Community Based Adaptation Strategy for The Urban Poor Under A Changing Climate

A Case Study of Flooding in Ho Chi Minh City, Vietnam

Submitted by

Kim Hong Tran

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Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

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Kim Hong TRAN

Date:
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Abstract

This thesis has two directions. First, this research examines the urban poor’s livelihood in Ho Chi Minh City, Vietnam to understand their capability of resilience and adaptation to risks and natural hazards, especially increasing urban floods in this city. Second, it highlights the importance of livelihood capitals to explore implications for policy, to establish a community based strategy to help people build strong resilience and adaptive capacity to withstand environmental events in the future.

Using qualitative research methods including ethnography and participation photography tools, the research focuses on vulnerability context to understand local adaptive capacity, resilience and institutional support in the urban poor community. The access to livelihood capitals of the urban poor was examined by 50 semi-structured interviews and participatory observation in two flooded communities in Ho Chi Minh City. Interviews with authorities at different levels, and professionals working in urban flood and climate change were conducted to examine the gaps of institutional and policy support in developing local adaptations.

The key findings from this research illustrate that the urban poor are more vulnerable in the changing climate as they have low adaptive capacity and resilience levels. The poor living in unplanned areas with limited access to livelihood capitals have increased the vulnerability for the researched communities. Inadequate support from local government has contributed to their level of vulnerability. However, they can be more resilient if their strengths of social and human capital are developed. Support from local authorities and mass organisations are critical for a good adaptation strategy. The outcome of this research therefore suggests policy intervention and community participation to strengthen livelihood and diversify accessibility to employment.
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Chapter 1

Overview of The Study

1.1. Introduction

This chapter introduces the nature and scope of this research beginning with the research problems that are justified by extensive academic and policy investigations related to the case study of Ho Chi Minh City, Vietnam. Stimulation for this research has come from past international practices for community based adaptation, the emerging national focus on urban flood management In Vietnam, spurred by changing climate, and the gaps in the related. Followed by the research aims and objectives, this chapter proposes a background to research design and analysis of the development of a community based adaptation strategy for local government in Ho Chi Minh City. Furthermore, it is anticipated that this strategy will contribute to risk management practice, and empower the urban poor community to cope with existing floods and other natural hazards. The detailed research methodology adopted is then introduced, followed by a discussion of the importance of the research, and finally the thesis organisation.

1.2. Research rationale

Today, climate change events have become a global concern. Although victims receive support from the international community, these people still face high risks of falling back into poverty or being vulnerable. In fact, the evidence shows that severe weather events hit the poorest people in a country or community (Ensor et al., 2009). The impacts of climate change events, such as floods, typhoons or storms, present a greater threat to the development of all countries, especially developing countries. For example, flooding had caused 50,000 deaths in Venezuela (Asian Disaster Reduction Center (ADRC), 1999), and 700 deaths and 250,000 homeless victims in Mozambique (Dankelman, 2002). In 2004, tsunamis in India and Indonesia caused over 275,000 deaths and there were many more
missing (Memorial webpage, 2004). More recently, in mid-2010, the floods in Pakistan seriously affected the livelihoods of 14.1 million people (United Nation World Food Program (WFP), 2010). Furthermore, in the future there will be approximately 262 million people affected, of which more than 98% will be in developing countries (UNDP, 2007). The IPCC (2007) forecasts that Asia will be the most vulnerable region, with 75% of people being affected by 2050. Asian countries, such as Bangladesh, Pakistan, India and Vietnam, have historically suffered from flooding and these increasingly likely events hold back the development of people in these countries. The IPCC (2007) also foresees that floods will increase in the deltas and seriously affect livelihoods, production, income opportunities and food security in developing countries, especially Vietnam.

These events highlight the clear impacts on the poor in developing countries raising the question about why people in developing countries are more vulnerable in a natural hazard than those in developed countries (Ensor et al., 2009). Bryan et al. (2013) argue that the poor have limited capacity to adapt to change. In other words, they lack the means to cope with damage and loss (Chamber, 1995). Lack of access to insurance, finance and proper social welfare systems has made the poor even more exposed to external shocks and risks. In addition, unexpected environmental events destroy their property, crops, houses and even life, making them highly exposed to risks and natural hazards. Situations such as these limit the poor in building a better life for themselves and for their children (UNDP, 2007). They tend to be caught in the poverty trap forever.

1.2.1. Background to poverty and vulnerability

Poverty is defined in various ways including economic and social contexts, pointing to a lack of access and lack of voice. The government of Vietnam (2007) examined that poverty is associated closely with vulnerability, as lack of resources will reduce resilience of the poor in extreme events. However, these issues are widespread. Every year, 1.1 billion people in developing countries have inadequate access to water, and 2.6 billion people lack basic sanitation (UNDP, 2006). According to the World Bank (2008b), there are about 2.5 billion people living at less than USD 2/day. They are considered as the poorest, living mainly in Asia and sub Saharan Africa (Jeffrey, 2005). These people are living largely without access to services such as credit, healthcare, education and productive assets. The United
Nations Development Program (UNDP) has considered their livelihoods as below the basic level of human development. These poor usually work in the casual sector and receive low payment for their work. Indeed, they are more insecure, as their livelihood is easily influenced by external stress or shock. For instance, the recent global financial crisis created 17 million poor people in Asia (ADB, 2010a) as their main income sources from casual jobs in manufacturing decreased.

Rakodi (1999) identified that since the poor cannot represent themselves in the political system, they are usually excluded from policy making processes and they become more vulnerable in coping with negative change. Moreover, as the social protection system in developing countries has not focused on the needs of the poor – especially women, children, the disabled or elderly people – they do not receive adequate access to job creation, healthcare services and education (Lopez et al., 1995). The poor, hence, have to live with increased pressures of daily life, as their basic needs are not met.

Department for International Development (DFID) (1999) suggested that sustainable livelihoods were key measures to poverty reduction and vulnerability. A Sustainable Livelihoods Framework was introduced as a tool to understand the main factors influencing people’s livelihoods, and the relationships between these main factors as well as the ways they could be utilised in social development planning. This framework introduces the concept of a vulnerability context related to the external environment that directly impact people’s assets and livelihoods. The vulnerability context comprises different trends (such as population, resource and governance), shocks (e.g. natural shocks, economic shocks, conflict) and seasonality (e.g. prices, production, employment) that relates closely to five main assets of livelihood. The framework then anticipates that the intervention of policy at different levels and livelihood strategies, would improve livelihood outcomes for the poor. Under specific programs, this framework has been adapted and adjusted by other development organisations such as Care, Oxfam and the United Nations Development Program (Carney et al., 1999).

Employing the concepts of a livelihood framework, the UN has developed eight goals to improve the human condition known as Millennium Development Goals (MDGs). These goals aim to provide opportunities for people around the world to enjoy human needs and basic rights, freedom from poverty, better education, improved health and decent employment. Among these goals,
environmental sustainability has also been stressed as a priority (Ban Ki-Moon, 2010). Developing countries that wish to eradicate poverty have been committed to these goals by developing relevant policies, programmes and strategies to make a better life for the poor.

The World Bank (WB) (2000) also employed the concept of sustainable livelihood to define poverty and vulnerability as non-income dimensions, which are: lack of opportunity; lack of capacity; lack of good governance; being excluded; being exposed in natural events; and gender discrimination. In order to strengthen developing countries’ capacity in poverty reduction and hunger eradication, the WB and the International Monetary Fund (IMF) have proposed a Poverty Reduction Strategy, in which each developing country will plan their own programs to support growth and poverty reduction (World Bank, 2002). This strategy aims to set up main tools for development and to help establish a socioeconomic policy framework, increase economic growth and focus on priorities of a particular country. These factors illustrate the fact that poverty relates to different issues of livelihood and policy intervention. Therefore, it is necessary to understand the nature of poverty and to identify specific issues to improve the planning process, and specifically the situation of vulnerable people.

1.2.2. Background to community adaptation

In developing countries, top down structures and limited access to sustainable livelihood opportunities have excluded the poor in the development process. The poor establish their own strategies to cope with shocks and risks including environmental changes (Denton, 2002). Some of these strategies increase their vulnerability and make them exposed to different hazards. For example, children may be tied to their beds when parents going out for work. Some parents have to reduce quality of meals and expenses on healthcare, cut back on their children’s education or sell their productive assets so that they can recover after flood seasons (Chinh et al., 2011). However, the poor can propose appropriate strategies based on their needs and living conditions. Among many survival strategies, there are suitable measures to be expanded. For example, in the Ganges Delta in India, people construct bamboo fences to protect themselves against floodwaters, whereas some poor community in the Mekong Delta in Vietnam plant mangroves in coastal areas to protect themselves against storm surges. Children and women living in the flood zones are taught to swim (Aslam Perwaiz, 2007). In Malaysia,
people raise their houses on stilts (Chan et al., 1996). These examples prove that people cannot wait until they are incorporated into a government climate change policy, or budgets are focused to improve infrastructure. People have to react promptly to environmental events or they suffer more damage. Their responses may not always be appropriate; however, they can play a direct role in responding immediately to any disaster (UNESCO, 2000).

Mulligan et al. (2010a) and Denton (2002) illustrated that successful response to hazards include women’s participation and support from different stakeholders including NGOs, private and public partners. Women are, indeed, key stakeholders in environmental management and adaptation measures. As women perform household chores, they relate closely to environmental issues such as clean water, fuel or land cultivation. Women also have strong interpersonal skills and they actively participate in income generating activities and micro credits (Boserup, 1989; Dankelman, 2002; Enarson, 1998). If men used to be hunters and women were gatherers (Boserup, 1989), the role is now changing, as women become another active actor in household economic activities. Overall, Dankelman (2002, p.23) noted that “women play a major role in actions to safeguard the environment, and their communities’ livelihoods and survival”.

Climate change has severely impacted poor communities and increases their vulnerability. It may be assumed that climate change events and other external shocks affect the livelihoods of people equally. These events do not discriminate between the rich and the poor, men and women, the old and the young. However, women seem far more disadvantaged and vulnerable in terms of their ability to cope with shocks and stress (Drekhage, 2006). Enarson (1998) estimated that 70% of the poor in developing countries are women, who live under strict social norms and bear heavy responsibilities, both at work and at home. Furthermore, women are not only more disadvantaged in the unequal division of labour between men and women, but they are also victims of violence and sexually transmitted diseases, if their men have to work in urban areas after natural disasters (Enarson, 1998). Sadly, in the policy making process, it is not clear that the capacity of the poor and women has been integrated into sustainable development strategies.
There is a need for an empirical study to identify community challenges and priorities to establish the initial steps of local adaptation. It is also critical to understand the livelihood of poor communities in flooding situations, especially when increased by climate change and rising sea levels. Policy intervention and implementation is also needed in order to better plan for the poor’s resilience in the face of the range of future natural events.

1.3. Problem statement

It is predicted that 10% of the population of Vietnam will be affected if sea levels increase by one or more metres. The mega river deltas of Vietnam, including Hanoi City on the banks of the Red River in the north, and HCMC and the Mekong Delta in the south, will be significantly affected by climate change (Downes et al., 2010). ICEM (2008) identifies HCMC as one of 10 cities in the world that will be severely affected by climate change. Although in rural areas flooding helps restore the land quality, by irrigating and fertilising farms and recharging reservoirs, it destroys infrastructure, causes deaths and brings devastation to livelihoods in both rural and urban areas.

In HCMC, the poor prefer to live in low lying areas because of land availability and proximity to income sources (Cairncross et al., 1990). Due to low topography and deficits of infrastructure improvement, these areas are increasingly flooded (Douglas et al., 2008). The IPCC (2001, p.13) has stated that:

“in such areas, squatters and other informal settlements with high population density, poor shelter, little or no access to resources such as safe water and public health services, and low adaptive capacity are highly vulnerable”.

HCMC is threatened by increased flooding that comes from both heavy rainfall and rising sea levels. By 2009, there were about 322 communes and 971,000 people (12%) living in flood affected areas (ADB, 2010a). Phi (2007) has also noted that flood prone areas in HCMC are increasing; while only 10 areas flooded in 1980, more than 100 areas were flood prone by 2008. The historical high tides in 2007 destroyed the dyke system around the city and there is increasing urban flooding in the city every year.

This mega city, known as the largest economic hub of Vietnam, has overall industry accounting for more than 60% of all manufacturing factories in Vietnam, creating jobs and income for the nation. It is
predicted that the city, sensitive to rising sea levels and tidal surges, will have more than 9% enterprises affected by climate change (Care Reid, 2007). The city’s rapid economic development has also attracted a high concentration of population, and informal settlement areas under inappropriate planning and management have been established. UNHabitat’s (2008) research also emphasizes that many poor people are living in informal settlements or temporary houses without access to formal income sources, credits, water and sanitation.

The ICEM (2008) estimates that floods will affect 43% of HCMC and the city population will face severe impacts caused by climate change in the next 50 years. Importantly, the future affected population may be higher due to local migration. However, this estimate does not include the potential impacts of flooding on big factories or informal businesses in HCMC. In future then, there will be many more poor people exposed to natural hazards and this will increase their vulnerability in HCMC (ICEM, 2008).

In order to tackle these negative environmental impacts, there are many approaches including actions before, during and after flood events. In Vietnam and HCMC, there are debates and discussion about flood protection. The proposals for a structural approach include how to construct protective infrastructure systems, how communities can use solar energy to alleviate climate change, and how people should construct residential buildings for a sustainable future. Unfortunately, like other developing countries, Vietnam cannot afford infrastructure improvement, such as the Netherlands’ expensive flood defences, or London’s Thames River barriers (Moser et al., 2008). In addition, there is insufficient capacity to run and manage these infrastructure projects.

Few (2003, p.47) proposed a more effective adaptation approach that starts from community level, this approach is “not to prevent floods but to reduce the short and long term impacts of the hazards”. Moser et al. (2008) also suggested that recognition of vulnerability and risks to livelihood would enable greater resilience to climate change. Similarly, Nguyen Huu Ninh (2007) highlighted the lack of assessment of impact on socioeconomic factors concerning climate variability, emphasising the need to develop coping mechanisms at a local level to empower adaptability and resilience under climate change. The Asian Management and Development Institute (2013) added that local
implementation, including budget considerations, and the limited integration between governmental and non-governmental organisations, are problems where societies rely on centralised or top-down approaches. Moreover, Denton (2002) argued that sustainable development can only be achieved if it takes into account all stakeholders and advances women and the poor. He particularly emphasises that gender-blind policies in a climate change context may worsen existing conditions for women such as increasing gender inequality, creating additional workloads and bringing higher vulnerability to women in poor households.

While flooding is not a new phenomenon in urban cities in Vietnam, there is a big research gap in understanding how floods can affect the poor community and what capacities they need to cope with external events, especially increasing flooding. The issues of severe impacts of floods on peoples’ life and assets, community coping capacity have not yet been discussed widely. As Moser & Satterthwaite (2008) observe, the Vietnam National Target Program on Responding to Climate Change does not mention specific roles for community, nor their responsibilities and participation in adaptation strategies. Further, they found that the program does not involve all key partners in adaptation identified by other stakeholders, especially local government. These are important issues for the development of response strategies, given that Vietnam is a traditionally patriarchal, male-dominated society, but women’s participatory role in the community is likely to be a key component of adaptation strategies.

As the national government and city government are more focused on infrastructure development, there are still gaps in research on social impact, community participation and capacities to cope with increasing flooding and climate change in HCMC. Hence it becomes essential to gain a deeper understanding of community response to flood risks and natural hazards. Formal and informal coping strategies, to minimise vulnerability of the urban poor, need to be identified, to help the poor be resilient and less vulnerable in severe floods and climate change in the city.

These issues create the need to examine the pressures that poor and vulnerable communities are facing, and the supporting mechanisms required to help them cope with external risks, such as changing climate, and related increasing flooding in the city. The purpose of this research, therefore,
is to ensure community will be well prepared for changing climate events. Ultimately, the research may lead to closing the gaps between existing concerns of structural and non-structural approaches, macro level formal prevention, and mitigation programs and vulnerability reduction at the community level.

1.4. Research aim, objectives and questions

Flowing from the discussion above, the aim of this research is to develop an adaptation strategy that can be used to build resilience, and to mitigate impacts arising from physical events in poor communities in HCMC.

The research can be considered as a pioneering study of the urban poor facing external impacts, and it can help policy makers put in place environmental resilience measures for mega cities in Vietnam in the future. To achieve this aim, the following research objectives and related questions have been developed:

- **Objective 1:** To identify the vulnerability of the poor in a changing climate context, especially urban floods. This encompasses questions of:
  - What is the nature of natural hazards and impacts?
  - What is the different degree of vulnerability of men and women to negative impacts of floods and climate change events?

- **Objective 2:** To identify the coping strategies currently being used and planned (locally, nationally and internationally). This encompasses questions of:
  - What are the lessons from international local community on risk reduction/disaster management/adaptation activities?
  - How do the local authority and policy support the urban poor in flood prone areas?

- **Objective 3:** To examine the socioeconomic characteristics of the poor and vulnerable to environmental impacts in HCMC. This encompasses questions of:
  - How vulnerable is local community to increasing floods, related risks and natural hazards?
  - How are existing coping measures used in local community?
Objective 4: To identify how assets and coping strategies can be more effective and establish a draft framework for community based adaptation strategy. This encompasses questions of:

- What capacities can be built at a community level to cope with climate change, particularly rising sea levels and increasing urban floods?
- What integration can be made to establish an adaptation strategy for the urban poor, so that women can get involved and their advances can be taken for a successful strategy?

Objective 5: To assess professional responses to the draft framework and to revise the framework for an appropriate community based adaptation strategy.

These objectives are formed based on the main research question: “What is an effective adaptation strategy to support poor community to, at least, mitigate the natural hazards in Ho Chi Minh City of Vietnam?”

As discussed in the following section, a research approach was developed to achieve these objectives.

1.5. Research Approach

To explore each of the above objectives, the research was carried out in two urban poor communes in two different districts of HCMC, Vietnam over a period of five months. The research methodology is discussed in chapter 5, and details of research findings are presented in chapters 6 and 7.

Qualitative research is an important approach for an in-depth understanding of a research topic or phenomena (Wimmer et al., 2006). In order to understand the communities of HCMC, I have used a qualitative approach in the form of a case study for my research, which incorporates various approaches of data collection including in-depth interviews, face-to-face interviews, observation and participatory photography (as discussed by Gotschi et al., 2009).

Guiding this approach have been the comments of Rowlands (2005) who suggested that interpretive research assists the understanding of problems, the nature of reality and process. As this research required the collection of a range of data types, and had the purpose of explaining and understanding vulnerability, adaptation and community support mechanisms, then use of a quantitative approach has been important in presenting a general picture of social reality (Bryman et al., 2004). However, Walter (2010) points out that a combination of qualitative and quantitative approaches will provide a more
comprehensive image, because it generalises the wider population under research and, simultaneously, provides a deeper understanding and meaning of social processes. By using a combination of qualitative and quantitative approaches, it has been possible to examine the concepts relating to climate change and floods as well as issues of community, to produce a result that reflects the reality of community.

The research was designed with three main components:

- The literature review facilitates an understanding of the general concepts of climate change and how this impacts developing countries and the poor; and to examine international experience in community based adaptation practices;
- The primary data collection was carried out by conducting semi-structured interviews with community individuals and in-depth interviews with representatives from different government levels and professional groups working on urban flood control and climate change issues.
- The secondary data collection and analysis comprise legal, policy and program documents at local and national levels. These sources help to provide information on what strategy or measures are planned, and the directions of government. The purpose of analysis is to identify which adaptation measures are currently planned, to decide the extent to which community’s vulnerability, resilience and adaptation are reflected, and what needs to be reviewed or developed. These sources provided a key guide to my research.

Additional approaches for the primary data collection included ethnography, observation and participatory photography and these will be discussed in Chapter 5, which provide details of the research methodology.

1.6. Importance of the research

The twofold challenge that the Vietnamese Government currently faces is to implement effectively their National Target Program on Responding to Climate Change (Vietnam Government 2007) and Ho Chi Minh City Adaptation to Climate Change (HCMC People’s Committee,2012b). These plans have been designed without stressing the important roles of community and community voice concerning
preparedness and adaptation. This research will provide a valuable tool for local government, offering an appropriate strategy for planning and implementing more effectively flood control and risk reduction activities in HCMC.

Another contribution of this research is the integrated and coordinated approach in engaging a range of relevant stakeholders in planning and action. The vulnerability, bottom-up and community-based approaches are used to investigate the contribution of all relevant stakeholders for a stronger, resilient city.

In addition, different sectors of government, including the city, can refer to the research and its strategy as initial guidance to plan for their climate change adaptation programs and activities that comply with the Ho Chi Minh City Adaptation to Climate Change Plan issued in 2012 (HCMC People’s Committee, 2012b).

1.7. Thesis organisation

This thesis is organised into nine chapters, followed by a list of references and appendices. Following this introductory chapter, chapters 2 and 3 introduce background literature for the research by explaining the concepts of poverty, vulnerability, adaptive capacity, resilience and adaptation in the context of climate change. Vulnerability reduction and community based adaptation are presented as background to propose a strategy in chapter nine.

Climate change, risks, urban floods and vulnerability of Vietnam and Ho Chi Minh City are discussed in Chapter 4 to highlight the context of this research. Also discussed is the existing policy and implementation to cope with urban flooding in HCMC to emphasise the research gaps for the proposed strategy of this research.

Chapter 5 presents the methodology employed for the research. In broad terms examination of the case study approach provides an opportunity to understand vulnerability of urban poor communities and explain the choice of locations. Qualitative and quantitative approaches, in combination, are discussed to illustrate their application to the research. In addition, tools of the qualitative approach used during three months of field study, such as visual ethnography, participatory, observation and participatory photography, are described in this chapter.
This leads to chapters 6 and 7 where the research findings are presented. These two chapters focus on vulnerability context, adaptive capacity and resilience. The outcome of interviews with professionals, city and local officers are then addressed in chapter 8 to seek understanding of the role for institutional support. By doing so, this thesis is able to critically evaluate the existing adaptation activities at the community level and provide a base for a community based adaptation strategy.

The community based adaptation strategy presented in chapter 9 incorporates roles of local government, NGOs, media and mass organisations’ contributions to reduce vulnerability, improve wellbeing outcomes, and empower community in coping with urban flood and other natural hazards in HCMC.

Chapter 10 provides a synthesis of key elements in previous chapters and an overall conclusion and recommendations for further study and the contribution of this research.
Chapter 2

Understanding Urban Poverty

2.1. Introduction

Natural events cause catastrophes to people, especially the poor who do not have enough resources to withstand shocks and risks. This raises the question of what poverty means and how it relates to coping capacity of the poor. Importantly, we need to identify what resources people do not have and what linkages between resources and vulnerability so that appropriate tools and a new strategy can be recognized to help the poor deal with risks and hazards. In order to achieve a certain level of understanding and knowledge, it is necessary to start with a deep comprehension of how vulnerability is established and what measures can be taken to prepare the poor coping with shocks and risks.

In view of the above, this chapter provides a broad picture of poverty and its definition, especially within the urban context. The chapter is then followed by the discussion of the household capitals and of the need for a framework to improve livelihoods and reduce vulnerability. Different frameworks will also be presented to provide a justification for the research objectives.

2.2. Poverty at a glance

First, it is necessary to understand the concepts of poverty fundamental to any analysis associated with research. Initial discussion revolves around the definition of poverty in developing countries.

Initially, the World Bank (WB) introduced the concept of a poverty line to evaluate poverty. Under the poverty line of USD 1 per day, 95% of developing country populations (equivalent to 79.7% of the world population) were living under this line. In 2008 when the WB adjusted the poverty line to $1.25 per day, 1.4 billion people in developing countries, accounting for 21.7% of the world’s population, were classified as poor (WB, 2008a). Nevertheless, Chamber (1995) criticised this income-based evaluation because it did not reflect the reality of the poor and only attempted to simplify the dynamic and complex nature of poverty. Chamber argued that monetary measures are only one measure among
other approaches to comprehend poverty. In reality, poor people are also associated with a range of
deprieved and vulnerable situations such as low education, child mortality, powerlessness or
environmental hazards. These situations also emphasise the capacity of the poor to cope with risks
(Nunan et al., 1999; Rakodi et al., 2002). Chamber’s critique on the poverty line highlights the danger
of simplistic measures, and the potential inaccuracy of simply dividing populations into poor and non-
poor. Although Chamber’s initial concept of poverty and vulnerability was used to understand rural
poverty, the concept has been largely applied to analyse urban poverty (Moser, 1998; Rakodi, 1999;
Wood et al., 2000).

Chamber (1995) studied that poverty is multidimensional. He also observed that issues of tenure,
employment, financial insecurity, social networks and power have informed the poor’s livelihood.
Chamber explained that different household members would do a range of activities to sustain their
capabilities from different sources of income, food or other productive means. Chamber defines
livelihood as the social and material resources needed for a means of living and these dramatically
affect poor people. Rakodi (1999) reassured that a picture of poverty can be captured through the lens
of livelihood. Importantly, Rakodi (1999) examined the implications of poverty and the ability of the
vulnerable poor to respond to shocks and stress. With unexpected shocks, the poor become vulnerable
and they have to diversify their survival by means of food, water, shelter, clothing, health, education,
ownershop of land and other social services. These are main stressors when examining poverty.

In addition, the poor are powerless because they are excluded from the policy making process. In
effect, they are disenfranchised from the social safety net designed to assist them (Adger, 1998). It is
not to conclude that income and consumption are not important to understand poverty, but to highlight
the complexity of poverty as a set of capacities, assets and activities. As Carney (1998, p.2) noted:

Capabilities, assets (including both material and social resources) and activities

[are] required for a means of living. A livelihood is considered to be sustainable
when it can cope with and recover from stresses and shocks, and maintain or
enhance its capabilities and assets, both now and in the future, while not
undermining the natural resource base.
Ellen (1995) believed that poverty was basically a concept of vulnerability and entitlement, arguing that these concepts should be better understood to comprehend the cause and conditions of poverty. Kelly et al. (2000) defined vulnerability as the capacity of individuals and social groups to cope with external stress on their livelihoods and wellbeing. The characteristics of vulnerability comprise defencelessness, insecurity, exposure and risk. The concept of vulnerability has become a measure of resistance against shocks (WB, 2002). As people become more vulnerable, they become less resilient to shocks and stresses (Adger, 2007; Pelling, 2003; Wilson, 2012). Wilson (2012) also points out that vulnerability is based upon how well livelihood capitals is developed. Moreover, Moser (1998) emphasised that vulnerability can capture the dynamics of poverty. In his study, Moser (1998, p. 3) argued that vulnerability is “insecurity and sensitivity in the wellbeing of individuals, households and communities and implicit in this, their responsiveness and resilience to risks”.

The concept of entitlement is used to understand how poverty affects people, as they need the ability to command resources. Thus power is considered the main aspect of entitlement because people need power to be able to change a situation (Wratten, 1995). The voice of the poor is mostly forgotten in the political system that can potentially make them worse off. In reality, the poor have little negotiating power relating to their low status in society, and they are isolated from both society and the policy making process. Chamber (1989) reinforces that vulnerability and powerlessness are the most decisive factors in falling into the deprivation trap. Pelling (2003) adds that political disturbance is one of the threats for community survival and it also influences the resilience of the poor (Wilson, 2012).

These references capture a dynamic and complex picture of poverty. Poverty is not what outsiders can label, and thus we need to comprehend the vulnerable poor and their view on poverty to understand poverty (Wratten, 1995). The poor need more than cash and income to cope with poverty and vulnerability. For these reasons, other social indicators have been suggested in different poverty reduction programs to address the needs of the vulnerable poor. In order to examine urban conditions, this thesis will further investigate the dynamic aspects of poverty in the urban context. The following section will discuss urban poverty to highlight the vulnerability of the poor in cities.
2.3. Urban poverty

Cities are always considered as economic hubs to the poor. Ellis (1997) states the incentive to earn more always attracts the poor, who come to work and live in the cities. Rakodi et al. (2002) also emphasise that limited development of rural areas push people to urban areas for higher productivity and better income. However, as the infrastructure and policies of cities are not yet prepared to accommodate urbanisation, the security and stability of the urban poor are affected and they become vulnerable in cities (Ellis, 1997; Rakodi, 2002). Rakodi et al. (2002) also noted that while globalisation brings the opportunity to develop exports, manufacturing and services, and to increase productivity and wages in developing countries, it increases the urban population and number of cities. From a broader perspective, urban poverty is viewed as a lack of resources to sustain people’s livelihood including issues of competence and insurance in the labour market, lack of capital to cope with shocks or stress (Moser et al., 1996), safe and secure housing (Amis, 1997), inadequate education, healthcare and emergency services (Sattherwaite et al., 2007).

Ellis (1997) maintains that high cost of livings, congestion, powerlessness and those without a voice do not bring a better life for the poor in the cities. Most cannot afford to buy houses in well planned areas; they tend to live in cheap, low quality areas lacking adequate infrastructure and basic services. They also tend to live in affordable housing where they are close to income earning opportunities or family. For these reasons, the urban poor usually live in undesirable areas for residential purposes, or squat on undeveloped land where are likely to be unsafe and without services (Nunan et al., 1999). To the urban poor, living on cheap land close by to income opportunities is “a rational choice, despite the risk” (Wratten, 1995, p.21).

The city congestion and degraded services are more serious as the number of rural migrants coming to the cities continuously increases. Nunan (1999) highlighted that service improvement has been the main focus for a broad range of urban development projects in developing countries and has become the main indicator for urban development and urban poverty. Degraded infrastructure and inadequate services create vulnerability and reduce the capacity of the poor to recover from shocks. As the migrants usually gather in hazard prone and informal housing areas because of affordability, the use of
basic services, such as water supply, sewerage or garbage collection, has steadily increased and the system is overloaded. Improper waste disposal service, smoke and dust, and blocked drains are the main factors creating pollution in the cities. These factors create high risk contamination and rapid spread of infectious diseases in dense population areas (WB, 2012a). From these evidences, urban poverty can be characterised as having little or no infrastructure provision, and has poor transport access, overcrowded cities, inefficient land use and informal settlement. These further contribute to inequalities in income and wellbeing in cities (Rakodi et al., 2002).

As urban context is changing and uncertain, urban residents need to prepare themselves to cope with unexpected changes to city life. The urban poor employ various livelihood strategies to survive including living on loans or seasonal work in the informal sector. However, working in the informal sector makes the poor even more vulnerable as this sector is defined as “small scale, household based, insecure, legally unrecognised and untaxed work” (Watt, 2000, p. 103). Rakodi et al. (2002) argue that inadequate labour policies, reduced public sector spending and retrenchment have pushed the poor to unemployment, because of limited human capital and they have no choice but to join the informal sector. Amis (1997) also argued that the labour market correlated with urban poverty and vulnerability as people used their labour to exchange money. As people do not have the opportunity to participate in the formal sector, they work in the informal sector with irregular income. Another reason why the urban poor join the informal sector is the urban economy is based on cash flow, therefore, the need for cash to pay bills and food has forced the poor and their children to work in the informal sector with low incomes and high workloads. Wratten (1995)’s study reinforces this view that cities are more commoditised than rural villages and urban people rely mostly on cash and market exchange. Obviously, commercial exchange influences the local economy, housing and education. It puts more pressure on the poor when they depend on money to pay their expenses. They exchange their labour for money; however, their ability constrains their choice of employment (Wratten, 1995). Children may also have to drop out of school to earn cash in this sector. They work without social benefits such as insurance, healthcare or sick pay in the workplace, they miss out on their childhood, and they suffer lifelong health problems (Sanderson, 2000). Children are potentially at risk, as their
mothers may have to work long hours as well as doing the housework and cannot accompany them to school. Street children, drugs, alcohol abuse, domestic violence, depression and family breakdown can be seen as common phenomena of urban poverty.

Inadequate access to education is affected by human capital as it does not encourage higher levels of education. Studies have demonstrated that women usually have lower education than men in developing countries. The reason for children dropping out of school is their families cannot afford education costs such as uniforms, textbooks or tuition. In some cases, young girls have to stay home and take care of younger siblings because parents cannot pay tuition and their education is therefore discontinued (Alyson et al., 2008; UNESCO, 2000; Wratten, 1995). In addition, Alyson et al. (2008) noted that women have to take care of their children and in some places, such as Latin America, they have more restricted mobility than men.

Furthermore, inadequate healthcare and lack of emergency services are also factors that increase vulnerability of the urban poor. Incidents of infection and ill health are most likely to occur in congested areas. Disaster risks from flooding, heavy rains or extreme heat may occur more seriously in areas that are not adequately planned or serviced (Sanderson, 2000). Additionally, the vulnerability of social capital is amplified by the political system, as the poor are not really recognised in planning and operation processes (Norton et al., 2001). Norton and colleagues also noted that while urban residents rely significantly on basic infrastructure services, government service providers and policy makers are not always positive with regard to vulnerability mitigation in relation to improving services and access. As city planners do not understand the needs of the poor and/or their surviving strategies, policies of settlement and infrastructure negatively impact people’s income opportunities and cost of livings. The poor may be far worse off as they must pay more to the private sector because the government fails in service provision and renewal. Policy failure will bring more vulnerability to the urban poor.

This discussion indicates how urban poverty can be characterised. In the urban context, the poor often lack opportunities to secure income and business that creates vulnerability. Meikle (2002, p. 44)
referred to the “susceptibility of individuals, households or communities to sudden shocks or longer term stresses imposed by changing economic, environmental, social or political contexts”.

The nature of urban poverty is also linked to the resilience of an individual or a community in regard to their ability to recover from negative impacts. In this context, Meikle (2002) also suggested that resilience is closely connected to diversification of livelihood strategies and livelihood capitals. In other words, if the livelihood of the poor is enhanced, this will reduce their vulnerability. Thus, it is necessary to examine the relation between livelihood and resilience in the urban context.

2.4. Livelihood capitals in the urban context

Carney’s (1998) definition of livelihood is focused on the idea of livelihood that affects the resilience of an individual or a community, by way of the productive means in which an individual or group of people diversify their livelihood activities. Meanwhile, household capitals or household assets are also considered as family savings to be stored, accumulated or exchanged for generating income and other benefits (Moser, 1998; Rakodi, 1999). Nevertheless, Chamber (1995) distinguished household capitals into two types of assets: tangible and intangible. Meikle et al. (1999) argued that these assets act as a buffer against vulnerability. The importance of each will be determined by a different context, such as economic, political, social or environmental, and they are the key to creating access to capitals for the poor (Meikle, 2002). Rakodi et al. (2002) also added that a household’s livelihood is based on availability of capitals. Natural, physical, human, financial and social can withstand vulnerability (Carney, 1998).

