Many of the NGO people are working here in Gabura on different projects. I knew one of the workers of an NGO and he offered me free paddy seeds for the field that I was preparing. The offer came when I was about to go to market to buy some seeds. He told me that I don't need to buy seeds, as they will provide them free. I thought it was a good opportunity to get some free seeds. Then, after 10 or 15 days they came here again and gave me seven kilogram of paddy seeds. Some others also got the seeds.

DESCRIBING NGOS AS SOURCES OF ADAPTIVE KNOWLEDGE;

NGO WORKERS ARE FAMILIAR TO THE VILLAGERS;

NGOS PROVIDE FREE SEEDS TO THE FARMERS;

Interviewer: That means you got seven kilogram of saline tolerant paddy seeds for free?

Respondent: Yes, only the seeds and yes, also advice on how to grow them. I actually needed a total of 22 kilograms of paddy seeds for the field. I bought the rest from the market.

NGOS GIVE ADVICES ON ADAPTIVE AGRICULTURE;

Interviewer: How much was the cost? Was it costlier than the normal paddy seeds?

Respondent: Yes, it is costlier than the normal one. The one that I bought from market was Taka 320 per kilogram. Normal paddy seed you can buy at Tk. 90 per kilo.

SALINE TOLERANT SEEDS ARE COSTLIER THAN NORMAL SEEDS;

Interviewer: What about the seeds that you bought from the open market? Are they also saline tolerant?

Respondent: When I was buying the seeds, the traders told me it is better than the 47 [the seeds provided by the NGO]. It is from India. They told me this. I found the Indian one is growing better than the one I got from the NGO.

Interviewer: How long will it take to harvest?

Respondent: I didn't do it before… I mean with this kind of paddy seeds. At first, NGO people told me it would take 90 days… three months. Two months have already been passed. Now they are saying four months for harvest. Let's see. But, I am sure I will get some production.

CULTIVATING SALINE TOLERANT CROPS FIRST TIME;

HOPEFUL ABOUT PRODUCTION;

Interviewer: Your paddy seems to be survived even in saline soil. But, others have failed so far to cultivate rice. Do others come to you to know the success story? I mean do other people want to know how did you grow paddy?

Respondent: Hmmm....Not regularly. But some people ask when we meet in the tea-stalls or in bazar or on the streets. It's not like that they visit my paddy field and want to know practically about it. It's just meeting on the way and talking about what I am doing now. That's it.

PEOPLE ASK ABOUT SALINE TOLERANT SEEDS AT LOCAL COMMUNITY PLACES;
INFORMAL TALKS IN PUBLIC PLACES;

Interviewer: What about your neighbours, those who have lands adjacent to your plot?

Respondent: No one in my neighbourhood actually had cultivated rice this season. Everyone was in dilemma as we had lost cultivation in last years. And, the main problem was water shortage. As I said….You can see water all around, but they all are saline water. And, how can you grow rice without water? Most of the people don't even have water for daily use. All are saline water after the Aila. Even the fresh water ponds are contaminated with saline water. Some people had cleaned the ponds and tried to preserve rainwater, but still too salty for any good. Let's say 7. You know what is 7. NGO people come here to measure water salinity ... they got 11, 12, 13 salt in the water. It's not that easy to grow rice. Chances are little that you will get back your investment. So people are reluctant.

PEOPLE ARE IN DILEMMA ABOUT AGRICULTURE;
WATER SHORTAGE;
SALINE WATER ALL AROUND;
CRISIS OF WATER FOR DAILY USE;
FRESH WATER SOURCES ARE CONTAMINATED;

NGOS MEASURE SALINITY;
GROWING RICE IS NOT EASY;
PEOPLE ARE RELUCTANT ABOUT AGRICULTURE;

Interviewer: You are irrigating with rainwater?

Respondent: Yes, rainwater.

RAINWATER FOR IRRIGATION;

Interviewer: Tell me more about preserving rainwater? I mean how do you do that?

Respondent: You see on these sites [showing the area]… you will see small ponds [water reservoir tanks] adjacent to almost all houses. We dig ponds to raise the base of the houses to keep them above the floods and also use the

RAISING HOUSE BASES TO PREVENT FROM FLOOD

ponds to preserve rainwaters during the monsoon. These are the sources of our fresh water. For everything - drinking, household uses and also for irrigation in rice fields. So, we get them in monsoon and use them in rest of the year – during the dry season. But, what happened in Aila was that embankments of the ponds [*that separate the ponds from the rest*] were destroyed and saline water intruded in the ponds during the surges. The pond water became polluted. And, we could not excavate the salty surface soil of pond beds. We could not raise the pond embankments again to preserve rainwaters or to prevent saline waters from rivers during the high tides. How could we do that? It needed money. You need to rebuild the embankments and excavate saline beds of the pond and that requires money. Some people did so with the help of organizations, but very few. I got some help in cleaning the pond. Others were not as lucky.

WATER; PONDS TO PRESERVE RAINWATER; DESCRIBING IMPORTANCE OF MONSOON; CYCLONE AILA BRINGS SALINE WATER;

LACK OF FINANCIAL CAPACITY TO PURIFY POND WATER; NGOS HELPED TO PURIFY POND WATER;

Interviewer: That means rainwater is the only solution for agriculture – especially for cultivating paddy?

Respondent: Rainwater is everything for us. As I said, its all around saline water, even the underground water is saline. So, you can only get fresh water from rains and need to preserve them somewhere to use all over the year.

DESCRIBING IMPORTANCE OF RAINWATER;

Interviewer: Do you mean that if there were supply of fresh water people of this area will cultivate rice?

