Understanding institutional changes for reducing vulnerability to landslides in Chittagong City, Bangladesh

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UNDERSTANDING INSTITUTIONAL CHANGES FOR REDUCING SOCIAL VULNERABILITY TO LANDSLIDES IN CHITTAGONG CITY, BANGLADESH

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Master’s Thesis 2009
Ecosystems, Governance and Globalisation
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Abstract

Ineffective hill management policy at the national level and weak enforcement by the local authorities has created space for developing many informal settlements along landslide prone hillslopes in Chittagong city, Bangladesh. These settlements are considered illegal by the formal authorities, the settlers perceive their presence in those areas as legal occupants, which have caused land tenure conflicts with formal authorities over the last decades. The continual land tenure conflict has weakened institutional arrangement for reducing vulnerability to landslides in the informal settlements. The thesis paper is prepared based on the findings of a case study on the landslides which occurred in 2007 in Chittagong city. The fieldwork of the study was carried out using qualitative tools such as individual interviewing of organisational respondents and a focus group interview in Matijarna informal settlement to examine what institutional changes have occurred for reducing social vulnerability of informal settlers to landslides in Chittagong city. The study finds that the institutional changes have occurred as short-term mitigation policies like establishing structural measures along hillslopes for adjustment and relocation of the most vulnerable informal settlers. Anchoring on institutional change theory, the study suggests that new policies may reduce social vulnerability of informal settlers to landslides through addressing the following issues. First, previous institutional arrangements and how those shaped present vulnerability of informal settlers to landslides must be understood. Second, land tenure security of the informal settlers must be well incorporated in current mitigation policies. Third, organisational coordination should be strengthened from national to local level, as well as, between government agencies and other organisations like NGOs and civil society to facilitate policy implementation process.

Key Words: Formal organisation, informal settlement, institutional change, landslide, land tenure conflict, social vulnerability
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**Acronyms**

BMD  Bangladesh Meteorological Department
CCC  Chittagong City Corporation
CDA  Chittagong Development Authority
DAP  Detailed Area Plan
DC   Divisional Commissioner
DoE  Department of Environment
DMB  Disaster Management Bureau
GOB  Government of Bangladesh
IEB  Institute of Engineers Bangladesh
MoEF Ministry of Environment and Forest
MoFDM Ministry of Food and Disaster Management
NGO  Non-government Organisation
BDT  Bangladeshi Taka
USD  United States Dollar
1. INTRODUCTION

Landslides occur around the world, but they cause the most human fatalities in the developing and least-developed countries (O’ Hare and Rivas 2005, Karsli et al. 2008, Nathan 2008). According to the EM-DAT (2009), between 2000 and 2008, landslides killed approximately 3345 people mostly in developing and least-developed countries like the Philippines, Nepal, China, India and Indonesia. Social vulnerability can be defined as a product of social, economic and institutional factors, which ultimately determine the susceptibility of a certain population to a hazard (Cutter et al. 2003). Then social vulnerability to landslides may be determined through, understanding how landslide process causes death and damage of property within a particular population (Alexander 2004, Crozier and Glade 2004) and examining specific socio-economic and institutional contexts of the affected area (Bonnard and Corominas 2005).

The landslide process is generally characterised as the downward movement of the earth materials; which is triggered by heavy rainfall, earthquake and volcanic eruptions (Fell et al. 2008). However, rapid urbanisation and human development activities such as, buildings and road construction through deforestation and excavation of hill slopes have increased landslide related fatalities in densely populated cities located in mountainous areas (O’ Hare and Rivas 2005, Galli and Guzzetti 2007, Schuster and Highland 2007). In fact, low-income people in the cities of poor countries often occupy government or privately owned lands both legally and illegally and build informal settlements along unstable hill slopes without following any existing building codes, standards or regulations (Boulle et al. 1997, Payne 2001, Nathan 2005). Case study showed that landslides are the major cause of deaths in the informal settlements of the cities in poor countries for example, 30,000 deaths in Caracas of Venezuela in 1999 (Cross 2001). Currently, many informal settlements in several cities such as Manila, La Paz, Caracas, Ri de Janerio and Ponce are found along vulnerable hill slopes (Alexander 2004, Nathan 2008).
Adger (2000) argues that examining the social vulnerability of particular population to a hazard should emphasize the understanding of their accessibility to the existing institutional arrangement. Over the last decades major institutional responses have been found in developed countries like Japan and the USA, aimed at reducing landslide vulnerability (Wold and Joehim 1989, Dai et al. 2002). These include structural measures along hillslopes, better land use planning, establishing proper drainage network, improved early warning systems and relocation of the affected people. However, there is still a lack of institutional arrangement to provide these mitigation measures to the vulnerable informal settlers in poor countries (Boulle et al. 1997). Few research has analysed vulnerability of informal settlers to landslides, focusing risk and social impacts of landslides (Alexander 2004, O’ Hare and Rivas 2005, Ayala 2008, Nathan 2008). Moreover, an absence of linkage between social vulnerability of informal settlers and institutional settings in regard to landslide hazard motivates me to conduct the current study.

1.1 Problem Statement

Bangladesh has already been recognised globally as one of the most vulnerable countries to natural hazards (Khan and Rahman 2007). Since 1997, landslides have caused the death of nearly 235 people in various informal settlements within Chittagong city and its adjacent small urban centres (Technical Report 2008). Different studies show that approximately 500,000 impoverished people are currently living in informal settlements on the risky foothills of Chittagong city (Islam 2008, Khan 2008). Since the 1980s, major urban growth has taken place through rural-urban migration in different cities of Bangladesh (Islam 1994).

Due to lack of land ownership and government housing schemes, low-income people often occupied unused government land illegally for housing in Bangladesh (Ahmed 2007). Since the 1990s, many informal settlements were developed on government hills illegally in Chittagong city (Khan 2008). However, there was no institutional arrangement for vulnerability assessment of those informal settlements to landslides.

The extent of institutional change occurs depends on outcomes of new institutional arrangements and the learning capability of implementing organisations (North 1990). According to Ostrom (1995), institutional change is a process, which involves minimum partnership among the individuals to agree on ultimate benefits of new rules. Pidgeon (1997) argues that new institutional arrangements may result in better hazard management, if formal organisations are able to incorporate their previous experiences in present policy. Adjustment and relocation are current institutional changes for reducing vulnerability of informal settlers to landslides in Chittagong city, Bangladesh (Islam 2008). However, the extent that these short-term institutional changes are optimum for reducing social vulnerability to landslides depends on the coordination mechanism of formal organisations\(^1\) with other concerned stakeholders and informal settlers for implementing policies.

### 1.2 Aim of the study

The aim of this thesis is to contribute to further understanding of institutional changes that can reduce social vulnerability of informal settlers to landslides. Based on a case study in Chittagong city of Bangladesh, it will examine post-landslide institutional changes to understand the social vulnerability of informal settlers.

### 1.3 Research Questions

To accomplish study aims, I sought the answers to the following questions:

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\(^1\) North (1990) includes organisations as political bodies (government departments, regulatory agencies), economic bodies (housing companies), social bodies (churches, clubs) and educational bodies (schools, universities). In this study, only government agencies, departments have been used as formal organisations as they took major initiatives for institutional changes through new policies.
Q1. What were the institutional settings before landslide on the 11th June 2007 in Chittagong city, Bangladesh?

Q2. What were the post-landslide institutional changes at national and local level?