DFID (1999) visualises interrelationships between such capitals by using a pentagon, the shape of which represents the variation of access to capitals (figure 2.1). The lines meet at the centre of the pentagon and represent zero access to capital. The outer perimeter reveals the full access to capitals. Different shapes can be drawn for the visualisation of capitals, depending on variation in community and household makeup. As capital endowments are constantly changing, shape of a pentagon is also steadily fluctuating (DFID, 1999). However, Rakodi et al. (2002) points out that there is trade off in these capital interrelations Wood et al. (2000) illustrate that the rationale of the pentagon shows
people’s wealth rather than their needs. From a broader perspective, however, the DFID (1999) suggested:

“In order to develop an understanding of these complex relationships, it is necessary to look beyond the assets themselves, to think about prevailing cultural practices and the types of structures and processes that transform assets into livelihood outcomes” (p.5).

Figure 2.1 The asset pentagon (adapted from the DFID, 1999)

The definitions of each capital in the above figure and their links to urban poverty are examined below.

**Human capital** is defined as the capacity to support income generation activities such as labour and education. Knowledge and education are considered as secondary priorities because they help find better income. In rural areas, households with better education will receive higher farm income and diversify their labour away from farming activities (Fafchamps *et al.*, 1997). For urban dwellings, human capital is crucial in terms of education and training, because it “affects the ability to secure a livelihood more directly in urban labour markets than in rural areas” (Rakodi, 2002, p.10). However, the poor usually do not have money for education and higher education does not always equate to higher income. Access to the job market is a determining factor for income (Narayan *et al.*, 1999). Labour is the biggest survival component in human capital and people need good health to provide labour. Therefore, health factors relate closely to labour as “illness removes individuals from the labour pool and can push a household into poverty” (Narayan *et al.*, 1999, p.42). In addition, when
social protection policies are inadequate, a family member’s sickness will bring financial burden to the entire household. If the main income earner of the household is the one who is unwell, the entire family will become vulnerable.

**Social capital** is defined as the community network used to support livelihoods. Narayan *et al.* (1999, p.44) defined “Social capital [as the capital that] broadly refers to the benefits of membership within a social network. The accessibility of additional resources via social connections enables poor people to meet [their] everyday needs”.

Due to insufficient or inadequate social protection, the poor tend to seek help from friends, neighbours and extended family. Through this network, they can find resources to help them recover from environmental catastrophes, financial woes or unemployment. Narayan *et al.* (1999) commented that although social capital significantly reduces the burden on the poor, it does not help the poor escape poverty. Moreover, it is a “two-way street, membership entails having claims made upon one’s own resources” (Narayan *et al.*, 1999, p.45).

Broadening the discussion, Devas (2002) highlighted that political capital is completely essential to the urban poor because their life is influenced by policies. Political capital should be separated from social capital in issues of urban governance including land use and development, regulations of local trading and economy, service operation and pricing (Gasper *et al.*, 2011; Tanner *et al.*, 2009). However, as politicians, including policy makers and planners, may have limited knowledge on the dynamics of urban poverty, these policies can be inadequate and increase vulnerability (Devas, 2002). In this regard, political capital is included in social capital as their boundaries are blurred (Wilson, 2012).

**Physical capital** refers to infrastructure, tools, equipment, savings (including personal belongings and jewellery), vehicles or housing, of which housing is used as a productive asset in the urban context. Rakodi (2002) and Satterthwaite (2003) argue that infrastructure and location directly engage with income generation because they impact labour, health, commuting time and access to income sources. Neefjes (2000) pointed out that in certain contexts, physical capital can be understood as “human made capital” as it is built by knowledge and need. Land ownership and access to land are key issues
Financial capital includes all available financial resources to secure livelihoods. In rural areas, any productive means can be considered as financial capital. On the contrary, the urban poor consider cash income is most critical to their livelihoods. Baharoglu et al. (2001) explained that farmers can survive on the availability of natural sources, while the urban poor depend on cash to buy goods and services in cities. For this reason, it provides savings and investments as forms of financial capital for urban residents. In addition, as people need cash or funds for daily expenses or investment, credit has become an important factor, especially for the urban poor. In the cities, housing is considered as a productive asset of the poor, as they can rent their rooms or open a small business selling drinks or food to neighbours (Narayan et al., 1999).

Natural capital refers to natural resources such as land, water, trees or forests. Devas (2002) noted that access to land and secure tenure are also considered as natural capital. Nevertheless, this access tends to define natural capital in a rural context, as people regard this as subsistence. Although access to land and housing is a major issue for the urban poor, it is uncertain as to whether urban land can be conceptualised as natural capital. Therefore, urban poverty does not include natural capital in livelihood capital (Rakodi, 2002).

2.5. Livelihood frameworks

There has been an increase in the discussion of livelihood and capital in the literature. As livelihood can be considered as a means of living, the poor categorise their means of living based on what they need in order to sustain their livelihoods. Access to capitals, discussed above, has become an important part of their means of living. Livelihood analysis attempts to understand the nature of poverty, the economic portfolio, household capitals and livelihood strategies and outcomes (Moser, 1998). Livelihood strategies can be seen in the form of household capitals that people utilise for their
survival and which are influenced by policies and cultures. People use their existing capitals to exchange for more resources and capital is viewed as input to livelihood strategies as well as livelihood outcomes (Norton et al. 2001). Hence, the livelihood approach has been constructed to identify access to these five components to build capitals for the poor, even with regard to policy intervention (Norton et al. 2001). In other words, the livelihood approach is a framework combining these components of capitals, which strengthen people’s capability (Moser, 1998; Rakodi et al., 2002; Robert, 1995).

The livelihood framework allows for an analysis of the relationship between individuals, households and institutions. It is used to combine the quantitative and qualitative nature of poverty. As its usefulness to understand the roots of poverty, it has been used by international development agencies for either analytical frameworks or program planning and assessment (Krantz, 2001). However, the concepts have been interpreted differently by individual organisations.

DFID (1997), for example, has engaged the definition of sustainability to livelihood approaches which highlight capabilities, capitals and activities used by the poor to cope with, or recover from, stress and shock in the short and long-term vision. Also, other institutions, such as CARE, Oxfam Great Britain and UNDP, have adopted different versions of livelihood framework to develop their own sustainable livelihood approaches and integrate them into worldwide poverty reduction worldwide programs (Carney et al., 1999; Hussein, 2002). Nevertheless, these frameworks share a common goal, which focuses on people’s participation to build their livelihoods and to improve related policies. The outcome of these frameworks is to create more participation, more income, increased wellbeing, reduced vulnerability, improved social equity and more sustainable environmental resources (see table 2.1). It puts a spotlight on the important role of government and different organisations to influence livelihood strategies and sustainable outcomes under shock, stress and seasonality (comprising nature and environment, markets, politics and war). In addition, a similar emphasis on policy and governance as the driving force to livelihood strategies is evidenced in all sustainable livelihood frameworks. In general, these frameworks have similar elements regarding capital, policies and institutions, and livelihood strategies and outcomes (Twigg et al., 2007).
Among these livelihood frameworks, the DFID sustainable livelihood framework is widely used to identify, understand and analyse the main factors affecting livelihoods, and their interrelationships so that appropriate objectives and interventions can be proposed and the trade-off between outcomes can be assessed (Andjelkovic, 2001).

Table 2.1 Different livelihood frameworks applied by international agencies

<table>
<thead>
<tr>
<th>Agency</th>
<th>Analysis procedures</th>
<th>Types of activity</th>
<th>Asset categories</th>
<th>Core principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARE</td>
<td>Identify potential geographic area; vulnerable groups and livelihood constraints;</td>
<td>Livelihood protection, promotion and</td>
<td>Human Social Economic</td>
<td>Household livelihood security and people-centred</td>
</tr>
<tr>
<td></td>
<td>Near poor live in poverty, with high levels of population</td>
<td>provisioning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DFID</td>
<td>Social poverty analysis; Livelihood and institution analysis; Partnership analysis</td>
<td>Poverty elimination and rights</td>
<td>Human Natural Physical</td>
<td>People-centred Multi-level partnership</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Link to rights and sector approach</td>
<td>Financial</td>
<td>Various types of sustainability Dynamic poverty focus</td>
</tr>
<tr>
<td>Oxfam</td>
<td>Focus on monitoring and evaluation participation of various stakeholders</td>
<td>Strategic planning activities</td>
<td>Human Social Natural</td>
<td>People-centred Multi-level partnership</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Physical Financial</td>
<td>Various types of sustainability Dynamic sustainability focus</td>
</tr>
<tr>
<td>UNDP</td>
<td>Participatory assessment of risks, assets, knowledge and adaptive strategies</td>
<td>A conceptual and programing framework</td>
<td>Human Social Natural</td>
<td>Adaptive strategies Conditioning factors</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Physical Economic Political</td>
<td>(i.e. shocks and stresses that affect asset use)</td>
</tr>
</tbody>
</table>

Source: adapted from Carney et al. (1999)

2.6. Sustainable Livelihood Framework of DFID

Using the abovementioned five components of livelihood capital, the DFID framework argues that sustainability can only be achieved if the dynamics of poverty are focused and improved. The framework starts with the vulnerability context of the poor and their livelihood capitals. People’s vulnerability is framed within three main categories: trends, shocks and seasonality. Of these, trends are at a more macro level and cover population, economics and governance. Shocks are more directed to external contexts including natural hazard induced shock, human health shock or financial shock. Seasonality is mainly related to pricing, production or employment opportunities. Twigg (2001) noted that vulnerability factors directly impact the poor, as they can force the poor to discard their capitals or eliminate options of livelihood to cope with hardship. In essence, resilience is considered as important to build sustainable livelihoods for the poor (Twigg, 2001).
The framework then introduces the determining factors (policy, institutions and processes) for access to, and use of, capitals to improve livelihoods. These factors shape livelihood and help to understand influencing factors regarding the poor’s choice of livelihood strategies (e.g. consumption, production or income generating activities), and strengthen the positives and mitigate the negatives of livelihood strategies. The strategies adopted define whether individuals or households have more or less wellbeing (Rakodi et al., 2002). These outcomes reduce vulnerability and they are considered as sustainable if they increase income, wellbeing, food security and a more sustainable use of natural resources. DIFD’s livelihood framework tends to simplify the complication of reality; however, it also provides a lens to examine and understand the poverty context and its influences (Rakodi et al., 2002).

This livelihood framework is used to analyse hazards and disaster awareness, trends, seasonality and shocks from the climate change context, in which resilience is considered to be an important factor for livelihood sustainability (Twigg, 2001). The framework highlights the link between poverty and conditions of natural environment that provide a guideline for this research, as adequate environmental management is crucial to obtain a sustainable livelihood in these communities.

2.7. Summary

This chapter explored the concept of poverty based on social indicators to address the needs of the poor. In the urban context, these social indicators are characterised as livelihood capitals to examine their dynamics and interrelations. The variation of each capital component was also presented in the capital pentagon. Livelihood frameworks applied to poverty reduction were introduced as tools to analyse the relationship between individuals, households and institutions and vulnerability. Among these livelihood frameworks, the DFID sustainable livelihood framework and its capitals are highlighted for this research. This framework introduces guidance to analyse pressures from hazards to poor people, trends, seasonality and shocks under climate change (see the case study presented in chapters 6 and 7). The following chapter will introduce the concepts of vulnerability and community based adaptation.
Chapter 3

Vulnerability and Community Based Adaptation

3.1. Introduction

This chapter analyses key concepts of vulnerability and community based adaptation in relation to climatic hazards. The theoretical framework of vulnerability reduction and community based adaptation is also examined to emphasise the importance of local adaptation in coping with natural hazards.

The chapter begins by reviewing vulnerability and adaptation literature to fully understand the meaning of adaptation. The two key interpretations of vulnerability are discussed: starting point and end-point vulnerability. The former interpretation refers to social aspects of vulnerability and underpins the concept of community based adaptation. Also discussed is the non-structured approach which supports the key concept of starting point vulnerability to address adaptive capacity, of which gender is one of the main contributors. This chapter therefore, provides understanding as to why gender should be mainstreamed into policy of local adaptation, and further discusses the lessons learnt from community based adaptation projects to shape the proposed adaptation strategies (see chapter 8).

3.2. Vulnerability definition

The concept of vulnerability is multifaceted and variously interpreted in the context of climate change (Brooks, 2003; Füssel, 2007; IISD, 2003). While different interpretations of vulnerability were suggested, two main definitions adopted the concepts of “end point” and “starting point” livelihood impacts of climate change to examine the vulnerability of community (Ensor et al., 2009; Kelly et al., 2000; Smit, et al., 2000). The key conceptual differences in the two interpretations of vulnerability were explained by Füssel (2007) as the “end point” concept is based on the risk-hazard approach to estimate the impacts after a hazard, whereas “starting point” vulnerability recognises the importance of livelihood activities, coping strategies, and by Ensor et al. (2009, p. 15) as “the possibility of change to the social, political, economic and environmental characteristics of a community”. Füssel (2007) also
pointed out that technical adaptation and natural science tend to be associated with end-point vulnerability, as adaptive capacity decides vulnerability level.

Table 3.1 summarises the differences between these two interpretations of vulnerability. These interpretations are important to understand community vulnerability and adaptive capacity that help build strategy later in capacity that will help build the strategy later in this thesis.

### 3.2.1. End-point vulnerability

Table 3.1 Interpretations of vulnerability (adapted from Fussell, 2007).

<table>
<thead>
<tr>
<th></th>
<th>End point</th>
<th>Starting point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root problem</td>
<td>Climate change</td>
<td>Social vulnerability</td>
</tr>
<tr>
<td>Policy context</td>
<td>Climate change mitigation, technical adaptation</td>
<td>Social adaptation, sustainable development</td>
</tr>
<tr>
<td>Vulnerability and adaptive capacity</td>
<td>Adaptive capacity determines vulnerability</td>
<td>Vulnerability determines adaptive capacity</td>
</tr>
<tr>
<td>Main discipline</td>
<td>Natural sciences</td>
<td>Social sciences</td>
</tr>
<tr>
<td>Meaning of vulnerability</td>
<td>Expected net damage for a given level of global climate change</td>
<td>Susceptibility to climate change and variability as determined by socioeconomic factors</td>
</tr>
<tr>
<td>Starting point of analysis</td>
<td>Scenarios of future climate hazards</td>
<td>Current vulnerability to climate stimuli</td>
</tr>
</tbody>
</table>

From a broader perspective of vulnerability, climatic hazards were classified into two forms, in which those relating to “physiological effects of crops, changes in disease vectors or changes to land, soil and water quality and quantity” are called biophysical impacts (Ensor et al., 2009, p.13). Biological impacts are considered as residual adverse impacts and they can be measured as a potential cost of climate change (Ensor et al., 2009; Hay et al., 2003). For example, climatic impacts, increasing population and intensive cultivation have damaged good quality land and threatened food insecurity in Pacific Island regions (Hay et al., 2003). As such, vulnerability is determined by exposure characteristics and thus adaptation is proposed as technological measures to minimise projected biophysical impacts (Kelly et al., 2000). Ensor et al. (2009) defined vulnerability as end-point livelihood impacts that seek to measure the effectiveness of a specific adaptation option rather than assess the context of vulnerability. Adger (2006) also noted that end-point vulnerability stemmed from natural hazards research since the 1960s and 1970s and underpinned by human ecology. These references have shed light on the relation of end-point vulnerability to human ecological perspectives and therefore the way humans use /change the physical environment causes vulnerability. Reducing
vulnerability involves engineering measures, such as banks, levees or dykes, or the natural events system to be modified (Burton et al., 1978).

### 3.2.2. Starting point vulnerability

In contrast to end-point vulnerability, the interpretation of starting point vulnerability focuses on examining community characteristics to identify vulnerability elements. Given the fact that starting point vulnerability relates to non-climate factors and processes, vulnerability reduction is indistinguishable from poverty reduction, local livelihood improvement and public service development (Huq et al., 2007). Within these activities, adaptive outcomes have been identified in different forms of food security, sustainable livelihoods or community development (Smit et al., 2006). In other words, starting point vulnerability emphasises non-climate factors and processes that people cannot cope with or adapt to (Ensor et al., 2009). This view is reinforced by the definition of social vulnerability by Kelly et al. (2000, p.325) that underpinned the level of capacity to cope with, or adapt to, any external stress placed on livelihoods and wellbeing. Starting point vulnerability considers people as active agents who are able to adapt or withstand natural hazards (Blaikie et al., 2004). Eriksen et al. (2007) highlighted the essence of strengthening people’s capacity to respond to natural risks rather than treating affected people as passive victims. Starting point vulnerability also determines adaptive capacity and focuses on what shapes people’s ability to cope with stress and shocks (Brooks, 2003). Ensor et al. (2009) and Blaikie et al. (2004) implied that vulnerability and adaptive capacity are closely linked, and improved adaptive capacity will reduce vulnerability and vice versa. In this context, climate change is a trigger to sustainable development, as it increases the urgency of good practice to reduce the vulnerability of the poor (Wilbanks, 2003). Adaptive capacity and resilience to climatic vulnerability will be discussed further in section 3.4 below.

### 3.3. Reducing vulnerability

This section presents the general viewpoints of the capacity of the poor to adapt to natural risks and shocks. Main definitions of adaptive capacity and resilience are presented to understand more about different approaches toward climate change adaptation discourse. The determinants of adaptive
capacity are discussed to highlight the importance of non-structural adaptation measures and women’s participation in local adaptation.

### 3.3.1. Adaptive capacity and resilience

The concept of adaptation appeared when Charles Darwin introduced the theory of “natural selection” that has been employed in social science as “a synonym for response to social, economic and technical as well as environmental change” (IISD, 2003, p.2). In climate change discourse, the question is “adaptation to what?” (Smit, et al., 2000) has been interpreted into different issues of climate change, climatic vulnerability or climate opportunities. In social science, adaptation highlights the role of government at different levels, with communities or individuals, and requires partnership (IISD, 2003).

Adaptation is concerned with “cultural practices that allow societies to survive” and cultures (or societies) which are able to respond to or cope with changes quickly and easily are considered to have high “adaptability” or “capacity to adapt” (Smit et al., 2006, p.283). It is highlighted that culture plays an important role in adaptation and it decides the success of an adaptation plan because different communities will have different cultures and practices. Therefore, “changes should be rooted in or build on local culture” (Ensor et al., 2009, p.34).

Adaptability here is synonymous to adaptive capacity as they bear same meaning of “ability to become adapted (i.e., to be able to live and to reproduce) to a certain range of environmental contingencies” (Harry, 2009, p.300; IPCC, 2001; Smit et al., 2006). In climate change discourse, adaptation is associated with adaptive capacity and resilience as it highlights vulnerability reduction.

From these considerations, adaptive capacity is derived from the concept of “capacity” in the climate change context and refers to resources, assets’ availability and socio-political structures that distribute resources to people (Blaikie et al., 2004; Ensor et al., 2009). As the starting point, vulnerability focuses on the ability of people to respond to natural hazards, and commonly refers to adaptive capacity (Adger et al., 2004). The assets defined in adaptive capacity and vulnerability, as mentioned previously, are tangible and intangible capital, including natural capital, physical capital, human capital, financial capital and sociopolitical capital (Bryan et al., 2013). Ensor et al. (2009) identified the
main elements of adaptive capacity which are skills, access to livelihood capital, and the ability to experiment and to learn from other communities or professional institutions. These are highlighted by social networks, technical advice, awareness and institutional support. Berger also emphasised the role of social capital in helping communities become agents of change in climate adaptation. Adaptive capacity can be built from social capital that can strengthen the community’s confidence and increase their skills to cope with unpredicted climate events (Ensor et al., 2009). These elements contribute to the approach taken in this thesis to understand community vulnerability.

Resilience is defined as “the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation and to adapt to stress and change” (IPCC, 2007, p. 880). In addition, Dodman et al. (2010) suggested considering resilience as a process that enables coping ability and addresses livelihood constraints. However, adaptive capacity is underpinned by resilience, considered as the ability to cope with shocks in the climate change context. Harry (2009) noted that there is little consensus to the relationship between resilience and adaptive capacity. Ensor et al. (2009) argue that adaptive capacity and resilience are interrelated as adaptive capacity can support the ability to cope and recover and vice versa.

Adger et al. (2004) and Smit et al. (2006) state that the determinants of adaptive capacity and resilience largely depend on particular climate change impacts and local context including social institutions and networks, governance structure, risk perceptions, skills, local knowledge, information and health. The interpretation of starting point vulnerability relates closely to adaptive capacity and resilience, as it sheds light on reducing exposure to hazards and building capacity and resilience. The starting point also emphasises the road map for an Adaptation Policy Framework (AFP) suggested by Michael (2008), as vulnerability led adaptation strategies.

These considerations lead to the four main principles for vulnerability led adaptation which are used in this thesis and based on the themes of Michael (2008, p.1):

- Adaptation to short-term climate variability and extreme events serves as a starting point for reducing vulnerability to longer term climate change.
• Adaptation policies and measures are best assessed in a developmental context.
• Adaptation occurs at different levels in society including the local level.
• Adaptation strategy and the process by which it is implemented are equally important.

IISD (2003) noted that these principles have been adopted for national adaptation plans in developing countries, as they imply the importance of a community based approach and assist poor communities’ ability to cope with natural shocks. They mainstream adaptation needs into policies and practices “by linking climate change adaptation to the closely related issues of natural resource management, disaster prevention and people’s decisions and choices at the local level, especially those that affect the livelihoods of the poor and the most vulnerable” (IISD, 2003, p. 11). In other words, the preferences focus on non-structural measures rather than infrastructure based intervention. Berger (2009) emphasised that if vulnerability is high, an adaptation response should concentrate on vulnerability reduction to reduce the risk of maladaptation. And in particular, the community based approach enhances people’s livelihoods and this should be recognised (IISD, 2003).

3.3.2. Importance of the non-structural adaptation measure

Vulnerability is considered as a complex socioeconomic and political process that influences how people are affected by natural hazards, and therefore it refers to the policies and activities that minimise impacts in the future (Blaikie et al., 1994). In the climate change context, such as rising sea levels and drought, approaches used are categorised into two types: “structural” and “non-structural” measures. The structural approach includes engineering interventions, such as walls, dams, dykes, levees and reservoirs. However, these “tend to increase disaster risk over the long term” (Kelman et al., 2010, p. 35). By contrast, a non-structural approach refers to policies, development of knowledge and awareness and encouragement of participation (Few, 2003; Ranganathan et al., 2011). Jha et al. (2012) point out that these two measures do not preclude, but support each other in coping with rising sea levels and climate change. However, structural measures share a common characteristic of transferring flood risk from one location to another. In addition, Blaikie et al. (2004) points out that it is costly to implement construction activities that may not be affordable to developing countries. In addition, without proper management and application, these measures may not be sustainable. Blaikie
et al. (2004) argued that disaster risk and vulnerability depend on the context of political and economic systems, as these factors decide different impacts on different social groups. From this viewpoint, they suggested to shift the focus from building artificial levees, embankments or walls to adapting to floods (living with floods) and reducing people’s vulnerability. Ranganathan et al. (2011, p.11) support these viewpoints by stating that “non-structural measures are well placed to serve both disaster risk reduction and climate change adaptation”.

Moreover, Jha et al. (2012) implied that structural measures are not appropriate responses and cannot eliminate flood risks. For this reason, non-structural measures are considered to be the first crucial steps taken to protect people:

Often [non-structural measures] are described as ‘soft’ solutions, non-structural approaches are defined as measures which are designed to keep people away from flooding and to reduce the impact of flooding on those people and assets still exposed to risk. They generally require little in the way of construction of physical infrastructure, and may therefore be less costly and quicker to implement than structural measures. In some circumstances, non-structural solutions can prove to be the most effective method of avoiding flooding and reducing its consequences. (p.292)

At the community level, non-structural measures are linkages between natural hazards and livelihoods. They form grassroots based disaster preparedness and thereafter, local adaptation always concentrates on vulnerability, livelihoods, coping and adaptation capacity (Australian Government, 1999). Jha et al. (2012) suggested the application of non-structural measures such as improving the connection between different communities, improving land use planning and regulations, and raising public awareness on risks and public health.

3.3.3. Mainstreaming gender into policy of local adaptation

As mentioned in section 2.3, women and girls tend to be more vulnerable in coping with natural events due to their roles and responsibilities in family and society. Lambrou et al. (2006) pointed out those issues of caring for ill family members, food security, water use and nutrition have impacted more
severely on women than men. Although men and boys experience vulnerability, it is important to engage women and girls in policy to enhance gender equity in the climate change context.

Having said that, it is not necessarily to encourage women to only support climate change policy as both men and women take on new roles and responsibilities to adapt; focusing exclusively on women’s activities can exclude relevant dimensions of their livelihood strategies (Lambrou et al., 2006). Not only should gender balance be considered, the local knowledge of both men and women needs to be integrated into strategies of adaption, mitigation and resilience (Dankelman, 2002).

However, in disasters, women and children are much more likely to die than men, and these deaths are connected closely to women’s socioeconomic rights and entitlements (Lorenan, 2008). Therefore, it is necessary to consider promoting equality to women in regard to income and opportunity, as these matters are important to strengthen women’s adaptation capacity (Dankelman, 2002; Lambrou et al., 2006; Project, 2001).

In practice, women play active roles in reducing risks and building resilience. Masika et al. (1997) argue that women have greater involvement in environmental management and related activities, as they manage household activities relating to environmental degradation. For example, kitchens, gardens, water installation or land regeneration are mostly managed by women. In addition, Masika et al. (1997) also illustrates that women in Chile wet and dampen roads or sidewalks to reduce the spread of dust, bag all household waste and/or secure garbage from animals and vermin. UNDP (2009) points out that these women can protect their environment by reducing pollution, controlling erosion of canals and improving agricultural outputs. The UNDP also presents an example of empowering women’s role in Bangladesh, as floods impact hundreds of thousands of people, who lose their lives and/or houses. In this case, women could organise shelters, helping with remedies and providing care.

Masika et al. (1997) also highlight that women have greater engagement with environmental management; for example, pollution can be reduced as women contribute to cleaning up waste sites in Mali, advocate for environmental friendly products in Europe, use energy more efficiently or even promote environmental interests in India. Lorenan (2008) also adds that women’s participation is critical, as they can improve or weaken climate change related programs such as energy consumption,
deforestation, burning of vegetation, population growth, policy making and economic growth. However, Alyson et al. (2008) comments that women are clear about what they need in order to adapt to climate change, but they do not have access to income diversification, formal employment, skills, knowledge, tenure of rights or ownership.

These examples discuss the important role of women, as they are “not just helpless victims of climate change – women are powerful agents of change and their leadership is critical” (Lorenan, 2008, p.3). Lambrou et al. (2006) also emphasise that very poor women may have a higher adaptive capacity as they have intimate knowledge of their natural environment.

In regard to the importance of mainstreaming gender relations into adaptation, mitigation and resilience planning, Rivero (2002) suggested to link women’s gender specific needs to participatory and policy making processes. In particular, Davis (2005) proposed that activities of capacity building, micro planning and livelihood security would help women develop alternative livelihoods, improving their health and skill base.

3.4. Community Based Adaptation

This section will present the theory and outline the reasons as to why community is essentially chosen for adaptation planning. It also justifies the objectives for choosing community as the main objective for research. Furthermore, the core issues to make up a successful community based adaptation plan are introduced as the main referral for the proposed strategy in chapter 9.

3.4.1. An overview of CBA theory

The definition of community is varied, depending on perspective. Shaw (2006) considers community is where people live together, share feelings of belonging and have faith that their needs can be met with the help of others. With regard to climate vulnerability, “community includes not only people living in a certain location, but also incorporates the local government, local business sectors, local academic bodies and non-government organisations” (Batterbury et al., 2011, p.3).

As the poor have to take higher risks to secure their living, they are more vulnerable. In poor communities, climate vulnerability depends on multi-dimensional factors such as social networks,
institutions, gender and beliefs (Blaikie et al., 1994, 2004; Cutter et al., 2003). Although it is recognised that the role of community is to recover, the conceptual features of community based adaptation are diversified. Each CBA approach, for example, tackles different issues such as building adaptive capacity and resilience, engaging a participatory approach, increasing local voice to have influence in the decision-making process, considered cultural practices and utilising local knowledge, perceptions, priorities and capacities (Allen, 2006; Huq et al., 2007; Reid et al., 2009). CBA then is defined with the characteristics of collective action, social capital, integration of local knowledge and perceptions of climate change into planning processes, community empowerment, community needs and livelihood benefits (Bryan et al., 2013).

On the other hand, it is hard to distinguish between community development and CBA as both focus on community empowerment and vulnerability reduction (Allen, 2006). However, the literature suggests that CBA is more integrated with sustainable development that addresses the inefficiency of a top-down approach and the social vulnerability of starting point vulnerability mentioned above (Ayers, 2009; Ensor et al., 2009; Huq et al., 2007; Reid et al., 2009).

Bryan et al. (2013) believe that adaptation could affect the wellbeing of people. Therefore, these scholars suggested a CBA framework addressing starting point vulnerability and strengthening local resilience presented in Figure 3.1. In this framework, the context of vulnerability is sharpened using the Sustainable Livelihood Framework discussed in the previous chapter. This framework highlights livelihood capital, sensitivity of physical and ecological systems, community’s access to information about climate risks and appropriate response and the context of institutional environment (Bryan et al., 2013).

In particular, the cooperation between external agencies, local organisations and governance institutions is highly emphasised as an “adaptation arena” to increase the ability of different actors to withstand climate vulnerability, and to cope with risks and damages. All resources should be utilised and linked together as “these linkages provide local communities with access to funding, inputs,
training, and other support for adaptation so that the burden of adapting to climate change does not fall entirely on the communities themselves” (Bryan et al., 2013, p.11).

3.4.2. The importance of CBA in climate vulnerability reduction

At the macro level, adaptation approaches comprise flood warning systems, evacuation programmes, land use control for flood prone areas, building regulations to prevent incursion of flood water and insurance systems (Chan et al., 1996). Since macro level adaptation is usually top down, inadequate and non-empirical at the community level, it is suggested to use the actual observation on current climate risk, adaptation strategies, policies and measures in order to identify empirical measures for climate change adaptation (Australian Government, 1999). This is consistent with Blaikie’s (2004) suggestion to observe hazard vulnerability and resource access so that coping strategies can be highlighted. However, a successful CBA needs to have an integration between top-down and bottom-up approaches as “adaptation requires collective action and coordination between multiple scales, from the local to the international, with significant linkages between institutions at the various levels” (Bryan et al., 2013, p.3).

At community and household levels, different traditional measures have been applied to cope with natural disasters such as using bells as warning system in Pakistan, building houses on stilts or plinths
in Malaysia, diversifying livelihoods, mobilising the community network to provide shelters in Bangladesh (Chan et al., 1996; Davis, 1994). These adaptation activities are only effective if they are carried out at the community level. Bryan (2013) pointed out that autonomous adaptation undertaken by individuals would only increase the vulnerability of other community members. Therefore, Wisner (2003) states that capacity of community as a whole is crucial to ascertain exposure levels in extreme events. In addition, CCFSC (2007) also notes that adaptation planning based on community priorities and capacity will empower community to cope and to plan for natural hazards. This view of community based adaptation was reinforced when Adger (2003) started to examine community vulnerability and assess community capacity in his studies. Although community may not have perceptions of reality, their viewpoint should be considered and incorporated in risk reduction initiatives (Davies, 1993).

Overall, the literature highlights that vulnerable communities can become resilient if adaptation “enables people to express their real needs and priorities, allowing problems to be defined correctly and responsive measures to be designed and implemented” (Batterbury et al., 2011, p. 3).

3.4.3. Community Based Adaptation Strategy – Some Successful Examples

Whether natural disasters are minor or major, people are directly impacted and suffer. From his case studies in Asia and some other developing countries, Shaw (2012) has proved that community participation will be of benefit to people at the community level and encourage them to be main actors. Shaw also states that community participation will help focus on specific needs of a community, and adapt and develop local measures to more sustainable livelihoods, of which innovation is the key point to success. In areas where public services are not adequate, community initiatives will transform the environment and improve local quality of life (Pelling, 1997). For instance, the city of Kobe, Japan can only recover and create a safer environment if government cooperates with community, balancing human interaction and education (UN et al., 2012).

Engaging community risk management plans decreases significantly the requirement for external resources and helps effectively deliver emergency services to people. As an illustration, Colten et al. (2008) supported this notion by demonstrating the failures of New Orleans City in Hurricane Katrina,
where community goals and priorities had not been taken properly into account. The different goals and priorities had caused conflicts between groups and other stakeholders “because they cannot be given equal attention in time, resources, and values” (Colten et al., 2008, p. 24). Few (2003) also affirms that if the community’s coping response is strengthened, this will help reduce health and socioeconomic risks for people. In addition, in order to be successful, engagement of different local stakeholders or implementers is also important. This view is reinforced by the findings of Shaw (2006) about the important roles of local institutions in Vietnam and Bangladesh, to sustain community initiatives, integrate community initiatives in policies and engage community effort in the implementation process. Community participation will increase levels of preparedness and create local awareness, while the involvement of local partners will motivate community to undertake tasks for their own safety, ensuring the success and sustainability of any risk or disaster preparation and management activities (Asian Disaster Preparedness Center, 2008). From a broader perspective, community knowledge plays a vital role in community participation. Local knowledge is “the result of a continuous process of experimentations, innovation and adaptation” (Shaw, et al., 2011a, p. 7) and therefore, it is significant to understand local practice and knowledge for adaptation in the climate change context.

In communities that have limited capacity and resources, the poor have already addressed impacts of natural risks by themselves. Informal actions such as repairing roofs, building stronger foundations, digging trenches to clear water, clearing drainage or planting trees in their houses are sophisticated, and should be takes into account in planning, implementation, evaluation and monitoring for disaster risks and preparedness (Parkinson, 2003; WB, 2012a).

Examples of local initiatives and actions abound in the flooded community of Georgetown, Guyana. For example, a local church group coordinated the construction of a raised public walkway with local labour and finance (Pelling, 1997). Pelling (1997) also highlighted another example of a community-based organisation named West Sophia Developers Group that has formed to coordinate regular drain digging and maintenance activities. This group also managed bridge construction and raised dwellings in flooded communities. In Bolivia, under conditions of heavy rains and flooding, with communities
lacking support from local government, each community elected two representatives to create an association supporting those who suffered losses. They contacted them and coordinated with the local authority to better distribute resources and lend sufficient support to housing reconstruction and upgrading works (Pelling, 1997). A similar example is noted by Hardoy (2009) relating to a community in Argentina that established an evacuation centre during floods and heavy rain to provide soup, beds, mattresses and clothing to the disadvantaged. This community also has an informal system to keep track of rising water levels in rivers and streams, and community members practise elevating plots or building small walls to keep water out of their houses. Likewise, in Jakarta’s slum, the community sends messages about water levels to members and spreads the news throughout their community so they can prepare for coming floods (WB, 2012a).