Respondent: Not really. I don't think so. You know most of the people in our area now have very little interest in cultivating rice. They don't give importance on growing rice. And, the other thing is that it is too costly to grow rice. I mean you have to spend a lot of money with a lot of risks that it could be lost. People don't give importance. It's not possible to survive only depending on agriculture.

LACK OF INTEREST IN CULTIVATING RICE; GROWING RICE IS COSTLY;

SURVIVAL IS DIFFICULT DEPENDING ONLY ON AGRICULTURE;

Interviewer: Why? Can you please explain a bit more?

Respondent: The main problem is that we have saline water all around. Right? We have a little bit of fresh water in another corner of our locality. So, people think paddy will not survive in this saline water saturated area. Why should we take the risk? It's only waste of money. You may ask why am I taking this risk? Yes, I am taking this risk because I have no other business to do and because I had preserved some fresh water. You may have heard that after Aila it's not permitted now to catch shrimp fry from rivers. That was my business. And, there is no way to do shrimp farming creating enclosures as authorities prohibited pumping in saline water [after the Aila]. So, we have nothing to do. What else can I do? I could go to the forest. That is also risky. That's why I am trying to produce rice. It's better than sitting idle.

SALINE WATER ALL AROUND;

SALINITY IS THE MAIN CHALLENGE FOR AGRICULTURE;

BAN ON CATCHING SHRIMP FRY AFTER THE STORM AILA;

PUMPING IN SALINE WATER IS PROHIBITED;

Interviewer: May be others will be encouraged when you harvest the rice.

Respondent: Yes, might be. But, who will do that? Most landowners in our area are shrimp farmers. Only those, the landless, like me wish to cultivate rice. For example, I don't have a single Katha of land. My father had the same. I am cultivating paddy leasing out other's land. I know farming shrimp is much more profitable than cultivating rice. But, I don't have the capacity to do that.

MOST PEOPLE ARE SHRIMP FARMERS;

LANDLESS;
LEASING OTHER'S LANDS FOR AGRICULTURE;
DESCRIBING LACK OF CAPACITY;

Interviewer: Why did people move to farm shrimp instead of rice cultivation?

Respondent: It's simple. Shrimp is more profitable. We have only one crop per year. This is a one-crop land. That means, you can grow rice only one season in a year. There is nothing in rest of the year. And…. we are frequently attacked by natural hazards. We loss crops frequently either in drought, floods or in saline water intrusion because of storm surges. That's why most people now have shifted to shrimp cultivation turning once paddy fields into shrimp enclosures. Small farmers leased out their lands to big shrimp enclosure owners. Now, in most places you can't grow rice even if you want… I mean, it's not possible to grow rice in a land, which is surrounded by shrimp enclosures. So, in another way many people were forced to lease their lands to shrimp farmers. Saline water of shrimp enclosures was dripped through the enclosures and passed to nearby lands. And, secondly, there is another problem … for example, some people tried last year to produce rice. At first it was the problem of irrigation, as we didn't have fresh water. Then, the monsoon came and heavy rainfall flooded all the crops. We did not have the system to drain out access water from the lands. You can see most of the lands are enclosed with internal embankments. And, after the Aila most of the sluice gates, which are used to control water level, are now closed. [Pause] On the other hand, farming shrimp is more reliable. It's less risky. One can produce fishes at least 2/3 times a year. On the other hand, if rice cultivation fails and in most cases we actually cannot make it productively.

SHRIMP FARMING PROFITABLE;
ONE CROP AREA;
NATURAL HAZARDS ARE FREQUENT; LOSS OF CROPS IN NATURAL HAZARDS;

PADDY FIELDS ARE TURNED INTO SHRIMP ENCLOSURES;
SHRIMP FARMING AFFECTS AGRICULTURE;

SHRIMP FARMS ESCALATING SALINITY PROBLEMS;

PROBLEM OF IRRIGATION;
CROPS ARE FLOODED IN RAINWATER;
PROBLEMS IN DRAINING OUT FLOOD WATER;
LIVING INSIDE THE EMBANKMENTS; SHRIMP FARMING IS RELIABLE AGRICULTURE IS UNCERTAIN;

Interviewer: Is it possible to cultivate shrimp here in your area?

Respondent: Yes… its possible.

FARMING SHRIMP IS POSSIBLE;

Interviewer: Then, why didn't you cultivate shrimp?

Respondent: We do, I mean we used to cultivate shrimp here.

Interviewer: In the same land that you have rice now?

Respondent: Yes, in the same land. We had shrimp cultivation in these lands last years in full swing. This year we got some sweat [fresh] water in ponds, and for the sake of these ponds people did not pump in saline water from outside the dam. I mean it was not permitted. And, this year it rained

heavily during the monsoon. So, many people have started to think about producing rice again. Actually, they don't have any option because for cultivating shrimp you need saline water. And, this is not permitted to pump in saline water from outside [rivers] after Aila.

PEOPLE RETHINKING ABOUT AGRICULTURE

BAN IN DRAINING IN SALINE WATER AFTER THE STORM;

Interviewer: Can you please explain?

Respondent: We have got some guarantees that government will not permit pumping in of saline water in this area anymore. Government wants people should grow rice here because lands are loosing productivity for shrimp farming. And, illegal pumping in of saline water from rivers installing pipes in the embankments make the embankments vulnerable. That's why government banned it.

GOVERNMENT BANS PUMPING IN SALINE WATER;
LANDS LOOSING FERTILITY BECAUSE OF SHRIMP FARMING;
PUMPING IN SALINE WATER MAKES THE DIKES VULNERABLE;

Interviewer: Which one do you think is good for this area – shrimp farming in the enclosures or rice cultivation? Tell me what do you think?