Q3. How have institutional changes shaped current institutional framework for reducing social vulnerability of informal settlers to landslides in Chittagong city?
2. THEORETICAL FRAMEWORK

2.1 What are institutions?

Institutions have broad perspectives and discussions, yet in general sense, these are human devices such as, formal rules, laws and policies and informal norms, traditions and self-imposed codes of conduct (North 1990). Both formal and informal institutions may certain framework to govern the human interaction with environment (Delmas and Toffel 2004, Fragkias 2007) and determine roles of organisations for implementing disaster management policies (Diaz et al. 2005). Several researchers simplify that organisation is a concrete representation or manifestation of specific institutions (Meyer and Rowan 1977, Zucker 1987, Barely and Tolbert 1997) that links institutions with society (Adger 2000, Young et al. 2008).

2.2 Institutional dimensions of social vulnerability

The concept of vulnerability is dynamic and cuts across disciplines. It includes a range of parameters for assessing the exposure of social-ecological systems to hazard and its capacity to adapt (Adger 2006). Cutter (1996) in his work explains that vulnerability of any social-ecological system encompasses three important dimensions: economic, social and ecological. Several researchers argue that vulnerability to any hazard is not only the outcome of natural forces, rather it also depends on institutional settings that determine the social and economic possessions of affected communities and their ultimate coping capacity (Adger 2000, Adger 2001, Wisner et al. 2003, Turner et al. 2003, Naess et al. 2005). Landslides as a natural hazard not only occurs due to natural factors like heavy rainfall, earthquake and volcanic eruptions, but are also triggered by human actions like unplanned hill cutting for informal settlements along unstable hill slopes (Islam 2008). Then social vulnerability to landslides depends on the strength of existing institutional arrangement for ensuring better hill management, early warning system, safe relocation and livelihood security of informal setters during pre- and post-landslide period.
In 1958, the Japanese government enacted the most comprehensive legislation in the world to reduce the damage on property and human fatalities (Wold and Jochim 1989). It included land use planning and structural mitigation measures such as, construction of check dams, drainage systems. Other technological controls such as, early warning systems during heavy rainfall to evacuate people safely before landslides were also developed (ibid.). As a result, the loss of property and life was reduced in Japan. Although, the government of the USA or Japan can relocate landslide-affected people in safer places or provide post-disaster insurances (Dai et al. 2002), the institutional capacity in poor countries to provide those opportunities remain much lower (Nathan 2005, O’ Hare and Rivas 2005).

In fact, institutional frameworks in many poor countries have neither effective disaster management policies nor organizational capability to resolve the underlying causes of social vulnerability to landslides (Ayala 2008). Even more, different populations living in different countries, as well as, within the country have diverse degrees of vulnerability (Adger et al. 2007). In the 1996 and 2003 landslides in La Paz, Bolivia and in 2003 landslides of Manila, Philippines, rich people were less affected, rescued quickly and even protected through social insurances (Pelling 2003, O’ Hare and Rivas 2005). On the other hand, informal settlers living in impoverished areas of those cities experienced high mortality and did not have sufficient access to any insurance schemes from formal institution (ibid.). In fact, informal settlers in the cities of many poor countries are still denied civic facilities and land tenure rights (Tanner et al. 2009); as a result, they are not involved in national and local level vulnerability reduction policies.

2.3 Theoretical context

The theory of institutional change has emerged in vulnerability research with powerful explanations for understanding both human and organisational capacity to adapt and learn from impacts of hazards (Jordan and O’ Riordan 1995, Adger 2000, Naess et al. 2005, Fragkias 2007, Young et al. 2008). Lin (1989) refers to ‘institutional change as the replacement of particular institutional arrangements through induced or imposed ways.’
He explains an induced institutional change as the modification or replacement of existing institutions or emergence of new institutional arrangements, which is voluntarily organised and executed by a group of individuals for particular actions. An imposed change is executed through government rules or laws for redistributing the opportunities of new institutions to reduce vulnerability across the societies (ibid.).

To respond immediately after a hazard, formal institutions are more effective than informal ones (Diaz et al. 2005). To cope with a sudden hazard, formal institutions can bring short-term measures rapidly and develop new policy for adapting to similar situation in future (Adger et al. 2007). North (1990) explains that formal policies or legislations are easy to change overnight through government agencies or political decisions, but informal institutions are more complex as those are historically embedded within the cultures of the societies.

A bulk of researchers has emphasized the roles of formal organisations as one of the key stakeholders for hazard management (Adger 2000, OECD 2004, Nikitana 2005, Adger et al. 2007, Tanner et al. 2009). However, their studies highlight certain requirements for institutional changes: understanding strength of existing disaster management policy; cross-scale coordination between government agencies and others stakeholder; and integrating ecological, social and economic aspects within the institutional framework to attain a holistic disaster management approach. Moreover, formal organisations may learn from past institutional arrangements (Adger et al. 2005), such as how ineffective hill policy increases informal settlement along hill slopes.

Hazards as sudden events may be essential for short-term institutional change, yet a substantial period is needed for adjusting new policy with existing institutional framework (Jordan and O’ Riordan 1995). In many cases, short-term institutional arrangement like relocation is not accepted by vulnerable informal settlers in the cities of poor countries (UN Millennium Project 2005, Weber 2008, Tanner et al. 2009). Informal settlers usually concern with eviction and their social components like safe livelihood and tenure security before relocation.
Summarizing the theoretical discussions, there are still uncertainties on the pre-requisites of institutional changes for reducing vulnerability to natural hazard. Most of the theoretical propositions have emphasised the role of formal institutions in shaping better interactions with the societies for disaster management. However, the success of institutional change will depend on how and to what extent new institutions address underlying factors that make informal settlers mostly vulnerable to landslides.

Therefore, analysis of institutional settings before and after landslides, co-ordinating mechanisms of formal organisations with other concerned stakeholders in the current institutional framework for implementing new policies and understanding the perceptions of affected informal settlers, is further required to understand effective long-term institutional changes.
3. CASE STUDY DESCRIPTION

3.1 Study area

Chittagong, the second largest city of Bangladesh is situated on the bank of the Karnafuli River to the south-east and formed of natural hill slopes from the north and surrounded by the Bay of Bengal on the west (Hashemi 2006). Geographically, the city is located between $20^035^0$ N to $22^059^0$ N longitudes and $91^027^0$ E to $92^022^0$ E latitudes, which is the south-eastern part of Bangladesh (Khan 2008). Because of its location along the Bay of Bengal, it has already experienced several devastating cyclones over the last years (Alam et al. 2007).

Chittagong city and its adjacent regions are characterised by several unique geomorphological features than other flood plain parts of the country (Islam 2008). Particularly its location along the Bay of Bengal, at least 210,000 people were affected by cyclones and storms and killed 1,651 people in the city and its adjacent areas over the last years (Alam et al. 2005). The Eurasian plate and Indo-Australian plate meet along the city (Alam 2007). Therefore, Chittagong is also an earthquake prone area of the country. In particular, due to hill topography, different hazards such as floods and earthquakes provoke landslides in the city.

Landslides are a geographically specific natural hazard, commonly observed in Chittagong and its adjacent areas of Bangladesh (Banglapedia 2008) (Figure 1). The study focuses on the landslides, which occurred on the 11th June 2007 along informal settlements in Chittagong city of Bangladesh (Figure 1). These landslides killed 127 people in those informal settlements, located at the foothills of the city (Islam 2008). The field study is limited to the area of Matijarna, within Chittagong city corporation area, one of the most affected informal settlements in the 2007 landslide (The Daily Star 2009). Studies show that the settlement is already identified as highly vulnerable to landslides because of a high population density along hill slopes (Mahmood and Khan 2008, Khan 2008). The informal settlement is located at the core of the city centre (Figure 1).
Figure 1: Map of Chittagong city (Khan 2008)
Easy access to work places and availability of government hills have over the last years, attracted low-income people who have built-up the settlement along hill slopes illegally. Currently more than 50,000 people are living within the settlement, 3 sq. km area (Manik 2009).