However, communities may not have substantial skills and resources to improve infrastructure systems or healthcare services; they need support from other stakeholders such as local government, professionals, NGOs and the private sector (WB, 2012a). A partnership between community, local government and others is necessary to avoid failure in coping with climate change and disaster risk (Shaw et al., 2011b). For example, in the Philippines, a local community organisation worked with local government to build or improve houses, secure land tenure, and design and implement risk reduction strategies. The local government also engaged community in technical work, identifying and prioritising community needs as well as mapping high risk areas (WB, 2012a). A partnership between local government, NGOs and a private sector firm has encouraged and involved people in upgrading flooded communities in Quelimane City, Mozambique (WB, 2012a).

Parkinson (2003) has emphasised that greater benefits for environmental health can be gained by enabling people to participate in such activities. For example, those who live in polluted areas can be trained to understand the causes of pollution and impacts, and they can then monitor and mitigate pollution. Further, at risk groups can promote prevention based messages within communities and social networking by eliminating breeding sites of mosquitoes or improving drainage (WB, 2012a).

Coordination within local communities can create a sense of ownership in community and pave the way for successful adaptation strategies (Shaw et al., 2011b). Additionally, the crucial factor for a
strong CBA is to understand needs and priorities of community and engage vulnerable people in designing, planning, implementation and monitoring (Parkinson, 2003; WB, 2012a). Importantly, community based adaptation is process oriented and “based on communities’ priorities, needs, knowledge and capacities which necessarily empower people to plan for and cope with the impacts of climate change” (Reid et al., 2009, p.13).

3.5. **Core issues of a successful CBA**

The key concepts of a good community based adaptation is to understand community capacity by its initiatives, to provide effectiveness of institutional arrangement by identifying influenced actors, reinforcing administrative frameworks, planning and infrastructure, to encourage partnership and attract adequate funding. These issues will be discussed in the following sections.

In addition, as Mulligan (2012) suggested, the importance of understanding both “geography of hazards” and “geography of vulnerability”, the establishment of vulnerability data and vulnerability profiles for communities is recommended to understand vulnerable areas and vulnerable groups in cities.

Likewise, the importance of capacity building and models of early warning systems and emergency response services will also be presented, to highlight the need for building skills to prevent or mitigate damage. These will introduce measures to reduce vulnerability of the research communities, in particular, and of the city community, in general.

3.5.1. **Community initiative examples**

In communities that have limited capacity and resources, the poor have often addressed impacts of natural risks. Informal actions such as repairing roofs, building stronger foundations, digging trenches to clear water, clearing drainage or planting trees has been noted previously (Parkinson, 2003; WB, 2012a).

In HCMC, Vietnam, the Environment and Development in Action (ENDA) organisation believed that community has the ability to evaluate what happens to them and the capacity to negotiate or discuss with local authorities about the support they need. ENDA has piloted a community based adaptation project, where the participation of community has been encouraged by community meetings (Schinkel
et al., 2011). In this project, ENDA suggested that at least three community meetings should be organised to identify the impacts of flood, existing coping strategies by community, discussing solutions to be implemented by community, and adequate time to implement and evaluate such implementation (Schinkel et al., 2011).

A community may have initiatives and experiences to cope with natural hazards; however, in order to avoid unforeseen problems, initiatives need to have support from different stakeholders such as local government, the business sector and NGOs. Many community measures based on local experience can be applied to cope with disasters; unfortunately, lack of additional support has made them become short-term strategies with ad hoc adaptation. For example, the Dar es Salaam flooded community elevated their pit latrines and foundations that consequently increased street flooding (WB, 2012a). Appropriately, initiatives need to be balanced between city or local government and community to ensure effective strategies (WB, 2012a).

When the resources of each stakeholder are not strong enough for adaptation, a partnership between community, local government and others is a good model to avoid failure in coping with climate change and disaster management risk (Prashar et al., 2012; Shaw et al., 2011b; WB, 2011). For example, in the Philippines, local community organisations contributed labour and ideas to build or improve houses, secure land tenure, and design and implement risk reduction strategies. The local government contributed technical knowledge to help prioritise community needs and map high risk areas (WB, 2012a).

3.5.2. Institutional engagement

Communities may not have substantial skills and resources to improve infrastructure system or healthcare services; they need support from other stakeholders such as local government, professionals, NGOs and the private sector (WB, 2012a). Furthermore, the ad-hoc adaptation given by community may be unsustainable unless local government and other partners participate – an approach that combines local experience and government knowledge will be more effective to cope with disasters. Also, the municipal government can work with local community to ensure service provision can be provided to the right people. The contribution and capacities of community should be
recognised by the local authority, so community they can be engaged in action plans to retain low unit costs for investment (WB, 2012a). In Vancouver, the Canadian government formed local taskforces including eight volunteering residents from eight districts who presented community tolerance levels for natural risks. Risk tolerance criteria were then established, based on public consultation and professionals, and these criteria were used as risk consideration for granting building and development permits. This model has become an example of involving community, municipal government and professionals for disaster risk reduction (UN et al., 2012).

These examples indicate a range of different actors’, roles, and administrative frameworks are needed to develop a strong resilience and adaptation to extreme events. Such combinations can aim to ensure that the city and its community “threatened by natural or other hazards can act in sufficient time and appropriately to reduce personal injury, loss of life and damage to property or nearby fragile environments” (UN et al., 2012, p. 52).

A combination of different actors is also an effective tool to help the urban poor mitigate adverse impacts from natural hazards and risks (Moser et al., 2008; Prabhakar et al., 2009; Shaw et al., 2011a).

The UN (2012) has proposed that local government (including city government) need to understand that disaster reduction is a team effort between local government, different sectors, academia, planners, community groups, NGOs, the business sector, national government and international organisations. Among these, local government is the main leader to convene, regulate and monitor other actors. However, the function of each actor, such as national/local government, different sectors, research institutes or NGOs, needs to be clarified at the beginning (UN et al., 2012).

When the resources of each stakeholder are not strong enough for adaptation, a partnership between community, local government and other actors is a good model to avoid failure in coping with climate change and disaster risk (Prashar et al., 2012; Shaw et al., 2011b; WB, 2011).

Parkinson (2003) also emphasised that municipal authorities’ role is likely crucial, as a key actor to facilitate and to guide community starting their own adaptation plan. New Delhi, India, has utilised the District Disaster Management Authority, a local authority organisation as an entry point to community based adaptation programs. This organisation is in charge of communicating to
community and stakeholders, preparing ‘to do’ lists and estimating budgets (UN et al., 2012). The importance of having different actors and roles is that it forms a decision-making structure and participation level for each stakeholder. The stakeholders can set their own priorities without overlapping with others, share their knowledge, and practically make use of their knowledge, raising awareness. Leya (2012) demonstrated this viewpoint by a case study in Toronto, Canada, where all stakeholders at different levels, including city staff, non-profit groups, the private sector and community groups, have formed the Weather Wise Partnership to work together identifying actions to reduce risk and improve the city’s resilience to climate change impacts. However, the right choice of change agents for implementation can also be a challenge to a successful CBA plan, because of staff time and resource availability of each agent (Leya, 2012). The view is also reinforced by Tong Thi My Thi (1999), who comments that an ineffective CBA program can result, if change agents are not well trained or coordinated, as the community depends largely on external resources rather than community. Indeed, the partnership can create a sense of ownership in community and pave the way for successful adaptation strategies (Shaw et al., 2011b).

3.5.3. Involvement of local governments

The World Bank (2011) reinforced the view that city government has an important role to ensure the wellbeing of citizens in relation to the delivery of a wide range of services to community such as: planning (land use); infrastructure (transportation, water, sanitation and drainage); housing (construction, renovation and regulations); economic development (job creation); public health; emergency management; and environmental protection. In addition, city government can play a convening role to facilitate communications between different stakeholders. In this sense, a taskforce comprising representatives of different officials can be formed and they must provide political support, operational knowledge and scientific expertise or competency (WB, 2011). In order to implement a successful project, all departments need to ensure they understand their roles and responsibilities as well as institutional capacity, which is strengthened (UN et al., 2012).

By incorporating community priorities and actions into their policy, it allows urban planners and policy makers to gain a better understanding of local hazards and risks, so they can access the risk and
opportunities for community. Additionally, it helps local authorities and planners build a close and strong connection with the targeted community (Prashar et al., 2012). Moreover, as city authorities and related agencies are in charge of delivering services and ensuring urban citizens’ wellbeing, the city government should organise a relevant task force and inter agency taskforce to develop communication among themselves and with the community. This cooperation would bring about “cohesiveness and uniformity”, which are important for successful adaptation plans (WB, 2011, p.24).

3.5.4. Adequate funding

The funding resources are not only from government, Overseas Development Assistance (ODA) or NGOs, but contributions from community or the private sector can also be considered. Obviously, financial support is one of the necessary forms of urban risk reduction that is “essential for effective adaptation resource mobilization and allocation from both a public and private sector point of view” (ICLEI, 2011, p.15) including development of tools, payment of full-time staff or launching an awareness plan (Ayers, 2009; Leya, 2012). Adequate funding sources enable a city to provide good services and amenities to residents and users in unpredictable circumstances (ICLEI, 2011). Risk/hazard reduction measures should be integrated into local government budgets and local government can seek support from national and city funds/programmes. As mentioned above, funds can come from a range of sources. The incentives from different stakeholders to contribute to building supplies as well as penalties for those who increase risks and degrade the environment will help raise resources and finance (UN et al., 2012). A resilient investment can offer the opportunity for profitable investment to reduce risks and increase resilience levels (ICLEI, 2011). An example of how funds can be generated is the government of Manizales, Colombia which has reduced construction tax to people who implement risk reduction measures in flood prone areas and impose an environmental tax on urban properties so they have a budget for disaster prevention and mitigation. This government also worked with an insurance company and allowed citizens to buy insurance through municipal taxes (UN et al., 2012). The WB (World Bank 2011, 2012a) suggested seeking additional outside funds by developing partnerships with international agencies such as UN Habitat, WB, UNCEF, ADB, AusAID that are keen on contributing to targeted programs. For instance, in the case study of Quelimane,
Mozambique, the local city provided an in-kind contribution of USD 100,000 (office space, equipment, meeting rooms, administrative staff and vehicles); the community provided the equivalent of USD 150,000 (through labour, awareness campaigns, management teams or temporarily moving off the construction site); international donors provided cash and in-kind support; and a private firm provided drivers and trucks to the urban upgrading program (WB, 2012a). In addition, funds can be mobilised from private investment in urban upgrade projects as in the case study of Mumbai, India, where a real estate investor decided to upgrade a slum area to combine informal housing and formal buildings (ICLEI, 2011).

In addition, community credit is another form of mobilising resources for community-based activities. The money from this fund can be used to upgrade roads, housing or solve community problems without waiting for support from the government (Satterthwaite et al., 2011).

3.5.5. Establishment of data and vulnerability profile

The UN (2012) pointed out that city and local governments need to understand clearly what risks or hazards they are facing, so they can make good decisions about development in their city. The Australian Government (1999, p. 6) noted that a proper plan and appropriate response would:

"Require a thorough understanding of the flood risk, the community and the nature of the interaction between them. Information about flood behaviour and its effects on a community is critical to effective flood management because it provides a basis for determining how response operations should be conducted."

City governments, as the stakeholder in the best position to establish data records including natural, man-made and technological events, then make information available to the public. In addition, vulnerability mapping can be integrated into databases to allow for better understanding of risks and vulnerabilities (Edwards et al., 2007). For example, vulnerability mapping can help develop plans and different measures to protect or to upgrade, ensuring all development activities will not cause damage or create more risk for the city (UN et al., 2012). An example of vulnerability mapping by the WB (2012a) found that community can help map the hazard areas as well as indicate areas to be upgraded. In Cuttack, India, it took more than two decades to collect data for mapping, and it could not be done without community organisations formed by the residents of informal settlements. The information
collected has been used to prepare digital maps (GIS) and to negotiate support needed for upgrading or relocating houses (UN et al., 2012; WB, 2012a).

In addition, Mulligan (2012) suggested that people living adjacent to or working in vulnerable areas should be taken into account, since environmental hazards can seize their income and make them highly exposed. Consequently, the establishment of a community vulnerability profile is suggested and it should be incorporated into future plans for economic development.

3.5.6. **Strengthening physical infrastructure**

Infrastructure services need to be maintained and function well to respond effectively and to recover quickly. Therefore, measures to prevent damages to existing infrastructure and plans for long-term development infrastructure should be assessed and prepared (UN et al., 2012). Communication and transportation are particularly important, since “complementing the ability to travel, telephones and cell phones allow individuals to communicate with others in distant location and to find out about a wide variety of factors (from jobs to market conditions) that influence their livelihood options and choice” (Moench et al., 2004, p. 25).

Other infrastructure is also important for livelihood, as shown by the Neighbourhood Upgrading project in Vietnam, to improve people’s livelihoods by upgrading basic infrastructure, including water supply, drainage, waste water collection, street lighting and street access improvement as well as protection of vital facilities such as schools, pre-schools and health centres in low income urban areas (WB, 2012a). A similar example from a rural area is in Annur and Palldam Blocks of Tamil Nadu of India, where people have diversified their non-farm activities and have increased their share of income from non-farm labour sources after road, power and communication systems were installed and upgraded in their communities (Moench et al., 2004).

3.5.7. **Building design, regulations and land use planning**

One of the key components of disaster resilience is to reduce damages and costs of rebuilding. In this context, building design is very important and includes all components such as foundations, building frames, services, doors, appliances, safety levels and the provision of first aid, torches or clean water to strengthen house structure under natural events (Jha et al., 2012). An example of such planning
comes from Hue, Vietnam, where people contributed 60% of construction cost proposed by Development Workshop France (DWF) to prepare their houses for resistance to typhoons. DWF suggested specific typhoon resistant design principles, which either reduces the risk of damage or reduces the risk of material loss. For example, balcony roofs should be separate from the main roof, doors and shutters should allow the building to be closed up, roof and wall structures should be tightly connected and trees act as windbreaks (UNISDR, 2007). Jha et al. (2012) also pointed out that urban or land use policy must engage flood management matters to ensure appropriate action be taken by a relevant authority.

Building codes and land use planning are critical tools to reduce vulnerability of cities under extreme events such as floods, earthquake or fires. As the UN et al. (2012, p.42) emphasised, resilient designs and planning are “cost effective when compared to relocation and/or retrofitting unsafe buildings”. To support planners, there are steps that the local government should take to ensure that building codes and regulations minimise disaster risks, including city development and land use planning based on risk assessment, upgrading informal settlements and promoting safe construction, building local capacities and strengthening participation in urban planning (Jha et al., 2012; UN et al., 2012).

Modern technology can assist. For example, in Queensland, Australia, the Queensland Reconstruction Authority used GIS, available satellite imagery, and local information to provide a guideline of floodplain management and land use planning for 116 river catchments in Queensland. This guideline was then combined with floodplain management of existing planning to provide a response for different agencies considering flood potential in development proposals (Jha et al., 2012).

3.5.8. Community capacity building

Community members can be better prepared if they know their exposure level, hazards and risks. Therefore, community participation, including capacity building awareness and education, is essential for a city to be well prepared and to help residents cope with disasters. The UN (2012) has suggested a local authority can promote public awareness campaigns regarding personal safety, risk reduction and people to encourage citizens to spread these messages. Such an approach has been taken in China where “National Disaster Day” on 12 May remembers the Wenchuan earthquake in 2008 (UN 2012).
Afghanistan has used BBC educational programs called New Home-New Life to share community disaster reduction stories with Afghan people so they can learn about what they can do in times of disaster, or how they can minimise disaster impacts (UNISDR, 2007). Information about risk reduction should be integrated into formal education programs, risk reduction training programs and health awareness campaigns should also be carried out for key city and local staff, local institutions, teachers, professionals and community (Jha et al., 2012; UN et al., 2012). The UN (2012) also proposed that city wide disaster safety initiatives should be undertaken, for example, locally memorable disaster days or international days for disaster reduction.

Building capacity for community is not only for knowledge and for awareness, but also for management, supervision and decision-making skills. Satterthwaite et al., (2011) have pointed out that women have developed skills, ambition and confidence as well as negotiation skills when offered a chance to participate in resilience training. By offering opportunities to participate in community activities, this helps women “both to address their gendered needs and to take on a public role” (Satterthwaite et al., 2011, p.14).

3.5.9. Early Warning System

An Early Warning System (EWS) helps communities and local authorities’ respond better to minimise damage and loss. The IFRC (2008, p.15) defines EWS as a set of

“elements that remain in constant fluctuation with movement in multiple directions. An end to end warning system is a complete set of components that connects those who need to hear messages to others who compile and track the hazard information of which messages are composed”.

Such systems can be quite varied. The Philippines established a Local Flood EWS Operation Center to inform people about flood levels and potential impacts in the Binahaan River (Jha et al., 2012). In Jakarta, a different approach was taken, where the community uses their own means to warn people about water levels such as mobile phone messages, news on FM radio channels, messenger bicycles, news on community boards or sirens (Jonatan et al., 2013; WB, 2012a).

Jha et al., (2012) suggested the main steps toward developing an EWS are defining stakeholder groups and warning levels for responders; analysing needs and applicability; identifying responders’ need
relating to their mobilisation and evacuation; establishing warning centres; determining communication media; training staff in warning communication; and carrying out drills. This view is reinforced by Jonatan et al. (2013) in identifying appropriate stakeholders and connecting them effectively.

3.5.10. Emergency response services

In order to prepare for a city coping with natural hazards, it is necessary to plan what should be done if an extreme event happens. People in risk prone areas should be trained to face potential impacts, techniques of response and use of equipment (UN et al., 2012). In addition, local government officers should be trained to use and prepare appropriate equipment for certain events. They also need to evaluate the potential resources mobilised for emergency response activities, for example, teams to conduct door knocking, to assess the special needs of individuals or have teams raise or move furniture, and establish reception centres to provide food, clothing, accommodation or first aid and transport for evacuation (Australian Government, 1999; UN et al., 2012). Further, the time for an emergency response is critical, therefore periodic drills should practise response skills of government, institutions, community and other stakeholders, so weaknesses and gaps can be identified and adjusted (Australian Government, 1999).

3.6. Summary

This chapter has discussed the interpretation of vulnerability and its complexity. However, the definition of vulnerability is situated within the concepts of impact and vulnerability reduction, and where adaptive capacity and resilience are key concepts. In adaptation discourse, CBA is distinguished from community development by its specific components that emphasise the importance of poverty related vulnerability that should be addressed to improve the livelihoods of the poor. Lessons learnt from different CBA strategies illustrated that non-structural measures would empower community and strengthen their capacity to withstand unstable climate change. In addition, the role of women in reducing impacts of climate change is recognised and it is suggested should be engaged in future policy of adaptation. These themes provide background for the research and subsequent data analysis in this thesis.
Chapter 4

General Context of Climate Vulnerability

4.1. Introduction

This chapter presents an overview of the impacts of climate change events that highlight the increasing threat of urban flooding in cities of developing countries. The most vulnerable groups in natural events are recognised, and their involvement as key players in vulnerability reduction plans and activities is outlined.

In the light of earlier discussion on vulnerability and adaptation presented in chapters 2 and 3, this chapter provides a general description of Vietnam to provide a picture of severe impacts of climate change in the country. Narrowing the focus to Ho Chi Minh City, this chapter will discuss the likelihood of floods in the city and flooding scenarios for the future, to justify and highlight the role of having HCMC as a case study for this research. The history of urban flooding in HCMC and causes are examined to emphasise the gaps that have been addressed in the proposed strategy in Chapter 9.

4.2. Climate change and impacts

Climate change is no longer a strange term to the world, when there are many extreme environmental events happening. The temperature has increased over the last 50 years, the warmest years have occurred since 1998, and sea levels have risen approximately 3.4 millimetres per year between 1993 and 2008 (Abhas et al., 2012). Natural events such as heatwaves, droughts, floods, tsunamis and hurricanes have threatened the lives of millions of people and placed all nations in a vulnerable position. Specifically, climate change, as defined by the United Nations Framework Convention on Climate, (UNFCC, 1992, p. 3):

“means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”

and it has adverse effects “on the composition, resilience or productivity of
The UN (1998) stated in the Kyoto Protocol that the reason for climate change is the increase in greenhouse effects, the exploitation of natural resources and the ecological system including the abundant chemicals in burning coal or oil for industrial production. Emissions are also from dumpsites or the exploration of natural oil in coastal areas. Climate change is related to global warming, which is shown by global temperature increases every year. The UNDP (2008) has identified key climate change events that pose a threat to human beings and ecological systems, as global warming has made sea levels rise dramatically. Global warming has caused multiple impacts and made the earth more exposed to extreme weather events such as flooding, tropical storms, drought and/or earthquakes (ADB, 2008). In his statement in the COP 18 in 2012, Ban Ki Moon, UN Secretary emphasised,

"The danger signs are all around. One-third of the world’s population lives in countries with moderate to high water stress; land degradation affects 1.5 billion people. Ice caps are showing unprecedented melting, permafrost is thawing, sea levels are rising. The abnormal is now the new normal.”

The World Meteorological Organisation’s (2012) research shows that global temperatures have been increasing significantly, threatening nations with drought and wildfires. It also indicated that there have been more devastating floods, rainfalls, tropical cyclones and unusual cold events worldwide over the last decade. The sea ice is melted quickly, and greenhouse gases in the atmosphere have noticeably increased (World Meteorological Organisation, 2012).

The changing climate has brought severe impacts on social and ecological environments and increased the vulnerability of the world population, especially in developing countries. The melting of snow in China in 1998, for example, caused more than 5,000 deaths; typhoons, cyclones and hurricanes in Bangladesh, the Philippines and Central America took more than 15,000 lives and the Mozambique floods in 2000 made more than 250,000 people homeless with nearly 1,000 deaths (Dankelman, 2002). Africa is suffering more from droughts and floods, and it is estimated that one-third of Africans live in drought prone areas and 220 million are exposed to drought. Latin America is facing heat stress,
particularly urban heatwaves and transmissible diseases in megacities. Similarly, Asia and small island developing states have shared the danger of being vulnerable, mostly from rainfall events, rising sea levels, monsoons or cyclones with related impacts of hunger, loss of income and livelihoods and wellbeing affected (United Nations Framework Convention on Climate Change, 2007). The poor with low income in these countries do not have much capacity to adapt and their lack of insurance, savings and social welfare structures have resulted in homelessness, illness, injury or death.

4.3. Climate vulnerability in the city

Pelling (2003, p.48) defined exposure as “a product of physical location and the character of surrounding built and natural environments”. As cities grow, out-of-date urban planning and inappropriate urban development have created high risk to cities, especially in Asian cities where the urban poor and informal sector are not engaged in planning processes. The urban poor are also exposed, as they tend to live in low quality housing and highly concentrated areas near heavy industrial zones where the risk of accidents or disease is higher. For example, the Bhopal industrial gas leak catastrophe in India killed more than 3,000 people and affected hundreds of thousands who lived in non-residential planning zones (Wratten, 1995). As Shaw (2011a) forecasts, 3.3 billion people live in urban areas and two-thirds will be living in urban areas by 2030. By 2050, as UN Habitat (2003) predicted, more than 70% of the population, or 9 billion people will be living in the cities. This concentration notably increases risks to urban residents. As we can see, in the Bhopal case study, the urban poor are already at higher risk of disaster and with the onset of climate change, it will not only affect the urban poor disproportionally, but also increase the likelihood of disaster recurring.

In 2010, there were 385 natural disasters affecting over 217 million people and causing nearly 300,000 deaths in the cities of 131 countries worldwide, of which Asia accounted for more than a third (WB, 2012b). As preparedness and emergency response systems are often inadequate in developing countries, the urban poor are likely to be more exposed to natural disasters and hazards than other urban populations. The urban poor living in overcrowded places are particularly exposed to the high risk of infectious diseases in floodwaters, such as diarrhoea, typhoid, cholera, dengue fever, malaria or meningitis. Mosquitoes carrying malaria and dengue fever live around stagnant water in flooding areas.
of cities (Amis, 1997) and this adds to the problem. Poor drainage and stagnant water are public health
issues in poor areas and their link to ill health is well discussed in the literature. For example, there
were 342 episodes of diarrhoea per 1,000 people and 43% of children aged under five years had
intestinal worms in Jakarta (Andjelkovic, 2001). It is also estimated that there will be 90 million people
in Africa at risk of contracting malaria by 2030. Of similar concern, dengue fever is expected to spread
out in slum areas and reach 60% of world population by 2070 (WB, 2012a).

The urbanisation of cities is rapidly increasing as cities become concentrated with people, assets and
economic activities. In high density cities, the temperature can be much higher than in suburban areas
as minimum open space, poor ventilation and high density of construction have increased local
temperatures (WB, 2012a). Vehicle emissions, industrial activities, loss of open space and increased
use of air conditioners increase the frequency and severity of heat stress in urban centres (Shaw et
al., 2011a). This heat stress is a health hazard. European heatwaves in 2003 killed 20,000 people,
mostly the poor, and Indian heatwaves in 2008 also took more than 1,000 lives, mostly the workers in
small urban settlements (Moser et al., 2008).

During the monsoon season or under heavy rains, drainage flows and water logging have made the
flooding severe and these are made worse by changing climates and human activities (Shaw et
al., 2011a). A study of slums carried out by the WB (2012a) shows that more than 50% of slums in
Bangladesh have been fully or partially flooded in moderate or heavy rainfall areas while 25% of
residents in Kathmandu, Nepal have been flooded in the monsoon season due to inadequate drainage.
The floodwater is stagnant in and around these houses, and they do not have waste collection services.
The low quality of services, such as water supply and sanitation, road and transport, energy and
environmental health, has made the urban poor more exposed to the dangers of climate change.
Narrow streets and irregular layouts have limited water supply and sanitation and contributed to the
problem (WB, 2012a). In addition, engineering approaches to reduce flooding may add to higher
levels of risk in urban areas. While engineering measures are considered as an important solution, if
the designs do not adequately address monitoring and supervision activities, the poor may encroach to
live in these regions. The construction activities may also cause local flooding to low lying areas
inside cities. In addition, the land market may be increased, the poor will sell their land to others, and move to other low lying areas in the city. Thus, engineering intervention may have negative effects for the urban poor.

Recently, it has become clearly evident that there are increased risks to urban centres regarding the number and intensity of extreme weather events such as heavy rain, cyclones or hurricanes. Table 4.1 details examples of these events.

Table 4.1 Damage caused by natural disasters

<table>
<thead>
<tr>
<th>Events</th>
<th>Year</th>
<th>Damages</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Hurricane Sandy</td>
<td>2012</td>
<td>Hundreds of kilometres of the east coast, power lines, trees, five deaths, thousands of people’s lives were affected</td>
</tr>
<tr>
<td>Japan tsunami</td>
<td>2011</td>
<td>More than 10,000 deaths, Thousands of homeless people, Millions living without heat, water or power</td>
</tr>
<tr>
<td>Philippine typhoon</td>
<td>2012</td>
<td>600 deaths, 900 people missing</td>
</tr>
<tr>
<td>UK flood</td>
<td>2012</td>
<td>Thousands of people’s lives disrupted, Damaged houses in the est county, Midlands and North Yorkshire</td>
</tr>
<tr>
<td>Venezuela flood</td>
<td>1999</td>
<td>50,000 deaths</td>
</tr>
<tr>
<td>Mozambique flood</td>
<td>2000</td>
<td>700 deaths, 250,000 homeless</td>
</tr>
<tr>
<td>Bangladesh, India</td>
<td>2004</td>
<td>275,000 deaths</td>
</tr>
<tr>
<td>Pakistan flood</td>
<td>2010</td>
<td>Impacted 14.1 million people, 1,985 deaths</td>
</tr>
<tr>
<td>Nanning flood, China</td>
<td>2010</td>
<td>Impacted 130 thousand people, 1,600 deaths</td>
</tr>
</tbody>
</table>

Source: District 8 PC (2010) and Binh Thanh Education Division (n.d.)

Notably city residents of high-income countries will have better preparation for infrastructure, housing and insurance systems; therefore, injuries and deaths are considerably reduced. However, cities in low- and middle-income countries will be more vulnerable under the same context, because of inadequate infrastructure systems and lack of institutional capacity for emergency services (Satterthwaite, 2008).

While the cities in developing countries have already faced challenges, such as inadequate infrastructure or services, lack of social support and increase of slums, natural hazards and climate change trends add a high degree of vulnerability. As indicated above, a critical aspect of climate change is the increased likelihood of flooding, and its attendant effect on vulnerable people.
4.3.1. Threat of urban flooding

Urban centres are not only exposed to other natural hazards such as earthquakes, volcanic eruptions or landslides, but also to flooding. Floods and water logging have significantly impacted communications and habitation as they can block the route to schools or damage the roofs of houses (The Zambia Vulnerability Assessment Committee, 2007). Flooding can undoubtedly make a city inhabitable or can damage physical infrastructures or energy plants (WB,2012a).

Under climate change and rising sea levels, the urban poor are more vulnerable since they tend to live in low quality/lying areas with cheaper land values and the land is prone to flooding with tidal surges, storms or cyclones. There is evidence of residents living in informal settlements which have more frequent and intense flooding than other city locations (Satterthwaite, 2008).

Today 38% of the world’s population lives in highly flood prone areas with 24% living in densely populated areas in coastal cities; the estimated average population density is 500 people per square metre (WB,2012a). Many people and lives obviously will be affected by floods, storm surges and heatwaves.

Urban flooding is categorised into four types: localised flooding (caused by blocked drains and culverts); small streams (occurring after heavy rains or high intensity storms); river flooding (caused by the breach of a dam or levee); and wet season flooding (appearing in lowlands and coastal cities). These four types of urban flooding have significantly affected the urban poor (ActionAid, 2006).

However, the description and categorisation of floods are varied and based on different causes, duration and impacts. Abhas et al.(2012) listed urban flooding as pluvial including overland floods, coastal floods, groundwater floods, flash floods and semi-permanent floods caused by human actions; however, the speed of onset needs to be understood to identify flood effects and mitigation measures in urban areas.

As previously mentioned, in addition to natural causes, humans play a significant role in urban flooding. For instance, most vulnerable people have to rely on natural drainage canals and their buildings are often an obstruction to these canals because of canal encroachment. Abhas et al. (2012) listed human causes as:
- land used changes
- urbanisation
- increase in surface run-off
- development of coastal zones
- destruction of coastal natural flora (mangrove)
- development of low lying areas
- interference with natural aquifers
- failure of water retaining structures
- inadequate drainage systems
- poor underground water management.

In essence, developing countries, inadequate or ineffective land and growth planning, high density population, overloaded drainage infrastructure and lack of flood defence mechanisms will possibly make urban citizens highly vulnerable to flooding (both in frequency and interruption), especially the urban poor (Abhas et al., 2012; Blaikie et al., 2004; Pelling, 2003).

### 4.3.2. Gendered impacts of climate change related events

It would appear that the effect of flooding would be similar for all individuals in vulnerable communities. However, women are especially affected. Studies about gender disparities in natural hazardous events have revealed that women are more vulnerable in earthquakes, floods and droughts (Blaikie et al., 2004; Pelling, 1997; Twigg, 2001). The impacts of natural hazards on men and women will be different; however, women seem to be more vulnerable because many of them live in social exclusion (Lorenan, 2008). The triple roles of maintaining family, engaging community activities and productive work in informal economies have taken most of women’s energy and time (Valerie et al., 2002).

- **Maintaining family**

Women are often seen as key actors in family duties such as family care, reproduction, educating children or collecting water for domestic use. In addition, they still have to earn income to ensure that family members will have proper meals and enough nutrition. Before any natural events occur, women
with the least economic and social power, have already suffered economical vulnerability; the impacts of natural hazards will heighten their exposure to cope with or recover from disasters (Alyson et al., 2008). Valerie (2002) stated there are more women working in insecure environments in the informal sector and in small enterprises that are often least able to recover from disasters.

In time of natural disaster or environmental events, heat stress, malnutrition, waterborne diseases or sanitation related illness are on the increase and threaten the poor. In some developing countries, gender discrimination has even made girls more exposed to low nutrition and lack of medicine. The expected role for women to care for families and the sick limited time to generate income and increases in medical costs heighten women’s vulnerability and poverty (Davis, 2005). The household workload potentially increase the school dropout rate in girls related to domestic chores. In drought regions, girls may be harassed or abused on the way to collecting water (Adger et al., 2003). In some developing countries, women’s mobility is restricted because social prejudice keeps girls and women from learning swimming, climbing trees or riding bicycles. Consequently, women become less mobile and this may threaten their life during disasters (Lorenan, 2008). While the elderly are considered at higher risk from climate change impacts, elderly women in developing countries are particularly at risk due to the lack of social protection networks. The vulnerability of elderly women can be captured as having heavy family and caring responsibilities, low income, lack of adequate knowledge on rights and limited access to medical clinics (Alyson et al., 2008).

❖ **Productive work**

Traditionally men were expected to be the important contributors to the family, and community. Yet Boserup (1989) notes that the role of men as hunters has been changing in relation to women as gatherers; they have become another actor in household economic activities. Similarly, Dankelman (2002, p.23) concluded that “women play a major role in actions to safeguard the environment, and therewith their communities’ livelihoods and survival”. Women are becoming key stakeholders in environmental management and adaptation measures. Their main role is to take care of family and perform household chores, and they relate closely to environmental issues such as clean water, fuel, land cultivation or good consumption. They contribute more in buying eco labelled food, sorting
recycled material or placing value on efficient energy than men (Lorenan, 2008). Women also have strong interpersonal skills and they actively participate in income generating activities and micro credits. In addition, Denton (2002) and Masika et al. (1997) illustrated that women’s involvement will ensure that the environment is not degraded and contribute greatly to climate change coping plans. In Peru, women organised local and productive activities to survive after the El Nino of 1997/1998 in La Argelia, Ecuador; women have undertaken environmental management tasks in Cerro Navia, Chile, where women reduced the spread of dust on roads, sidewalks and paths (Masika et al., 1997).

Community engagement

Sadly, the poor generally, and women’s capabilities and roles particularly, have not yet been integrated into the policymaking process for sustainable development. Lorenan (2008) pointed out that women do not have equal opportunity to participate in decision making relating to climate change adaptation and mitigation policies. By 2012, the percentage of women participating in climate change dialogues accounted for 33% in comparison with men’s participation (WEDO, 2012). Mulligan et al. (2010a) also mentioned the engagement of outside organisations (i.e. NGOs) to support women and communities to build capacity. This is important for the success of adaptation and mitigation measures. This research aims to better understand women’s vulnerability and their important role in responding and recovering from natural hazards.