Respondent: I am for shrimp framing in enclosures. It's more profitable than rice. But, it has a negative side as well. I mean the profit is only for the owner of the enclosures. Others hardly receive monetary benefits. Furthermore, there are also risks of losses in shrimp farming. Suppose, five out of ten enclosures in an area could be affected by viruses. Then, five enclosures make profits and the rests are in great loss. However, there are also signs of hope in next cycle of shrimp farming …just only after few months. While in case of rice production if it is damaged we have to wait for the full season… I mean for one year for next cultivation time. That's why I think shrimp cultivation is profitable than rice production, especially for this area. Actually, people could not survive if they were not moved to shrimp farming. It's not possible to sustain livelihood depending only on rice production when its productivity is reducing every year and when natural hazards are frequent. But again, I am not fully for shrimp farming. As I said, it's benefiting only for a handful number of people for the sake of huge agricultural land. In past, we were farmers, but after the shrimp enclosures most people become labourers in those enclosures. Influential people have leased out most of the lands for shrimp enclosures.

SHRIMP FARMING IS PROFITABLE THAN AGRICULTURE;
FARM OWNERS MAKE THE PROFITS;

SHRIMP FARMING IS LESS RISKY;

SHRIMP FARMING BRINGS ECONOMIC DEVELOPMENT;

SHRIMP FARMING DAMAGES AGRICULTURAL LANDS;

Interviewer: Why do you think so?

Respondent: Well, we used to work in the paddy fields. There were various types of works there. Many people didn't have their own lands, but they could survive working in others' lands to cultivate paddy or leased them on the basis of crop sharing. But, most of us lost these jobs once land owners transformed the lands into shrimp enclosures which do not require many labourers.

AGRICULTURE CREATES MORE JOBS

SHRIMP FARMING REQUIRES LESS LABOURERS THAN AGRICULTURE;

Interviewer: Why are you telling that? Could you please explain a bit?

Respondent: Benefits of shrimp farming is more for a limited time, but the losses it has … I mean when you produce shrimp that means you have to drain in saline water and with the process we are bringing saline water from the rivers. And when we want, we can't produce rice because of salinity of soil. And, these enclosures are also polluting the ponds of fresh water, our sources of drinking water. So, what is the benefit of firming shrimps? Level of salinity in the lands is very high because of years of shrimp cultivation. Now, it's no longer possible to cultivate rice in these fields. I got information about saline tolerant paddy seeds from an organisation. I'm still waiting to see its production.

OWNERS ENJOY MOST OF THE PROFITS;
DRAINING IN SALINE WATER FOR SHRIMP ENCLOSURES;
SHRIMP FARMING ESCALATING SALINITY HAZARDS;
QUESTIONING ABOUT ECONOMIC BENEFITS OF FARMING SHRIMPS;
NGOS PROVIDE INFORMATION ABOUT ADAPTIVE AGRICULTURE;

Interviewer: What could be done to improve the situation of providing safe drinking water?

Respondent: There is fresh water and it's not too far from here. It's only few kilometres away and you will get fresh water there through tube wells. I heard that some organizations [NGOs] are supplying fresh water through pipelines in a village. [I] don't know exactly which one, but they are supplying water. So, I think it's possible to supply that fresh water to our area as well through pipelines. Its not too far... only 6 – 7 kilometres. This is the main problem right now for us. I mean scarcity of fresh water. If we can do it, I think the problems will be resolved soon. We need external help for that. It's not possible by us.

NGOS ARE SUPPLYING FRESH WATER;

CRISIS OF FRESH WATER IS THE MAJOR PROBLEM;
SEEKING EXTERNAL HELP;

Interviewer: Well, you have also mentioned something like risks of natural hazards here in Gabura. For example, you said it's very risky to do agriculture because of floods and cyclones. Could you please tell me more about these issues?

Respondent: Yes, it's always uncertain to grow rice or to do some kind of agricultural production. I mean shrimp farming is also risky as it could also be washed away by storm surges. As we are living close to rivers natural disaster can happen anytime. It's occurring every year – either flood or storms. It was also in the past, but now the trends are increasing. Risks of natural hazards are increasing because of climate change. We don't know what will come after Sidr and Aila. Three years have passed since the last one and I guess next one is not too far.

DESCRIBING UNCERTAINTY OF AGRICULTURE;

AWARENESS OF LIVING IN HAZARD PRONE AREA;
CLIMATE CHANGE INCREASES RISK OF NATURAL HAZARDS;
STORMS ARE LINKED TO CLIMATE CHANGE;

Interviewer: You were referring to climate change. I assume you heard about this. Could you please tell me what do you know about climate change?

Respondent: Hmmm… Yes, we heard a lot. [We are] hearing that climate is changing. We are not responsible for it, but the foreigners. It's their (foreigners) responsibility… [We are] hearing this. Climate change is happening. We are witnessing weather variances. For example, lack of rain during the monsoon and heavy rainfall in dry season. These are because of climate change. We are hearing these things.

HEARD A LOT ABOUT CLIMATE CHANGE;
FOREIGNERS ARE RESPONSIBLE; CLIMATE CHANGE IS HAPPENING;
WEATHER VARIANCES AS EVIDENCES OF CLIMATE