3.2 Population growth and economic context

A.D. Barros, the only great Portuguese chroniclers of Asia remarked ‘Chittagong as the most famous and wealthy city of Bengal kingdom because of its port that satisfies the easiest traffic demand’ (Banglapedia 2008). The city started as a small municipality in 1863 and significant urban growth began after the country’s independence in 1971, when it turned into a hub of major commercial and industrial activities (Hashemi 2006). Presently, the city has eight industrial zones, more than 720 industries and factories along the banks of the Karnafuli river (Alam et al. 2007). Its industrial opportunities and coastal environment create an economic diversity in the city that is greater than any other part of the country (Tanner et al. 2009). The city has experienced a large population increase from 1 million in 1990 to presently around 3 million within Chittagong city corporation jurisdiction, area-157 sq.km (BBS 2008) though another estimate says the population would be as high as 5 million (Tanner et al. 2009).

3.3 Vulnerable hill ecosystems and threat to landslides

Hills are an important natural resource of Chittagong city that balances overall environment quality and provide unique aesthetic values (Alam et al. 2005). Islam (2008) explains that soil structure is an important contributing factor to landslides in Chittagong city. The soils of the city are sandy which makes them easily saturated during heavy rainfall and susceptible to massive soil erosion through formation of unstable and steep hill slopes (Khan 2008). Unplanned hill cuttings and removal of forest vegetation for construction of buildings on those steep hill slopes have increased landslide vulnerability to Chittagong city (CDA 2008). A field survey on hill ecology found that out of 86 existing hills, 57 hills have already been damaged by infrastructural development and permanent housings with urban expansion (Khan
In fact, due to lack of sustainable urban planning, Chittagong city has expanded through transforming hills, which are presently fraught with landslide hazards.

3.4 Key organisations for landslide disaster management in Bangladesh

3.4.1 National level

The disaster management framework of Bangladesh government is broadly divided into two levels: national and sub-national (GOB 2008). According to the framework, the ministry of Food and Disaster Management (MoFDM) at the national level is mainly responsible for coordinating disaster management through the Disaster Management Bureau (DMB) with other agencies across different levels (ibid.).

3.4.2 Local level

Key organisations with important roles for landslide disaster management in Chittagong city corporation (local level\(^2\)) area, are mainly the Department of Environment (DoE), Chittagong Development Authority (CDA) and Chittagong City Corporation (CCC) (Technical Report 2008).

3.4.2.1 Chittagong City Corporation (CCC)

The City Corporation is the highest authority of urban local government (Islam 2006). The City Corporation is principally responsible for overall governance at city level (ibid.). Six large metropolitan areas (Dhaka, Chittagong, Khulna, Barisal, Rajshahi and Sylhet) have been given city corporation status in Bangladesh. CCC delivers basic services such as infrastructural development, solid waste disposal, improvement of drainage and sewage systems, providing educational and health services, management of hills, environmental protection and disaster preparedness activities (Alam et al. 2007).

\(^2\)Local level is mostly recognised as policy implementing level (Naess et al. 2005). In the study, local level authorities include local branches of the national ministries and autonomous bodies like city corporation and development agencies.
CCC is an autonomous body governed by elected representatives comprising of a Mayor and Ward Commissioners under the administration of the Ministry of Local Government, Rural Development and Co-operatives, Bangladesh (ibid.). At the local level, the Mayor is the chair of the disaster Management Committee (DMC) who coordinates other responsible agencies (ibid.).

3.4.2.2 Department of Environment (DOE)

DoE was established in 1977 under the Environmental Pollution Control Ordinance 1977 (MoEF 2009). In 1989, DoE was placed within MoEF as its technical wing tasked with the implementation of the Environment Conservation Act-2005 (ibid.). The department tasks include developing environment policy and acts, necessary amendments and their practical implementation in the field (DoE 2009). DoE is divided into two major bodies: Administration, Planning and Development and Technical. Currently, DoE has six divisional offices in Dhaka, Chittagong, Khulna, Barisal, Rajshahi and Sylhet for enforcement of rules and regulations. In the Chittagong division and other hilly districts, DoE has specific responsibilities for implementing hill management policy, particularly carrying out enforcement against illegal hill cutting.

3.4.2.3 Chittagong Development Authority (CDA)

CDA was established in 1959 as an autonomous body to ensure planned and systematic growth of Chittagong city (CDA 2008). Its principal functions are preparation and continuous review of Chittagong City’s Master Plan, preparation of long and short-term development programmes such as housing, road infrastructure, shopping complexes and industrial estates, and the development of regulations according to the Bangladesh Building Construction Act 1952 and its subsequent revisions (ibid).
3.4.3 Other stakeholders

3.4.3.1 NGOs and Donor agencies

Historically, NGOs started work with Bangladesh for relocation of the distressed population after the independence war in 1971 (Khan and Rahman 2007). The Disaster Management Bureau (DMB) under MoFDM coordinates relevant NGOs in disaster management activities (ibid.). NGOs such as CARE-Bangladesh, OXFAM-Bangladesh, Action Aid, Bangladesh Disaster Preparedness Centre (BDPC) and some others are currently working with government in different activities in pre-, during-and post-disaster activities (GOB 2008).

Donor agencies play great role in assistance to post-disaster relocation and reconstruction programmes in Bangladesh (Khan and Rahman 2007). Some notable assistance from donor agencies are: aiding GOB to implement disaster management projects, technical support for an early warning system and developing a disaster management committee at the local level (ibid).
4. METHODOLOGY

4.1. Rationale of qualitative research

The qualitative research approach is often characterised as reflexive, flexible and iterative in contrast with rigid, linear design of conventional research (Norman and Lincoln 1994, Preissle 2006). The greatest strengths of the qualitative approach are its richness and depth of explorations and descriptions of complex phenomenon (Myers 2000). Therefore, the ultimate advantage of the approach in this study was to gain real insights into the research problem in a comprehensive way. According to the questions of this study, there are many institutions involved with landslide disaster management between local and national level. In fact, social vulnerability is not only derived within the community itself, but also influenced by organisational actions within institutional frameworks (Turner et al. 2003). To this point, qualitative approach offered me flexibility to conduct this study with multi-level informants from vulnerable informal settlers to the policy makers (Appendix 1).

4.2 Data collection

4.2.1 Review of literatures for stakeholder identification

My research was conducted between November 2008 and January 2009 in Chittagong city, Bangladesh. The field study was divided into different phases. The initial phase consists of secondary data analysis such as review of the scientific literatures, publications by the government and non-government organizations and news articles on landslides in Bangladesh. The ultimate aim was to identify stakeholders, select of the informal settlement area and prepare a framework for primary data collection.

4.2.2 Organisational respondents

Twelve in depth interviews using semi-structured questionnaires (Guion 2001) were carried out with key individuals from government and other relevant organisations (e.g., NGOs, university and media) at the national and local level (Appendix 1).
A framework created by the Institutions for Floods in Asia (IFA) was reproduced to prepare a semi-structured questionnaire (Nikitina 2005) (Appendix 2).

The individual informants were selected from the technical report (2008), which was produced after landslides in 2007, based on their affiliation in the disaster management committee. Each interview lasted for 60-90 minutes. Individual informants were asked to list what kinds of policy actions are currently available for landslide vulnerability reduction in Bangladesh (Appendix 2). Individuals of local level government agencies described institutional settings before landslides in 2007. They also described post-landslide institutional changes for reducing vulnerability of informal settlers. Other than government agencies, informants from the university, NGOs, media personal also provided valuable information on institutional arrangements for vulnerability reduction to landslides from their context.