However, Alyson et al. (2008) emphasised that women and girls noted in the environment and gender literature bear the burden of household duties such as collecting water, cooking, washing, and maintaining hygiene and nutrition for the family. In addition, women’s role is less publicly identified than men’s and they are excluded from income or education. Consequently, it deepens women’s inequality and limits the effectiveness of coping strategies within the climate change context. Sarah (2004) suggests that men and women need to be considered in planning a strategic gendered approach to climate change. Nevertheless, Sarah emphasised women have a greater perception of their contribution to the home and demand greater decision-making power; therefore, they need to be empowered.
It is noted that men and boys are also vulnerable in disasters in different ways and this aspect needs more research (Alyson et al. 2008). For example, men are more disadvantaged as they are less engaged with social networks. In addition, men are expected to ensure economic status for their family and this expectation is stressed in the context of natural disasters or hazards.

4.4. Climate change that impacts Vietnam

Vietnam has become the third largest country in Southeast Asia, with a population of 90 million and Vietnam has become the 13th largest in the world. In the decades of 1999 and 2009, Vietnam suffered annual losses of nearly 500 people to natural disaster events with a loss of 1.3% GDP (WB, 2012b). At the same time, in recent years, Vietnam has experienced an average of six to eight typhoons, storms and floods, followed by annual drought damaging assets, infrastructure and economic activities (WB, 2012b). During the last 10 years, Vietnam has suffered from an increase in climate change, with more than 9,000 deaths and missing people, with a loss of 1.5% GDP every year (UNDP, 2007). In 2009, typhoon Mirinae killed more than 100 people and left a damage bill of approximately USD 280 million to property (DiGregorio et al., 2012). On average, between 2005 and 2009, some 48% of deaths and 70% of missing cases were from storms (Few, 2003). Yet Vietnam is already at risk from increasing frequency of floods, drought, typhoons, storm surges, saline intrusion in coastal areas, increasing temperatures in the Central Highlands and heatwaves in urban areas (Vietnam Government, 2011).

Vietnam has not been well prepared for climate change, which has negatively impacted the ecosystem, production of agriculture, aquaculture and fisheries, as well as human health and livelihoods. The UNDP (2012) stated that the increase in extreme weather events will continue to threaten people’s lives, increasing insecurity and inequality, especially for the poor and women in Vietnam. As climate change puts pressure on people’s livelihoods, they will be more inclined to seek better economic opportunities in the large cities, such as HCMC, and this will place additional pressure on the ability of those cities to cope with the consequences of climate change.

Vietnamese cities are facing increasing severe climate events that seriously affect their socioeconomic development, for example, the Ketsana storm in Hue and the Hanoi urban floods in 2008 caused
damage to human life, assets, transportation systems and jobs (Few et al., 2010). As the city population is increasing, the drainage systems and clean water are not adequate. The urban poor are facing income loss and health risks including exposure to vectors and pathogens within an inadequate healthcare system (Harry, 2009; UNDP, 2007). It is predicted that 10% of the population of Vietnam will be affected if sea levels continue to rise by one or more metres. The mega river deltas of Vietnam, including Hanoi and the Red River in the north, HCMC and the Mekong delta in the south will be significantly affected by climate change (Downes et al., 2010). The Mekong Delta will be of most concern for the country; it is listed as the world’s three hot spots regarding the impacts of flooding for the existing population (Adger et al., 2003). HCMC has the most density of population in Vietnam. As Alam et al. (2012) explained, about 55% of Vietnam’s population lives in low lying areas, of which 38% live in urban areas. Although the urban population accounts for less than 30% of the total population, it is rapidly increasing at an annual rate of 3.4%, adding approximately 1 million people to urban cities each year (WB, 2012b). In the scenario of sea level increases of 1m, 40% of the Mekong Delta and 20% of HCMC will be flooded. National GPD losses will be up to 10% (ADPC, 2006). The directly affected population will be mostly in the Mekong Delta with 32% and HCMC with 7% respectively (MONRE, 2011).

Obviously, the impacts of climate change, especially SLR, will threaten the target of poverty reduction and implementation of Millennium Development Goals (MDG) in Vietnam and in HCMC. MONRE (2011) and ICEM (2008) demonstrated that more than two-thirds of the biggest cities in Vietnam will be more severely flooded than other urban cities in the nation.

4.5. Vietnam Government commitment

Since Vietnam participated and ratified the Kyoto Protocol in 2002 and the UNFCCC in 1994, specifically, the government has implemented measures to reduce natural disasters, increase awareness, enhance social protection systems, support agricultural extension activities and invest in large scale infrastructure projects to cope with climate change. The government has demonstrated its concern with over 200 laws, policies and strategies relevant to climate change and risk management (Asian Management and Development Institute (AMDI) et al., 2011).

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In 2008, Vietnam established the National Climate Change Adaptation Target Program (NCCA TP) and a National Committee on Climate Change was established in early 2012 to facilitate all activities and programs relating to climate change. In the NCCA TP, an integrated strategy has been proposed to evaluate impacts of climate change on socioeconomic development and sectoral development at the local level. The program also evaluates capacity and awareness of local officers to implement the program efficiently. The achievement of this program is the evaluation of climate change impacts on every sector all over Vietnam, and it also helps construct short- and long-term plans to ensure national development within the climate change context (MONRE, 2008).

In addition to these launched national adaptation programs, Vietnam also has other policies and programs including the:

- National Strategy for Natural Disaster Prevention
- Response and Mitigation, Community Awareness Raising and Community Based Disaster Risk Management (CBDRM) program (to 2020)
- National Platform Disaster Risk Reduction and Climate Change Adaptation in Vietnam
- Pilot program on Agriculture Insurance (2011–2013)

Within these relevant policies and programs, the Ministry of Natural Resources and Environment (MONRE) is the leading agency for climate change coordination. The Ministry of Agriculture and Rural Development (MARD) is mainly responsible for natural disaster mitigation and response, and other relevant agencies such as the Ministry of Planning, Ministry of Science and Technology, Vietnam Red Cross and Vietnam TV (Huy et al., 2010).

However, these programs and policies have their weaknesses such as limited staff capacity, limited community awareness, low ability community to participate, lack of budgets for implementation and lack of basic databases. Lastly, local staff “do not have experience, knowledge and expertise to work with community to develop local action plans, and they do not have sufficient guidelines, tools or resources to support them” (Beijk et al., 2011, p.9).
4.6. Ho Chi Minh City and climate change events

4.6.1. Historical development and its impact

HCMC is located in a low elevation coastal zone by the Saigon River; it is also close to the Mekong Delta and 60km from the South China Sea. Since it was established in 1698, this city has used rivers and canals as a primary means of transportation. Canal based systems of the city consist of five main water channels, used for social economic activities such as the port-boat market (see figure 4.1) and canal handicraft villages (Hanh, 2006). Unfortunately, the original functions of the canal system have been forgotten as city policy considers this canal system as a drainage system. In addition, canal slums and encroachment have made this historical system polluted and degraded.

Tanner et al. (2009) also noted that the city’s extensive waterway system has been severely affected by tides and heavy rain.

Figure 4.1 Canal used to transport commodities to the city (photo: author)

Under the context of climate change and SLR, the ADB (2010b) explained that HCMC have been dramatically exposed to floods and it is projected that by 2030, 61% of city land will be exposed to regular flooding and 71% of the area will be exposed to extreme flooding (see table 4.2). In a paper presenting his findings of coastal and inner-coastal cities in Asia, Tanner et al. (2009) also estimated
that 65% of HCMC territory is less than 1.5m above sea level, 50% of areas planned for development are less than 2m above sea level and 16% of HCMC consists of waterways and degraded dykes. These factors contributed to “disrupt natural waterways and degrade coastal zones creating yet more fragile conditions for residents” (Tanner et al., 2009, p.23). The terms ‘regular flood’ and ‘extreme flood’ are given to flooding conditions of HCMC as they relate directly to the main types of flooding in this city. Regular flooding is defined as daily and seasonal floods caused by monsoon rains or a combination of high tides and monsoon rains. Extreme floods relate to flooding caused by a combination of tropical storms, storm surges, rising tides and monsoon rains (ICEM, 2009).

Table 4.2. Flooding in 2009 and projection for 2050

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th></th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regular flood</td>
<td>Extreme flood</td>
<td>Regular flood</td>
</tr>
<tr>
<td><strong>Affected community</strong></td>
<td>154</td>
<td>235</td>
<td>177</td>
</tr>
<tr>
<td><strong>Area flooded</strong></td>
<td>108 ha</td>
<td>135.5 ha</td>
<td>123 ha</td>
</tr>
<tr>
<td><strong>% of whole city affected</strong></td>
<td>54%</td>
<td>68%</td>
<td>61%</td>
</tr>
</tbody>
</table>

(Adapted from ADB, 2010b)

A significant challenge for HCMC is the intensified impact caused by failures in urban management. Uncontrolled urban expansion, inefficient land use management, increasing sealed surfaces, removal of natural retention and infiltration areas have adversely impacted this city (Wust et al., 2002). The ADB (2010b) also agreed that the reasons for HCMC’s vulnerability under SLR are low topology, a large and increasing population, degraded infiltration and extreme climate change. In addition, increasing population growth, an ongoing influx of migrants from rural provinces and housing for low income groups are other challenges (Eckert et al., 2009). Given that HCMC has a tropical monsoon climate with an approximate annual rainfall of 1,800 mm, the city is usually flooded. More importantly, drainage and storage capacity for flood water and rainwater is strongly reduced by illegal construction activities (Tanner et al., 2009).

Other environmental events that happen in urban areas of HCMC are storm surges, land subsidence from excessive use of ground water, intense local precipitation, typhoons, high tides, poor drainage and sedimentation from river estuaries. These events have accelerated with the erosion of river banks
and loss of land with environmental relocation, degradation of tourist beaches and/or salinity of ground water (HCMC People’s Committee, 2012a). It is likely that the severe impacts on water supply sources are unavoidable for cities such as HCMC.

In HCMC, these events cause damage to agriculture and the food processing industry because of saline inundation and degrading quality of water resources in coastal districts. In 2010, HCMC had five serious tidal floods, five erosion cases and five typhoons. The damage has been serious with more than 88 damaged houses and some deaths. The total cost of these environmental events was approximately 2.9 billion Vietnam dong, equal to more than AUD 200,000 at that time (HCMC People’s Committee, 2012a).

The ADB (2010b) evaluated that the impacts of SLR to HCMC will be extremely important to Vietnam’s development as this city accounts for 23% GDP and 20% of national Foreign Direct Investment (FDI). Increasing flood events have challenged HCMC for more than a decade and there has not been much improvement. Although about 20% of flooded areas has improved dramatically, many new flood prone areas appear and people still have to suffer regular floods. Since 2000, HCMC has experienced an increased flooding frequency to more than 100 regular flooded areas all over the city, causing disruption and damage to people and socioeconomic activities (Phi, 2007).

Phi (2012) explained that the flood situation is caused by hydrological impacts from upstream floods, Mekong Delta floods, local rainfall and additional land subsidence. There are four main rivers upstream influencing HCMC and their maximum water level has increased dramatically from 130cm in 1994 to 160cm in 2010.

4.6.2. Ho Chi Minh City and coping measures

🔹 Policy framework

The City People’s Committee plays a lead role to assign relevant stakeholders and to make final decision for all city issues. The main central agency in charge of environmental issues and climate change is the Ministry of Natural Resources and Environment (MONRE). The Department of Natural Resources and Environment (DONRE) is in charge of guiding other relevant agencies to implement action plan responses to climate change or relevant issues including flooding and sanitation. The
DONRE has various offices in charge of different environmental issues such as land use, flood control and sanitation. The Recycle Fund (REFU) is one of DONRE’s offices in charge of raising public awareness, facilitating recycle activities and developing environmental protection strategies proposed by different agencies. In addition to these agencies, the HCMC Steering Committee for Flood and Storm Control has formed to manage urban flooding and other natural hazards in the city. Some specific organisations mentioned by the ADB (2010b) will be incorporated in the proposed strategy (see chapter 9) including the:

- HCMC Steering Committee for Flood and Storm Control (SCFSC)
- Department of Natural Resources and Environment (DONRE)
- Department of Planning and Investment (DPI)
- HCMC Environmental Protection Agency (HEPA)
- Department of Planning and Architecture
- Department of Construction.

Other line departments are in charge of transport, power supply, water management and sanitation, public health and industry.

Communication units have been formed at the district level to help people cope with natural disasters. For example, there are two units in charge of storms and SLR issues. In riverside districts, the communication unit is in charge of erosion; in urban districts, the unit focuses on tidal floods and/or earthquakes. Nevertheless, the SCFSC and these communication units have been more reactive than proactive in flood related issues and there has been no priority for climate change adaptation in city agendas (Tanner et al., 2009).

Under seriously increasing flooding from both regular and extreme weather, the SCFSC has been established to supervise solely all anti flooding and drainage projects in HCMC (City People’s Committee, 2012a). The city government has also taken a structural approach to adapt to climate change. In 2012, the city reduced flood prone areas by 10% by investing in improvement of infrastructure such as drains, streets, regulation lakes and sluice gates (Thanh Dong, 2012).
By late 2012, HCMC People’s Committee drafted their action plan to climate change adaptation to 2015, tackling the issues of climate change that impact the city’s socioeconomic conditions. In this action plan, key agents have been identified and assigned main responsibilities to deal with issues of climate change (ADB, 2010b). In the action plan, the Science and Technology Department plays a key role in promoting clean technology, environmental friendliness, and renewable power to reduce greenhouse gas (GHG) for manufacturers and services in the city. Together with these key departments, other sectors including Education, Construction, Finance, Planning, Investment and Health have been called on to contribute and participate in climate change adaptation programs or activities. The DONRE and Technology Department have also taken the lead to open discussions on climate change adaptation plans, to promote knowledge of climate change and its effects on all city officers.

All activities which focus on city development are under the Department of Planning and Investment (DPI). The DPI is in charge of establishing a socioeconomic development plan for HCMC that sets the targets and activities to be met for city development (HCMC People’s Committee, 2012b). The projects and activities mentioned are mainly what needs to be done by different government agencies in the future, but they do not adequately address the issues of private investment and future development.

- **International cooperation**

Cooperative programs and activities for climate change adaptation have been developed in cooperation with San Francisco in the United States, the US Peace Winds organisation, Bangkok City (Thailand) and the Netherlands government. Of particular importance is the Technical Assistance project for flood control and the City Expansion to the Sea (HCMC People’s Committee, 2012c), due to the scope and financial contribution from the Netherlands government.

- **Community Based Adaptation of the City**

- **Actions from the city government**

In response to the national program on “Community Based Risk Management”, the city has also planned to implement activities such as designing websites or adding climate change topics to the...
People’s Committee’s website at different levels, organising communication programs, and printing leaflets with protection and natural disaster coping information (Liem, 2012).

Other actions based on both social and technical approaches are also planned. For example, the competition called “Green – Clean – Beautiful” is planned for construction projects in HCMC. This activity targets public areas such as streets, residential blocks, bus stations, train stations, supermarkets, hospitals and schools. In order to win the competition, the responsible agencies must think about what to do to keep their public areas green, clean and beautiful; it can be seen as a driving force for officers to be more responsible in their duties and also an opportunity to gain more knowledge on “green definitions” in relation to the environment (Nam Lam, 2013).

Aimed at development, the city government also drafted land use planning regulations to adapt climate change in the future including developing green space, ensuring soil for water discharge, regulation lakes and regulations for construction in flood prone areas (An Nhien, 2013).

In order to implement these plans effectively, the city government needs to focus on renovation of unstable structures, reduction of surface run-off, increasing natural ventilation and use of rainwater: all of these primary activities benefit from local community’s participation in planning, implementation and monitoring processes (Schinkel et al., 2011). While these plans need people’s participation, the traditional highly centralised approach to urban planning and urban development has been used in this city. Consequently, people are left out of the process and the poor are marginalised from policy planning and implementation (Tanner et al., 2009). The priority actions for climate change are suggested by different key departments of the city, but the important roles of community, NGOs and civil organisations has not been mentioned in climate change adaptation activities (ADB, 2010b).

**Community Based Actions**

There was only one community based adaptation project partnership between one international NGO (Environment, Development Actions) and the local government of District 4 to raise public awareness of climate change impacts. This project encouraged vulnerable communities to discuss their problems and propose appropriate adaptation measures for their community. Workshops were organised for community members to discuss their vulnerability and offer opinions (Schinkel et al., 2011). This
project proved that if community is encouraged and participates in adaptation activities, the city would be less vulnerable to coping with urban flooding and heatwaves in the future. Unfortunately, this project has not been replicated because the information has not been shared publicly. Besides this project, there has been no other community based action recorded or mentioned in the city.

❖ **Availability of resources**

In 2009, HCMC received approval from the government to invest USD 650 million for an irrigation plan to control flooding to 2050 (ADB, 2010b). The budget proposed for the period 2010-2020 is VND 12 billion (approximately AUD 600,000). The city government will supplement this budget for climate change adaptation from the state budget, ODA and private sector (HCMC People’s Committee, 2012c). By early 2012, the city government decided to invest more than 70.5 billion VND (more than AUD 4 million) for anti-flooding activities, mainly in infrastructure improvement (Thanh Dong, 2012). As Tanner *et al.* (2009) noted, although the city has budget constraints for adaptation and resilience activities, government has not mobilised community resources effectively.

Although the city has focused on developing infrastructure to control floods, the dyke system is still inefficient and ineffective with high tides. Some causes have been noted including a limited budget that delays construction progress with flood control projects and limits the effectiveness of public awareness programs. The resources to implement public awareness programs are also limited, due to overlapping duties, low skills and inadequate knowledge of climate change adaptation (HCMC People’s Committee, 2012c). The IDS (2009, p.14) also reported “co-ordination mechanisms and collaboration in the city is poor. Responsibilities either overlap or fall between agencies.” Besides, lack of adequate communication among the city authority, private sectors and NGOs creates a deficit in the communication system between authorities and the urban community (Gero *et al.*, 2011).

❖ **Information access**

Given the fact that HCMC does not have an information centre for disaster management, transparency of information is a topic hotly debated in this city (Pamela, 2010; Tanner *et al.*, 2009). While the city still needs people’s participation to implement risk management plans, the role of community, especially the poor, is not prominent. Tanner *et al.* (2009, p.36 stated:
The poorest citizens seldom have access to the information required to participate, even when projects are likely to have a significant impact on their lives. In disaster management, vulnerable communities are simply informed of urban disaster management plans formulated without their participation, usually communicated through community meetings or mass media.

If information is contributed by community and accessible to community, the city can avoid inappropriate responses from the community such as keeping ground floor business activities safe from an adaptation viewpoint (Pamela, 2010).

❖ **Identification of vulnerability**

It is assumed that the poor, living in cheap, low lying areas with poor drainage, will mostly suffer from urban floods. These poor people are also identified as those living in shoddy housing and they “have less access to insurance and less capacity to rebuild or move away from affected areas without financial help” (Webster *et al.*, 2009, p.4). As the city government has not carried out vulnerability assessment to communities, they will be unable to understand the complexity of vulnerability and poverty dimension. Consequently, city policy will again exclude the poor from policy making process. Additionally, if the city has to resettle people to a safer area, it will create problems of compensation and eligibility (Pamela, 2010).

❖ **Role of private sector**

Adding to the challenge of not engaging community in the policy making process, the private sector is another crucial player excluded in adaptation planning. Pamela (2010) noted that none of the adaptation activities of HCMC have the private sector on board, for example, insurance for people in high risk areas or insurance mechanisms for relocation. So far, the city has been funded by the state government and international donors, but it needs to diversify its adaptation budget by involving the private sector in infrastructure investment via public–private partnership (Eckert *et al.*, 2009). The private sector can also contribute in solving housing problems for the poor in this city (Waibel *et al.*, 2007).
4.7. Summary

Climate vulnerability for the poor and women has been reviewed in this chapter. The discussion provided an overview of existing natural events in Vietnam and Ho Chi Minh City. Indeed, while Vietnam is experiencing the negative impacts of climate change, especially SLR and floods in urban areas, HCMC is especially considered as one of the 10 most vulnerable cities in the world affected by SLR over the next 50 years.

This chapter also highlighted the gaps of existing adaptation measures in Vietnam and particularly in HCMC. Although the Vietnam Government and the city authority have tried to tackle the issues of climate change, by arranging key departments and applying structural measures, people’s participation is not prioritised in any plans or implementation. Tanner et al. (2009) argue that the lack of transparency and access of information has limited capacity and coordination between agencies and community. The issues of participatory decision making are not well placed in the planning and implementation process. Community adaptive capacity and resilience have not been identified and/or developed as a necessary tool to adapt to climate vulnerability. In addition, the cooperation between agencies and community is not yet introduced to the implementation of adaptation activities in Vietnam and HCMC. Building on this information, the following chapters identify the information gaps to develop a strategy for improvement and discuss how the data were collected.
Chapter 5

Research Methodology

5.1. Introduction

An explorative approach has been used to fulfil the aim of this research. As indicated previously, the research is based on a case study, and specifically two communities within Ho Chi Minh City. This approach allows and encourages multiple data collection methods. This chapter highlights the data collection and presentation process and by doing so, the ethics of the researcher as an outsider in her own land is outlined.

The chapter begins with an explanation of how crucial a qualitative approach is in social research and how quantitative data can modify qualitative methods during field research, data collection and analysis. The research tools employed in this research are justified. Employing the case study approach for this research involves the use of several data collection methods including semi-structured interviews, in-depth interviews, ethnography and visual ethnography. The demographics of the two research communities are introduced to highlight location characteristics of the case study. The process of secondary data collection, data analysis and verification as well as the constraints faced and overcome during field research are also presented in this chapter.

5.2. Research design

5.2.1. A combined research method

Conducting social research encompasses the description and explanation of phenomena relating to human beings, organisations or communities. Data are not necessarily expressed in numbers or figures; they can be presented as words, images, impressions or even emotions. Broadly, social research should provide “a general sense of reference and guidance in approaching empirical instances” (Blumer, 1954, p. 7) and it should be allowed to view social systems through people’s perspectives (Bryman et al., 1999). In qualitative research, informants are able to provide a true assessment of the situation. In other words, instead of reading the phenomena, qualitative research
discovers how community define and evaluate those phenomena from their own viewpoints (Bryman et al., 1999).

In addition, qualitative research employs methods to ensure that in a natural setting, issues being studied can be thoroughly understood (Creswell, 2003). In this regard, the researcher is an integrated part of the research and he/she can use different strategies in conducting qualitative research such as case study, ethnography, photography, narratives and procedures of sequential, concurrent and transformative methods (Hessler, 1999). Moreover, any social research problems have different approaches and each researcher employs a specific approach to identify themselves (Hesse-Biber, 2010, p. 67).

On the other hand, a quantitative approach can present a general picture of sociality and can satisfy the need for accessing information (e.g. the stability of marriage in households, household composition or social background). The similarity of both quantitative and qualitative approaches is the use of multiple research techniques including surveys, interviews and even ethnography to collect and analyse data. Nevertheless, the researcher detaches from interviews and they can be time consuming, due to many cases and subjects to be studied (Neuman, 2011). Therefore, Swanborn (2010) argued that the combination of both qualitative and quantitative methods provides more comprehensive and in-depth understanding and meaning of social processes.

In this regard, this research decided to employ a qualitative approach, mainly to present the findings of diversity, experiences and community perspectives to capture “a richer and more complex story” (Atkinson, 2001). The inclusion of the quantitative component will strengthen knowledge of livelihood research such as community assets, regularity of floods or credit accessibility. In order to serve this purpose, data collection techniques (e.g. semi-structured interviews and observation) have been used. In addition, the application of case study and ethnography (sections 5.2.2 and 5.2.3) will allow the researcher to interact with local people in research communities to understand how they deal with shocks and stresses and to observe coping strategies in the local community.
5.2.2. Case study approach

The approach adopted for this research and the particular focus on HCMC lend themselves to case study. This section will introduce the importance of case study and how it should be used in this research. The section also presents details of how the case study was selected.

❖ Justification for using case study

It is suggested that case study should be used if the research question is to describe or to explain a social process in which

- we have little knowledge of the phenomenon, and specifically if we are interested in the ways several individuals and groups of stakeholders interact with each other and interpret each other’s behaviour and the way in which they cope with problems (Denscombe, 2007).

Indeed, a case study is one of many approaches employed in qualitative research, and it is a preferred method to answer questions of “what” “how” or “why” (Swanborn, 2010).

A case study is considered as a research approach, not just field data collection techniques (Creswell, 1998). A case study is also where multiple sources of information including observation, interviews, reports and documents in a specific setting are used (Creswell, 2003; Perry, 2002). Information collected and analysed is selected by researchers but concepts of anthropology comprising “evolution”, “culture”, “relativism”, “structure”, and “function” are located in interview questions, and data collected, analysed and interpreted. These methods influence ethnographic research in a specific case study (Hough, 1996). In this context, Werner et al. (1987) also highlights that case study is the best means for research projects that seek to explain the dynamics of a social unit in a certain period of time.

Researchers should be aware of defining a clear boundary to collect data in a descriptive manner that cannot be analysed or evaluated. The issues of confidentiality of data, people and communities being studied and false information from participants are concerns in case study (Denscombe, 2007). However, case study has been encouraged in qualitative research because it can employ different methods that help approximate reality. Additionally, the findings from multiple sources will enhance
the holistic analysis of data and case study is suited to small scale research (Bryman & Brugress, 1999, p. xvii). Swanborn (2010) affirmed that case study encourages a researcher to focus on one specific instance or a small group of instances in its own context to understand the phenomena deeply. In other words, case study examines a phenomena rather than generalises it to a larger population scale (Swanborn, 2010).

In view of the arguments presented, within the qualitative paradigm, case study has been chosen for this research to develop understanding of people’s responses to climate change, including the dynamics of the livelihood system and how people deal with flooding and other natural hazards. The case study also allows opportunities for in-depth analysis of community and relevant authorities.

Introduction of the case study

The criticism of case study is that it is limited to a general conclusion; however, Yin (1984) argued that case study allows a researcher to collect empirical evidence that can meet the three tenets of qualitative research: describing, understanding and explaining. The size of the case study is not necessarily relevant. The purpose of conducting the case study is to collect the data to respond to the research questions (see chapter 1).

This research was set in HCMC, one of the two biggest cities in Vietnam. As discussed in chapter 4, HCMC will continue to be affected by climate change and many urban poor people will be vulnerable and may be left behind. By selecting HCMC as a case study, it will provide information relating to a high proportion of vulnerable people in urban flood areas and in a climate change context. To consider how national level policies impact community coping measures, the study was undertaken at the administrative level of a ‘residential unit’ (To Dan Pho in Vietnamese) and it was considered as community level.

The case study was of a qualitative nature with some quantitative demographic information such as length of residency, age, education level and poverty level. The research has been carried out in two select communities categorised as poor, regularly flooded by rain or tides, and located by a river or channel. The flooded areas caused simply by degraded infrastructure were not selected.
The choice of case study location was based on initial investigation. Since starting my research in early 2011, I have collected policy documents, reports, legal documents, and statistics from many different sources in Vietnam including agencies at national and local levels. However, the local data has not been clear because the socioeconomic statistics are not well managed at ward level. The government reports only provide general information on local level adaptation and coping strategies. Aside from reading reports and other relevant documents sourced from the government, I purposefully interviewed local authorities and related stakeholders as well as professionals to understand the implementation of government policies, difficulties and perceptions on how policies have been implemented and/or should be implemented. This approach helps generate adaptation ideas and to understand strategies for the case study communities.

Before selecting communities to study in detail, I communicated with government representatives to select good examples. However, before discussing this process, it is necessary to explain the government and administrative systems in which these representatives work. Although the selection of community was mainly based on the category of sharing common interests, it was still part of the administrative system of the city. The two communities in this research, as mentioned, were the two residential units under the management of two different Ward People’s Committees. In HCMC, there were many different residential units in a ward and each residential unit had a leader, who was the bridge between the local authority and people living in the unit. This person was elected by community and he clearly understood his community and neighbours. It was likely impossible to approach these leaders and the two communities if the Ward People’s Committee did not approve.

Binh Thanh District, Ward 17 was recommended by professionals and city officers. After working and consulting with this committee, residential unit 9 was selected, as they were usually flooded, housing was semi-permanent and partly constructed on canals. In District 8, aside from information collected from online newspapers and reports, Ward 16 was also recommended by professionals for more closely met the criteria of my research. After considering some other residential units, unit 3 was selected because it has poor housing, poor infrastructure and was located near the canal and river. An administrative management chart is presented to illustrate more clearly the hierarchy of selected communities.
communities in legal administrative terms. A primary chart of administrative management is presented in Figure 5.1. People’s Committees perform state administrative functions at different levels. These committees are responsible for making decisions on a range of different issues that include political, socioeconomic development, budget and reserve, investment and development and personnel resources (An, 2003).

![Diagram of administrative management]

**Figure 5.1 Communities selected under administrative management chart**

**Selected communities in the case study**

With the support and recommendation letters from my host organisation, the Water Resource University in Ho Chi Minh City, I identified specific flood areas and approached the local authorities for potential sites.

Two communities were chosen for this research in the Binh Thanh District and District 8 respectively. These locations were selected based on the context of being flooded regularly by tidal surges or heavy rain. These communities have experienced floods for years but there was no solution to mitigate the
flooding situation. These locations would provide more particular context for the case study in this research.

Figure 5.2 Locations of the two research communities

The first location is in the Binh Thanh District located at the north-eastern gate of the city. The canal system of the city runs through this district and it was an important waterway for the city in the 1800s. The canals provided access for small boats coming to this district and it was described as “boat at door” or “It was so easy and convenient, I heard sounds of boats every morning from my back door and I could even buy things from these boats” (Interview 1). This district was an agricultural district; trading and business activities have been developed as it was convenient to transport commodities to and from the district along the canals. Urbanisation has increased rapidly and sectors of the industry, thus trading and tourism have replaced agriculture. Expansion of houses and new urban development has filled up half of the canal system. People throw their litter in the drains which block them.

The waterways have since been restricted and hardly navigated. The Binh Thanh District and study location is frequently flooded with heavy rain and tidal surges. This is also a high risk area for river/canal bank erosion. As a respondent mentioned: “You can ask any city resident about Binh Thanh, I am very sure that you can get the answer for flood and bank erosion. We are famous for those”.

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The studied community was located in a small lane off Xo Viet Nghe Tinh and Nguyen Cuu Van main streets in the Binh Thanh District. The residents called these two streets ‘urban rivers’ because they were flooded frequently and seriously. However, the laneways along these main streets suffered most, as they were lower and water always ran towards these low lying areas. Without a good drainage system, water was blocked and caused flooding. The studied community was also surrounded by canals, but these canals were filled with garbage and illegal housing construction (see figure 5.3, the canal at the back of residential houses is filled with scrap materials, plastic bags, garbage and an illegal construction (red house)). The stagnant water turned dark and became polluted. Littering and stagnant water have bred mosquitoes and spread dengue fever in the studied community.

Figure 5.3. The canal at the back of residential houses is filled with scrapped materials, plastic bag, garbage and an illegal construction (red house)

• **District 8 Community**

This is a historical district formed to support the development of Chinatown in the 1800s. Rural villages located along the An Thong River and Ruot Ngua canal were established. By 1905, the French dug a canal from the An Thong River to the Saigon River estuary to provide a shortcut for ships coming to Chinatown and the factories in District 8. Not long after that, the French also dug another canal called Kinh Doi (Parallel canal), to meet increasing water transport needs. District 8 is one of the largest districts of the city. Unlike other districts, it has extended canal branches everywhere. There are some 16 canals, 44 bridges, 14 boat stations for cross river traffic and 4 main wharfs in this district.
District 8 has been attached to the historical development of Ho Chi Minh City as a busy business port. Although the name of District 8 has been formed for more than 50 years, its areas existed for over 300 years (District 8 PC, 2010). The population is mainly poor immigrants who work on the wharfs and in the factories along the canals and rivers. Residents are mainly poor workers, labourers or farmers. Residents in the researched community stated that their location was badly affected by floods, with all roads damaged, and a respondent has mentioned that “*most of alleys here are lower than river tide. Therefore, we always suffer when the rainy season comes or tide is up. It is a nightmare for all residents living here*”.

The community was located in a laneway of a main road by the main river branch. This main road was about 4m wide, while the laneway of the studied community was approximately 2m wide. It was low, uneven and narrow. The main vehicles travelling in the community were motorbikes, bicycles and three-wheeled vehicles. On the main road, trucks, buses and cars travel most of the time and they cause traffic congestion as well as damage to the road surface. When the tide was up, the main road, community laneways and the river had the same water level, making it dangerous to travel. In the laneways, it was worse when the water level was high: up to pedestrians’ knees, motorbike’s engines stopped running and people had to walk in dirty, polluted water. People in the studied community as well as their neighbours were busy, nearly every day, cleaning up the mess after flooding, and moving furniture around to release stagnant water trapped in their houses. Daily life was disrupted severely and health risks increased at an alarming rate as people came into direct contact with dirty water, floating garbage and the bodies of animals (mainly rats).

**5.3. Ethnography approach**

Within the framework of case study, a range of methods can be used to collect relevant data. For this research, because of the need to understand many aspects of residents’ livelihoods in the selected communities, an ethnographic approach was chosen to collect some of the data. This section explains why ethnography is appropriate and how ethnographic procedures have been applied to the research.
5.3.1. Justification for using ethnography for the research

When research problems are related to human meanings and insiders’ views on a daily phenomenon, ethnography is considered as an appropriate tool to apply, and it can be an important component of case study (Hough, 1996). The focus of ethnography is to reconstruct real stories from people by engaging with their world and this contributes to the data collection of a case study. In practice, ethnography is used by social researchers doing qualitative research with the process of observation in case study. As Hammersley et al. (2007) pointed out, ethnography strongly emphasises deep understanding about specific social phenomena, in which data collected will not be coded and observation is made only of small detailed cases.

Ethnography can be expressed as a Vietnam proverb “eat together, work together and sleep together in a community” so that accurate information about any phenomena in a selected site can be gained. In other words, ethnographers have to go out and get close to the activities and everyday experiences of other people (Creswell, 1998; Spradley, 1979). Murchison (2010) believed that an ethnographer studies patterns of culture, behaviours or languages of a specific group, so it is important that the researcher is an observer to study a cultural phenomenon in action. Also, ethnographic researchers need to collect data and gain insights by engaging with research subjects and informants as a research strategy to allow the fundamental cultures and societies of human experience to be explored and examined (Jorgensen, 1989).

There are various definitions of ethnography as well as versions of research models and styles (e.g. physical mapping, household census or assessment of network ties) (Edwards et al., 2007). However, the classical elements of ethnography are the use of qualitative research that include case study, participant observation, interviews, field notes, narratives and the close distance to informants in research population or community (Hammersley et al., 2007).