Interviewer: When did you first hear about this?	CHANGE;
Respondent: It's a long time that we are hearing about climate change. At least 10 years or so… climate change and season change. That is, season is changing because of climate change.	HEARING ABOUT CC FOR A LONG TIME; SEASONAL VARIANCES ARE LINKED TO CLIMATE CHANGE;
Interviewer: Anything else that you know about climate change?	
Respondent: It's difficult to explain, but as I said we do hear a lot about climate change nowadays, specially after Aila and Sidr. I mean I have been hearing about climate change for a long time, but we now are hearing the word more frequently. We didn't experience storms so frequently in the past. It's happening now what we heard about impacts of climate change. Climate change is bringing more storms and disasters in Bangladesh. You see, we had Sidr, and then came Aila.	DIFFICULTY IN EXPLAINING; HEARING MORE ABOUT CC AFTER THE STORMS; STORMS WERE NOT SO FREQUENT IN THE PAST; CLIMATE CHANGE IS BRINING STORMS AND DISASTERS; LOCALISING IMPACTS OF CLIMATE CHANGE;
Interviewer: From where did you hear about climate change?	
Respondent: Well, It's mainly from radio. I listened to radio almost daily. Organisation people also tell about climate change.	RADIO AS SOURCE OF CC KNOWLEDGE; NGO AS SOURCES OF CC
Interviewer: What do they say?	
Respondent: I can't remember all, but it's mainly about what will happen in Bangladesh. I heard something like that coastal area of Bangladesh including ours will be submerged in seawater.	LOCALISING CLIMATE CHANGE IMPACTS; COASTAL AREAS WOULD DROWN IN THE SEA;
Interviewer: I see. What do you think?	
Respondent: Well, my own understanding about climate change is… I mean what I got from radio, TV and others is that climate change is not a thing of our country. Our country is responsible for very small amount of air pollution. It's the foreign countries whose mills and factories are emitting poisonous smokes in the air. How can we do it? We don't have many mills and factories. But, I don't have clear idea how the factories in foreign countries are polluting the air.	RADIO AND TV AS SOURCES OF CC KNOWLEDGE; AIR POLLUTION AS REASON OF CC; INDUSTRIAL EMISSIONS OF POISONOUS SMOKES; FOREIGN COUNTRIES; EXPRESSING LIMITED KNOWLEDGE;
Interviewer: What do you mean by foreign countries? I mean which are these countries that you identified as responsible for either climate change or air pollution or both?	
Respondent: The developed countries, for example. . I don't know… I mean there are some six or seven developed countries [might be referred to G7] in the world. Different atomic plants, bombs and different types of projects, mills and factories are responsible for this. They are launching different kinds of …., you know that … they have more cars. We even don't have enough cars on the streets. What else? Well… I just heard it… not very clear idea. But, I think people	DEVELOPED COUNTRIES RESPONSIBILITY; ATOMIC PLANTS AND BOMBS AS CAUSES OF CC; EXPRESSING LIMITED

who have tools and techniques and who are involved in this kind of research they can give more detail idea of this subject.	KNOWLEDGE; A MATTER OF MORE EDUCATED PEOPLE;
Interviewer: Well, just think… if I ask you to define climate change what will you say?	
Respondent: To me climate change means season change. Something that is not normal. It says change and change of something, right? That means, something that is not like before.	CLIMATE CHANGE MEANS SEASON CHANGE;
Interviewer: Well, that's good. Could you please tell me how did you learn or from where did you get this information that you just explained to me?	
Respondent: Mainly from radio. As I told you before I listen to radio news bulletins regularly, everyday. They often have different kinds of programmes on climate change, like why it's it happening, how its happening...and many others. But, to be honest we don't understand everything … I am illiterate. I studied only till grade three.	RADIO AS SOURCE OF CC; REGULAR RADIO LISTENER; EXPRESSING LIMITED UNDERSTANDING OF CC; LIMITED EDUCATION AS BARRIER TO UNDERSTAND;
Interviewer: Well, let's talk about your own experience with the climate that you are living. Do you think that the climate that you are known to is being changed?	
Respondent: Yes, it's changing.	BELIEFS IN CLIMATE CHANGE;
Interviewer: What kinds of changes have you witnessed? Can you please explain with some examples?	
Respondent: Let's say, particularly I can say about monsoon rains. They are not timely. It's not raining when we need them, but it's raining a lot when we don't want. We have experiencing both heavy rains and dry spells. Shortage of rain. It creates flood when it rains, and when it's not raining, it's all around droughts. It was not like this before.	UNUSUAL MONSOON; DROUGHT;
Interviewer: Do you think that these weather patterns were normal in past? Like say for example 20 or 30 years ago?	
Respondent: When I was young rain used to start in the month of Ashar. Now rain does not come until Bhadro; and we need to wait for rains to prepare our lands. Now, people are talking about climate change. If it [climate change] means change then the most visible change is in the rainfall pattern.	GIVING EXAMPLES FROM CHILDHOOD; ATTRIBUTING RAINFALL CHANGES ASEVIDENCES OF CLIMATE CHANGE;
Interviewer: Do you normally think about climate change and related issues?	
Respondent: To be honest, not regularly only when there is a cyclone, like after the Aila we talked a lot of it. And often when we listen to radio, I mean when there is something in radio about climate change and if it refers to our problem. Then, we think. But, you know we don't find any solution.	CLIMATE CHANGE IS NOT A REGULAR TOPIC TO THINK ABOUT; HAZARD AND MEDIA INSTIGATE CC DEBATE;