4.2.3 Focus group

A focus group is a kind of group interview, which facilitates participant interaction and discussion on certain topics (Morgan 1996, Freeman 2006). The focus group as a qualitative method identifies diversity of perceptions on specific topics through interactions of members within a group (Merton et al. 1990). After collecting data from the respondents of different organisations, I arranged a focus group interview on January 05, 2009 at the Matijarna settlement in Chittagong city, Bangladesh. The aim was to identify the implementation of the post-landslides institutional changes at the local level. Moreover, the focus group interview allowed me to explore diverse perspectives and experiences of landslides from the participants and to understand problems like land tenure conflict from their context.

The focus group consisted of 7 people from the study site (Appendix 3). The participants were selected based on their experiences with landslides in 2007. Two individuals were selected from household level as families that were affected both with landslides and experienced with temporary relocation. The ward commissioner was selected as a politically elected representative from the area to CCC. The community leader was selected as he dealt with law matters on claiming land tenure on hills.
One home owner was selected who owns some risky houses along the hill slopes for rent to low income people. A small seller from the area has been selected as landslide has damaged his business property.

To identify participants from the household level for the focus group, I first compiled a list of affected families (30) in the informal settlement of Matijarna area, while interviewing government officials and then used the list to draw a random sample. Other participants in the focus group were selected through snowball sampling within the informal settlement. The sampling procedure is done by asking individual to select two other potential interviewees who were affected by the landslide of 2007. The focus group interview lasted for 150 minutes. In the focus group, the participants were asked to gather data on what institutional arrangements were available before and after the landslides in 2007 for them (Appendix 3). The group answered certain questions and the participants were also allowed to discuss and ascertain the key gaps between them and formal organisations regarding vulnerability reduction to landslides and whether they found any institutional change.

4.3 Data validation

Validity is important throughout different stages of research to produce valid scientific knowledge (Kvale 1996). Data validation is necessary to check whether the collected data from different respondents are not misinterpreted for better discussion and intended research outputs. In my study, data of the respondents were in Bengali language. As a Bangladeshi citizen, it was an advantage to me for easy understanding of different data from the interviewees in the study. However, while interviewing individual respondents, I tried to avoid misinterpretations of the questions to my best knowledge. For instance, how informal settlers occupied government lands in Chittagong city? To this question, one or two respondents answered that Railway authority allowed them to live there. But, on the same question, respondent from the Railway answered those informal settlements were built with the support from local authorities like CCC and CDA. To avoid biasness, I returned to those respondents and finally found that, due to lack of hill management policy and law enforcement, those settlements were established in Chittagong city.
At local level, participants in the focus group explained land tenure conflict, how they owned current settlements and what kinds of institutional arrangements were available before and after the landslides in 2007. At the end, I checked the key findings of each section of the focus group interview by explaining the data in front of the participants. Then participants helped me to fill any gap in understanding with regards to their vulnerability to landslides.

I also verified some important findings of the study like land tenure claims of the informal settlers in the focus group by returning to individual respondents at the local government agencies. This recheck helped me to understand, how land tenure conflict arose, whether informal settlers were legally owners of the area or not from law perspectives.

4.4 Data analysis

Content analysis is a procedure of data analysis in qualitative research used for categorising verbal data and finding out hidden messages from the mass of the interviews (Hancock 1998). The data in my study was mostly verbal and document based without any statistical tests. Therefore, the advantage of the content analysis in my study was to analyze the data in light of the institutional change theory to explore the existing mechanisms for reducing social vulnerability to landslides. According to the content analytical procedure, I followed the following steps (ibid.).

First, data were listed from the answer script based on relevance of answers from the interviewees in two segments: pre- and post-landslides in 2007. In the pre-landslide segment, rather than using pre-conceived categories, I analysed the text to find the categories (Taylor et al. 2003). For example, why informal settlements are more vulnerable to landslides? I developed with the following categories:

1. Unplanned hill cutting
2. Weak hill management policy
3. Absence of structural mitigation
Second, in post-landslide segment I analysed the technical report (2008) and compared it to the answers of the individual respondents to find out what new policy is now in practice for reducing vulnerability of informal settlers.

Third, to avoid redundancies of the categories I was careful when in putting data into new categories. For instance, weak hill management policies have resulted informal settlements in Chittagong city and created ownership conflict between informal settlers and formal authority. However, both hill management policy and hill ownership conflicts have different values for understanding institutional arrangement for reducing vulnerability to landslides. I divided these carefully in two categories.

Fourth, I also put some important quotations by the interviewees in each category to support the categories. For example, early warning or structural mitigation could reduce human deaths from landslides in informal settlement, yet I used some important quotations of individual respondents, why those measures were not implemented. Quotations of the focus group were also used to understand whether they agree or really need relocation based on the new institutional arrangement.

Finally, after analysis of the data results were represented in descriptive form, using important quotations of the respondents.

4.5 Limitations of the study

As a self-financed researcher, I would not only argue that finances were one of my main limitations. Rather I experienced how financial insufficiency impeded me from exploring the big picture of the landslides during this field study. Though, I have formed a focus group in the informal settlement; it would have been more informative if I could broaden my focus group participants to include administrative respondents. In fact, it required sufficient funds just to create an environment where all could come together and share their views.
Then I faced another difficulty: angry attitudes of the informal settlers while conducting the preliminary survey. As there was an ongoing conflict between informal settlers and government, local people were reluctant to answer questions individually. Informal settlers thought that I came there to take information or pictures of the area for the government, which would ultimately force them to leave the settlements.

Another limitation of my study was data insufficiency on landslide issues at different administrative levels in Bangladesh. The number of deaths from landslides is not well documented in government documents. Most of the government reports on institutional facts on landslide mitigation are still confidential. Therefore, I had little accessibility to existing reports and relied on respondents’ answers, research papers and news articles.
5. RESULTS

Based on the findings, from analysis of relevant literatures, interviewing the organisational respondents and a focus group, this section aims to present results for understanding how institutional changes occurred for reducing social vulnerability of informal settlers to landslides in Chittagong city, Bangladesh.

5.1 Pre-landslide social and institutional settings

5.1.1 Weak hill management policies

Bangladesh had neither specific hill cutting nor hill management policies at the national level that could be executed at the local level. Only, according to the section 3(C), Bangladesh Building Construction Act, 1952 (amended in 1990), hill cutting has been allowed (not prohibited) with the permission of authorised government department under some terms and conditions. As per section, the authorised officer allows hill cutting when satisfied that the cutting or razing of hills is necessary for public housings and could be done without seriously damaging the original hill ecosystems, adjacent human lives, property and infrastructure or increasing siltation of water bodies. If anybody violates those rules or has no permission for hill cutting, the offender will be imprisoned for up to 10 years or bound to compensate not more than BDT 1 million\(^3\) or both according to Article No. 15, Bangladesh Environment Conservation Act 1995 (Amended in 2000) that has been elucidated by Bangladesh Government Circular Letter No. Environment/General 497/91/604 dated 11\(^{th}\) March 2002. However, with the rapid urbanisation in Chittagong city, the laws could not ensure the effective guidelines for where and how housings should be established. So, most of the government administrative respondents understand that landslide vulnerability is an ultimate result of weak hill management policies.

\(^{3}\) 1 United States Dollar=69 Bangladeshi Taka
Most of the informal settlements were built in a haphazard manner by private hill owners and illegal occupants of the hills, without following building rules and consequential vulnerability to landslides. No one from either CDA or DoE was there to assess the vulnerability of those settlements to landslide.