Participant observation is a useful technique commonly employed by ethnographers as they wish to immerse themselves in the study of people’s livelihoods, motives, interests, perceptions and knowledge in a natural setting. Emerson (1995) also emphasises that the process of being engaged in daily activities to observe people’s activities, culture and other different aspects is crucial, especially
for an ethnographer. Central to the discipline of ethnography is participant observation, which has been evolving for years, and the findings are within particular social contexts at specific times. Bryman (2004) also affirms that participant observation should be engaged in the interview process so that data collected can become more accurate and more reflective. Nonetheless, an ethnographer can find it easy to lose their objectivity as they engage themselves as insiders. This may create some bias as the nature of the relationship between researcher and participants in the field changes (Angrosino et al., 2000).

Field information is gathered by participant observation that includes spending time and participating as much as possible with the researched community or population to observe social settings and daily activities. Therefore, observation is considered as the core of ethnographic research, and community engagement in the research will help the researcher gain in-depth understanding of what they think they are doing and should be doing for a better life (Angrosino et al., 2000). However, there is a possibility of being affected by the observed community and the researcher’s work can be suspect. Indeed, by positioning oneself within community activities and lives to study and observe the whole context, the researcher develops a certain relationship to the researched population and sensitivity to local rules. In practice, people in the community may not be willing to have an intensive interview if they do not trust someone they are not familiar with. From this viewpoint, prior to carrying out any data collection, the first step is to gain trust, by taking part in an activity in the community as a volunteer (Angrosino et al., 2000; Denzin et al., 2005).

While early ethnographers spent more time living with research communities, modern ethnographies have focused on specific issues or problems related to research questions (Muecke, 1994). This is focused ethnography and it is much shorter in terms of spending time in the field. Muecke (1994) defined focused ethnography as having a limited time to explore the research in a discrete community or organisation. In order to avoid the unsystematic nature of the observation process, researchers must consider how they act on observation to gain a deeper understanding and knowledge of the research community. Observation with a focus on everything will lead to “irrelevant minutiae” or will focus on certain things only and mistakenly ignore important things. Researchers, therefore, should carry out
selective observation that allows them to concentrate “on the attributes of different types of activities” (Angrosino et al., 2000, p.678).

A key aspect of interviews and observation is personal experience that will potentially influence a researcher’s study. Indeed, the strengths of ethnography are mainly from the methods applied, that combine the insider and outsider perspective. Spradley (1979) emphasised the power relationship in ethnographic research, by the need for the researcher to develop a “making role”, that is, to be part of interviews, not simply to assume a “taking role” to listen and ask questions. By establishing a close relationship with the subject, an ethnographer can develop trust in people so they feel secure and safe to be open and reveal personal information.

Interviews carried out in ethnographic research aim to obtain more understanding about cultural activities in a studied community, and this preferably starts in a welcoming atmosphere. This is likely to create a close and friendly atmosphere that helps the researcher easily obtain information about feelings or narratives of experience (Angrosino et al., 2000). The WB (2011) pointed out that the characteristics of community are revealed during interview and observation and this should ensure minimum mistakes and errors as well as avoid being influenced by bias or misjudgement.

The ethnographic researcher should notice that relationships during an interview are likely to be unbalanced, as informants seldom ask questions and only answer about their experiences. Calabrese (1998) stated that the logical process of opening, interviewing and closing must be followed to get a good interview as it establishes the relationship with interviewees. Hence, positionality is the first step to establish interactions between researcher and studied community/people (Hopkins, 2007). It may, as pointed out by Bryman et al. (2004), include different aspects of identity (e.g., gender, class and sexuality). Being an outsider, a researcher can learn the social issues and problems of the researched community. On the other hand, acting as an insider, by taking part in community activities, will help the researcher collect data by informal conversations that bring in-depth knowledge about that community and enrich research data.

In qualitative research, researchers tend to view the social world in terms of processes, and they attempt various approaches to collect data to emphasise these processes, especially ethnographers who
desire trustworthiness and reliability (Bryman et al., 1999). More importantly, Bryman et al. (2004) suggested that ethnographers should emphasise the process by using the elements of participatory observation, interviewing, life / oral history and visualisation, so the values of a social system can be revealed and deeply comprehended in an immersed context, in which participant observation and interviews are suggested to employ ethnographic research.

5.3.2. Participant observation

As discussed in section 5.3.2, participant observation has been used commonly to enrich data collected. Observation also brings more reflexivity to data collected. In this study, my role was as a participating observer. However, my role was made explicit to avoid suspicion about why I wanted to observe and participate in some activities. In addition, I also had to clarify that I was not at interviewees’ places to spy on their life: my observation and research would have no effect on their daily lives in any aspect. Observation of women at home was to understand the family and social roles that may influence women’s wellbeing and vulnerability. There were some meetings on women issues and environmental awareness; however, I was not allowed to attend because I did not have permission from local authorities. The observations were mainly at home or at a shop where they had social interactions with neighbours, customers, spouses, children and other community members. Observation of culture, behaviours and daily activities to prevent impacts from flooding were made and noted in field notes. Observations of furniture, house conditions and decoration, local traffic and flood prevention were also included. These observations are aimed at understanding their vulnerability and coping strategies in response to urban floods and other natural risks. My field notes from observations created a deeper understanding to a phenomena and it distinguished my qualitative methods from quantitative methods. Data from observation is always an important component of data collection for an ethnographer (Bryman, 2004).

5.3.3. Coffee table conversations

After being introduced to community leaders, I spent the first few days getting used to the research sites and people. In particular, local authorities and community leaders recommended that I spend my time in breakfast stalls and meet residents at a morning cafe in the area. There were quite a few
breakfast stalls and coffee shops in each community but there was always a main one where people gathered to talk. I observed the number of people sitting in those places on the first day and from the second day onwards, I located myself in a food stall to have my breakfast and coffee. Those who went to that stall for breakfast and morning coffee included local passengers, drivers, food sellers and lottery sellers.

As a HCMC native with a southern accent and by sharing common knowledge on city flood and language, I easily made contacts and talked with people in both communities. My everyday appearance eased their suspicion and I became a usual café person in their eyes. For the first few times, I mainly listened to people’s conversations about their life, their house, children, job, neighbour, flood and traffic. In order to become part of local residents, I introduced some sentences in the conversation and then asked questions. They became familiar with me and asked me why I came to the sites so often. After two days of sitting and chatting with people, they understood I was neither a state officer nor a journalist, but simply a PhD student doing my research. From that point, I gradually became part of the community, who enjoyed talking over breakfast and a cup of coffee, or sometimes a glass of iced tea. After having breakfast and morning coffee, I walked around with community leaders. Sometimes, I went back to the breakfast stalls in the afternoon for a cup of coffee and talked to the stall owners. During my conversation with people, I took notes openly when talking and shared these notes with people, if they asked.

5.3.4. Outsider in my own land

My fieldwork experiences also gave me an awareness of my identity in the survey, that is, to create a neutral position of being neither unfamiliar nor too familiar to these two research communities. My position in surveyed communities was considered as an ‘outsider in my own land’. Nevertheless, my language, culture and local identity allowed me to form a good rapport with communities. Despite my merit, I still had to keep my own judgments to myself and to interpret and understand completely the research communities, regarding their perceptions, wishes and daily coping strategies in floods. Being an insider can build rapport with communities more easily; however, it may bring the complication of being expected to be a community representative. As my survey was coming to an
end, some informants also expected the thesis could help them out of existing situations of living in “dirty water” and the government could take the research into account. One commented after I finished my interview:

“We hope that you now have enough evidence and data to write your thesis and to report to upper level of authorities that we are suffering from floods here, we cannot have a stable life and it is extremely hard for us. If the government can do something for us, it would be appreciated.” (Fieldwork, 2011)

However, it is crucial to balance the outsider position, and not become engaged in communities’ problems or conflicts. Surveys, such as that conducted by Ergun et al. (2009,p.27), have shown that maintaining a neutral position necessitates constraint efforts on the researcher’s part to balance attempts to become an insider, on one hand, and to preserve the distance, on the other.

I positioned myself as a listener, rather than voicing judgments on what the communities complained about, and I also took these opportunities to ask about their desires for a better life without floods. As I had not had the same experiences, I could not fully understand their experiences, their feelings and vulnerability, as they live in the flooded areas, and face floods most of the time. They also work hard in the informal sector. In other words, I was an outsider in my own land.

I was careful to explain who I was, what I was doing, and confirm that the interviews would not bring any harm to their lives, assets and living conditions. The participation in this research was voluntary and anonymous. The study I was conducting would not help the communities immediately; however, the voice of communities will enrich data provided to policy makers, professionals or even the outside world, to gain a more comprehensive understanding about floods and urban communities in Ho Chi Minh City. I explained that data about community and their adaptation, as well as perceptions on floods and climate change, had not been collected properly, especially in urban areas, so the contribution residents would make to my research was extremely useful and important.

I provided each person with a short paper that explained the purpose of the survey and my observations in some pilot interviews (see section 5.4.2) to residents and potential informants, who became more helpful and provided as much information as they could. They even appreciated that
someone came to them and was willing to spend time to learn of their circumstances. As one participant commented during the pilot stage:

“Oh my God, your questions are very detailed into our life, there was no one done [sic] it before, I guess if they want to do a project here and they ask us the way you are asking, I believe there might be better for us and easier for them to do.”

It is noted that the relationship with interviewees was shaped by researcher’s level of education, profession and age. They can see themselves as important, giving answers and sharing experiences with a young academic person. With respect, the informants answered my questions and participated well in the interviews. They consider me as an example for their children and a better future:

“My grandson will be like you in the next few years after he graduates from the university.”

The residents in two communities did not show any bias to my gender, but rather they showed concern “what a pity for a girl driving 40km every day to meet us, we hope your research will be successful. You are so amazing”.

By receiving these comments from the participants, I understood that I have gained their trust and support in sharing information with me; in other words, I have been welcomed into the research communities.

5.4 Use of interview methods

5.4.1. Applying the semi-structured interview method

Qualitative research may employ the unstructured interview that allows interviewees to have lengthy talks with few prompts from interviewers. It is considered as a natural conversation between interviewer and interviewee (Bryman, 2004). Similarly, semi-structured interviews in qualitative research also provide a leeway to interviewees. Although it is criticised as “potential for exploitation of the informant interviewee”, the semi-structured interview is more commonly used by social researchers for its flexibility (Bryman, 2004,p.323). Neuman (2011) pointed out that there are three types of questions used in interviews: descriptive, structural and contrast questions. Neuman argues that descriptive questions are to explore basic general information from interviewees, whereas structural questions are based on initial analysis of the researcher to focus on how interviewees
categorise specific issues and how they respond to them. Contrast questions explore similarities and differences between highlighted issues.

In addition, a well-conducted semi-structured interview will provide strong support for research findings, providing that key informants are selected carefully to reflect professional/life experiences, as well as their indigenous knowledge about the community and its activities. The strength of both unstructured and semi-structured interviews is that they are also used in life history and oral history interviews, where they are referred as in-depth interviews (Bryman, 2004).

The choice of using either semi-structured or unstructured interviews is dependent on many factors, however,

if the researcher is beginning the investigation with a fairly clear focus, rather than a very general notion of wanting to do research on a topic, it is likely that the interviews will be semi-structured ones so that the more specific issues can be addressed. (Bryman, 2004, p.473)

Indeed, the semi-structured interview will allow more flexibility for interviewees, elaborating widely their ideas and points of interest. These build the basis for research questions to community and different stakeholders and the objectives of the research forms the topic for guided questions.

Before any data collection was undertaken, the purpose of this research was explained carefully and openly to local authorities responsible for the selected communities. All my questionnaires and the interview schedule were reported to the vice chairman of the Ward People’s Committees that managed the research communities. After three weeks, I obtained approval to visit both communities and started the interviews. The local authorities were supportive to discuss the selection category and appropriate community. The study engaged tools of semi-structured questionnaires, interviews and ethnographic interviews, where I spent most of time in informal conversations in coffee shops and street food stalls in both communities.

5.4.2. Interview with community

The semi-structured interview is designed to carry out field research, focusing intensively on issues to be explored. It provides a checklist to ensure that the same information is collected. Interviews,
however, do not constrain the flexibility of getting relevant information. In principle, the ethnographic researcher can freely go after certain questions to get more comprehensive data on the topics he/she wishes to explore (Spradley, 1979, p.67).

Semi-structured questions have been used for different interviewed groups (see Appendix 1). In the communities, the questionnaire aimed to collect information about demography, poverty and assets of the poor. It was followed by a set of guiding questions asking about communities’ daily life, coping strategies to floods and their needs. The questions were designed to elicit socioeconomic conditions of the informants, family members, age, profession and education and the main income source. Data collected were important, as they provided a general picture about households, income earning activities and financial stability. Questions about time of residency, house conditions, and flooding characteristics provided information on people’s experience in floods, and impacts of floods. Questions of access to public utilities and financial support provided information on accessibility to services that supported their livelihoods. Questions of income and expenses provided information on poverty and vulnerability, especially for women, who may have to cover expenses of the extended family. These questions are sensitive and were raised carefully in the field. Usually, people do not want to talk about their income and expenses; they may provide wrong information on their income and expenses to save face, or to expect financial support from others. By having questions of income, expenses and access to financial support would provide a cross check. The significantly higher expense to income, or a loan taken for basic needs such as education, income generation activities or health, would help provide consistency in data collected.

The semi-structured questionnaire was then followed by a series of questions which helped provide detailed information relating to livelihoods, flooding experiences and perceptions of coping measures. Information about the role of women, their participation and needs were also collected during interviews. Although a set of prompting questions were prepared, the interviews did not follow exactly the order of questions.
Initial contact

One week before I started any interviews, I became familiar with potential informants by walking around the communities and talking with them. The community leader received instruction from local authorities to take me around the communities and introduce me to residents. The role of these community leaders was described as “a best ticket” to research communities (Fetterman, 1998, p.33). With the introduction from community leaders, I gave all residents a written form of consent, including my contact details, a brief explanation of my research objectives and sample selection, so they could read this material and probably asked someone to confirm the sensitivity of the survey. I also verbally explained to them that given all qualified, interviews would be selected randomly from a list provided by community leaders, so they would not wonder why they were chosen to participate in the study.

Pilot stage

Questionnaires used to interview people were piloted in the selected communities before I officially started my survey. A few initial visits to the two communities were made to test the questionnaire and questions. With the consultation of community leaders, who knew all community members and replies of some potential respondents, I reworded Vietnamese in certain questions so they would be more appropriate. Some categories of occupations had been adjusted to be more precise for local communities. The direct questions of length of residence, flooding impacts, coping strategy and occupation were asked to select appropriate informants and to save time for the field trip. During these pilot interviews, observations were made to ensure they were appropriate for selected categories.

Interview

Initially there were some opinions in Binh Thanh District community that the survey was aimed to get information on land tenure and assets, so that it would help the local authority clear their houses for upgrading the backyard canal without adequate compensation. They even told each other not to reveal much information. Some of them were initially not willing to receive me and showed their cautiousness and defensiveness. There were some other opinions about media coming to the sites,
writing some articles on newspapers and disappointing community later on. They firstly thought that it would be a waste of time to receive me, as one participant said when I first met:

“There will be nothing changed for this area, we all have waited for a change to avoid being flooded and to have more stable conditions so that we can feel secured [sic] for our daily earning. We now feel tired and bored with what people said and promised to us. Your study will contribute nothing to this community; I do not want to say anything.”

My community interview experience and my respect for them have helped me open doors to an open conversation. I talked to them about the flood, the research and the reason why I am passionate about doing the research. I showed them my student card, my introduction letter from the Water Resource University in Ho Chi Minh City, and even my questionnaires and notes. I also thanked them, even if they would not talk to me, or not participate in my interview. The criteria of my household selection were also presented so that they understood why I selected their households, even if it was for pilot interviews.

The main income earners of households were selected to explore the linkage between different assets and livelihood strategies; however, in some cases, these people were absent. Information was provided by their husbands, wives or a family member with deeper understanding about family circumstances. There were 50 interviews in total, completed across the two communities. The specific time to visit each interviewee was discussed and agreed at their convenience. The appropriate time to visit for an interview was between 10 am and 4 pm. There were cases where interviewees sold lottery tickets in the streets so they left their houses early in the morning and did not come back till late. In these cases, the interviews were rescheduled to between 7 pm and 9 pm. I usually interviewed two respondents in the morning and three in the afternoon or evening. All the interviews took place in their houses or businesses. I spent time with these respondents in their homes or their business stalls for interviews. I also spent time with other community members at the breakfast stalls and coffee shops. The observations made from the extra time spent in food stalls and coffee shops helped me understand more about the research communities and validate my data.
In return

As pointed out by Fetterman (1998), it is essential to show reciprocity to informants for their time and willingness to participate in interviews. However, as mentioned in the literature, reciprocity can cause unethical views, obstruction or contamination of information. I did not promise or give anything to informants during interviews. I came back after my interviews were completed and gave each interviewee a litre of cooking oil and a kilo of sugar. These were not much in value, but it could help them save some money. All informants were happy to receive my gift and showed their willingness to help with follow up, if I had any further questions later. However, as previously mentioned, the political system does not allow me to come back without local authorities’ approval.

5.4.3. Interviews with policy makers (at national, city and local levels) and international NGOs

The participants of this policy makers’ group are selected based on relevancy of their work to climate change adaptation, urban flooding and community development in Vietnam and in HCMC. The snowball technique was used to identify professionals, governmental agencies and researchers. It was also fruitful to ask for introductions from one to another to eliminate political suspicion that may be aroused in interview. Asking face-to-face questions also allow for flexibility and for follow-up replies more easily. As suggested by Lisa et al. (2004), in-depth interviews with different sources would gain insight into their perspectives on specific issues, such as flooding and related issues, and, in this case, also increased the validity of the study.

Local government in this context were representatives from different government offices at the local level, who received guidance or instruction from city municipality, and who were directly involved in activities of flood control, environmental events or poverty reduction programs. They included the vice chairman of Ward People’s Committee, environment staff, the Women’s Union and Poverty Reduction Unit of the two wards where the research was carried out. They have been selected for the research interview as local informants, because of their local knowledge and direct engagement with communities. They worked in the flooded areas and most of them shared flood impacts as they lived nearby. In addition, under the political system of Vietnam, they were government bodies and mass organisations that were there for the benefit of and to protect the people.
During my research, I conducted 19 in-depth interviews with national/city/district level officers, professionals and researchers working in different institutes and universities in HCMC. It was planned to interview international NGOs (INGOs) with the purpose to find out what these organisations were doing to help reduce natural hazards and how they could help urban communities cope with floods and other natural hazards. However, most of the INGOs’ headquarters were in the capital of Vietnam, three hours’ flight from HCMC. As it was hard to arrange the trip, the main form of communications was via emails and phone. Some INGOs such as CARE, Oxfam UK and World Vision had some disaster mitigation projects in rural areas of Vietnam. Although they did not have any projects relating to disaster mitigation in urban areas, they were supportive and provided me with some project documents and relevant information on climate change adaptation and community development.

Based on literature and documents collected before the field trip, questions used to interview this group were designed to understand perceptions of floods and climate vulnerability. The issues included levels of knowledge on floods and climate change, concepts of adaptation or coping strategies, their personal experiences on adaptation, the barriers they may face to integrate anti flood activities into their work, their perception of climate change and future flood conditions in the case study areas.

At the beginning of each interview, as required by the ethical regulations of RMIT University, informed consent was provided to different participants including the local authority, the city authority and professionals. They were also informed that information collected would be treated anonymously and only served for this doctoral thesis. The assurance of confidentiality was repeated from time to time during interviews so interviewees felt secure about continuing to answer questions.

5.5. Visual ethnography

With the aim of obtaining a rich and deep understanding of community perceptions and traditions in coping with floods as well as enriching data collected, the approach of participatory photography recommended by Gotschi et al. (2009) was applied. Not all people were willing to participate in this activity, as they were not interested or did not want to provide information. During my field trip, I
managed to invite 50 people for interviews, and there were 10 photos taken by people to reveal current flood conditions and their concerns.

5.5.1. Justification for using visual ethnography in the research

One of the most popular tools in qualitative research is that of visual materials, especially photographs. Photographs are considered to “aid memories” to ethnographers and a source of data for analysis. They also entail an awareness of and sensitivity to a particular issue (Bryman, 2004). Moreover, Bryman noted that photographs enhance participation by bringing research participants and researchers together to decide what photographic images will be taken or how to interpret them. However, Bryman also stated that interpretations of a photograph is always different from different perspectives, thus photographic ethnography may be influenced by the experience and knowledge of researchers, informants or others, therefore it needs to consider an awareness of sensitivity level as interpreting a photograph without losing its reality.

Furthermore, using visual ethnography requires ability to analyse images without bias, in what context it is generated, as well as raising the concern of relation between words and images in data analysis plus ethical issues of privacy and confidentiality.

Bryman (2004) takes an alternative approach to utilise visual ethnography in order to understand the researched community through their eyes, called photo elicitation. This approach asked studied people to take photographs on what they considered was significant, with the intention of not including others in their photos. They were then asked to discuss photographs and meanings. Although photographs may not be good quality, they still uncover messages about negative and positive aspects of their lives.

5.5.2. Participatory photography

I identified three men and three women from each community to take photos. Two disposal cameras were given to them. They were asked to take photos on problems, livelihoods, coping strategies or even dreams. It was a learning process for both communities, because they did not know how to take photos, and it was a completely new way of thinking. In order to reduce the risk of offending people, it was explained to them not to take people’s photos, but only to take photos of scenes or objectives.
This revealed that men were more active than women. It turned out there were some other residents that wanted to try this new technique of data collection and I let them use the cameras. The nominated photographers explained to others how to use the camera and what it was for. It was not difficult, because I was on site most of the time, so they could call me when they wanted to ask about cameras and photos. The quality of photos did not matter to my research; the important thing was that these photos would reveal more about people in my research communities. The photos were developed and brought back to each community for explanation and discussion about who took the pictures, and what they wanted to tell. The original photos were scanned and filed for presentation in this thesis.

5.6. Secondary data

The secondary data are a source of documents that provide a general picture of city context, city floods or climate change related issues and events. These cannot be investigated by direct observation and interview. The secondary data comprised media reports, government publications, IEC leaflets, internal reports and project documents. Among these documents, the Vietnam Climate Change National Target Program, Ho Chi Minh City Adaptation to Climate Change to 2015, reports of HCMC Flood Control Units, Ministry of Natural Resources and Environment, and Ministry of Agriculture and Rural Development were highlighted documents for information at national and city levels.

The secondary data also consists of databases from the Asian Development Bank (ADB), World Bank (WB), UNDP, Intergovernmental Panel on Climate Change (IPCC) and different international NGOs that provide information on climate change impacts worldwide, including Vietnam and HCMC. These documents also provide details on urban flooding, scope of impacts, coping measures and other social census data.

All of these have been a major source of documents used in this research to identify impacts, existing measures and strategic strategy to cope with urban flooding in Vietnam and HCMC. Apart from this documentation, there is hardly any detailed information on socioeconomic data for the two research communities in Binh Thanh District and District 8.
5.7. Data analysis and verification

This section will briefly discuss the process of data analysis based on the concepts presented in chapters 2 and 3. Data verification steps are also explained to provide high validity for data analysis.

5.7.1. Data analysis

The concepts of poverty, adaptation and CBA presented (see chapters 2 and 3) are used in data analysis to understand community vulnerability. Vulnerability is also examined to identify adaptive capacity and resilience levels in the research communities. The elements to build adaptive capacity were analysed to identify weaknesses and strengths of research communities and options for the community based adaptation strategy (see chapter 9).

Applying different data collection methods means the research will accumulate rich data. Therefore, analysis of data must be planned and it depended mainly on the source of qualitative data collected. In qualitative research, the analysis process must stay grounded to reflect the empirical data, without biases or prejudices arising from either knowledge or being imported directly from existing theories or previous research, otherwise it blinkers the view of the researcher (Fettermann, 1998). Original file backup and compatible software or templates are also highly recommended in qualitative data analysis. The data set collected over three months of fieldwork included interview notes, observation, semi-structured questionnaire and notes, plus meeting notes with local government and professionals. They were retained in Vietnamese. Electronic copies of data were saved on the RMIT University hard drive. Some interviews were translated to English for the purpose of quotation for this thesis.

With the raw data collected, it is significant to identify the main parts of data based on themes set in semi-structured questions for the research, so that a number of proper codes can help highlight issues of community concern. In light of using semi-structured interviews and participant observation, narrative analysis was encouraged, especially for writing up ethnographic research. In order to filter data and “crystallise” ideas, a memo of each theme or main issue was also encouraged, so that it provided a “permanent and tangible record” considered as an audit trail (Bryman, 2004; Descombe, 2007). In order to identify themes and codes for qualitative data, interviews and observations were written in descriptive form in Microsoft Word and then marked in different colours. Research
participants explained the meanings of each photo taken and these explanations were processed as for interview and observation data.

Quantitative data from semi-structured interviews were entered and analysed by SPSS. Data analysis in SPSS comprises descriptive statistics, frequency and other basic statistical analysis. SPSS tables were exported to Excel for table presentation in the thesis.

5.7.2. Data verification

While different information is collected, good data is a critical aspect of the data analysis process. The core purpose of data verification is to provide credibility for the research that makes others believe in research outcomes. In this study, as suggested by Ergun et al. (2009), data was triangulated under forms of talking to other community members or other different participants to increase the validity of data collected (Hammersley et al., 2007). Bryman (2004, p.543) also explained that “this is a process whereby a researcher provides the people on whom he or she has conducted research with an account of his or her findings and requests feedback on that account”.

Indeed, by using this method, participants’ views, expressions and experiences collected from interviews can be assured. However, it is noted that the analysis of data can go off track as participants may explain more than they should in the consultation (Ergun et al., 2009). Importantly, being involved in a community while conducting research will help build a “detailed scrutiny of the text or visual images… this provides a solid foundation for the conclusions based on the data and adds to the credibility of the research” (Denscombe, 2007, p.298).

Different research methods are used to collect data that address each research question through a research design (see Figure 5.4). The targeted data set were analysed and presented in different chapters.
5.8. Limitations of the research approach and methods

The research based on urban settings of HCMC from which to study people exposed to urban flooding and climatic hazards and how they cope. Being guided by Few (2010, p.530), the two locations for this case study were chosen “as a means of broadening insights from different hazard settings rather than as a basis for comparative analysis”. The selected communities were within the boundary of metropolitan areas at ward level to examine vulnerability, resilience and the role of women in shocks and stress recovery. Use of a range of tools (i.e. observation, ethnography, participant photography and interviews) helps counter the small sample size and limited areas in this study.

I discovered that interviewees from local/city authority groups and professional groups shared a common view about what to say and how to say it. Indeed, they were not eager to answer all questions relating to barriers and future conditions of floods and people. They were also anxious when I referred to my notebooks for questions. Additionally, they did not have time and were often distracted by staff or phones. Given my previous experience in working with authority agencies, I prioritised my questions to ensure I could get answers face to face. All were asked the questions
regarding their knowledge about floods and climate change, current flooding situations in HCMC, government programs on climate change, their perceptions of floods, and climatic vulnerability. The priority of questions depended on what sector the interviewee was working in. In some cases, I decided to continue my communication with them via email and phone. In some other cases, interviewees automatically answered numerous questions in one go. I did not attempt to stop them and interviews sometimes digressed into natural conversations without control. On numerous occasions professionals tried to turn my interview into conversations about technical topics. Consequently, there were few irrelevant answers in my interviews.

Supposedly, the interviewees shared the same experiences in floods and natural hazards as they all lived in the same community. Due to limited time and resources, not all community members were interviewed. Interviews were semi-structured and therefore some factors of vulnerability may be likely inductive. However, the different tools of data collection allowed triangulation and legitimated the evidence to identify vulnerability to flooding and natural hazards.

Another problem I encountered in the Binh Thanh community was that the community living along the canal planned to resettle. Although there was no clear resettlement plan, people were rather sensitive to providing information. They were initially sceptical that the information collected would support resettlement projects planned in the community. It took time to explain the purpose of my visit and their right not to participate in my interviews. I expressed to them that I was willing to leave if they were not willing to participate in the interviews. Some of them expected that the information would bring immediate benefits to them, so they exaggerated their stories to make me believe how vulnerable they were. The interviews sometimes took longer than planned and also required lot of concentration and encouragement.

Sharing personal experiences is an effective way to establish trust and overcome suspicion. I shared with them, I lived in the same city, and my area was always flooded in heavy rains and high tides. I mentioned about my experience in being trapped in dirty water after heavy rain, trying to take my motorbike out of the flooded area, and my blistered foot became infected later. They empathised with my story and this helped create friendliness and openness later in the conversation.
5.9. Summary

This chapter discusses the research methodology applied to the research. The qualitative research tools, such as case study, ethnography, interviews and visual ethnography, are explained in this chapter to highlight the reasons why different methods are applied. The chapter explained the challenges and solutions applied during the field study. This chapter also examined the characteristics of two selected communities to emphasise their high risk of increasing urban floods caused by humans, heavy rain and rising tides. A data analysis framework based on the concepts of adaptation and starting point vulnerability provided a foundation for understanding community livelihood and vulnerability in the research communities. The following chapters will present the outcomes of data analysis based on the data analysis framework and tools developed in this chapter.
Chapter 6

Community Livelihood and Vulnerability

6.1. Introduction

This chapter presents the results of the research conducted with two resident communities – Binh Thanh District and District 8 – with a focus on vulnerability. The results have been collated under the key themes of the research. The chapter will focus on the community’s resources by discussing four livelihood assets of the research communities, availability of access to these resources and their vulnerability.

In order to present a structure for the presentation of results the concept of livelihood assets is used, namely, human capital, finance capital, physical capital and social capital to understand comprehensively the complexity, dynamics and vulnerability of the two research communities under study. These four assets have been emphasised as key assets to understanding how urban people cope with hazards and shocks (Blaikie et al., 2004; Rakodi et al., 2002). The findings will be presented as a gendered discussion of respondents and the two research communities. In addition to numeric data, a set of quotations gathered from semi-structured interviews will also be introduced. (The primary data upon which this chapter is based can be found in Appendix 3.)

6.2. Demographic characteristics of the two research communities

Blaikie et al. (2004) illustrated that different variables influence disaster vulnerability. Demographic characteristics, such as age, income, education and length of residency, help understand vulnerability in relation to hazards in specific communities. It also provides a general picture of risk reduction policies among different community groups. This section presents the linkage between demographic characteristics and vulnerability to hazards in the research communities.
6.2.1. Age

Blaikie et al. (2004) argued that different age groups are disproportionately affected by hazardous events. The age of household members may affect the household’s ability to cope with hazards and flooding. The study found that the general age distribution of community respondents ranged from 25 years to over 70 years in both male and female groups. The majority were between 46 and 65 years old. Males seemed younger than females in the research communities as they represented a higher percentage in age ranging from 36 to 65 years. While females accounted for zero in the age group 36 to 40 years, males represented 14% in the same age group. Data also showed a small group of the elderly, aged 66 to 75 years, lived in the research communities, of which 14% fell between the age range of 71 to 75 years, and the majority of this group was female in District 8 community. (More detailed demographic data can be found in table A2.1 in Appendix 2, which details the age distribution of males and females in the two research communities.)

6.2.2. Education

The findings showed that the level of education among respondents was rather high, of which the overall highest education level was secondary, followed by high school and finally primary school. Women from these two research communities have gained a higher level of education than men. The percentage of females who finished primary schooling, for example, is much higher (34%) than males (14%). However, the figure was opposite in regards to those who completed secondary school and the number of men attending high school was relatively higher than women, in the case of the Binh Thanh community. Illiteracy was not high, with 19% of males and 3% of females not going to school. The
single case of having a post graduate degree was in the Binh Thanh community. (See table A2.2 in Appendix 2 for more specific data.)

6.2.3. Income

In general, the main income source of these research communities was from formal and informal sectors. The majority of people in these two communities worked in informal activities (e.g. self-employment, casual work or part-time work for private entrepreneurs). Low income, inadequate social protection and welfare have added more risks and less resilience in these poor communities. (See details of interviewees who worked in the different sectors presented in table A2.3 in Appendix 2.)

6.2.4. Length of residency

The selected families have a minimum of three years and a maximum of 70 years living in the communities. The majority of families that visit the Binh Thanh community has a longer residency of between 31 years and 49 years than that of District 8. The findings showed that residency and community were more stable in Binh Thanh as most of them have lived in the community all their life. In District 8, the community was less stable, due to migration from other provinces and from other places in the city. Despite the length of residency, all respondents in both communities have experienced severe flooding over the years. They have established coping mechanisms to flooding. Different households would have different coping measures in the same flooding situation, for example, building up the ground floor to a higher level, moving furniture up high, building temporary dykes around the house. Table A2.4 in Appendix 2 presents the details of people’s residency that revealed the majority of people living in the research communities had been there for at least 6 to 10 years. People who have resided for more than 30 years have also occupied a large portion of the research samples.

6.2.5. House type and condition

It was found that in both research communities, people divided their previous land into small blocks and sold them to those who had migrated from rural provinces or resettled from an infrastructure development project. They did not obtain approval to subdivide their land; in other words, the
community had been developed without formal planning. Severe economic pressures and tight budgets for housing combined with lack of employment opportunities in their previous places of residence were reasons to migrate to District 8. This district was considered as one of main access to wholesale markets and privately owned factories of the city. In District 8 community, there were more households (24%) relocated from other state projects and they wanted to live in these cheaper flood prone areas because they could save their compensation money for their old age or healthcare in the future. There was no technical advice on how to build or renovate houses to cope with flooding in these areas. It is worthwhile mentioning that most respondents owned their houses (88%) of which 66% were permanent, 10% were semi-permanent or 4% were total temporary. The permanent structure was mainly brick walls without cement coating. As Blaikie (2004) stated, informal urban growth and bad housing conditions increased the vulnerability of people living in flood prone areas, and residents often faced greater risks from natural hazards than people living in other places.

6.3. Analysis of livelihood and vulnerability

This section presents the households’ capital profiles that shape livelihoods and vulnerability of people living in the two research communities. (Details of livelihood capitals were presented in chapter 2.) Identifying capitals of the research communities was crucial, because this would provide an overview of how the poor were able to survive and cope with risks and shocks. It also provided a comprehensive understanding of community adaptive capacity and examined the potential of a “local based actor” to reduce their vulnerability and build resilience in coping with hazards and risks (Pelling, 2003).