And, what to think about? You need money to think about this kind of problems. People who can affords are migrating to high lands in Jessore, Khulna and other places ...they are leaving, [they are] building houses in more safer places. We don't have any way to leave.	LOCALISING EFFECTS; EXPRESSING INCAPABILITY OF SOLUTIONS; MIGRATION AS SOLUTION;
Interviewer: This might be a repetition, but tell me what comes to your mind when you hear the words climate change?	
Respondent: Actually we didn't pay attention on it. We didn't care. We only got interested about the topic after the Aila hit us devastate in 2009. Before that nobody cares about warning signal ...whatever it is no 7, 8 or 9. Our mentality was that .. okay lets see what happens. Wait until it hits us.	PAID LITTLE INTEREST ABOUT CLIMATE CHANGE; STORM FORCES PEOPLE TO THINK ABOUT CLIMATE CHANGE;
Interviewer: Don't people take shelter at the cyclone shelters?	
Respondent: How will we go there? Its too far … at least 3 to 4 kilometres from here. People from this area hardly go there. They observe the situation and if it gets deteriorated then people rush to the embankment or on the road. No one goes to cyclone shelter. And, how many people can it accommodate? Suppose 5,000 in total! We are around 40,000 people are living here. And, if someone goes there he or she must come back with some kind of diseases. The atmosphere is not healthy. Can you imagine 5,000 people are packed in a place, which can hardly accommodate 500? People fall sick after getting there. You have to stand still for hours. Not a single inch even to move your body. How long can a man stand? It's all crowded and especially problematic for women and children. You have almost no place for …it might be ridiculous, but I don't feel any necessity of building a new cyclone shelter. But, we need to build the embankment first. Raise the embankment, build it strongly. That is the main thing we need now to thwart intrusion of saline water. And, another important thing as you asked me why people don't go to cyclone shelter? Well, if you decide to go there you have to leave behind all your valuables – most importantly cattle. Is it possible to leave behind all these things. So, we think its better to stay at home and try to save the things. I don't understand who take such planning. We need embankment first, not the cyclone shelter. Embankment can save all the people. Cyclone shelter can only save handful number of people. And, if we can prevent intrusion of storm surges with strong embankment we can save our valuables also. There is no alternative to live here, but embankment. Lets forget about storm surges. We are flooded daily naturally twice a day by high tides. If we have strong and higher embankment, I think we can survive both against saline and sweat water. Not only in our area. All areas in Bangladesh which are on the banks of the rivers need embankments. So, I think we will survive if the embankment remains. Our life, our livelihood everything depend on the embankment. We have only this weapon against the whims	CYCLONE CENTRE IS TOO FAR; PEOPLE TAKE SHELTER ON EMBANKMENT DURING THE STORM; LIMITED CAPACITY OF CYCLONE CENTRE; ATMOSPHERE AT CYCLONE CENTRE IS NOT HEALTHY; CYCLONE CENTRE IS CROWDED; PROBLEMATIC FOR WOMEN AND CHILDREN; STRONG DIKES TO INTRUDE STORM SURGES; DESCRIBING REASONS FOR PUBLIC RELUCTANCE TO GO TO CYCLONE CENTRES; EMPHASISING ON DIKE TO PROTECT FROM NATURAL HAZARDS; TIDAL SURGES ARE COMMON HAZARDS; SURVIVAL DEPENDS ON DIKES; DESCRIBING DIKES AS

of nature.	WEAPON AGAINST THE WHIMS OF NATURE;
Interviewer: You told me that you were involved in shrimp fry business. What do you think about any relations between your work and climate change? Is there any link?	
Respondent: Shrimp fry and climate change. I heard that species of fishes in the rivers are declining because of environmental pollution. I don't know really whether it has any relation with climate change. I can't grasp the things properly. There might be. I don't know. It seems to me that things are not the same as it was in the past. People are polluting the environment. You see there is *zinc* in the air and many more other poisonous elements. I even don't know their names. The air has become poisonous. It was in the TV news …Dhaka is the most polluted city in the world.	DESCRIBING CLIMATE CHANGE AS ENVIRONMENTAL POLLUTION; EXPRESSING DOUBT ABOUT PERCEIVED KNOWLEDGE; ENVIRONMENTAL POLLUTION; DHAKA IS MOST POLLUTED;
Interviewer: You told me that climate is changing and it has some impacts in your locality also. Now, what should you do to adjust with the changing situation?	
Respondent: It might be better if we can plant some trees.	PLANTING TREES AS SOLUTION;
Interviewer: Any other suggestion? Could you please explain a bit further?	
Respondent: Tree plantation is the main… and others… like if it is possible to stop emissions of smokes from factories then the environment will be better. [pause].… What to say! We are illiterate people. We don't understand too much about environment. However, what I understand is that more trees are good for environment. It's true that saline water is destroying trees. But, you know it has also good side.	STOPPING FACTORY EMISSIONS; LIMITED EDUCATION AS BARRIER TO UNDERSTAND CLIMATE CHANGE; TREES ARE GOOD FOR ENVIRONMENT;
Interviewer: That means you can see both positive and negative aspects of saline water?	
Respondent: It would had been better if there were no saline water and if we had more trees. But, what we have now is only saline water. You will see saline water all around. Yes, it's a threat to us. But at the same time we can't survive without saline water economically. This is the source of our income. Our livelihood has become so much dependent on saline water. This means saline water has both positive and negative effects. Positive in the sense that we are now totally dependent on shrimp production and for shrimp enclosures we need saline water.	REFERRING TO SALINITY HAZARD; DESCRIBING POSITIVE AND NEGATIVE EFFECTS OF SALINE WATER; SALINE WATER IS PART OF LIVELIHOOD;
Interviewer: Well, let's talk about media. You said you listen to radio. Tell me more about your radio listening habit. For example, what do you listen to radio, like which programmes?	
Respondent: Yes… I mainly listen to news bulletins. This is a must. Dinner might be missed, but not the evening news bulletin [with laughter].	LISTENS TO RADIO NEWS BULLETINS;

Interviewer: Which stations you mainly listen?

Respondent: Well, foreign stations that produce Bengali news bulletins like BBC, Radio Tehran, German (DW), America (VOA)… and also Bangladeshi ones. But, you know [with laughter] Bangladeshi radios [stations] hardly produce true news… all are lies!

LISTENS TO FOREIGN RADIOS' BENGALI BULLETINS;
DOUBT ABOUT CREDIBILITY OF LOCAL RADIO NEWS;

Interviewer: That means, Bangladeshi radio news bulletins are not very credible to you?