“CDA controls major building construction rules and regulations in Chittagong city, but they don’t go for any field monitoring whether the proposed structure will destroy the total hill ecosystems or increase harms to adjacent human lives and property. Though DoE has filed 20 police cases against illogical hill cuttings, but these could not stop hill cutting or inhabitation of the informal settlers along risky hillslopes” (A respondent from DoE, Chittagong).

5.1.2 Hill ownership conflict

There was a land tenure conflict on hill resources between local people in the informal settlement and Bangladesh Railway over the last 20 years. On one hand, respondent from the local office of the Bangladesh Railway, Chittagong claimed the informal settlement area as their own property, which they acquired from British emperor at the end of their regime in 1947. On the other hand, informal settlers argued, ‘they were the legal occupants of those hills. They have legal documents as original owners of the hills’ (Respondents from the focus group). However, an estate official of Railway, Chittagong complains, ‘those houses were built with the support from some corrupt lawmakers, CCC, local politicians and fake land registration officials’ (A respondent from Bangladesh Railway, Chittagong office).

Regarding the land tenure conflict, a respondent from Chittagong District Office explains, according to the law of The Limitation Act, 1908 (Bangladesh),

“If someone uses any land in the absence of original owner without any objection for 20 years, the present occupants may claim the land as his own. However, there was objection from the Railway Department on the informal settlement before the stipulated time. So, those informal settlers are seemingly illegal occupants in those areas” (A respondent from Chittagong District Administrative Office).
Rural-urban migration is an important factor for building the informal settlement on railway owned hills. After entering the city, many poor people have no chance to rent safe and expensive housings. So, over the last years, some corrupt local people built cheap housing on unused railway owned hills to rent to low-income people. Because of land tenure conflict of the informal settlement with the Railway department, no civic facilities were available from CCC and CDA in the area before the landslide in 2007.

“My house was destroyed from river erosion in 2004 then we came to Chittagong city settled in those cheap houses beneath these risky hill slopes. But, I could not avoid my misfortunes and distress to natural calamity. Due to lack of proper drainage facilities, my family suffer during heavy rainfall when water with soil mass comes in the floor of our houses” (A woman from the focus group).

5.1.3 Exclusion of landslide issues at national level

To a large extent national disaster management policy of Bangladesh focuses on vulnerable communities, who generally live in coastal areas or riverine flood plains. Landslides are generally perceived as a local hazard in Chittagong region due to its hilly topography. Therefore, many organisational respondents claimed that national authorities were less concerned with landslide hazard management. Nevertheless, the landslides in 2007 raised attention to the national level to incorporate the landslide issue in disaster management.

“In 2002 a Public Circulation was published against hill cutting and landslide in Bangladesh. But, the government could not emphasise on landslide issues effectively. So, DoE and other local authorities often lacked the technical and geological knowledge and equipment to work on landslide hazard assessment” (A respondent from DoE).
5.1.4 Absence of early warning system

On 11th June 2007, there was record rainfall (425.20 mm in 24 hours) in Chittagong city (Technical Report 2008). However, there was not any responsible agency to convey early warning to the informal settlers that they needed to move to a safe location. Generally, Bangladesh Meteorological Department (BMD) forecasts weather report through electronic media (TV, Radio and Web) (BMD 2009), but it is not available in time to local people for taking early preparation. Almost all respondents of the focus group were aware that landslides might occur during heavy rainfall between June and September, but they had very limited knowledge of exactly why and when a landslide will come down on them or how they should take preparation. In fact, they were rarely informed of the meteorological data to predict the intensity of rain and no cooperation was found with CCC or any other organisation to take emergency preparation before landslides.

“We already surveyed 60 risky informal settlements along hillslopes in Chittagong city and recommended the local authority to take right initiatives like awareness building during rainfall or relocation of those people as early as possible. But, government authority did not take it seriously.” (An expert on landslide issues in Bangladesh).

5.1.5 Lack of structural measures

Many residential buildings of Chittagong city were also established along hillslopes through safety measures, building codes and even guarded with concrete reinforcements and better drainage facilities. However, informal settlers as illegal occupants of hilly lands, CDA and CCC could not establish any structural measures along the settlement. To the point, Local ward commissioner argued that

‘I presented the issue to local authorities, but they could not conduct any survey for landslide risk assessment along the informal settlement’ (Local ward commissioner, CCC).
In fact, before the landslides in 2007, local authorities emphasised how to stop hill cutting and always blamed the informal settlers. Due to their negligence and inaccessibility of informal settlers to political decision-making process and as a low-income group, neither local authority nor the vulnerable population were able to establish any structural measures along those risky slopes.

5.1.6 Lack of organisational coordination

There was no preparation beforehand from the national level to the local level for emergency recovery of a landslide affected community. At the national level, MoFDM had no communication with the local government agencies to come up with an institutional response on an emergency basis before the landslides in 2007. At Chittagong city, there was a disaster management committee (GOB 2008). However, the local community claimed that before the landslide in 2007 they did not find any activity of the disaster management committee raising awareness of people regarding landslide hazard management.

‘If there were early preparation and communication from government with other agencies at local level, then recovery could lessen the death.’ (A respondent in the focus group).

5.2 Post-landslide institutional changes to reduce vulnerability

After the landslides in 2007, a national level Ministerial Order No. 07/01/03 came to the Divisional Commissioner (DC) office to look into the major causes of landslides and prepare mitigation measures (Technical Report 2008). Accordingly, a technical committee (combination of formal government agencies, CCC, CDA, researchers, engineers and other non-government organisations) was formed to identify the priorities for mitigation action.

The committee had emphasised the necessity of integrated hill management policy with urban planning and different institutional reforms such as-Economic Growth, Environmental Conservation Act 1995 (for complete ban of hill cutting), Building Construction Act
1952 (right given to individuals instead of authority for filing case against hill cutting) (ibid.). Finally, two mitigation policies - adjustment and relocation were available for vulnerability reduction to landslides.

5.2.1 Adjustment through structural mitigation

According to mitigation policies, some informal settlers along hillslopes were allowed to live along the hillslopes upon fulfilling some prerequisites. Firstly, a vigilance team was formed at the city level with responsibilities to assess landslide risk and vulnerability through developing maps, monitoring informal settlements during monsoon to disseminate early information for early preparation. Second, a structural committee was formed with different local government agencies CCC, CDA and the Institute of Engineers Bangladesh (IEB) to establish cost-effective engineering measures like reinforcement walls along hill slopes, where landslide risk may be reduced without evacuating existing settlers.

5.2.2 Relocation

A relocation policy has come out for extremely vulnerable populations who live along the most risky hill slopes in the informal settlements. DC as a regional body and other concerned authorities at the city corporation level have been assigned to select the relocation plot for vulnerable people within the city corporation areas. Accordingly, to implement the relocation programme, two sites have been proposed for the relocation in Chittagong city corporation area to relocate around 200,000 people.

5.3 Current institutional framework

According to institutional changes, major responsibilities for implementing adjustment and relocation were distributed to the DC and local authorities such as CCC, CDA and district administration (Figure 2). However, in case of implementation of policies, weak coordination has been identified among local authorities.

‘Who will provide the expenditure of the structural mitigation for the informal settlements?’ (A respondent from CDA).
Though CDA and DC have selected plots for relocation, these are not adequate for the total number of vulnerable informal settlers estimated to be 500,000.

Then another conflict arouse in the new framework for implementing relocation policy as local authorities tried to demolish the informal settlement. This eviction process created social conflict between informal settlers and the local government.
A journalist explained about the hidden barriers of eviction and the relocation policy, ‘Government should consider where those poor people will reside after eviction. If government wants to reduce vulnerability of those informal settlers, then they must ensure better communication with informal settlers before relocation.’