6.3.1 Human capital

Human capital of urban residents refers mainly to qualitative aspects of skills, education, labour ability and healthcare status. Unlike rural livelihoods, human capital is determined mainly by education and training that can help secure livelihoods in urban labour markets, as this capital enhances the prospects of a permanent income (Hy, 2009; Rakodi et al., 2002). Likewise, health is crucial factor that relates directly to household’s wellbeing. Health can restrict the quality of urban labour and earning capacity (Meikle, 2002; Moser, 1998).
Access to education

From the overview about education demography presented in the previous section, it is noted that the number of people who drop out of school or do not attend is fairly high. The number of men who dropped out of high school and/or secondary school is higher than that of women respectively, especially the population in the District 8 community. The findings demonstrated that education was not the poor’s priority and their family only expected children to know how to read and count. The findings also showed unexpected information about women having higher levels of education than men. Men tended to drop out of school to earn a living earlier than women.

Observation has indicated that the level of understanding problems and solutions was more limited in District 8. It highlighted the need to have different methods of delivering any communication and education programs to these communities. Poverty is the main cause for both men and women to drop out of school early to earn money for their family. Although women have better levels of education, they still have to undertake unpaid home duties and earn income for the family at the same time. Women in the research communities consider themselves as providing family assistance to reduce the hardship of men working outside the home. Therefore, they have to balance their time for income activities and household responsibilities.

“Me? I stay at home and do housework, cooking, cleaning. My husband is motorbike taxi driver. I want to find a job but who will take care of my house and my little son while my husband is out there to work, he is main income earner of the family” (Fieldwork 2011, interview 8 – district 8).

“My wife stays home to cook and clean. If someone needs a hand, she would arrange time and go so that she can earn some extra money to buy food” (Fieldwork 2011, interview 24 – district 8).

People with low education participate mainly in the informal sector (e.g. motorbike taxi, motorbike repairs, hairdressing, tailoring, street vendors and casual security staff). This exacerbates their vulnerability to hazards and flooding, as they either do not have enough regular income or receive welfare benefits to secure their livelihoods. In addition, observation shows that people with low education are slow to understand a leaflet or a talk relating to any specific issues such as flood,
hygiene or healthcare. Therefore, their awareness on these issues is also low, and they are unlikely to protect themselves and/or their family in potential hazards.

Observations showed that the ability to use education and skills to participate in the formal sector of the economy were limited in the two research communities. The respondents and their household members did not receive any official training, provided by the government to increase their skills and their ability to join the formal sector. Some have paid to learn hairdressing, tailoring or motorbike repairs that help them survive in an informal economy. Some have learnt skills through “learning by doing” such as making incense sticks, prayer papers or bricklaying. Some participated in the informal economy sector, providing services such as selling incense sticks, lottery tickets, motorbike taxis or house cleaners. People participated in the informal sector because it did not require high levels of skills and knowledge.

Data linking education levels and various types of labour also demonstrated the high level of vulnerability in human capital assets, as there is no secure access to formal paid work and people tend to work more in jobs with low skills and knowledge. Without access to other skills training, women without education or low levels of education took on household care responsibilities, and worked in petty trade such as opening home based businesses to sell groceries or drinks, doing home laundry service or cleaning and cooking for busy neighbours. Men dropping out of school were able to find permanent jobs as security guards, drivers or electricians in state offices or private companies, while women with lower education levels would participate in the formal sector as office cleaners or providing hotel room service (see table A2.3 in Appendix 2). Although they may get more stable income than others, they had to work in hard conditions and income was low. They did not receive social policy and welfare in their workplace, especially in private enterprise that may not operate in line with legal labour laws. They were also concerned about losing their jobs unexpectedly without any compensation. These working conditions had increased long-term vulnerability to ill health and wellbeing (Sanderson, 2000).

It was assumed that higher levels of education, such as high school, graduate, postgraduate or even vocational training, would enable them to participate in the formal sector with permanent income.
Unfortunately, the study found that a higher degree did not necessarily secure a place in formal employment, thus accessibility to permanent employment was not easy. Moser (1998) has also demonstrated that the capacity to work was crucial to the urban poor; income was managed effectively if additional labours of family were able to work. In the research communities, family members had to contribute to family income and when a family member could not gain access to work, the life burden was increased. They had no choice but to participate in the informal sector or accept low paid jobs. (The linkage between education level and employment is described in detail in table A2.5 in Appendix 2.)

The story presented in Box 1 is an example from the findings that some of the poor do not see education as a key to opening doors to opportunity and better income. They rather learn some skills and earn instant cash in the informal sector. It is likely there will be a risk of falling back into poverty and being more vulnerable as the informal sector is easy to access but there is no security in the long term. In general, this explains why education comes as a second and even third priority for men and women in these two communities (although there is disparity in women’s priority of education in both research communities).

Women in these research communities consider education is the second most important issue in their life. However, women in District 8 stated that education is important, but it is not as important as having better living conditions, and having some income. Some respondents in District 8 stated that a job training course would bring better returns and ensure future employment, which means skills are more important to the poor as it helps them generate income more quickly.

“Not all people who graduate from university can find a job, having a business to develop is the best.” (Field trip 2011 – interview 16)

“I am saving my money so that my son can go to vocational school….studying in other schools are good but it takes long time to be able to earn money...having a specific profession will help better.” (Fieldwork 2011 – interview 8)
Box 1. Lack of access to employment

Ms. A is a mother of two daughters, one has finished university with a Hospitality degree and another is still studying in the university. She has a drink store in front of her house as main income source of the family. Her first daughter cannot get a job, so now she is a worker in a private garment factory. The second daughter helps Ms. A to sell drinks or to clean houses of neighbours for petty cash. The family feels desperate because the money invested on the first daughter’s education seems not to be a good return. Now Ms. A is considering her second daughter’s education, and she said: “I hoped the first one would have a permanent job with reasonable salary so that I can rest a bit, it turns out hopeless… I have got a loan for my second daughter to go to university, now I start reconsidering that option… probably, a vocational training course may ensure a better life”.

As money is crucial to pay for food and shelter in the urban context, income generation is most important to people in these two communities. However, this strategy is only helpful in the short term, as Moser (1998) warns that their vulnerability and insecurity will be increased in the long term.

It was observed that not all respondents believe the way to stable income is to get skills. Some pursue educational benefits and long-term development. As found by Sanderson (2000), they believe that it is hard to get a permanent job, but there will always be a chance to get a stable job and a secure livelihood. They are trying to overcome barriers to establish a more sustainable livelihood. Although they have to sacrifice their immediate basic needs to education, they are building a better buffer against risks and shocks. People may increase their ability to access better paid jobs in the future (Sanderson, 2000).

“My grandson will be like you in the next few years after he graduates from the university. My family is not rich but I believe higher education can bring better future, so I have tried to help my grandson to go to school. Sometime he said he wanted to quit and look for a job, I encouraged him not to do so, the family can still cope with life so his only responsibility is to study hard and pass the university exam.” (Fieldwork 2011 – interview 4 – Binh Thanh)

“My wish is my children can pursue their education so that they can have a better chance to stable income.” (Fieldwork 2011 – interview 10 – District 8)
Health

The study demonstrated that not only education but also an individual’s health were important. Health determined the capacity to work, to generate income and enable savings. Some respondents stated that it would bring a financial burden when their children contracted waterborne diseases and they had to spend extra money on healthcare. During floods, children had to stay home to avoid dirty water. But this increased the risk of dropping out of school. These findings indicated that accessibility to healthcare was closely related to financial status and access to education.

“What a pity for the children. Sometime they have to walk back home and water level is up to their chest, some got nails off their toes because water ‘eats’ their feet. The adults can cope but we all feel pity for the kids.” (Fieldwork 2011 – interview 21, District 8)

Results from the interviews indicate that menstruating girls were afraid of going to school on flood days; they mentioned unhygienic conditions but none would talk about protection or prevention. Their health was threatened and they potentially drop out of school. In such circumstances, they were likely to start another circle of dropping out of school, bearing more of the household workload, participating in the informal sector and being vulnerable in the future as identified by Khosla et al. (2010).

While most men did not see health as important as house improvement and business development, women considered health was one of their first priorities in life. Women highly valued their health status because they wanted to protect their family; they understood that once a family member was sick, there would be additional costs to be paid and more burdens to the family.

“Rains cause flooding for this area bringing health risks, especially waterborne diseases. I hope I could have more knowledge on health protection so that I can protect myself in the rainy season and flooding situations…” (Fieldwork 2011 – interview 4, Binh Thanh).

“The health program is necessary for people here, we are poor and have low education levels. Our understanding and knowledge about health issues is very limited.” (Fieldwork 2011 – interview 20, District 8)

The findings also examined that health risks were an issue to both communities because the environment was polluted with a bad odour from stagnant water, filling canals and excess garbage and
they were more frequently ill. Women felt extremely insecure as flooding not only harmed their physical assets but also negatively impacted health and daily income:

“Rainy season or tide ride are worse, I cannot sell anything, I worry that I do not have money to pay for my daughter’s education fee” (Fieldwork, 2012 – interview 19, Binh Thanh)

“I am making cakes and sweet sticky rice for breakfast...my house will be flooded up to 30 cm within two or three hours, nobody wants to buy breakfast because they do not want to walk and stand in dirty water....I am also scared of itchy foot and joint aching” (Field trip, 2012 – interview 3, District 8).

The findings also indicated that both communities were exposed to environmental related diseases such as malaria, dengue fever or infectious diseases. The majority of respondents asserted that floods caused diseases for communities: skin related diseases were of greatest concern, followed by diarrhoea and dengue fever. Respondents of both communities were also concerned that illness would increase their daily expenses and reduce earning capacity. However, most respondents in these two communities stated they did nothing to protect themselves during the rainy season and in polluted floodwater. In both communities, some respondents said they were aware of diseases brought on by mosquitoes, so they bought mosquito spray from the pharmacy to spray around the house in the evening and in the morning. Only a few respondents stated that they bought antibiotic cream to prevent waterborne diseases. The findings also highlighted that people in these two communities also considered staying home, and putting their legs up on the table as measures to prevent diseases in the rainy season and during floods. It was observed that mosquitoes, breeding in stagnant water, were a serious problem for both communities. Although the local government had helped by spraying mosquitoes, the problem still remained. People in these communities, especially children, had a high risk of dengue fever. These findings suggested residents’ vulnerability, through poverty, would increase as their cash income was reduced if a family member was sick.

The survey has also suggested that most respondents were concerned that health would have directly impact their wellbeing, and some respondents even called for help and more support from the government for a sufficient preventive healthcare program.
“Many poor families have to spend extra money for their illness so their life is more miserable. My family can be a case, my son gets stomach ache and heart weakening, my husband had just passed away, my daughter-in-law is house cleaner earning VND 50,000 a day…. our life is not stable…mosquitoes and dirty water are horrible, it would be worse for our family if we get sick, that is the reason I think a health program is necessary for us…” (Fieldwork 2011 – interview 19, District 8).

“I have high blood pressure, whenever my house is flooded, thinking about water level, I am very concerned and most of the time, my blood pressure gone up…!” (Fieldwork 2011 – interview 20, District 8).

“I think a health education program is important and necessary for people living in this area, so that they can have awareness in how to keep hygiene and health.” (Fieldwork 2011 – interview 19, District 8).

The main elements of human capital are healthcare, education, skills and knowledge to sustain their livelihoods and wellbeing. Although it may increase the chances for people with higher education, limited access to formal employment, an inadequate healthcare system and lack of knowledge would increase greater vulnerability to people, especially women in the research communities.

In addition, it was observed that the elderly were less mobile and they struggled with physical health conditions. Where the elderly headed households in the communities, they were not always assisted by the local authority for their property and assets. These people relied on their children or neighbours who lived nearby, but they were busy earning a living. Some were retired and received a monthly pension from the local government; however, this amount did not cover all expenses including healthcare and house maintenance. Some had never had a job in the formal sector in their life and they completely depended on their children to take care of them.

The data showed that most families in the two research communities did not have health insurance or social benefits; they had to spend their money for healthcare and better housing and it has become another burden for the elderly’s children. In this case study and as observed by Blaikie et al. (2004), social protection was unreliable, and the vulnerability of the elderly was increased.

Blaikie et al. (2004) also stated that the elderly were less resilient to diseases and disasters. The findings showed that in both research communities, the elderly were more dependent. In some
families, for example, the children working in the informal sector looked after their parents, who suffered from bad health and were not completely mobile. With the sudden onset of flood, these elderly people may not be able to move or be evacuated in time. These results supported by Blaike et al. (2004) have found that natural disaster causalities in these elderly groups would be increasing.

6.3.2 Financial capital

The survey has identified different groups of income established in these communities. Income groups are classified based on poverty line set by the city municipal government. According to the city’s poverty line, income below VND 9,000,000 was considered a low income and income earner would not pay income tax. However, the study found that the poor have different levels of poverty. Income levels were divided into five different income groups: (1) extremely low, (2) very low, (3) moderately low, (4) low, and (5) better off. After analysing the data, the income level is divided as follows:

- Extremely low income group: USD 22 – USD 50 per month
- Very low income group: USD 50 – USD 175 per month
- Moderately low income group: USD 175 – USD 250 per month
- Low income group: USD 450 per month
- Better off group: USD 500 – USD 1,000 per month.

The findings showed that the majority of people in these communities belonged to different low income groups, with the better off group only accounting for 10%. Binh Thanh and District 8 have more people falling into the very low income group. In addition, many research communities have low incomes and unstable employment. Table A2.3 in Appendix 2 provides more detail on the number of people in each specific group. The results support the observations of Downes et al. (2010), that people with low income seemed to concentrate in hazardous areas and these people were less able to cope with risks and hazards.

Financial capital is important to urban residents because it provides different livelihood options. Financial resources may include income from labour, pensions, savings, credit and remittance from their relatives, of which savings and accessibility to credit are important in dealing with shocks and stress (Meikle, 2002; Rakodi et al., 2002). However, for the two research communities, the data
highlighted that the difference in the main income source was from selling their labour as casuals, having small businesses at home or working in privately owned factories.

With a burden of home responsibility, women also play the breadwinner role in their family, if their husbands cannot find a stable job. Lack of choice in employment has made women in these two research communities highly vulnerable and they end up with “dead-end occupations with low pay and long hours” (Moser 1998, p.6). The findings suggested that differences in women’s education did not relate to the fact that women may have a chance to participate in the formal sector. It is the commoditised nature of urban livelihoods that leave the urban poor, including women, with limited chances to survive outside the cash economy and increased pressures and risks to their livelihoods (Moser, 1998).

-income and its diversification

It was observed that women with low incomes tend to engage in multiple livelihood activities. They could diversify their income by both selling drinks at home and doing housework for neighbours, or even running a home laundry service after work. Women mainly did unpaid family labour or participated in the informal sector with self-employment activities such as selling groceries, drinks and coffees or food, sewing clothes, hairdressing, subcontracting or working part time in some family owned factories nearby. Some of them cleaned house or washing clothes for neighbours in exchange for some cash. The income earned from these activities helped with family expenses as personal or family advancement strategies. However, it did not help women who were less vulnerable, because they were still working in the informal sector, without social protection policies such as health and medical benefits, job security and noncompliance with government regulations. In line with the above observation and as an example, box 2 below presents a case of an interviewee who was working in the informal sector and at risk of increased vulnerability.

Further, the research found that more men could access casual work than women, mainly providing a motorbike taxi, casual labouring work on demand, motorbike fixing, farming or bricklaying. The potential for men to have more opportunities was higher because of their physical strength and because they had less home duties. Men can also get permanent jobs as security guards or drivers in
privately owned companies, whereas women may be able to find less secure part-time employment. In this context, part time work describes workers who are working in private factories and for manufacturers. These people do not feel secure as their boss may ask them to wait for a new assignment for days without being paid; the community explained that the owners of these private manufacturers do not have adequate supply for their production.

Income from these activities was usually low and there was no insurance policy, healthcare or sick pay at their workplace. In the communities, men tended to work outside while women preferred to work at home or in the neighbourhood, so they could take care of their family. This supports the findings of the UNDP (2012), that women might be more marginalised than men, as they have the double burden of household activities and income generation.

### Box 2. Risk of vulnerability

Mrs. B’s family has four people, and her husband is doing tri-wheel transport service. She has two children, one studying in year 10 and one in kindergarten. Her husband earns about VND 4,000,000/month (~USD 200), if he works hard in the dry season and on weekends. In the rainy season, the income is dramatically reduced to only VND 1,000,000/month (~ USD 50). They pay education fees for their children and that costs about VND 2,500,000/month (~ USD 120). Mrs. B is subcontracted to work in garment factories and this has become the family’s main, stable income. However, she has had to pay for a heart operation for her youngest son, and her husband has just stopped working temporarily because he has lung disease. Without her contractual job, she would not know what to do. Her time is now divided between her work and taking care of her husband and children.

Based on the city poverty standard, a household is considered as poor if family members earn under USD 50 per month. Nevertheless, the respondents evaluated themselves as poor if their monthly income was below USD 300 per month. The cost of living was increasing continuously, and additional expenses of healthcare and education had increased the level of income needed. In other words, as Meikle (2002) noted, there was no surplus to convert to financial capital, for example, saving to cope with stresses and shocks in the future.

Observations demonstrated that during flood periods, households having home based businesses worried about their loss of income and the costs of damage caused by floods. The unexpected costs for
water bills, electricity bills and labour had been noted during interviews, as people had to use water, fans, pumps and time to wash their muddy floors. Floods caused damage to the infrastructure system and people’s property in these two research communities. Pelling (2003) also found that damaged infrastructure and housing would destabilise households and livelihoods. Sanderson (2000) noted these risks also increased vulnerability to sudden disasters or shocks. However, for these two communities, there was no appropriate action being taken at the community level to ensure their livelihood was protected.

**Financial accessibility and support**

In the communities, access to formal financial sources was possible. Data shows that some respondents’ families receive loans from the banks, social welfare or local government. However, the reality provided by interviewees is that the loans and cash received from formal financial organisations is not enough, and families are still in poverty. Most respondents prefer not to have a loan because they may not be able to repay the money:

“My family tries to live with what we have; we dare not borrow or get a loan because we may not be able to repay the money. Our income is not stable enough so we are scared of getting a loan. My family is in the poverty list of the government so we get some support. My son is a worker and his salary depends on the availability of products, sometime he gets high salary, sometime he gets little sum only… it is also hard to calculate loan and return…” (Fieldwork – interview 2, District 8)

In addition, the study indicated that although formal financial support was available, it was not easy for informal labourers to access these services. The purpose of borrowing is to supplement daily expenses, to invest in their home business or to deposit cash for their subcontract work. The banks always ask for papers to prove the ability to repay. As they do not have stable incomes, they have low credibility to apply for a formal loan, and so they have to approach informal lenders for a loan with high interest.

“In the past two years, my business has been slow because of frequent floods, I got an instant loan to pay for my expenses and to invest in my grocery store” (Field trip – interview 22, Binh Thanh).
It was revealed that they have to pay approximately 15% to 20% per day to those informal lenders. If they cannot repay the loan, their productive assets (e.g. motorbikes) will be taken. Consequently, people with these loans have become poorer and more vulnerable as most of their income has gone to the informal lender by the end of each month.

This research observed a strong degree of kinship in urban settlements and women were the main actors in this relationship. Men tended to want to prove their capability to sustain family livelihood, while women were more practical and concerned with family expenses. The majority of men did not want to borrow money from friends or relatives, or they would “lose face”. However, the women tended to borrow money from their networks. Most of them borrowed money for income generating activities, education and healthcare for the family. Women were able to gain more access to informal lenders, local government funds and the state bank in Binh Thanh community, while women in District 8 considered borrowing cash from relatives, friends or neighbours as an alternative option. (Further detailed information can be found in table A3.2 in Appendix 3.)

“My wish is my children have stable job after graduating, my family has stable income and I have money to cure my husband’s hearing sickness” (Fieldwork – interview 11, District 8)

“I want to secure my income, I have to pay loan interest for my daughter who has a loan from Student Support Fund in her university; the loan rate is low, only 0.5% a year and I feel lucky because my daughter still has a chance for her study” (Fieldwork, interview 19, Binh Thanh)

More broadly, the findings showed that the poor in these communities did not have strong access to formal institutions as a source of support and, as a result, they were more vulnerable in coping with shocks and hazards.

For these reasons, people in these two communities expressed that they were not optimistic for their future, as income was not stable, saving was difficult and access to local funding support was not easy.

This finding was explained by people saying that their jobs were not stable and this made them feel insecure in their income earning capacity.
6.3.3. Physical capital

- Housing conditions and ownership

- Housing conditions

Most houses in the research communities had either brick walls or brick walls rendered with cement. In the District 8 community, most of the permanent houses were constructed with bricks and without cement rendering. The roof was mainly made of iron sheets or was temporarily covered by bamboo leaves. Some floors were made of concrete and some were made with a mix of half concrete and small stones collected from major construction sites. There were only a few houses built permanently and they were in Binh Thanh.

It was apparent from the study that extended families usually shared a small house, and they slept either in front of their stores, or on the ground. It was also common research communities that community housing was used as a productive asset (a workshop, a stall or rental rooms). These families expressed their insecurity by noting that they may be flooded overnight and all furniture and household goods would be damaged. This revealed the situation that housing may be thriving with small businesses but people nevertheless had to live in low lying, flooded and polluted areas.

Most people, especially women in both communities, evaluated the quality of their houses as slightly degraded because of floods. Their houses were flooded in high tides, with heavy rain or water running from main roads, and flood levels were increasing. Raising the level of the floor was not preferred in these communities because it cost money. In addition, when the floor was raised, ceilings and doors needed to be raised at the same time. There were cases where people could not afford to raise both the floor and the ceiling, so they only raised the floor. This disrupted their livelihoods as it became hard to move around the house. Some houses raised their floor level 2 or 3 times, some did it 4 times. Each time, the floor was increased at least between 50cm and 70cm and the former window became an additional door. This ad hoc method did not always bring satisfaction to people because nowadays, water not only comes to the front door but also from the toilet bowl and underground.

The interviews revealed that people in these communities could get approval to start housing construction and renovation, but none of them received technical advice to build or to renovate their
houses to adapt to increasing floods. In other words, there were no construction guidelines to develop an appropriate natural disaster preparedness strategy, or people were not aware of them.

- **Housing ownership**

  The survey discovered that a person in charge of the family would be registered as the head of the household. Among these household leaders, women, elderly and the disabled are the majority. These households were especially vulnerable in flooding situations as they had low mobility and low income earning capacity. There was no emergency plan to evacuate the disabled and the elderly in unexpected situations and therefore, it increased the vulnerability of these households.

  In both communities, there was not much difference between men and women in house ownership (see table A3.4 in Appendix 3). The findings showed that women’s main duties were to take care of their family, including getting legal paper work done or going to public meetings, while the men went to work. Some were widows taking care of their children with no support. In many cases, men owned the property because they were the main decision makers and they had to deal with the public administrative system. In general, housing ownership was not a concern in these two communities.

  “*I am in charge of dealing with legal paper work including connecting the water, electricity or getting house ownership certificate done….my wife is too busy with household work and she does not know much about these procedures*” (Fieldwork 2011 – Interview 9, District 8).

  The study also showed that children growing up in poor families usually lived with their parents because they looked after the elderly or they could not afford a new place. When there were many generations living under the same roof, the younger ones usually used their house as an income generating asset:

  “*My son and his family stay here with me….all of my family adds up to six people staying in 30 m2, but my daughter-in-law can use the kitchen to do laundry service, we just invested in a new washing machine*” (Fieldwork 2011 – interview 5, Binh Thanh).
Basic public infrastructure
- Road conditions

In the Binh Thanh community, the findings revealed that some parts of the alleys, where better off people live, were upgraded while other parts were low and flooded. It was getting worse with heavy rains or high tides as water ran from the higher part of alleys or main streets to lower parts along the road. Not all people could contribute money to road for construction; the better off people benefitted more than the poor as they could pay for construction materials. This observation was supported by Nguyen (2008) who concluded that increased flooding was quite common in Ho Chi Minh City, especially in the alleys where the poor lived.

Similarly, in District 8, the better off had more income opportunities on the main road, and the alleys in the communities were slightly degraded. Figure 6.2 illustrates the conditions of people living in the alleys in research communities. Most of houses were built up, some better off families used their money to build up the road in front their house and created a big hump on the road which increased the risk of traffic accidents.

As shown in Figure 6.3, the roads in front of premises were in good condition in Binh Thanh. People explained that both communities and government had contributed to these roads and the people’s contribution varied from 30% to 40%. However, if it rained heavily, even the main streets were flooded and traffic was blocked, as illustrated in Figure 6.4.

Figure 6.2 Part of community alley is built up to avoid flooding
Accessibility to basic infrastructure services

The survey showed that access to basic infrastructure services, especially to the power supply, was good. In the Binh Thanh community, the percentage of families connected to power was slightly slower than that of District 8 community (see table A3.5 in Appendix 3). Some were still not connected to water and power, and they had to pay the extra fee for connection to a neighbour’s system. The poor families tried to limit their usage of electricity to basic amenities. They did not own a fridge or a washing machine. The poor families used water from ponds, underground wells, canals or rivers for their washing to save money. It increased the time taken for home duties and there was an increased risk of waterborne diseases. In some houses, the washing machine was considered as a productive asset because it could provide a laundry service to neighbours.

The general figure of households having connection to the sewerage system was relatively high; however, the data showed that both communities still had a high percentage of discharge into canals or rivers, especially in the Binh Thanh District community. As both research communities did not have drainpipes connected to the main drainage system in the main streets, the majority of households interviewed still discharge wastewater into rivers, ponds and onto the road in front of their house. The drainage capacity of these two communities is not high, because the natural drainage system was filled by household disposal. And there was inadequate maintenance of existing drains. These factors increased the risk of flooding from high tides and high rainfall in these communities. As observed,
although the two research communities suffered from dysfunctional sewerage systems, Binh Thanh seemed cleaner and tidier with better structured properties. This can be explained, as Binh Thanh historically had been an urban area for more than 100 years.

Other related assets

Most people owned a TV, a washing machine, a motorbike or a gas stove, especially in the Binh Thanh community. (The details of household assets are given in table A3.6 in Appendix 3.) The TV was a valuable asset to people who watched TV for updating information and for entertainment. Although computers and the internet were so much more popular in HCMC, only a few families had computer and internet access. Most people did not think computers should be a means to update information and those who had a computer mainly used it for games. Only the better-off families could afford to have a computer, and only families with members working in the formal sector were interested in having a computer and internet access.

Motorbikes were considered as a productive asset to earn income in these two communities, and people used their motorbikes to provide taxi services or goods delivery. A motorbike was also important for independent contractors working in the informal sector who delivered their products to customers. Motorbikes were a means to commute from home to work, or to take children to school or pick them up. During floods, it was hard to use motorbikes productively and effectively, as water would damage the engine and cost them additional money to repair any damage.

6.3.4. Social capital

While other capitals (physical capital or financial capital) are more visible or measured, social capital is considered intangible and it is a resource that people rely on to maintain a support network and reciprocity between individuals, households and communities. Importantly, the identification of social capital can be seen as a valuable resource to the poor in times of crisis (Meikle et al., 2001). Moser (1998) has stated social capital in urban communities comes mainly in the form of social support mechanisms such as loans, childcare support, food and accommodation that offers an informal safety net amongst the poor and increases their ability to work together (DFID, 1999). Meikle et al. (2001) also argued that social capital can be shaped and developed as people shared information, especially
information about opportunities including information about the casual labour market. This section examines the social capital of these research communities to decide important determinants to be developed for stronger resilience within a climate change context.

- **Neighbour support mechanism**
  - **Willingness to help**

In both communities, reciprocity existed among households and between individuals. Data illustrated that the majority in both research communities were willing to help their neighbours and other people with difficulties. Only a minority of respondents were not interested in helping others or they hesitated to give answers on the issue of supporting their neighbours. Some stated they could help neighbours with their labour and time without money being involved. The interviews indicated that hesitation stemmed from distrusting anyone who asked for financial help, and people needed to know the details before making a commitment. In addition, people did not have enough money to spend daily, so they would contribute their labour and time instead. In District 8, the majority expressed they would definitely offer labour support and help to their community.

- **Neighbourhood support**

The findings examined that the neighbourhood cohesion in both communities was pretty strong, especially in District 8. The respondents knew everyone well in their community. They shared common interests including flood recovery, children’s education and income earning activities. Most of them were casual labourers, self-employed people or workers. They had opportunities to see each other and talked about things happening in their family, their neighbour and their community. Women from poorer families could get a casual cleaning job from wealthier families among their community. It highlighted the quality of social networking in these communities that importantly sustained safety to people.

Childcare support in extended families was relatively strong. It was important to women who had to work and earn money. This explains why people chose to live near other family members in these research communities. The respondents benefited from having close relations nearby who could help them at any time and they were able to maintain regular contact. Although in some cases where
family and/or relatives could not help, most respondents considered family and close relatives were the first solution in hard times. As was apparent from this and also noted by Stefan (2005), the proximity of family relations was crucially important to secure their livelihoods and acted as a buffer against shocks and crises.

In addition, the study identified that people in these two communities were willing to help others in other ways such as selling goods at cheaper prices, giving away free drinks or providing shelter from the sun or rain. They were willing to watch their neighbour’s house when the neighbours were away. Most of them had their neighbour’s phone number to call in case of emergency and some would receive messages on behalf of their neighbours. The neighbourhood could be considered as a community asset that should be mobilised and strengthened over time.

Observations from the research also demonstrated that neighbourhood support also came as a form of charity and the spirit of Buddhist voluntarily giving.

“My family gets financial support from local authorities, however, sometime it is not enough for my kidney treatment, so I usually borrow from neighbours” (Interview 19, District 8).

“You see the way to my house? All the sand and small stones donated by my neighbours, I do not have money to do it…” (Interview 19, Binh Thanh).

“Last time when I levelled up [sic] my floor, thanks to the neighbour’s donation, I could have materials to construct my floor. The cement was paid by the local government” (Interview 22, Binh Thanh).

Social network

Social network and connectedness are developed either vertically (between patron and client) or horizontally (between individuals with the same interests or facilitating work together)(DFID, 1999; Putnam, 1993). The study showed that in these research communities, social networking was formed both vertically and horizontally. Neighbours, friends, relatives and clients had built the social network in these research communities. In Vietnamese culture, the neighbourhood plays an important role in people’s life, as the saying goes: “Trading far distanced relatives for a close by neighbour”. It is also illustrated by comments from a respondent in District 8: “Nowadays, neighbours are still kind
and nice as ever, we ask each other about impacts of flood, any help needed after flood…” (Interview 20, District 8, Fieldwork 2011).

In addition to close relatives and neighbours, it was evident that both men and women in these two communities depended on their social networks to obtain casual income, to borrow a small loan for food, to reduce education expenses, and to share information about their communities and surrounding areas. The social networking research communities were relatively close. The study also examined that working people seemed to have less social interaction with their neighbours. However, these people also came by to grocery stores or food stalls to buy things in case they did not have time to go to the market.

One of the issues that emerged from these findings was that active participation in community activities, as community leaders of both research communities, were women.

- **Community space**

In both communities there was no official community space where people could get together and converse. Even the Ward People’s Committee headquarters were pretty small for meetings, especially Binh Thanh District community; the alleys were small and the Ward office was located in a small tube house in the main street. The District 8 People’s Committee office was bigger; however, the security guards sitting in front of the gate created uncomfortable feelings for anyone coming to this place. For these reasons, people’s food stalls, grocery stores and coffee shops became common public places to gather. People came here not only to drink coffee or to buy things but also to exchange information about their community. Everyone came to these common places including wealthier people.

- **Women’s role**

  - **Sharing information**

In the research communities, men collected and shared their information over a cup of morning coffee in a coffee shop and most women consolidated their network and obtained information on different activities such as buying and selling groceries, having breakfast or even coffee with others, visiting or working casually for their neighbours and participating in public meetings.
• Participating in collective activities

The percentage of women participating in community meetings was much higher than their male counterparts. The research implied that women have more access to informal information and stronger social networks:

“They [women] usually stay at home and take care of the family activities so they understand what to ask for. Also women have skills to better communicate and to ask for information” (Interview 7, Binh Thanh District, Fieldwork 2011).

Data linked to the percentage of participants in public activities demonstrated that women were more active than men. Women had more access to information and therefore their social capital was much stronger. The strong mass organisations in the research areas were the Women’s Union, Youth Union and Veteran’s Union. While there were only a few male respondents having membership of the Veteran’s Union, most female respondents were members of the Women’s Union. Although mass organisations are strong and gaining membership of a group can extend people’s access to political institutions and other organisations (DFID, 1999), men in these research communities were not interested in becoming a member of any mass organisation. And therefore, they had less access to information in comparison with women. In other words, men had weaker links to vertical social networks than women.

There were more women participating in the events for environment, gender balance or other social activities in the community. In addition, the community leaders of both research communities were women. Women who did not participate explained that they were busy with family tasks after work, or they did not see the benefits of joining mass organisations. Those who were not Women’s Union members also elaborated that being a member entailed obligations and was time consuming: earning income was more important to them. Some women added that they had to look after their children after school. These findings highlighted women’s difficulty in facilitating their important role of developing social networks to provide access credit, accommodating children and more importantly, increasing the opportunity for women to have a voice in the political system.
• **Main actors in the family**

In the research communities, women were main actors in their family. Although they did not state clearly whether they were the real heads of family, they agreed that they made decisions for daily expenses, and managed family budgets and savings. In addition, women also decided how their house should be renovated or how much they should get from loans and from what source they would approach for a loan. The moral of giving best care to family had put women under pressure, as they needed to find extra income to maintain family nutrition and save for their family. When women performed their domestic task of keeping their house clean, they faced health risks of cleaning garbage, and coming into contact with contaminated water and waste after floods. The findings suggested that women’s burden was increased and the health risk was higher after flooding.

As women spent their time taking care of their family, they did not have time for improving their knowledge or learning new skills. This finding implied that women therefore did not have as much opportunity as men in developing their skills to generate more income.

❖ **Support from local organisations**

The interviews also suggested that mass organisations did not clearly demonstrate the benefits of joining as a member, so they could attract more members to join. These mass organisations have not yet extended their activities and focused on supporting women and their family in household tasks and flood control activities such as building up floors, renovating houses, and protecting the environment.

One of the mass organisations, the Red Cross, was considered as an active player in promoting healthcare activities; however, they did not engage women with any action plans to educate them on prevention or minimising health impacts caused by floods and other natural events. In other words, the importance of women’s role is yet to be recognised in some mass organisations’ activities.

On the other hand, there was no community based organisation in the research communities that could help maintain the solidarity of community or call for community participation. Some families had better awareness of cleaning drains and keeping neighbouring areas clean, while others did not really participate to improve their active involvement in these two communities. The research communities did not have the relation between mass organisations, community based units and people; this
challenge would reduce effectiveness in coping with floods and other natural events in these communities.