Respondent: How can we believe them? All are lies! It says what the government wants. Our chairman told us …no problem in repairing the dams, but keep it in mind that it should pass the water. They are creating leaks in the embankments in broad day, openly. No one dares to prevent them. And, what should we protest? We are happy to get money for works. Now dams have leaks again and it would be washed away if there is another cyclone like Aila.

QUESTIONING TRUSTWORTHINESS OF LOCAL RADIO NEWS;

DESCRIBING CORRUPT PRACTICES IN DEVELOPMENT WORKS;

Interviewer: Could you please explain what do you mean by creating leaks in the embankments?

Respondent: That is, we will build the dike but keep some leaks so that saline water can intrude.

CORRUPTION IN BUILDING DIKES;

Interviewer: Is it for the shrimp enclosures?

Respondent: No, not really. It's for relief materials. If there is no water, if the people don't suffer in saline water then there will be no relief aid from the foreigners. These people don't want to end the plights of people, they do make money out of it. That's why when we were trying to fix the leaks in the dam, the goons of the chairman asked us not to make it perfectly.

SOME ARE MAKING MONEY OUT OF PEOPLE'S PLIGHTS;

DESCRIBING CORRUPT PRACTICES;

Interviewer: Can you please tell me a bit more about it? I didn't get it.

Respondent: Well, if there is water there will be aid. This is our country. This is cyclone politics. We are the victims of cyclones, but these people made millions of taka out of Aila. Yes, its plight for many, but blessings for few. Even the NGOs also made money. It's like a business. If the problem is over or solved the business is also ended. If you want to work in the food for work or any other programme you need to give bribes to union members and also the people in the NGOs to make sure your name is in their list.

"CYCLONE POLITICS";
DESCRIBING CORRUPTION IN RELIEF MANAGEMENT;

MANAGING HAZARDS IS A BUSINESS FOR MANY NGOS;
BRIBERY IS REQUIRED TO GET AID FROM NGOS;

Interviewer: Hmmm…

Respondent: So, many people take this as an opportunity.

Interviewer: What about local people? Do they protest about this kind of wrongdoings?

Respondent: Who will do that? Who dares to do that? Who have rice [money] at home? These are the poor people who are being mistreated and they don't have any courage to fight against the strong hands.

POOR PEOPLE DON'T RAISE VOICE AGAINST INFLUENTIALS;

Interviewer: I see…Union *Parishad* people are highly influential?

Respondent: Yes, they are highly influential in terms of both money and muscle. Their hands are too long. Please don't quote my name or tell anybody that I have told you all these stuffs. Then, I will be in trouble.

Interviewer: No, no, don't worry your identity is absolutely confidential. Please feel free to talk. Well, we were talking about radio listening. Tell me more about this. I mean about your radio listening habit. What time?

Respondent: Well, normally daily, from evening to… let's say around 10 or 11 at night. I mean I start listening radio daily from 7.30 in the evening.. [I] Listen to BBC with my neighbour.

LISTENS TO RADIO IN THE EVENING;

Interviewer: At your neighbour's place?

LISTENS TO RADIO AT NEIGHBOUR'S PLACE;

Respondent: I normally go to my neighbour's home to listen to radio in the evening.

Interviewer: Don't you have your own radio? I mean at your home?

Respondent: I have one. Both of us actually have radios. But, you know it's enthralling to listen together. We do have chat together when we listen to radio programmes and also after that. I like to listen political news a lot.

OWNS A RADIO;
LISTENS IN GROUP;
DISCUSSES ISSUES AFTER LISTENING TO NEWS;
POLITICAL NEWS IS INTERESTING;

Interviewer: That means, you discuss the issues after listening to the radio programmes?

Respondent: Yes, you can say that. That is normal. If you listen something then you normally discuss them. We do that. What else can we do in the evening? It's the free time for us.

DISCUSSING ISSUES AFTER LISTENING TO RADIO;
RADIO LISTENING IS A LEISURELY ACTIVITY;

Interviewer: Is there anyone else who comes to listen with you apart from your neighbour?

Respondent: Not many people at our place. People usually go to bazar in the evening. They watch TV. But, not at our place.

PEOPLE GATHER AT BAZAR TO WATCH TV;

Interviewer: What types of radio programme do you normally listen?

Respondent: Well, we start with BBC news … 7:30 evening bulletin and then German radio…and others …some are on music … but mainly listen to news bulletins. We also listen to local [Bangladeshi] news bulletins… but you know

MAINLY LISTENS TO NEWS BULLETINS;