### 5.4 Major findings

Over the last years, due to absence of effective hill management policy, informal settlements were established haphazardly along risky hillslopes in Chittagong city. At the national level, hill management policy describes only how to control hill cutting, but lacks clear explanation of the hill management within the local context. Consequently, low-income people occupied unused Railway owned hills illegally and built Matijarna informal settlement in Chittagong city. In the first place, it was the responsibility of the Railway to reclaim the land from the informal settlers. However, because of land tenure claims from the informal settlers and the complexity of land acquisition law, the Railway was incapable to resolve the conflict.

Evolved land tenure conflict hinders local authorities to draw attention to the vulnerability of informal settlers to landslides in the area. It is observed that before the landslides in 2007, there was no preparation from local authorities to coordinate with BMD and emergency agencies. Moreover, the national government treated hill management issues as a local problem. Landslides were not as extreme as other hazard like floods and cyclones. Eventually, local institutions could not estimate that landslides affects would be devastating to the informal settlers in 2007.

After the landslides in 2007, major institutional changes occurred through new mitigation policies such as adjustment and relocation programmes for the informal settlements (Technical Report 2008). The aim of adjustment policy was to establish structural mitigation like reinforcement walls in the less vulnerable informal settlements, develop risk map and reforest the barren hills.
To complement the adjustment policy, a vigilance team was formed at local level to assess vulnerability and raise awareness on landslides in the informal settlements during monsoon. Another structural committee was formed to develop the reinforcement wall along the hillslopes in the informal settlement. Relocation was another policy for relocating people to safer places from the most vulnerable settlements. Divisional administration as a regional coordinator and other agencies like CDA and district administration at local level arranged housing areas for the relocation of the informal settlers.

According to the new mitigation policy, an institutional framework is currently active to address landslide hazard in Bangladesh (Figure 2). However, in the framework, very weak coordination exists between national and local authorities for implementing the relocation programme. CDA and DC have selected land for relocation, but it is very small compared to the total population. Therefore, those authorities are facing difficulties to estimate how many people they might be able to relocate.

Land tenure conflict between local authorities and informal settlers has also impeded implementing the relocation policy. In fact, informal settlers want assurance of better income opportunities and their land tenure security before relocation. Respondents from the focus group in the informal settlement argue that ‘we have heard about structural mitigation and relocation. But, we did not find any implementation of the policies after the landslides in 2007’ (Respondents from the focus group). The informal settlers only experienced that government agencies tried to evict after the landslides in 2007. In fact, after the landslides in 2007, some affected people were rehabilitated instantaneously, but most of them returned to their previous place. So, respondents claim that ‘government agencies should communicate with us and discuss relocation measures in the first place. Otherwise, we will not accept their new institutional arrangement for us’ (Respondents from the focus group).

In the current framework, CCC has been assigned to coordinate with BMD for disseminating knowledge during the rainy season to the informal settlers (Figure 2). However, CCC has still no effective coordination with BMD at the national level. A vigilance team was formed to monitor vulnerable settlement during the rainy season, but in the field they were absent.
Lack of skilled staff, less attention on responsibility and little coordination with vulnerable informal settlers, the team could not show any pro-active response to landslide hazard management. The structural committee estimated the cost of a reinforcement wall for the settlement; however it was not built after two years due to lack of available funds.
6. DISCUSSION

By linking the findings in the light of the research questions and relevant literatures, the analysis has revealed short-term institutional arrangements like adjustment and relocations for reducing vulnerability of informal settlers to landslides in Chittagong city. However, these short-term institutional measures are currently obstructed by land tenure issues and weak coordination among the implementing agencies. Here, I will discuss the land tenure issue and coordination mechanisms under adjustment and relocation policies and relate these to institutional change theory for understanding where government policy could intervene to reduce social vulnerability to landslide; then how coordination should come into play pro-actively rather than reactively.

Adjustment of the informal settlers to landslides as a short-term policy in Chittagong city mainly concentrates on establishing a reinforcement wall along less vulnerable hill slopes in the informal settlements. This structural measure only reduces the physical vulnerability (i.e., exposition of those informal settlements to landslides) of informal settlers, but it does not address social components of informal settlers such as socio-economic marginalisation, land tenure conflict and inaccessibility to existing institutional framework for landslide hazard management. In fact, the current adjustment policy should incorporate land tenure security of informal settlers to help the understanding of their social vulnerability to landslides in the long-run.

Relocation has been used as another policy instrument for those informal settlers, who are extremely vulnerable to landslides in Chittagong city. A study in the city of La Paz, Bolivia showed that after landslide in 1996, mostly impoverished informal settlers were relocated to less risky hill slopes and provided only adjustment to landslide slopes through land terracing and reforestation by municipal government (O’Hare and Rivas 2005). However, those informal settlers had poor quality housings, sub-standard drainage facilities during heavy rainfall and in particular they faced more uncertainty on their land tenure right. Other studies also revealed that relocation of informal settlers was not successful in the cities such as Manila, Philippines and Kanpur, India (Porio and Crisol 2004, Milbert 2006).
In those cities, though people from informal settlements were relocated to less risky places, yet these informal settlers were more aware of their tenure security and afraid of eviction from the government. From those case studies, it is obvious that the current institutional arrangement for relocation should ensure land tenure rights for the informal settlers in Chittagong city.

Lin (1989) refers to institutional change as imposed rules or policies from the government. The present relocation policy seems imposed as government tries to evict people from informal settlements neglecting their claims on land tenure in Chittagong city. Eventually, this hastily designed institutional arrangement from the government has diminished trust between government agencies and the informal settlers to the long-term institutional changes. However, Lin argues for formal government agencies to enhance voluntary arrangement for implementing imposed rules (ibid.). According to Kingston and Caballero (2006), benefits from a proposed institution should be equally distributed, otherwise the losers will try to oppose in accepting new change. In Chittagong city, informal settlers are reluctant to appropriate the relocation scheme, as they understand new policy is not improving their land tenure security or income opportunities in the end. Therefore, government agencies should coordinate with informal settlers to ensure their tenure security before relocation.

Lin et al. (2008) in their study showed that though landslide affected people experience higher impacts of landslides than general public, they have less willingness to adapt to mitigation measures. They explored that mostly trust (with government agencies, experts and media), socio-economic status (education, income) and powerlessness inhibit those populations in accepting new institutional arrangements like relocation. In fact, growing distrust due to land tenure conflict between the government and informal settlers has particular implications for vulnerability to landslides in Chittagong city. The conflict has tightened pre-landslides institutional limitations that already affected the social vulnerability of informal settlers in 2007.

Presently, very few government responses are found for improving informal settlements. In the recent Detailed Area Plan (DAP) made by CDA for Chittagong city, there was also not enough room for informal settlers (CDA 2008).
Studies on informal settlers in the world show how these populations have been excluded from any decision-making process or even how they know nothing about development programmes, which has significant impacts on their lives (O’ Hare and Rivas 2005, Wamsler 2007, Tanner et al. 2009). Lin et al. (2008) argues for institutional arrangements that can enhance mutual trust among vulnerable population and government agencies. Several researches in disaster management explain that institutions evolve over time with response to the needs of a vulnerable group of people (Adger 2000, Naess et al. 2005, Fragkias 2007) and succeed depending on the capacity of key implementing agencies like formal organisations (Jordan and O’ Riordan 1995). Therefore, this is the prime responsibility of formal organisations to apply conflict resolution mechanisms such as allocation of those lands to the informal settlers, financial support for building standard housing in the informal settlements, partnership building with technical experts and NGOs for cost-effective mitigation measures such as reforestation along the informal settlements.