In some cases, interviewees expressed their understanding of city activities but they also revealed they did not trust the government to deliver an effective flood control system. They were not sure when these projects could be completed. Some showed no interest in what the city or local government was doing to control flooding. People also discussed the limited capacity of local officers and mass organisations in passing on environmental or healthcare information. These organisations sometimes failed to deliver the assistance needed to help the urban poor cope with flooding and health risks from mosquitoes. Some government programs propagated by the city government such as “sweeping the streets” or “raising small fish to eradicate mosquitoes”, did not last for long and were not sustainable. This finding implied that people’s trust toward local government and city government was not high.

In this situation, where community access to wider institutions of society was not strong, Asley et al. (1999) suggested a safety net for people, especially the poor.

**6.4. Discussion of community livelihood and vulnerability**

This section identifies causes of poverty and vulnerability in the research communities under study to understand their resilience and adaptive capacity in the face of climate change. Limited access to livelihood capitals limits the availability and development of resilience in community. By exploring the vulnerability of community in coping in these two communities, it is clear that they are less resilient to shocks and stress, especially climate induced variability. Although they have been prepared for the flood, with the increasing occurrence of floods and heavy rains nowadays, their preparedness for any higher level of flooding is not strengthened and that may affect completely their assets and livelihood in coming years. They need strong support from the local government and organisations, so their adaptive capacity can be strengthened to cope with increasing flood events and unexpected hazards in the future.

The analysis showed that access to human capital is limited in these research communities. Vulnerable families are characterised by low education levels. These levels have also restricted understanding and awareness of people to climate vulnerability and to coping measures. Limited access to develop their
education, employment and skills reduces the possibility of getting into formal secure employment and income opportunities. Developing skills and access to employment can help them reduce their vulnerability and increase access to human capital.

Low education also limited the understanding of health risks and healthcare prevention. People in these research communities were highly exposed to environmental related diseases but they were not able to protect themselves or their family. The poor also experienced more difficulty, as a sick member also meant reduced income and increase expenses and they do not have insurance. They rely on local government support to provide information on healthcare issues and to offer preventive healthcare programs. However, the service provision from local government does not adequately meet these demands. The findings help shed light on people’s needs, and to have better awareness on the issues of health protection and infrastructure maintenance. It is clear that health vulnerability reflects a lack of sufficient healthcare, and insurance and support of local government.

Diversification of income and livelihood strategies is another vulnerable factor of these two communities. Although livelihood diversification activities were dynamic, as different family members had different strategies, they are only able to respond to short-term shock events. Despite the responsive actions of community only allowing people to secure their immediate needs, working in the informal sector is crucial for the poor in these communities. In addition, limited access to formal loans has forced the poor into insecurity, as they have to borrow money and pay high interest from informal loan sources. The findings provide evidence as to how vulnerable these communities are when they have to turn to the informal sector as a means of living.

Bad management and degraded infrastructure have made these two communities more vulnerable to frequent floods and disease. Road and basic infrastructure system were another physical vulnerability. As people built up part of the community road to avoid flooding, roads became less accessible and dangerous in floods. Accidents happened and they caused injuries to pedestrians and motorbike riders. The fact that there was no signal marked to identify rivers and main roads, revealed extreme risks of fatality in the flood season. Together with pollution, these factors were also affecting climate induced health shocks in these research communities.
While land tenure is minimal, the quality of housing is an important factor in vulnerability within an increasing flood context. The poor people in these communities did not have enough resources to build permanent houses, and they did not have technical advice for appropriate design and construction to withstand flood events. The outcome was that they often had to spend more money to fix or renovate their houses.

Highlighted in these findings was strong social capital in which good relations with neighbours can be considered as a valuable source of support and resources (Stefan, 2005). In these two communities, good kinship relations were valuable and considered as a source of support. This sheds light on the reality that getting support from kinship networks was easier than getting support from a bank, as they only needed to explain their situation. The importance of credit accessibility had been stressed by Rakodi (2002), and credit has helped manage daily expenses, meet certain healthcare demands or house infrastructure and build up financial assets.

The research indicated that financial support from family, friends and neighbours was considered as women’s social capital. It also illustrated the potential role of neighbours in supporting each other to overcome shocks and stress in these research communities. It implied the existence of solidarity and cooperativeness. Sanderson (2000) noted that the neighbourhood was an asset and it would become a preparatory action coping with hazards and shocks in the future. Support from community and relatives could help members reduce their vulnerability and secure their survival. In other words, the findings indicated that the reliance on kinship support and social networks was major, and it was a likely a resource for the poor and the vulnerable people coping with hazards and risks (Asley et al., 1999; DFID, 1999). As the access to social capital is strong, it can shed light on the potential for developing community resilience in coping with increasing floods and other environmental related impacts (Adger et al., 2003).

Although there was little evidence to suggest that females who were the heads of households were more vulnerable, they were more sensitive to risks and hazards. For example, they had to pay male labour to fix their walls or doors after floods, while men could do these things easily. The linkage between gender, domestic tasks and vulnerability was highlighted. Data also illustrated that women
were the breadwinners of their family, and therefore they seemed more vulnerable in flood events. However, the findings demonstrated that women were the main actors in climate vulnerability reduction and they would engage in adaptation activities.

The case study and livelihood capitals are used to illustrate the way local community conceptualised their livelihood vulnerability. Livelihood capitals and limited access are outlined not to portray a negative situation. On the contrary, they are used to frame vulnerability concepts discussed in previous chapters. They emphasise social capital and women’s role can be used as the main determinants of resilience and adaptive capacity.

In addition to livelihood vulnerability, understanding environmental sensitivity and appropriate responses are essential to a good community based adaptation plan (Bryan et al., 2013). By using the livelihood capital framework, the discussion has identified key factors that lead to vulnerability, in particular, climate pressure on people and the key factors that build capacity and community response to climate vulnerability. With this understanding, it is possible to consider what is needed to reduce vulnerability. However, the ongoing effect of climate change must also be considered.

Chapter 7 will examine the exposure of research communities in the flooding context, their responses, and institutional support to provide a better picture of vulnerability and the potential for better adaptive capacity and resilience.
Chapter 7

Community Environment and Vulnerability

7.1. Introduction

As with the previous chapter, this chapter draws on the data collected using the methods discussed in chapter 5 to present an overview of how the communities of Binh Thanh and District 8 think about climate change. This chapter also presents existing coping strategies, knowledge and demand during flood events in these communities. By analysing the capacity of and challenges in community, this chapter identifies key actors who can play an important role in community adaptation. The desperation in seeking appropriate and relevant ways of adapting to uncontrolled urbanisation, frequent urban flooding and its impacts are presented. Local authority’s support and their lack of ability to lead community in coping with increasing flooding are also discussed.

7.2. Analysis of environmental vulnerability

7.2.1. Flooding

❖ General context

The study found that flooding in both communities was getting worse every year, especially in comparison to five years ago. Most respondents evaluated flood conditions in their community and validated the above claim. Flooding not only occurred in low lying agricultural land, but also in the urban areas, such as Binh Thanh and Districts 6, 8 and 9, of which the two research communities were included. The main causes of flooding were land that had subsided, low lying areas, rising tides, heavy rains and ineffective drainage systems. Most of the sluice gates and drains were lower than river by 0.5m to 1m. On the other hand, as the city is situated on the main estuaries, linked to the South China Sea and also downstream from the Dong Nai River, the city receives a reasonable amount of water from different sources, including rising tides, storm water and swollen upper streams in rainy seasons (Phi,2012), and this affects the city.
The data showed that respondents have lived with and experienced floods for years. From their viewpoint, the flooding season usually started in May and ended in November. Binh Thanh community, located near the Thi Nghe main canal, suffered more floods in November, while flooding subsided in October in District 8. Small branches of the Thi Nghe main canal have been blocked by garbage, extended structures of houses and construction projects in the area. This is why flood levels have increased dramatically in the abovementioned seasonal periods in Binh Thanh community. The interviewees observed that floods appeared to be more irregular due to unexpected rains between June and January every year. (see table A4.1 in Appendix 4, which details these trends.)

Respondents of District 8 community noted that the flooding level was high and varied between 10cm and 80cm in rainy seasons or high tide periods. The estimation of flood levels in Binh Thanh community differed, as respondents could not be precise about these levels. They described the water as being up to their ankles, up to their knees and occasionally, when it rained heavily, up to their laps if they walk in the water.

- **Human cause of flooding**

![Figure 7.1 Garbage and obstacles to water draining in the research communities (source: author)](image)

Flooding was a threatening and desperate topic for people in these research communities. People frequently referred to the polluted environment around their houses and in their communities. They were also concerned about garbage that floated into their houses (see figure 7.1). But the majority of interviewees did not consider littering as degrading the environment or adding to the flood problems.
In this study, extra cost was found to be another concern for communities, as they had to clean up garbage and mud after floods. It was not only threatening and disruptive to business during flooding, but also life threatening, as health risks, such as skin related diseases and dengue fever from mosquitoes, also brought stress and insecurity. Not all of respondents understood that humans caused flooding in their communities.

The results of this study highlighted the misuse of land in these communities. People occupied public land, canals or even gas pits to extend family space; some families have put their bins or flower pots in the alleys. These objects cluttered the public area and partly obstructed water run-off from heavy rains.

It demonstrated the lack of awareness of people regarding flood prevention and ineffective management by local government. Another important finding was that both communities gave priority to building or renovating the drains. The drainage system in both communities was old and overloaded. In addition, upgrading the alleys and roads has been highlighted by both communities in the study.

- **Urbanisation**

The results of this study found that two main impacts of urbanisation on community flooding were that the population increased and residential planning did not keep up with this increase. An outcome of inadequate planning is that people had filled up the paddy fields, which functioned as reservoirs. Consequently, as most of the paddy fields overflowed, water spilled over into rivers and canals, accelerating the flooding situation.

![Unplanned construction in local area (source: respondent)](image)

Figure 7.2. Unplanned construction in local area (source: respondent)
The issues of unplanned construction are illustrated in Figure 7.2. Various participants also commented that local government has not supervised and planned appropriately for new development, and bigger houses were inappropriate for small alleys, where downpipes were too small and consequently drains were overloaded:

“The road has not been paved yet. House level is always higher than the road.”

“The new construction in the area of district 8 community, the floor level is much higher than ground. It is good for people staying in the house but it is not good for public drainage. Water will all go to the street. The infrastructure is not yet finished and the road is still not paved. If the flood happens, it becomes very dirty to move around.”

“Houses are built nicely in area without infrastructure. The small alley with big houses.”

- **Other reasons**

The study also found out that human behaviour was also a cause for flood. In particular, people used concrete for yards and gardens had reduced water surface and number of reservoirs in the city. The findings were supported by local authority’s viewpoint below:

“The concrete is replacing for soil, water surface is reduced and no place to store water.

It causes local inundation. In addition, people illegally fill up the canals to construct their houses.” (Fieldwork 2011. Interview with local officer 02)

In addition, local authority noted that garbage thrown into the streets caused flooding for some certain local areas. The overloading drains increased the risk of flood.

- **Community and flood impacts**

In the research communities, most people ascertained that flooding was getting much more serious. Some respondents were disappointed in the level of support: “I think it is increased a little more, but what for... we have lived with it, we get used to it and no one can help so...” (Interview 3, District 8).
People did not really think about the impact of future flooding and community disruption, providing their houses were built up. Flooding has become a normal event and they perceived that floods no longer threatened their families.

- **Property and cost**
  
The survey also showed that floods not only damaged physical property but also eroded financial capital, as people had to pay to repair or renovate their houses. Both communities have stated that it was very costly for them to fix or renovate their house, especially in District 8 community where houses were mostly temporary and the ground floor was below the river level. These houses usually belong to the low income group, who do not have money to upgrade floors or walls damaged by floodwater.

- **Environmental pollution**
  
  Another important finding was that houses were not only flooded or leaked, but they were also polluted. After floods, garbage such as plastic bags, shells or animal bodies were floating inside people’s houses and in their gardens. The surrounding environment also became more polluted when the weather got warmer, animal bodies remained, and water could not drain into the ground. As the majority of respondents were not connected to a public drainage system, stagnant water remained in people’s houses and in the community for few days. Both research communities agreed that flooding was the most serious problem in their life and for their communities. It was noted that in District 8, all respondents complained and their stress was visible when they talked about floods.

  In this study, garbage clogged and overloaded drains caused flooding in both communities, especially in District 8. It was somewhat surprising that littering was regarded as a serious issue for both communities and they were desperately seeking support to resolve the issue.

  The concerns for children’s wellbeing were highlighted in the photos taken by respondents in the research communities. Vacant land was full of scrap metal. In addition, these areas are also breeding sites for mosquitoes and dengue fever. The photo in Figure 7.3, taken by one of the respondents, illustrates that children were at high risk of being injured or contracting dengue fever in these areas.

  In addition, their understanding and knowledge about the city flood control activities were extremely
limited. More than two-thirds of respondents in District 8 and Binh Thanh were not aware of any flood control programs in their areas.

Figure 7.3. Risks to children in these communities

- **Life and business disruption**

The photos in figure 7.4 showed people’s concerns and how flooding impacts and disrupts their lives and those of others in the community. Their lives were disrupted, and traffic came to a standstill with rising tides and heavy rains. They considered flooding as the enemy. They could not resist and did not know how to escape:

> “Water is up, getting hard to travel in the area, a motorbike ‘died’ in flooding.”

> “Water starts to rise in the community.”

> “Flood makes traffic horrible….my neighbour sells snacks in front of a factory, she usually gets wet if a bike runs fast [sic]. This happens in the afternoon around 5 pm when the workers finish their work and go home.”

> “Water is raising [sic], the road looks lower than the water level from the other side of the river.”

Flood impacts to business and income were of serious concern as illustrated in the photos. Figure 7.4 also provides a general picture of flood impacts to business; no one wanted to visit these communities in flood time and income earners therefore suffered. Women who sold groceries, drinks or food on the street were severely affected. The implications of flood impacts were illustrated by their expressions captured in their photos:
“Business affected, walking in dirty water, garbage floating and coming to the house. A photo replaces [a] thousand words.”

“Surrounded by dirty water in flood, coffee shop is an island.”

7.2.2. Urban heat in the research communities

On the question of climate change events, this study found that warmer weather was another concern for these communities. Respondents explained that temperatures were increasing yearly, more houses were built without planning and they did not have many green trees. In addition, there were more vehicles on the streets causing high emission. In Binh Thanh, many factories built nearby caused air pollution.

One unanticipated finding was that in addition to flooding, people had to pay extra costs for electricity bills in the dry season and this was increased every year due to using more fans in warmer weather. In wealthier houses, air conditioners were used most of the time in the dry season, and it would seem that air conditioning was part of the cause for air quality and pollution in the city.

• Impacts on health

In both communities, the research also revealed that health was another issue for people. Weather related sickness, such as headaches, colds and heat stress, were raised in research communities. Flies bred in stagnant water, animal bodies and garbage produced pathogens of tropical diseases that threatened community health. In Binh Thanh community, the concern about security and the increase in crime were also expressed, as people needed to open their windows at night. This combination of
findings provided evidence that community wellbeing was at risk. Figure 7.5 illustrates the existing condition of these areas, filled with garbage and scrap material.

7.3. Analysis of adaptive capacity and resilience

From previous analysis, data has illustrated that the vulnerability level of these research communities is relatively high, depending on their vulnerability to environmental events and their lack of adequate access to livelihood capital. As examined in chapters 2 and 3, adaptation capacity is based on the level of vulnerability in the community. If a community faces a higher risk of vulnerability, it does not have the adaptive capacity to withstand climate change; for instance, critical elements of adaptive capacity are awareness, technology and institutional support. These elements form adaptive capacity and this understanding provides direct input to data analysis. This section will examine these elements to identify gaps to be improved in the proposed community based adaptation strategy (see chapter 9).

7.3.1. Community awareness

Figure 7.5 also illustrates the lack of public awareness in these communities. Although domestic garbage, animal bodies and broken furniture were usually seen after floods, throwing garbage out on the streets or in the canals has become a bad habit. During high tides, water carries all garbage, littered in surrounding canals, back to people’s houses and community alleys, causing unhygienic and polluted environments. A local officer has noted:

"People consider the streets as garbage bins; every night people bring their domestic garbage out and put them [sic] near the culvert cover. If it rains, the garbage will be floated everywhere and block the water stream running to the sluices.” (Fieldwork 2011, interview with local officer 02)

However, people did not think they were contributing to the problem. Many examples were given to illustrate garbage thrown out and blocked drains in heavy rains. Surprisingly, no differences were found in relation to the government’s role. The two communities expected government was the key actor and that they should concentrate all of their resources into solving the flood situation.
The study also found that people usually put domestic garbage outside their houses in the evening, and food stalls did not gather food trash before the garbage collectors came. This habit has developed over the years, especially in poor communities, with no urban management regulations. As a result, garbage was all over the place when the floods came to these communities.

“People always put garbage outside when it falls dark. This is a bad habit and I am not sure when it has become popular everywhere. This is definitely bad for urban civilisation and water drains.” (Fieldwork 2011 – Interview with local officer 10)

In community participatory photos, littering was also raised as a problem and people did not know how to minimise impact. The two communities highlighted their desperation in seeking a solution:

“Who can clear up the surrounding areas for us….My house, how good is it?”

“Dirty water cannot be good for health, very smelly….but what can we do?”

“At the back of my house, when can it is cleared out so that I can enjoy the canal? It is smelly and very dirty now. The mosquitoes are around, the flies come in summer, horrible!”

“We collected the broken bricks from construction site to make our yard better and less dirty in flood.”

### 7.3.2. Technology advice

- **Local forecast system**

The findings demonstrated that both communities hoped to have a local forecasting system that informed them about potential floods or heavy rain in their areas. The weather forecast on TV was too
general and some of them did not have time to watch TV. However, there were quite a few people who disliked the community broadcasting system, as they had experienced noise problems with the radio system.

- **Radio broadcasts**

The study also examined if radio weather forecast programs could help people better prepare for coming floods or other environmental events. There were no radio weather forecasts where community could update their information on weather events. However, findings also illustrated that a few people did not want to have a local forecast system, as they thought it would be like the noisy community radio that disturbed people. They stated: “it [radio broadcast] is noisy and as before we had it here, we could not sleep because it started at around 5 am [or] something” (Fieldwork 2011, interview 12, Binh Thanh community).

- **Other communication channels**

This study has been unable to demonstrate that research communities updated weather information from other media outlets. However, on the question of how people updated information of city life and ongoing events, they confirmed they used TV, newspapers and community meetings. In addition, the internet, neighbours and mass organisations were mentioned as an information source although not often used.

**7.4. Analysis of community coping strategies**

This section describes the resilience measures taken by the research communities in the context of flooding. The data also illustrates the community’s viewpoint on coping measures.

**7.4.1. Coping strategy**

For years, people in the two communities under study have dealt with floods, but they are not prepared to cope with floods. They did not have any plan in place for coming flood events and some even thought, “the die was cast”. Families better off mentioned moving to a better place, while the poorer could only stay in flood prone areas. Otherwise, the inactive measures applied in both communities were to move things up higher during floods, bailing water out of the house using buckets, building temporary dykes around their houses or using timber/sand bags to create access to houses and to
prevent water from entering the house. However, some mentioned these measures did not really help, when the water came up from the toilet bowl or from the canal at the back of their houses. In District 8, the community used similar measures, but they did not use timber to create temporary access to their houses, as “timber is expensive and not really necessary if everywhere is flooded” (Fieldwork 2011, interview 13, District 8). Raising house floors and yard levels has been implemented when people could afford to do this. This ad hoc method was used commonly in the two communities. Figure 7.6 below demonstrates some coping measures used in both communities.

Figure 7.6. Coping strategies (source: author and Nghia, 2013)

These observations were demonstrated in community photos presented in Figure 7.7. People explained that these temporary measures were not their desired solutions, but they did not know what to do and they needed technical advice. They used these photos to metaphorically highlight their preparation for flooding. Some of them commented:

“A temporary plastic fence used as fence to prevent garbage from river.”

“Window becomes door, you can see how serious flooding is in my area.”
“We levelled up [sic] our floor once, then the road was levelled up [sic], and my house becomes low like this. Is it good?” “No money to level up [sic] the house, so we chose to build a small dyke...slippery in water though.”

“My house...the toilet is horrible place in the house, it is lower than other parts of my house. We do not have money to renovate house so we stay upstairs, everything is up high so that it is less damaged in flood. You can see upstairs is where all family sleep”.

Figure 7.7. More coping strategies of research communities through community lenses (source: author)

7.4.2. Coping with heat

On the question of urban heat, the two communities provided some coping activities such as creating more green space, installing air conditioners, lifting the roof, installing simple insulation systems in the roof and moving furniture to make more space in houses, especially in the wet season and to cope with the heat. Creating green space was often mentioned, however, space was limited due to the size of their properties.
7.5. Institutional support

Government agencies, environmental organisations, NGOs, community and the private sector were suggested as participants in community adaptation measures. Entrepreneurs should be the main actors in minimising impact from environmental events and supporting the poor to cope with such hazards. The role of community was not considered as important. People were not aware of their role in coping with local floods or that they had partly contributed to the problem. Both communities think it is the responsibility of local government to help them:

“We only worry how to find food and money to survive; we do not really care about changing climate. I think it is the responsibility of the government.” (Fieldwork 2011, interview 17, District 8)

However, the findings revealed that people expressed their need to be supported by the government. The two communities assumed that local government did not do a proper job and did not attempt to communicate well with them. Local government, in people’s viewpoint, has not taken adequate action to control floods and to support affected businesses. In this regard, the interviews with local government revealed that Ward government was not proactive in taking initiatives to cope with floods, as they wait for support from a higher level. The mass organisations have more focus on giving money to renovate houses or pay a visit to sick people.

This did not raise people’s awareness of the root cause of vulnerability under natural events and did not encourage people to be a part of any activity. In addition, the findings suggested some people had lost faith in the government.

7.5.1. Voluntary units

The findings showed that at the community level, voluntary units were formed to communicate with community and update information on the elderly, children and vulnerable families so that these people could be looked after if disasters happened. They were also in charge of reporting damages and helping people after events. The members of these voluntary units were mainly from the Youth Union. However, the roles of these units were not recognised in either community as they did not work effectively.
7.5.2. Environmental events and campaigns

Local officers in charge of environmental issues stated that some environmental events, such as Green Sunday and Volunteering Environment, had been organised by the local authority to encourage people’s participation. Leaflets about environmental issues, solid waste collection and levels of fines paid for causing environment pollution were also distributed to households in both communities. The findings also demonstrated that some health protection programs, such as eradication of dengue fever or prevention of foot and mouth disease, were carried out in the communities. On the question of the effectiveness of these programs, people emphasised their inadequate knowledge and their low level of understanding about these problems. In general, people greatly appreciated these practical programs.

Local officers also discussed the limited capacity of local officers and mass organisations in passing on environmental or healthcare information, or in providing assistance to help them cope with flooding and mosquitoes. Moreover, they mentioned environmental events propagated by government such as “sweeping the streets” or “raising small fishes to eradicate mosquitoes”.

7.5.3. Expression of challenges

The interviews with local officers showed different expectations on the topic related to climatic vulnerability policy. Some emphasised the importance of general climate change knowledge, energy saving or integrating climate change into land use planning. Others wanted more specific information of greenhouse gas (GHG) definition, impacts of climate change on HCMC, flooding maps and clear guidelines with regard to floods and environmental pollution. Some local staff suggested having a separate website at the city level to educate people, including state officers, on environmental vulnerability and risks. The content of the website should be more detailed and focus on vulnerability and solutions, policy and guidance and environmental events in HCMC including floods, heatwaves and land erosion.

- **Limited availability of funds**

The findings showed that in government infrastructure and construction government projects, there was no funding for facilitating coordination between agencies. The project owner would pay all expenses within their project area, but other agencies would not modify or move their assets, that may
be affected by construction. In addition, investment and budgets were short term, because it depended on the annual budgeting process. Therefore, it was hard to coordinate and plan for medium or long-term strategy and action.

Although local officers were aware of the importance of communication and education programs, they did not have enough funds, staff and training skills to develop these programs. Previously, HCMC had been funded for clean river and canals, but this funding was cut, creating another challenge for the local authority to control littering activities. These projects were not completely effective, as the local officers were not well prepared or skilled, and had little time to supervise the community.

The local authority had also funded the poor to build houses and repair leaking roofs, and lifting the ground to mitigate flood impacts. Nonetheless, this funding was only active for permanent residents and migrants from other provinces had restricted participation. Despite the fact that these people lived in temporary houses and were affected severely by flooding, they were marginalised in city policies.

The findings indicated that in these two communities, there was no community funding to repair, renovate or help with emergency responses. Although people were keen on establishing a community fund, they relied on the local authority to take the initiative. Issues of transparency in administrative and management systems were mentioned as an obstacle to community funding.

**Local government capacity**

Although the city has instructed the local authority to put more effort into educating community not to litter the streets, the result was not as good as they had expected. The current study found that only a few local staff had been trained to work with these communities and they had other different tasks they were also expected to do. By undergoing training to become an environmental trainer and doing their usual tasks at the same time, they had become overloaded. Environmental protection was thus considered more crucial than vulnerability issues in the research communities. Their knowledge of climate change was mainly from workshops organised by the city government. On the question of describing the links between climate change and vulnerability, the local government officers described their location as one of the “belly buttons for flood”. “Streets turn out [sic] a river” was also another expression of local officers in District 8, in describing their community and flooding.
“You do not need to go anywhere else to look for flood, you can come here around 5 pm, you will see flood in front of our People’s Committee’s office...Be careful that you may not be able to go back home until it gets dark.”

“The raising awareness programs are extremely necessary, however, there needs to be someone coming to community and training them. Our trainers’ skills are still not adequate yet.” (Fieldwork 2011, interview 06)

“It is good to design a community meeting every month. Activities such as films, information sharing or training them to protect themselves in flooding situation, fire, earthquake or heatwave will be very useful, even how to keep their valuable things and papers so that if something happens they can take and go with those are also good. However, we do not have budget and personnel to do this.” (Fieldwork 2011, interview 09)

Their communication skills were not adequate to educate people. It was good for them to get support from relevant departments and institutions at different levels to achieve more effective environmental programs. The local urban management officers also needed to raise awareness and knowledge on these issues because they were in charge of construction and urban behaviours.

7.6. Analysis of key actors of community resilience

7.6.1. Role of community leaders

In the two communities, the role of community leaders was important. They were liaison people communicating between the local authority and community. The community leader was a person who was highly respected in the community, participating in local authority’s activities and selected by community. Community leaders were in charge of supervising all activities in their community, and in charge of transferring the local authority’s message to everybody in the community. Community leaders also supported community members to prepare a legal form to be submitted to the authority, to help telephone relatives in an emergency or to remind community not to throw garbage into drains or canals. People trusted their community leaders and relied on them in specific matters such as asking about local authority’s legal procedures, complaining about noisy neighbours or reporting community damage and violence. It was noted that anything relating to personal matters, people asked for the
community leader’s support; however, they did not all always listen when being reminded about littering or violating public areas in their communities.

“Community leader has to go and explain to those who litter or build house on the canals, everyone listens to him, we rely on him in many issues.” (Interview 17, District 8)

This finding supports the observation of the DFID (1999) that the role of community leader could strengthen people’s trust and enhance their ability to work together, widening their access to political institutions and different organisations. It strengthened both horizontal and vertical social networks, as it was based on the good relationship between the community leader and community members, especially in poor households, and community leaders provided better understanding between the local authority and community.

7.6.2. Role of women

❖ Sharing information

While men collected and shared their information over a cup of coffee in a coffee shop or had a chat with friends and colleagues, most women consolidated their information network in business activities such as buying and selling groceries, having breakfast or coffee with friends, or during neighbourhood visits or casual work, and even in public meetings.

❖ Participation in public activities

Data linked to the percentage of people participating in public local activities demonstrated that women were more active than men; they had more information and their social networking was much stronger. The relevant mass organisations in the research areas were Women’s Union, Youth Union and Veteran’s Union. While there were only a few male respondents having membership of Veteran’s Union, most female respondents were members of Women’s union. Although mass organisations were strong and gaining membership could extend people’s access to political institutions and other organisations (DFID, 1999), men had limited access to become a member of an organisation. And thus they had less access to information in comparison with women. In other words, men had weaker links to vertical social networks than women. Interviews with local officers
also revealed that women had engaged in different environmental activities organised by the local authority such as cleaning streets or group discussion.

Regardless of whether they were poor or better off, women had limited knowledge of climate change and climate vulnerability. However, they could confidently discuss conditions of flooding, environmental pollution or extreme heat impacts on health. Due to lack of public awareness, women were still not aware that their daily activity could contribute to environmental vulnerability, for example, littering or putting garbage out on the streets would contribute to flooding and pollution. The findings also implied that willingness to participate in community activities was high, providing that women could see the benefits of participation for their family.

7.6.3. Role of mass organisations

Mass organisations including Women’s Union, Youth Union, Veteran’s Union, the Red Cross and Fatherland Frontier Committee played a key role in working with community and educating community to targeted programs. Membership of these organisations was high in both research communities, especially Women’s union members. However, these organisations had not really demonstrated the benefits of becoming a member to attract people’s participation. These mass organisations had not yet extended their activities to flood control and risk reduction such as training people to prevent or mitigate impacts of flood on health, helping people move furniture or removing garbage after floods. These organisations could also educate people in protecting the environment, monitoring construction activities in the community and even discussing effective coping measures. These findings discussed that the relation between mass organisations, community based units and people were not effective in coping activities, even though the communication was established.

7.7. Discussion of vulnerability, adaptive capacity and resilience

This chapter considered how increased flooding from climate change triggered people’s vulnerability in the two research communities. By way of association in community photos, people captured their vulnerability, living near rivers and canals. The poorly maintained sewerage system was part of the problem raised by respondents. They were also affected by major construction projects that blocked
waterways in their communities. The findings suggest that they were highly exposed to floods because they also had limited access to sanitation, warmth and secure shelter. These reduced resources did not help people recover or resist other environmental shocks (Pelling, 2003). In addition, poor people without resources have less access to finance and construction materials to repair or renovate their houses. They cannot build up a more solid house and they are more impacted by flooding events. Their temporary places of business are also disrupted dramatically in floods. The findings have illustrated that coping measures were a short-term response. And as Harry (2009) suggests, this sort of response indicates these communities would be considered vulnerable from exposure to environmental events. Thus the question arises as to what components of these communities can be used as adaptive capacity to improve their vulnerability in the context of environmental events.

Together with the previous chapter, the findings reported in this chapter once again confirm that social capital and social networks are important to these two communities. The role of community leaders was highlighted along with women’s participation and institutional support including local government. These components could be utilised and developed to help people withstand severe floods and other environmental hazards. Firstly, a community leader can mobilise people’s participation in public activities such as upgrading alleys or clean-up projects or supervising littering behaviours. Community leaders can encourage people’s participation in adaptation activities and help build adaptive capacity. People of these communities voted for whom they trusted could lead the community and negotiate with the local authority. Secondly, women’s active participation in community activities has the potential for women to act as a resource for building capacity. As women are directly involved in environmental issues, such as sorting domestic waste, using water and planting orchids, they could help spread information, and engage other family members, friends and relatives in adaptation activities.

Although observation showed that some alleys and streets were upgraded by the community and the local authority, most families were still coping with floods themselves. Most respondents simply stated that building up their ground would prevent flooding. It could be seen that people were not yet aware of vulnerability and their ad hoc solutions. In addition, the cooperation between the local
authority and community was not sufficient, and the relation between mass organisations, community and local authority was not developed closely in these research communities.

The community’s photos suggest the fact that they understand how their community is suffering and reacting to flood events. They understand the connection between timing, flood trends and rainfall. These observations noted that some people know the best escape routes in case their community is flooded. They also understand partly the reasons why their community is flooded and how to improve the situation. However, littering is a bad practice and has not improved.

The findings also revealed that people need technical advice to achieve long-term coping strategies. The awareness of some individuals is high, but it is necessary to increase public awareness in environmental related issues. People requested practical support and strict construction management from the local authority and close coordination from others. Practical support means technical advice or information and close cooperation with community leaders in mobilising community to participate in adaptation activities. Mass organisations needed to propagate information on climate change and adaptation to community and support community leaders in these roles. These issues also rolled out the need for building capacity by local officers so they could handle their tasks better.

The photos taken by community, participatory interviews and observation have helped identify the problems, community priorities and possible solutions in the flooding context. Analysis confirmed that adaptive capacity and resilience co-exist in these research communities. Nevertheless, some things go beyond the reach of poor people and they need institutional support. Berger (2009) also demonstrated that institutional support can help fill the gaps in knowledge and practice. This viewpoint paves the way to examine how different institutions supported the flooded communities in chapter 8 and what should be integrated into the proposed strategy in chapter 9.
Chapter 8

Institutional Support and Climate Vulnerability

8.1. Introduction

This chapter presents the findings on how representatives of different agencies view social vulnerability in the flooding context to examine what supports government and other institutions have given to the city and flooded communities of HCMC. The interviews were conducted with representatives of professional institutions and government organisations at different levels and who were directly involved in climate change adaptation activities. The support given by these organisations is identified via their viewpoints of climate vulnerability and potential solutions. Similarly, their understanding of causes of floods and flooding impacts on people and activities undertaken by government organisations indicate how climate risks and vulnerability were perceived and confronted in HCMC.

8.2. Experts in HCMC

As discussed in section 5.4.3 in chapter 5, in-depth interviews were carried out with selected experts who were professionals, having had experience in flood control, or researchers and planners in different agencies, organisations or institutions in HCMC.

Only a few opinions mentioning community engagement in natural disaster prevention and mitigation were offered. Rather structural solutions were preferred for coping with urban flooding and other related issues. Although the response depended on where an interviewee worked and guidelines of departmental policies appeared to be influential. For example, a person working in the Ministry of Natural Resources and Environment’s (MONRE) project office proposed irrigation planning and sluice construction, and it is known that MONRE was keen on working on irrigation and sluice projects. A professional working in urban planning suggested urban planning strategy or urban
management to solve urban floods in the long term. Nevertheless, the data were summarised to reflect viewpoints as a whole; also the data collected from the interviews were used to check the consistency of information across different sources and uncover deeper meanings based on where the information was consistent.

8.2.1. Perceived impacts of climate change and flooding

- **Socioeconomic impacts of HCMC**

The information provided by people dealing with environmental pollution and people’s awareness can highlight issues of urban planning and relocation sites to people affected by floods in the future. They also suggested that vulnerable people, such as the urban poor living along canals or in low lying areas, should be identified to provide assistance. These people would lose their homes and their earnings if sea levels increased 1m higher, leading to social insecurity, lack of accommodation or even loss of earning ability and capacity.

Flood impacts may create more poverty in the future. The poor may fall back into the poverty trap when they move to other low lying areas and their cheap housing would be degraded quickly in floods in the long term. The slums along rivers and canals of District 8 and Binh Thanh were considered as the most vulnerable areas as they were already exposed to floods. Income would be disrupted or lost and education would be likely discontinued. In addition, SLR would raise concerns for investors who planned to invest in the city. In the future, urban land would be reduced, pollution would be increased and water scarcity would threaten the city.