QUESTIONING ABOUT

they are not credible… they only talk what the government people say.	CREDIBILITY OF LOCAL RADIO NEWS;
Interviewer: Do you watch television?	
Respondent: Yes, sometimes.	
Interviewer: Where do you watch?	
Respondent: At the same place, my neighbour's house.	WATCHES TV AT NEIGHBOUR'S PLACE;
Interviewer: Do you have TV at home?	
Respondent: Yes, I have. But, I don't watch it at home. I usually go to my neighbour's home. You know women mainly watch soap operas and entertaining programmes at my home TV.	DON'T WATCH TV AT HOME; WOMEN WATCH ENTERTAINMENT PROGRAMMES ON TV;
Interviewer: What is your opinion about the programmes in radio and TV that are on climate change issues?	
Respondent: It's not that I am very much interested about climate change and seek out there [in TV or radio]. I mainly listen to news, whatever it is, and find it [climate change] there. And, as for programmes, some are problematic to understand, but we do understand that something is happening in the world. We do understand, but don't know what should we do. May be we can plant more trees. What else to stop it? Planting trees. Again, for planting trees we should set our priority – food for survival or planting trees to save the environment? [pause] …as I said, we hear a lot , specially nowadays. But, to be honest we have little idea about it. We are illiterate people. What I understand is that it's the matter of people like you to think about. We are busy with our daily issues.	LACK OF INTEREST ABOUT CLIMATE CHANGE PROGRAMMES IN MEDIA; DON'T SEEK OUT CLIMATE CHANGE INFORMATION; PROBLEMATIC TO UNDERSTAND; LACK OF KNOWLEDGE IN FINDING SOLUTION; SETTING PRIORITIES; CC IS A RECENT ISSUE; LIMITED EDUCATION AS BARRIER TO UNDERSTAND;
Interviewer: Well, that's good. Some of the people that I talked in this village told me that they had training on disaster management where they also learnt about climate change. Did you have any such training from any organization?	
Respondent: Organization…. I just finished a training organized by Karitas. I actually came from there right now.	PARTICIPATED IN DISASTER MANAGEMENT TRAINING BY AN NGO;
Interviewer: Oh, I see. Then tell me about your experience in the training. What happened there?	
Respondent: Hmm… [We learnt] how to tackle the risks of climate change? How to minimize damages of cyclones? But, you know these all are mere talks, nothing is really happening here. We only talk, but not interested in implementing them in real life.	LEARNT ABOUT RISKS OF CLIMATE CHANGE IN DISASTER MANAGEMENT TRAINING; GAP BETWEEN LEARNING AND PRACTICES;
Interviewer: Could you please tell me a bit more about the training? I mean what they talked about and how should you prepare and face the cyclones?	

Respondent: I mean … yeah … How to make the houses stronger so that it can face the strong winds of cyclones? How to protect the flood dams? How to stop intrusion of saline water? How to reach to the cyclone shelters in times of crisis? These are the things. They gave trainings for 3 days. And, then you will be listed for their programmes. Once they start development work all the listed people will be asked to join. Normally, we get Tk. 150 per day for working for the NGOs.

LEARNT ABOUT TECHNIQUES TO MINIMISE RISKS IN NATURAL DISASTERS;

GETTING AID WORKS IS A PREREQUISITE TO TAKE PART IN DISASTER MANAGEMENT TRAINING;

Interviewer: How did they teach you? I mean, is it through discussion, speech or any other method?

Respondent: Organization (NGO) people gave some lectures and asked us what are the main problems now. Then, they showed us some pictures and maps. That is, pictures of people on what to do before cyclones and so on. There were some posters also. But, our main concern was who would be listed for work. We don't have any work except the organisation's aid works.

DESCRIBING METHOD AND TOOLS OF NGO TRAINING ON DISASTER MANAGEMENT;

Interviewer: I see. How will you evaluate NGOs work on climate change or natural disaster issues in your area?

Respondent: Some organizations came here to tell us about climate change and natural disasters. But it's not that frequent after the cyclone. Now three years have passed and very few organizations are working here. You know about polio immunization? Why do we need that? Because we can prevent the disease and that's why we need to take the injection. It's the same with climate change. Now, we have this disease and constructing the embankment is the only immunization against this disease. It does not matter to us why this disease has been created. Its now reality. I mean the disease is here. Now, we need medicine against it. This is the main thing. And, as I said, I am sure other people of this village feel the same that we need the embankment first, a strong embankment to prevent water. But, the problem is that we don't have honest people who are involved in constructing the embankment. There are corruptions. You will find the real height and width of the embankment only in the plan, but in reality it's always lower and thin than the one in the original plan. All are corrupts – the local representatives, contractors and the government authorities. All the money is in their pockets. Yes, we are in living in the risks of storm surges, but we need the embankment first to save us. What will happen with training if all is washed away by water? We don't need any external help only if we have the embankment. People of our area can do hard work. We are living here fighting against tigers and salt water. So, we are not afraid of cyclones if we have the embankment. But, if water intrudes where will do they work? We can't fight against the intrusion of water. This is our main fear. At the same time, I think people have little to do to prevent such things like storms and floods. We can make embankments,

NGOS AS SOURCES OF CLIMATE CHANGE KNOWLEDGE;

EMPHASISING ON DIKE TO PREVENT FROM CLIMATE CHANGE IMPACTS;
DESCRIBING CLIMATE CHANGE AS A REALITY;

DESCRIBING IMPORTANCE OF STRONG DIKE TO PREVENT TIDAL SURGES;

CORRUPTION IN REBUILDING THE EMBANKMENTS;

AWARENESS OF LIVING IN HAZARD-PRONE AREAS;

DESCRIBING LOCAL PEOPLE'S CAPACITY IN DEALING WITH HAZARDS;
PEOPLE ARE FAMILIAR TO STORMS;
PEOPLE CAN'T PREVENT NATURAL HAZARDS;

but it can prevent water, not the storms.

Interviewer: Well, were you here during the cyclone Aila? I mean what were you doing when it hit this area?

Respondent: Yes.

Interviewer: Can you remember what had happened on that day? I mean your experiences?

Respondent: Aila? In the morning… it was cloudy and the wind was a bit stronger. I was talking to some other people after selling the shrimp fry. I saw water level in the river is increasing. Then, it was started to rain… not too much…it was drizzling. Then, all of a sudden the water came heavily. It did not take more than 15 minutes to flood the whole area when the embankments in several places were collapsed.

OBSERVING WATER LEVEL DURING THE STORM;
STORM SURGES ATTACKED SUDDENLY DURING THE STORM AILA;

Interviewer: What did you do next?

Respondent: Me? I came my house. It had not been flooded till then. There was water around the house, but my house was a bit higher. Then, I tried to pack some important things and essentials and put them on a small boat. I had asked my wife and children to take shelter in a makeshift platform inside the house that we constructed by this time with bamboo and woods.

USED BOAT DURING THE TIME OF STORM AND SURGES;
MANAGING THINGS AT HOME;
ASKED WIFE AND CHILDREN TO TAKE SHELTER IN MAKESHIFT RAFT;

Interviewer: Didn't you take refuge in the flood protection dam?