Lack of coordination between government agencies hampers a new institutional framework for landslide mitigation. As landslides are very often related to heavy rainfall, Bangladesh Meteorological Department (BMD) should be responsible for monitoring, collecting and releasing meteorological and hydrological information. It has, however, very limited capacity to provide early information on rainfall to local authorities or target vulnerable people (Figure 2). Due to weak communication between BMD and the disaster management committee at the local level, emergency defence authorities could not perform in time.

In Bangladesh, until recently landslides have been included as a local hazard in the national disaster management plan and a comprehensive landslide hazard management programme has been proposed for reviewing relevant policy, filed based landslide mapping and computer modelling of slope stability at national level (GOB 2008). However, in practice Bangladesh government could not provide effective institutional arrangement for landslide mitigation because of data insufficiency, ineffective technological devices and less interest of the policy makers at the national level (Khan 2008).
A case study on Nicaragua showed how the national government was able to develop a landslide database and inventory maps through collaboration with media, scientific community and foreign agencies who were working on landslide issues in the country (Devoli et al. 2007). Eventually, the Nicaraguan government was able to initiate landslide management policy at all levels identifying the gaps in knowledge and strengthening institutions.

Institutional changes can reduce the vulnerability of a target community if they evolve through coordinated governance arrangements among multi-level authorities at local, national and international levels (Wilbanks and Kates 1999). At each level, institutions possess certain skills, resources and decision-making capabilities, which are important to sustain vulnerability reduction practices for the informal settlements (Masri and Tipple 2002). Centralised government structure in Bangladesh often delay effective respond under formal arrangements due to lack of understanding of the importance of changing laws or allocating resources needed for implementing relocation policy at the local level (Khan and Rahman 2007). Though centralised government fails to create enabling policies in Bangladesh, there are some examples from the USA and Japan showing that adequate resources at provincial and local levels and strong financial support from national government may succeed in implementing vulnerability reduction strategies to landslides (Dai et al. 2002).

Local authorities play a vital role for improving informal settlements (Satterthwaite 2008) and reduce vulnerability to landslides. Case study in the USA show how its local governments were able to reduce losses from landslide through innovative policies (Schuster and Highland 2006). The major policies included determining required local government resources (such as technological support and financial arrangement), restricting development in landslide prone urban areas through susceptibility map, coordinating national government agencies that deal with local needs, educating local officials and emergency response personnel and communicating target populations to raise their awareness on landslide hazard. Although CDA in DAP prepared zonation of the hills for Chittagong city, it did not assess social aspects of vulnerability to landslides in the informal settlements (CDA 2008).
Unlike the USA, the local authorities in Chittagong city face technological limitation for risk assessment as well as financial constraints for taking preparation beforehand landslide hazard. In fact, the local authorities could facilitate relocation policy if they have available land resources, as well as, financial arrangement. Therefore, formal organisations at national level in Bangladesh should work with the local level to identify real problems of institutional change regarding landslide, flexible disaster management structures, technical assistance required for an early warning system and economic incentives for relocation of informal settlements.

North (1990) explains that institutional changes could be encouraged through the interplay of organisations and institutions as both can influence each other. For instance, execution of a disaster management policy requires changes of co-ordination patterns of government agencies with other stakeholders. When multiple organisations come within a framework, they may shape institutional changes towards better disaster management (Berkes 2007). Some case studies on successful relocation can be found in Lima, Ecuador and Papua New Guinea (El-Masri and Tipple 2002) where low-income people were relocated from vulnerable slopes to safer locations through collaboration between government agencies, NGOs, urban poor associations and private landowners. In those cases, government solved land tenure conflicts through building joint partnership with the private sector to develop land suitable for housing for the poor and provide infrastructural facilities, which ultimately reduced the encroachment on hazardous hill slopes by the informal settlers.

In the current framework, no contacts are found between the national government and other agencies like Bangladesh Railway (original owner of the informal settlement), private land developers and NGOs to share ideas to design site for the poor in accordance with the nature of hazards, cost and benefits, land market and socio-economic conditions (Figure 2). Apart from mandated formal organisations, NGOs have extensive experiences in response to post-disaster relief and relocation in Bangladesh (Matin and Taher 2001). Most of the NGOs in Bangladesh, through their micro-credit programmes, provided opportunities for assuring livelihoods across poor households in the country (Rahman 2005).
This study has revealed that when formal organisations face land tenure conflicts with informal settlements, some NGOs are still working with vulnerable populations to incorporate the perceptions of the community in their project and to educate them on landslide risk. Several international organisations such as UNDP, DANIDA, SIDA etc. are providing relief and relocation funds through local NGOs. However, coordination between government and NGOs in the existing framework of landslide disaster management is very weak at local level (Figure 2). Nevertheless, institutional coordination between government agencies with NGOs can smooth the progress of implementing new policies (Berkes 2007). Therefore, coordination between NGOs and government may introduce promising policies for reducing vulnerability to landslides.

6.2 Implications of the study

Adjustment as a short-term policy should not be limited to only structural mitigation, but also needs to address land tenure security as well as the socio-economic aspects (O’ Hare and Rivas 2005, Ingram et al. 2006) that shaped the formation of informal settlements in Chittagong city. In fact, national government should change the limitation part of the land use policies that provided opportunity to the informal settlers to claim present land tenure rights (Technical Report 2008). Then, along with implementing the adjustment policy, other institutional supports such as improving civic facilities, diversifying livelihood opportunities and cost-effective mitigation such as reforestation on barren hills, should be applied to enhance long-term adaptation in the informal settlements.

Relocation policy for the informal settlers is still in the preparation stage of the government. However, before implementing the policy, government should carefully consider diverse emerging factors such as who actually needs relocation, what might be a cost-effective arrangement and whether relocation could provide enough compensation, secured tenure and livelihood opportunities to the informal settlers at the new location. In this regard, government should coordinate with NGOs and international aid agencies to collect finances for improving environmental quality in
the informal settlements and to implement the relocation policy with maximum benefits.

The policy making process of Bangladesh is still centralised, which very often weakens the decision-making capability of the local authorities (Islam 1994). Decentralisation of decision making at local level may enhance better institutional changes (Savitch 1998, Fragkias 2007) for hill management, as well as, improving the environment in the informal settlements in Chittagong city. In this regard, the national government should facilitate the decentralisation process through providing technical experts on landslide mitigation, financial arrangement for relocation and slum improvement and creating policies that really enable local administration for regulation and implementation of policies to the local needs.

Different organisations have diverse roles regarding landslide disaster management at the local level (GOB 2008). The present city disaster management committee should develop strong network with all organisations relevant for landslide management (Figure 2). For instance, better communication with Bangladesh Meteorological Department could enable local vigilance team for disseminating early warning awareness to informal settlers; fire brigade defence may present their available resources for recovery; and NGOs could share their experiences with government officials on how to work with affected people in a harmonious manner.

Currently, the local authorities have no strong coordination with informal settlers (Figure 2). Vulnerable informal settlers should be involved in the decision-making process for landslide disaster management. Inclusions may have two benefits: raising awareness of landslide risk through disseminating knowledge and exploring socio-economic context of the affected community for identifying the drivers behind their social vulnerability. Promoting those activities could also broaden windows of opportunities such as: better network between formal organisations and informal settlers, reviews of existing adjustment or relocation policies for integrating social and economic aspects of the vulnerable communities in future institutional arrangements.
Finally, Bangladesh government should consider a holistic approach for reducing vulnerability to landslides. First, it requires changing the existing hill cutting rules through examining its feasibility with respect to urbanisation. Second, a vulnerability assessment of the existing informal settlements to landslides should be urgently carried out through collaboration with all stakeholders. Third, an equitable distribution of lands and livelihood opportunities to informal settlers should be prioritised during adjustment and before relocation. Fourth, cost-effective structural mitigation such as reforestation along hill slopes should be integrated in the adjustment policy.
7. CONCLUSIONS

The reduction of social vulnerability of informal settlers to landslides in Chittagong city largely depends on long-term institutional changes. Current adjustment and relocation policies mainly emphasise reducing physical vulnerability of informal settlers to landslides without paying much attention to social aspects. Therefore, these policies may not reduce social vulnerability unless land tenure right and livelihoods of informal settlers are well addressed.

It is obvious from the case study that rural-urban migration, social inequality and ineffective hill management policy shape present informal settlements in Chittagong city. Indeed, institutional change may succeed if past and present social and economic aspects of informal settlers can be integrated into current institutional arrangement, as well as, long-term vulnerability reduction policy. However, due to land tenure conflict between informal settlers and local authorities, weak coordination mechanisms among organisations in the existing framework, institutional change process faces uncertainty in Chittagong city. Nevertheless, implementing current policies like adjustment and relocation requires shared responsibility of diverse actors from the formal institutionalised organisations at the national and local level to other agencies like NGOs and target informal settlers.

Several researchers explain that formal institutional change occurs rapidly to cope with the hazards (Jordan and O’ Riordan 1995, Adger 2000, Berkes 2007, Fragkias 2007). As this case study also shows, formal institutions emerge rapidly with short-term responses to reduce vulnerability from landslides in Chittagong city. However, this study suggests that these hastily designed policies will not contribute to long-run institutional changes required for social vulnerability reduction until concerned agencies and informal settlers perceive the problem and learn the crises from a common context.
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9. APPENDICES

Appendix 1: List of organisational respondents contacted

<table>
<thead>
<tr>
<th>Interview date</th>
<th>No. of Respondents</th>
<th>Position</th>
<th>Organisation</th>
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<tr>
<td>20th November 2008</td>
<td>1</td>
<td>Chief Town Planner</td>
<td>Chittagong Development Authority (CDA)</td>
</tr>
<tr>
<td>11th January 2009</td>
<td>1</td>
<td>Executive Engineer</td>
<td>CDA</td>
</tr>
<tr>
<td>14th January 2009</td>
<td>1</td>
<td>Additional Deputy Commissioner (Revenue) (A member in the technical committee in the Chittagong city, Bangladesh )</td>
<td>Chittagong District</td>
</tr>
<tr>
<td>15th January 2009</td>
<td>1</td>
<td>Assistant Commissioner (A member in technical committee report)</td>
<td>Chittagong Division</td>
</tr>
<tr>
<td>25th December 2008</td>
<td>1</td>
<td>City Planner and Head</td>
<td>Department of Architecture and City Planning, Chittagong City Corporation</td>
</tr>
<tr>
<td>19th November 2008</td>
<td>1</td>
<td>Director (A member in the technical committee)</td>
<td>Department of Environment, Chittagong</td>
</tr>
<tr>
<td>24th December 2008</td>
<td>1</td>
<td>Library and Research</td>
<td>Disaster Management Bureau (DMB), Bangladesh</td>
</tr>
<tr>
<td>24th December 2008</td>
<td>1</td>
<td>Professor (Member of the technical committee)</td>
<td>Department of Geography and Environment, Jagannath University, Dhaka</td>
</tr>
<tr>
<td>18th November 2008</td>
<td>1</td>
<td>Estate Officer (Concerned with land tenure issue)</td>
<td>Bangladesh Railway, Eastern region, Headquarter, Chittagong</td>
</tr>
<tr>
<td>12th January 2009</td>
<td>1</td>
<td>Estate Officer</td>
<td>Water and Sewerage Authority, Chittagong</td>
</tr>
<tr>
<td>18th November 2008</td>
<td>1</td>
<td>Staff reporter and Researcher</td>
<td>The Daily Suprovat, Chittagong</td>
</tr>
<tr>
<td>27th December 2008</td>
<td>1</td>
<td>Training Coordinator, Training Advocacy and Awareness, Urban Disaster Risk Management (UDRM)</td>
<td>Asian Disaster Preparedness Centre, Bangladesh Branch.</td>
</tr>
<tr>
<td>25th December 2008</td>
<td>1</td>
<td>Technical Manager, Humanitarian Assistance, Shouhardo Programme</td>
<td>CARE Bangladesh, Chittagong Regional Office</td>
</tr>
</tbody>
</table>
Appendix 2: Questions for organisational respondents

Pre-landslide

For government organisations

1. Why informal settlers were more vulnerable to landslides than other population in Chittagong city?

2. What national disaster management policies or strategies were in place to reduce vulnerability to landslide?

3. How were national or city level disaster management committees prepared?

4. Were local people communicated?

5. What structural measures were taken before landslides?

6. To what extent hill cutting laws and land use regulations were implemented in affected areas.

7. Was an appropriate early warning system before landslides in 2007?

For other stakeholders

1. Did you have any experience with informal settlers before landslides in 2007?

2. Did your organisation work with informal settlers for raising awareness on landslides?

3. What do you think institutional arrangements necessary for reducing vulnerability of informal settlers to landslides?

Post-landslide

1. How were decisions made who should be saved first?

2. Were there gaps between stated policies and implementing agencies for emergency recovery?

3. Were special efforts to assist mostly affected populations from landslides?

4. What were the new institutional arrangements after landslides in Chittagong city?

5. How was new mitigation policies integrated into improving life of informal settlers?

For other stakeholders

1. Do you think new policies are enough to address the social vulnerability of the informal settlers? Do you have suggestions?
Appendix 3: List of the participants in the focus group

<table>
<thead>
<tr>
<th>Interview Date</th>
<th>Name of the participants</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 05, 2009</td>
<td>AFM Kabir Manik</td>
<td>Local ward commissioner</td>
</tr>
<tr>
<td></td>
<td>Abdus Sattar</td>
<td>Clerk in Glaxo Smith Kline, Chittagong</td>
</tr>
<tr>
<td></td>
<td>Kabir Hossain</td>
<td>Official in telecommunication company</td>
</tr>
<tr>
<td></td>
<td>Abdur Rahim</td>
<td>Small businessman</td>
</tr>
<tr>
<td></td>
<td>Amena Begum</td>
<td>Housewife</td>
</tr>
<tr>
<td></td>
<td>Sirin Akter</td>
<td>Housewife</td>
</tr>
<tr>
<td></td>
<td>Shilpi</td>
<td>Housewife and working as housemaid</td>
</tr>
</tbody>
</table>

Appendix 4: Questions for focus group interview

Section 1:
Q1. Where were you when the landslides occurred of 2007 occurred?
Q2. How long time you were living along hillslopes?
Q3. How many people were living in the settlements?

Section 2:
Q1. Do you support that these hills are the property of government, but you are living here through encroachment?
Q2. How do you claim that these hills are your own property?
Q3. Did you face any conflict for property rights with government?

Section 3:
Q1. Do you feel that these places are risky to landslides?
Q2. What do you know about the precaution of the landslides?
Q3. Why do you live in these places?
Q4. Do you all live in own houses or rent?
Q5. Did you observe any early warning system before landslides?

Section 4:
Q1. What kind of institutional supports were available before landslides in 2007?
Q2. Do you think the financial support after landslide is enough for life expenses?
Q3. Which organisations were responsible for emergency after landslides?

Q4. Did you see any mitigation measures such as structural defence along hillslopes by the government?

Section 5:

Q1. Do you want to be relocated?

Q2. Despite you are aware of the landslide, why you do not want to leave these places?