Respondent: I didn't go on that day. We were in our house, but later when it was impossible to stay at home then we were forced to leave as the water was all around. We were in the road for seven to eight days. We had created a makeshift platform with wood and bamboo and stayed there for a week.

FORCED TO TAKE SHELTER ON EMBANKMENT;

Interviewer: Well, didn't you get news about Aila before? I mean you told that you listen to radio every day and there were radio bulletins on Aila.

Respondent: Yes, we started to get news bulletins in radio might be one or two days ahead of the cyclone. But, as I said before, nobody paid any importance on them. We don't care about signal 5 or 6, and for Aila it was only signal number 4. Have you got what I said? Well, I am still confident no one will pay importance even now if the signal is only up to the level of 5, 6 or 7. No one will leave his or her houses. People don't care until it happens and washes away everything.

GOT EARLY WARNINGS OF STORM THROUGH RADIO;
PEOPLE HARDLY PAID IMPORTANCE ON EARLY WARNINGS;
DESCRIBING GAP BETWEEN ACQUIRED INFORMATION AND PUBLIC RESPONSE;

Interviewer: Why? Can you explain?

Respondent: Where to go? Where should we go leaving beside our houses and other belongings? We have cattle and other things. It's not possible to leave behind all the things.

LIMITED ABILITY TO TAKE SAFE SHELTER;
NEED TO TAKE CARE OF BELONGINGS;

Interviewer: Do you have mobile phone?

Respondent: Yes, I have one. Mobile is now in every household. — OWNS A MOBILE PHONE;

Interviewer: Did you use mobile phone during the cyclone Aila?

Respondent: No, I didn't have mobile phone at that time. — DIDN'T HAVE MOBILE PHONE DURING THE TIME OF AILA;

Interviewer: Okay, how did you communicate with others, like your families and relatives during the Aila crisis period?

Respondent: Yes, I communicated with others with mobile phones. I didn't have one, but I borrowed my neighbour's phone to call my elder sister and enquired about her conditions. She lives in another village … it's around five to six kilometres away. — USED NEIGHBOUR'S MOBILE PHONES TO ENQUIRE ABOUT RELATIVES DURING THE TIME OF STORM;

Interviewer: What about circulating early warnings through mobiles phones?

Respondent: Through mobile phones?

Interviewer: Yes.

Respondent: It's a good idea to circulate early warnings through mobile phones. I guess people will pay more attention on it when they will get news [message]. As I said people get it through radios, but hardly pay attention. — MOBILE PHONES CAN BE USED TO DELIVER EARLY WARNINGS OF STORMS; GAP BETWEEN ACQUIRED INFORMATION AND PAYING ATTENTION;

Interviewer: That means, people know about the warnings, but don't pay attention or importance?

Respondent: Yes, the main thing is it has little importance to people. We only pay some attentions when the things start to get worst. You, know about the people here. They are living with storms, surges and other types of risks. We know these are parts of life. The reason is that we are used to such events. We are witnessing floods, cyclones for long time. We know what to do. That's why we hardly care about these events. Suppose cyclone of 1988. It was a tremendous cyclone – you can't imagine the strength of wind. We have not seen such cyclone until today. And, Aila, it was not a storm in a sense. The main thing was surge of water. The waves of waters washed away everything before our eyes. — PEOPLE REACT WHEN THEY ARE PERSONALLY AFFECTED; DESCRIBING NATURAL HAZARDS AS PART OF LIFE; PEOPLE HAVE TAKEN NATURAL HAZARDS AS GRANTED;

Interviewer: Well, if I ask you about the main problem that you are facing now, what would be your answer?

Respondent: The main problem is population. — INCREASED POPULATION IS THE MAIN PROBLEM;

Interviewer: Really?

Respondent: Yes, our main problem is population increase. We have a lot of people, but our resources are

limited. For example, we were seven siblings, 5 brothers and two sisters. But, now all of my brothers and sisters have their own families with children. But, if you think about lands that my father had is still the same. We could not increase our lands, but divided them and now I am landless. … [pause] Just think about the situation. You just think – what will these additional people will do? We need to survive, we need to live and feed our children. There is no other way, but to go for natural resources – which were once free, like the forest, rivers. But, now these things have also become dangerous to get it. You have to pay bribes to forest people and extortions to the pirates to have access in the forest. Let alone the dangers of tigers and crocodiles.

SCARCITY OF LANDS FORCES PEOPLE TO LIVE IN VULNERABLE AREAS;

Interviewer: Do you want to say anything more about climate change?

Respondent: About climate change? Actually I don't know enough on the matter. I only heard about this from radio and from NGO people. And, we are just illiterate people. It's the matter of those people who do research on climate change, who are involved in jobs like in NGO. It's not our issue. But, what I do understand is that more trees are better for the nature. Then, we will feel less of the strength of the cyclones. And, one more thing, we want to see something practical. We need something in a practical way. I mean hands on training. Then, we can tackle the problems. And, of course the best way to learn how to deal with natural disasters is improving our economic situation. If we have money, we don't need anyone to tell what to do. We can do by ourselves.

EXPRESSING LIMITED KNOWLEDGE OF CLIMATE CHANGE;
RADIO AND NGO AS SOURCES OF CLIMATE CHANGE KNOWLEDGE;
CLIMATE CHANGE IS A MATTER OF SCIENTISTS;
HANDS ON TRAINING TO TACKLE CLIMATE CHANGE PROBLEMS;
POVERTY REDUCTION AS SOLUTION TO CLIMATE CHANGE INDUCED HAZARDS;

Interviewer: Thank you very much for your time.

Respondent: Thank you.