Migrants from other provinces were excluded in the policy system; for instance, in order to be recognised as HCMC citizens, they needed legal housing (with either a land use certificate or local certificate), a stable income (which the urban poor seldom had) and ongoing stay duration at a certain place that was impossible, because of their jobs and financial instability. These people would have to bear unfairness in access to resources such as water supply, food, energy, urban infrastructure and healthcare in the future. One opinion from a professional working in development studies suggested that the legal status for local migrants be reconsidered.
Another interviewee in charge of the city’s research on development issues had expressed that the mountainous ethnic minority groups had exploited national forests and contributed to potential risks of bushfire, increasing temperatures and urban heatwaves. People living in urban areas would also face the threat of body temperatures increasing in hot weather, especially outdoor workers and the elderly.

**Agriculture and forestry**

A professional researching climate change impacts provided the research results that there would be severe impacts on socioeconomic sectors in Vietnam and traditional production in the agricultural sector would be severely affected. Besides, water resources would also be impacted by saline water. These impacts also implied that habits of planting and harvesting would also be changed. The interviewees were concerned that deforestation would also happen under climate change and higher temperatures and evaporation would make bushfire risks exaggerated.

On the question of what sector should have more focus and preparation for climate change, a researcher from a university stated that all sectors would be affected; therefore each sector needed to have a specific plan to cope with changing climate and SLR.

**Industry**

A professional working in the science and technology field was of the view that industry would be impacted by climate change in future. The developing industry of Vietnam has thus far exploited resources for food processing or energy production and caused pollution. These industries had to develop to reduce GHG and improve environmental friendliness. If Vietnam could not improve industrial activities, it would also be difficult to compete with regional and international markets.

**Transportation**

Regarding impacts of climate change on transportation, professionals working across sectors expressed their concern that many sections of the national highway were flooded and damaged. Some roads had been blocked because of heavy storms. If sea levels increase, the main north and south railway and delta transportation network would be largely disrupted. Seventy seaports and more than 20 airports located all over the country would be threatened by flooding in the scenarios of SLR. Increasing temperatures have already caused damage to asphalt road systems of the nation and
maintenance and operations were extremely costly. Given the fact that the temperature may increase from somewhere between 2°C to 3°C in the future, the economy would suffer from transportation disruption.

- **Public health**

Another issue highlighted in interviews with professionals working in universities and development was public health affected by climate change. The Human Development Index (HDI) was constituted by three main factors including the GDP/head, education index and longevity. If the GDP was not constantly developed, poor communities would not have conditions to increase the education index and longevity. In this regard, the HDI of Vietnam would not develop in compliance with expectations for socioeconomic development, if sea levels increased.

- **Tourism**

The interviewees also noted that climate change may have positive impacts on tourism such as the warmer weather encouraged people to go to the beach and the scenes seem more attractive in tidal rise. Nonetheless, sea levels also brought landslides or strong waves to beaches, increasing the danger for community. One professional working in flood control areas stated there were boat and ship tours that met with accidents because of sudden storms or strong winds.

8.2.2. **Urban flooding in HCMC**

- **Human causes**

While urban planners argued that urban planning and resettlement were key issues to mitigate increasing floods in HCMC, some interviewees working in different sectors commented that better urban planning policy and urban management action plans were necessary. It was also essential to control construction that dramatically reduced water absorption. Rapid development of the city had produced factories or high rise buildings and occupied thousands of acres of land considered as natural water drainage: “Hectares of land and canals have been replaced by industrial zones and residential tall buildings; these constructions have blocked natural drainage” (interview 04). Urbanisation and industrialisation also increased urban heat for the city and floods over the last few years. One interviewee expressed:
“Industrialisation has made Saigon an oven and rains become unusual...urbanisation, 
urbanisation, urbanisation” (interview 07).

Similar points were made by a professional in charge of development studies. Between 1999 and 2005, the annual rate of population increase was 4.3%. The booming population had concentrated in peri urban districts of the city. Population gradually developed buildings everywhere, the surface for drainage was narrowed and, consequently, drainage systems became overloaded. An officer had claimed that “urban planning and drainage are two inseparable poles in city development”. Urbanisation and discreditable land development contributed partly to increasing flooding. It highlighted the need for proper urban planning to cope with rapid urbanisation of the city. A suggestion made by a professional doing research on city development showed that urban planning, transportation and construction should be engaged and considered as an important three-column model for city development and flood control.

“To reduce concrete area, save energy and increase at site regulation should be 
combined in seeking a positive solution for heavy rainfalls. Building dykes and sluices 
are costly and probably it might bring reverse effect to the city.”

Finally, solid waste management was considered as another cause for flooding, especially people’s littering of roads and canals.

Natural causes

Data collected for this section were mainly from professionals who had experience in examining causes of flooding for the city. As they pointed out, the upstream rivers were considered as the first cause for flooding in HCMC. In addition to local rainfall and land subsidence, hydrological impacts from upstream floods had largely contributed to flooding in HCMC. The second cause of urban flooding was land subsidence that stemmed from exploiting ground water in urban areas – approximately 1.5cm per year over the last 20 years. In addition, an interviewee working in hydrometeorology claimed that other natural hazards were also escalating in the city. Storm urges, intense local precipitation caused by SLR, typhoons, high tides, poor drainage and sedimentation of river estuaries were increasing and threatening the city and people causing erosion to riverbank and
made land loss. The potential of environmental relocation, degradation of tourist beaches and damage to water supply sources were unavoidable for cities in Vietnam, especially HCMC in the future.

8.2.3. Adaptation projects

The city officials expressed that HCMC would focus on infrastructure improvement activities such as improving drainage systems, upgrading urban streets and building dykes to mitigate urban flooding to adapt to climate change (see details presented in table 8.1). Some projects have been implemented and not yet finished. In some projects, the designs were not appropriate anymore as these projects were delayed for so long. There was only one project focusing on public awareness that was leaded by national government and funded by WB.

Table 8.1 Some projects implemented in HCMC

<table>
<thead>
<tr>
<th>No.</th>
<th>Project</th>
<th>Benefits</th>
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<tbody>
<tr>
<td>1</td>
<td>HCMC Environmental Improvement Project (funded by WB)</td>
<td>There are about 1,040 km of drains installed, meeting small part of demand.</td>
</tr>
<tr>
<td>2</td>
<td>HCMC Water Environment Improvement</td>
<td></td>
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<tr>
<td>3</td>
<td>Urban Environmental Improvement</td>
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<tr>
<td>4</td>
<td>HCMC Urban Upgrading</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Water resources Plan for flood control project (Ministry of Agriculture, and Rural Development - MARD)</td>
<td>The dyke is 172 km starting from Saigon river to Long An province (neighbouring province of HCMC). Sluice system to control not only the flooding of 3,393 ha of land in HCMC but also the flooding caused by reservation lakes upstream.</td>
</tr>
<tr>
<td>6</td>
<td>Saigon river bank improvement project</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Flood Management Plan 2020 (HCMC PC)</td>
<td>Data are not available</td>
</tr>
<tr>
<td>8</td>
<td>HCMC Flood Management Project - bilateral fund between HCMC and Dutch government</td>
<td>Proposing flood management strategy and capacity strengthening for national agencies involved</td>
</tr>
<tr>
<td>9</td>
<td>Public Awareness MARD and WB</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>HCMC Moving Towards the Sea with Climate Change Adaptation- Funded by Netherlands Government</td>
<td>Expanding HCMC to the sea controlling flood risk, facilitating soil and water system, redesigning the drainage system and developing rainwater storage system, reducing salt intrusion, managing groundwater and reducing urban heat island.</td>
</tr>
</tbody>
</table>

Source: Fieldwork 2012
8.2.4. Obstacles for the city

❖ Urban planning and cooperation

During the interviews with professionals in HCMC, the term “urban flood management” had been repeated and introduced as a new concept to control urban flooding in the city. They believed that once a model of urban flood management was applied, it would largely reduce the existing flood situation in HCMC. In order to mitigate climate change impacts, the first thing to be considered was to achieve cooperation between planners, policy makers and engineers. According to one of the interviewees who undertook research in this area, cooperation is always difficult to achieve.

When it came to a solution, there were always complaints about inappropriate urban planning, blamed for urban flooding in HCMC. The fact that a city is planned by three different agencies is a critical issue to be solved:

“It is hard to identify infrastructure and urbanisation as a whole and integration of climate change in urban planning becomes a disputable topic.”

Interviewees noted that HCMC is under the authority of the Architect Planning Department (in charge of urban planning), DONRE (in charge of land use planning), and Planning and Investment Department (in charge of socioeconomic development). In order to achieve effective planning, interviewees recommended that the mentioned agencies’ capacity needs to be enhanced, cooperation among them needs to be strengthened, and information should be shared so they can take initiatives and be proactive in planning and implementation.

“Engineer only does math to calculate drainage volume, planner only presents nice useless drawing, urban manager only cares for ad hoc solution – how can you get a best result from this?”

❖ Community engagement

Data collected from interviews show that HCMC has not yet focused on community engagement. As presented in table 8.1, most conversations and information regarding a solution for flood control in HCMC are hard, structural approaches focusing on improvement and renovation of infrastructure, not on people and community. This can explain why dykes and other structural solutions are always considered effective solutions. Non-structural measures have been mentioned vaguely in some
conversations and it limits urban planning and land use planning to minimise risks. As one professional pointed out: “urban planning tools will help develop urban [planning] to higher zones and provide solutions for high risk zones”.

Women’s participation in environmental activities

The programs and activities for women on climate change issues as well as their coping/adaptation ability is limited to group discussion or meetings on environmental topics. There are no other activities implemented. There are about 482 women’s clubs all over the city for environmental protection activities, mainly to sweep the garbage in the streets. There are few places for women that are active in environmental protection activities. However, they have no funds to maintain these activities in the long run. The positive signs of women’s ongoing role in environmental protection programs are that HCMC has encouraged Women’s union to be more proactive in promoting women’s participation at the community level.

Adaptation strategies

- Applied international models

In discussion of solutions for urban flooding in HCMC, the concept of “living with water” and “room for rivers” has been mentioned in conversations with professionals. The professionals explained that it means to restore and construct reservoirs or water storage in low lying and riverside areas that will function as regulation lakes and reservoirs.

A professional even suggested learning from Holland, where canals and rivers form a “natural climate buffer” to cope with flooding: “Building a dyke may not be the best solution, HCMC needs to protect Cangio coastal zone to be a natural climate buffer”. Increase of green space in the city is also mentioned, it is suggested to plant more trees, not only in public areas, but also on the roofs of houses to “reduce the water running down to the ground and it can help reduce water volume in heavy rains”.

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• **A local integrated model**

According to interviewees in this group, HCMC is looking at an integrated flood management strategy that includes structural and non-structural measures in which flood risk management requires multi-sector management.

"Structural measures to protect urban areas could create overconfidence and indirectly reduce adaptability and preparedness; we need to focus on adaptation to cope with uncertainty and resilience to prepare for extremity. If we can do that, we can provide 90% to 95% safety to people."

When being asked about what solution should be the best for the city, the professionals have mentioned an appropriate flood management strategy called ‘model of resettlement action plans’ that include resilience (damage reduction under extremity using mix measures), adaption (adapting to uncertainties using mixed measures) and prevention (provide safety to people using technical measures to alleviate flood risk). However, the suggestion was made that the mindset of decision makers must be changed to get a more successful result, which means they should engage community with their planning and implementation: “Encourage the community [to] do by themselves!”

• **Policy improvement**

Flooding is an existing risk regardless of construction solutions. A short comparative analysis of the Bangkok flood in 2011 is a lesson learnt for HCMC in that the city should not rely too much on the infrastructure system to protect the city. In addition, the planners were expected to respect the space for minimising water damage, not only risks. The city government also suggested focus on providing clear guidelines and instructions regarding space for water, planning management, and warning systems and response procedures. The city should also give more priority to drainage systems and pumping systems. And finally, construction projects or planning related directly or indirectly to water areas needs to be limited.

Information collected from the 2011 field trip was that HCMC had initiated programs responding to climate change and related issues since 2009. HCMC government is very interested in climate change and actively participated in international workshops as well as local workshops in the region, for instance, participating in the C40 Cities Live Program as an affiliate to mitigate and adapt to climate change.
change. In addition, HCMC also participated in the Tokyo conference regarding urban energy to minimise CO2 gas emissions. It is noted that the Tokyo conference has opened a new viewpoint on using energy efficiently, GHG emissions and green house construction.

HCMC has also cooperated with international organisations comprising German, Arup of C40 Live Cities, Netherlands, Asian Development Bank, New Zealand, JICA, DANIDA or UNDP to address urban development and land use, water resource management and flood control in the climate change context.

- **Urban planning**

  The interviews bring light to professionals’ viewpoints on reducing flood damage rather than reducing the risks. They assert that the flood control systems provide space for water and can reduce the risks, but they indirectly increase damage. Therefore, it suggested that HCMC should review all urban planning issues to adjust and reduce these damages.

- **Community engagement**

  While there is agreement on decentralisation to each local province to develop and adopt its own coping programs, there was disagreement as to whether local authorities cooperate. However, all proposed adaptation must be accepted as a "learning by doing" process and community involvement in planning, implementation, monitoring and evaluation is crucial. The professionals also recommended an approach to educate and inform people on climate change in that the relevant agencies should find a simple way to explain the impacts of climate change as people may feel scared and nervous for their life: "their psychology may be affected and it may cause disruption to their daily life".

8.3. **Policy makers at a national level**

National policy makers are people directly involved in natural resource management and natural disaster control such as planning water resources, building dykes to prevent floods or doing research on climate change scenarios in the future. They also submit proposals to government and related ministries action plans to mitigate natural disaster impacts.
Similar to the group of officers working at city and local levels, participants from these groups were asked about their knowledge on climate change, their viewpoints on HCMC urban flooding, and any policy or project being planned or implemented for Vietnam and HCMC within climate change context.

8.3.1. Climate change issues

All national representatives showed their concerns about and understanding of climate change and its potential impacts on Vietnam and HCMC. It is estimated that Vietnam will have severe impacts from climate change that will come from flooding, drought, SLR and saline inundation over time. The risk of health caused by urban heatwaves is also mentioned. The information from interviews revealed that in Vietnam, especially the Mekong Delta and HCMC, more natural events will occur due to climate change. One representative noted: “In the Mekong Delta, there are floods, saline intrusion, storms, landslides and drought. It is horrible”.

Agriculture in Vietnam will be impacted by natural disasters in the future and these disasters will also damage production and trading in urban areas:

“This is also time for flooding and drought affecting agriculture, water supply, hydro power supply as well as trading and industrial productions in urban areas”

8.3.2. Flooding in HCMC

When asked about how flooding in HCMC is evaluated, all raised their concerns about urban flooding all over the country, especially Hanoi and HCMC, which have dense populations and lead the national economy. It is advised that urban flooding is not only problematic for HCMC but also for other urban cities in Vietnam and worldwide, especially urban cities in developing countries. Urban floods impact peoples’ living conditions, cause environmental pollution and affect economic development. A recommendation was made for better preparedness for the future and not just ad hoc solutions: “Climate change is not ‘a single day event’, SLR is predicted for the future”.

According to the interviewees in this group, HCMC will be more flooded in future because of its low topography. The flooding will be more serious if it rains in the afternoon when the tide has risen: “If you can see in rainy afternoon, HCMC is like a sea filled with motorbikes and cars.” District 1 is the
centre of HCMC; it was never flooded before, but now flooding is evident with heavy rain or rising tides:

“It is dilemma for the city. Flooding causes so many inconvenient and miserable issues for people. When you travel on the road, you always worry about whether you get stuck because of the water....In some part of the city, it is flooded without any rains. The construction of drainage projects is a messy issue need to be solved. Flooding is increasingly concerned now, it is not only for Saigon, it is also for Hanoi.”

❖ Root cause of flooding in HCMC

There are different reasons stated for when HCMC urban flooding is mentioned. Urbanisation, ineffective urban management and planning, and out-of-date dyke design are the main reasons to cause flooding in HCMC in which urban governance and urban management are emphasised, mostly in conversations. People build houses on agricultural land, and as the soil’s surface has become concrete, water cannot absorb into the ground and reduces water regulation, causing more pressure to canals and river systems. Most canals and rivers inside the city have been used for housing, while there is no replacement lake built elsewhere. In addition, construction of dykes to protect agriculture from floodwater has made the water return to the urban areas in HCMC. In addition, throwing garbage in rivers or canals, and encroaching on canals to extend houses also reduces drainage and water flow increases.

8.3.3. National adaptation

The Vietnam Government has increased the forest coverage from 27% in 1990 to 38.2% in 2007. Cement production has improved to save energy and follow strict energy management regulations. The government is also discussing and calling for international support on renewable energy, especially wind and sun. Since Vietnam participated and ratified the Kyoto Protocol (in 09/2002) and the UNFCCC (in 11/1994), the government has implemented measures to reduce natural disasters, increase awareness, enhance social protection systems, support agricultural extension activities and invest in large scale infrastructure projects to cope with climate change.

In addition to these programs, Vietnam also focuses on the Support Program Response to Climate Change (SPRCC). In this program, the government will approve investment projects in response to
climate change as well as establish a matrix of development issues relating to climate change. The program is constructed based on three main poles: adaptation, mitigation and capacity building. The adaptation pole focuses on solutions and actions by local governments or sectors to mitigate vulnerability for natural systems and humans under climate change; the mitigation pole includes solutions and actions by economic sectors or local government to reduce GHG, minimising global warming. The capacity building pole comprises activities that develop strategic planning, monitoring and evaluation, strengthening capacity and raising awareness. Every year, these poles and their activities will be reviewed and revised.

- **Adaptation at community level**

The community based adaptation programs or projects are in the majority in the list of climate change projects implemented all over the country. They include posters, leaflets, training, tree planting, road sweeping, and activities for natural resource management or environmental protection. There is only one community based adaptation project in the Mekong Delta and this project concentrates on activities for managing natural resources along the coastline. The projects are mainly initiated by international NGOs who engage the community in their project activities and this engagement helps to improve knowledge and community awareness of environmental issues. It can be seen that community has been gradually engaging in climate change adaptation via NGO projects.

- **Engagement of business stakeholders**

Vietnam’s economy is developing; there are considerable numbers of entrepreneurs all over Vietnam. However, this potential stakeholder seems less involved in climate change projects or programs. So far, there are only a few activities that have happened among their businesses. The government has focused on carbon and GHG reduction issues. They also get involved in training and supportive programs for energy saving and clean energy. Supporting community in preparation for or coping with natural disasters or broader climate change issues have not been discussed widely. Their potential capacity to support the poor community, especially the urban poor, has not yet been mentioned.
Capacity building

Projects for capacity building supported by international NGOs in Vietnam include organised workshops explaining climate change and impacts for every sector, and building climate change strategy and policy. The donors also support and provide technical knowledge on climate change and related issues. The participants for these projects range from children in schools to national government officers and private entrepreneurs. However, there is no long-term program to have adequate time for training needs assessment, especially government funded projects. They have mainly been organised under workshops (training or education). It is not adequate to map out climate change and link it to community or to encourage community participation.

Women from different levels of government are also invited to participate in capacity building activities. However, according to a representative, women and entrepreneurs have not been fully engaged in activities for capacity building and adaptation. The activities introduced to women are mainly training workshops and they have been organised for women working in different state agencies. Women in the community have not been engaged, or if they have been engaged in capacity building, it is under village radio programs.

8.4. Discussion of institutional perceptions and climate vulnerability

The interviews with professionals in HCMC show two possible future actions: whether Vietnam should try to reduce climate change and SLR or whether it should strengthen the capacity to prepare for the worst case scenario. In case climate change is not happening and impacts will not be as serious as predicted, the government and people will be able to cope with risks for a more sustainable development. So far, there are many flood control projects around HCMC; however, there is doubt about their effectiveness and efficiency.

The findings also demonstrated that HCMC is extremely vulnerable in the flooding context. As the government and policies do not focus on climate vulnerability of the poor, people including the research communities in this study are more exposed to floods. With the hope to mitigate impacts of natural disasters to HCMC residents, HCMC focuses on capacity building for officers and communities to manage disasters. Information systems to support this plan, such as weather
forecasting, disaster warning and management of protected forests, have also been reviewed for updating.

However, the city still faces challenges with cooperation between agencies and community participation. The first challenge to be faced is lack of cooperation between agencies, districts and ward levels. Equally, there are no regulations requiring coordination and cooperation between national agencies and city agencies, or between city agencies and ward agencies. Moreover, budget allocation is mainly by sector and infrastructure belongs to the city and national authority. Therefore, district and ward levels do not have a chance to participate in these budget plans. Consequently, coordination between wards and districts to city level is poor in regards to infrastructure projects such as electricity, telecommunications and city streets/roads. At district and ward levels, the District People’s Committee (DPC) is assigned to be in charge of approving new housing construction based on regulations and guidelines of the Department of Construction. Ward People’s Committee will only approve renovation activities that do not change the main structure of houses.

The second challenge that needs to be confronted is insufficient urban management staff within relevant agencies (such as City People’s Committee, Ward People’s Committee and Department of Construction) required to supervise investment, construction and renovation works in accordance with approved plans. As local staff handle different tasks, it needs community participation to supervise local development in their neighbourhood. In other words, as Gero et al. (2011) suggested, while community participation and community role are still vague in city plans, city government needs to involve community to learn more about their knowledge and broaden their awareness about people affected by urban environmental degradation (e.g. floods).

The interviews demonstrated that there are gaps in national policies regarding climate change adaptation in Vietnam. It suggested that urban floods in HCMC are increasing and threatening more to whole economy system, the construction activities and community environmental behaviours should be improved. However, the engagement of community and women in capacity building and adaptation is still limited. These interviews recommended gaps be bridged in policies and implemented at national and local levels. Issues to be supported include: developing legislation related
to disaster risk reduction; improving knowledge on climate change and vulnerability at different levels; encouraging community participation; engaging media, private sectors and experts into adaptation activities; and establishing risk maps and early warning systems. These proposals are similar to actions identified by others in relation to adaptation strategies (see for example Huy et al. 2010).

These findings have also indicated that community climate vulnerability is not high on the list of flood control activities in Vietnam, particularly in HCMC. The problems of flooding were identified and prioritised for “end point” vulnerability approach. The findings from local community have emphasised vulnerability is increasing because of social factors and escalating because of floods. The solutions applied have not been adequate or practical in the context of urban flooding in HCMC. The findings also suggested that people are able to help themselves. Nevertheless, they need support from different agencies to increase their adaptive capacity and resilience rather than focusing solely on structural adaptation. These seem to have potential in empowering community so they can develop their own foundation. This suggests that HCMC should build community power by implementing community based adaptation strategy. This strategy will help with sufficient response and effective climate related risks, particularly the severe flooding situation of the poor in the city.

These findings provide a background for the community based adaptation strategy proposed in the following chapter, which focuses on institutional development and community strengths and weaknesses.
Chapter 9

Proposed Community Based Adaptation Strategy

9.1. Introduction

In the context of climate change, severe impacts will be greater, particularly for the poor and disadvantaged communities in developing countries. However, if the community’s capacity to minimise vulnerability improves, hazard exposures will be reduced (Blaikie et al., 2004).

In order to prepare and enhance capacity for poor communities, different stakeholders and community groups need to be engaged in planning, implementation and monitoring processes. Alam et al. (2012) emphasised the important role community plays in planning and implementing to reduce hazard exposure. He also added that the key issue of an adaptation plan is to encourage the government, at different levels, to participate in community programs. Furthermore, as the delivery of international aid and community needs generally have not been addressed adequately in catastrophic events, lessons learnt from past tsunami events in Asia must be acted on to strengthen community capacity to cope with future hazard risks (Mulligan et al., 2010b).

In reality, Mulligan (2012) noted that the term ‘community’ should be understood as a complex issue of culture, political, individual needs and objectives, different vulnerable groups, etc. Mulligan also argues that the weakness of disaster recovery is its failure to understand affected communities in order to deliver the best outcomes for recovery.

These insights provide direction for how vulnerable communities may be better prepared for natural disasters. Building on this understanding, this chapter sets out to propose a community based adaptation strategy that focuses on engagement of key stakeholders. As suggested by Alam et al. (2012, p.1), this strategy will attempt to provide community access, so that communities can reach:

- Their own strengths, vulnerabilities, knowledge and capacities and it empowers communities to plan for and cope with climate change impacts
based on their priorities, needs, knowledge and capacities that are necessary in devising strategy for climate change adaptation and mitigation.

Specifically, this strategy emphasises community self-reliance and increased awareness of related environmental issues. This strategy also develops a practical problem solving approach for communities likely to be affected by natural events such as flooding in HCMC.

The lessons learnt from vulnerable communities and the understanding of the issues poor communities in HCMC face (discussed in previous chapters) will support the idea of developing appropriate measures to empower poor communities in the strategy section that will follow later in this chapter.

9.2. Problems

The case study described in this thesis has found that in addition to rising tides and heavy rains, vulnerability of research communities could be due to poor urban planning and management and low awareness of residents in these communities. Data from interviews and observation illustrate that livelihoods of urban community are complex and affected by environmental and socioeconomic change (see chapter 7). In addition, gaps between implementation and policy requirements are identified to work towards better urban environment and livelihood (chapter 8). Government policies and programs for welfare and environmental protection of research communities are inadequate. Further, this research indicates that the best solution for these communities and the city is to develop an urban redevelopment plan, relocating illegal residents, renovating houses and upgrading roads to cope with flooding. Technical measures such as storm sewer upgrades, retention space or infrastructure improvement should be applied.

While the analysis of all linkages is beyond the scope of this thesis, the main issues are explored to arrive at a strategy for HCMC in Vietnam. This strategy lays out the key elements and processes to ensure core goals of sustainable livelihoods and development are obtained in HCMC.

Within many key components needed to build up a successful strategy presented below, the appropriate and important concepts for HCMC community based adaptation strategy will be adopted and developed later in this chapter.
9.3. **HCMC Community Based Adaptation strategy**

This strategy attempts to demonstrate the commitment to ensuring core goals of sustainable livelihoods in relation to future development of HCMC. The purpose of the strategy is to improve coping capacity and minimise impacts of environmental hazards. It is based on the key concepts presented above, which propose a strategy that focuses on preparedness, adaptation and reduction in maintaining or improving livelihood of the urban poor.

This strategy is developed based on vulnerabilities, adaptation needs and mitigation potential of the case study communities (see chapters 6 and 7) and lessons learnt from other vulnerable communities (see chapter 8). Due to the limited scope of this research, the proposed strategy is most relevant to Ho Chi Minh City. However, there are practical issues such as funding, land use planning or improvement of infrastructure, which can be extrapolated to other cities. The following section will introduce the strategy aims, main components of the strategy and responsibilities for implementation by each separate stakeholder.

### 9.3.1. **Aims of the strategy**

This strategy aims to blend issues of climate change, risk management and stakeholders’ coordination into action. This strategy proposes to build capacity for HCMC multi-stakeholders, including community, to cope with flooding and other environmental hazards under SLR and within the climate change context. It is designed to strengthen livelihoods for the urban poor to make them more resilient to risks and natural disasters. The poor living in flooded areas and other risky areas will be assisted to improve their livelihoods, to help them cope or prepare for environmental risks. Besides, the strategy expects to empower urban poor women, with coping with risks and flood impacts in the future.

### 9.3.2. **Components of the strategy**

The targeted population for this proposed strategy will be city government, NGOs, city agencies, local authority, mass organisations and other stakeholders who are able to assist with risk management in HCMC and other cities in Vietnam. This strategy provides initial ideas as a starting point for field work, putting more detail into actions as well as to facilitate appropriate agencies.
In order to achieve the aim of providing a city strategy applicable to all city communities, this strategy will integrate mitigation measures as a part of adaptation. The work of the WB, UN or ADB provides a clear basis from which to guide strategies for vulnerable communities. The strategy has six main components discussed in detail below, which have been applied to HCMC and informed by the general data and experiences (see chapters 2, 3 and 4). This strategy focuses on four main components:

- governance development defined as arrangement of governance structure to improve administrative mechanism supporting community adaptation;
- capacity building concentrated on planning, preparedness, implementation and supervision of local activities for climate change impacts and urban floods;
- reducing vulnerability of the city by focusing on physical infrastructure and urban planning/management; and
- community participation with a focal point of engaging community in a series of activities such as community fund, community environmental protection plan or community early warning system. In addition, the issue of gender, suggested by the research findings, is included in this component.

In the strategy presented in table 9.1, the issues of what to do and how to achieve each goal of each component are presented by a separate column. In this strategy, the organisations (government departments, non-government organisations and community mass organisations) will have a critical role to play in implementation of the strategy proposed. These organisations have been nominated, since their current roles and responsibilities indicate they are most relevant, and identified by HCMC People’s Committee (2012b). The suggested timeframe for the strategy is referred from the Vietnam planning timeframe.

It is noted that in practice, there are issues to be solved at the national level, for example, funding, land use planning or development of an adequate public transport system. However, within the context and limitations of this research, the strategy concentrates more on city and community levels. A discussion of the six key components of the proposed strategy and suggestions about how each would
be developed will follow. To guide the strategy’s implementation, two main teams will be set up: advisory team and community liaison unit, (the organisational chart can be referred to in figure 9.1).

![Organizational Chart](image)

**Figure 9.1. Proposed organizational arrangement for implementation**

**Component 1 – Governance Development**

The findings of this research, as discussed in previous chapters, show that it is important to have coordination and cooperation between professionals, researchers, policy planners and community. Therefore, this strategy has prioritised the action of developing a better governance structure to cope with flooding and other environmental risks. The goals of this component are to identify the main stakeholders, key agents and tasks for each stakeholder.

Besides, the Action Plan to Climate Change of HCMC to 2015 has been stated clearly: the responsibility of each department and organisation to provide guidance in different sectors, to participate in climate change events as well as to mobilise community participation (HCMC People’s
Committee, 2012b). However, there are gaps between identifying the main coordination and participation of community and mass organisations.

This strategy, therefore, suggests forming an Advisory Team comprising representatives of all stakeholders including government agencies, NGOs and media organisations. This Advisory Team is suggested to firstly identify main roles, tasks and responsibilities of each stakeholder and to be able to:

- develop, implement and review policies and strategies including integration of climate change into existing policies and planning;
- coordinate activities and services to community to minimise flooding impacts for flooded communities and to avoid flooding in other communities;
- facilitate cooperation between different agencies or departments;
- manage risks from government department programs, activities, assets and investment projects;
- strengthen capacity for relevant stakeholders at city and local levels; and
- liaise between communities, city authorities and other stakeholders.

This team will provide information, guidelines and tools for decision makers and planners to establish effective adaptation plans at district levels and with governmental agencies. This team will have information about varied climate change impacts on HCMC and offer sound advice to any department or organisation, to invest or to develop adaptation plans. The assessment of climate change and hazard risks will be undertaken twice yearly to learn and share experiences with relevant stakeholders and other cities in the regions.

In addition, this team will also provide quick responses to unexpected situations of flooding and environmental hazards. Further, they will build capacity for relevant stakeholders at the city level by providing training for specific key issues of climate change, facilitating coordination between stakeholders. This team will also be in charge of coordinating climate change and risk information, education and communication.

In order to be able to establish the Advisory Team, it is crucial to identify all stakeholders, key roles and responsibilities of each stakeholder and to what extent each stakeholder can contribute to
mitigation and adaptation programs and activities. At the city government level, it is crucial to enhance the capacity to plan, prepare, implement and monitor local actions for climate change and urban flooding. The capacity to integrate climate change related issues into relevant city plans should be focused. In order to do so, the city government should form expertise groups at different levels to share information, research outcomes and relevant knowledge. By doing so, the professional network will be expanded to research and development (R&D) activities including establishing and using data for early warning, disaster preparedness, vulnerable assessment (community and area) and other climate services can be improved. R&D and science and technology (for environmental events, especially flood reduction and prevention) are expected to be more rationalised and enhanced to ensure climate change relevant issues are mainstreamed in city activities.

The research also shows there are critical barriers in policy, management and implementation as there is a lack of communication and cooperation between the city level and local level. Therefore, it highlights the need to introduce new sections or position within existing organisations that have the sole responsibility of coordination. This section or position should be supported by the board of directors of these organisations and report directly to the Advisory Team.

In addition, the importance of coordination needs to be improved among staff in these organisations, so they can coordinate relevant work with other departments. Moreover, the linkage between community and city government, professionals, private enterprise, NGOs and/or potential donors should be created to develop a common view and share similar knowledge regarding community development.

**Component 2. Capacity Building**

The purpose of this component is to develop knowledge and awareness of risk and hazards for staff in both the public and private sector, and to develop effectiveness and efficiency in risk management and utilise different funding resources to address the vulnerability of the urban poor.

The research has revealed that capacity building needs to be strengthened from the local level to the city level. Identifying objectives related to policy planning, organisational development and improvement should be implemented at city, district and ward levels. Stakeholders identified should
also be guided by these objectives. Capacity training needs should be assessed and planned to improve knowledge and practices of adaptation and mitigation, so implementation of this strategy will be effective and sustainable.

As mentioned above, the initiatives of local community should be encouraged and the capacity to undertake these initiatives will be strengthened. The initiatives from local institutions and different stakeholders should also be enhanced. However, it requires skills to be achieved by staff working directly for community (e.g. mass organisations). The interviews revealed that local government at district and ward levels need train the trainer programs so they can educate and mobilise community with regard to risks and natural hazards. The skill training section will be provided to those who work directly or indirectly with community, especially urban planners, policy makers, and mass organisations (e.g. Women’s union, Youth Union or Fatherland Front Association).

The Advisory Team will coordinate with other relevant agencies to assess and design training needs for staff in these agencies including the public and private sector. The training assessment will evaluate levels of knowledge of general issues of risk, preparedness, mitigation and adaptation.

In addition, it is necessary to develop effectiveness and efficiency in risk management to ensure related climate change events, risk awareness and knowledge are incorporated into city plans. The People’s Committee of HCMC should issue guidelines to consider risk maps and vulnerability profiles for planning activities. Relevant agencies should disseminate to potential investors to make sure all projects take vulnerability and risk into account. In addition, the Advisory Team should ensure knowledge of preparedness and rescue work is developed by organising emergency drill practices for staff and in-charge personnel in different sectors at different levels including the business sector and mass organisations. Workshops to share information, knowledge and experience should be organised regularly in the city and with other cities in the region. Besides, these activities should be publicised, so that people have more chance to access information.

In order to highlight the importance of awareness of risks and hazards, appropriate assessment tools applied for each sector should be proposed by different agencies. Assessment tools such as investment assessment, community vulnerability assessment or environmental assessment are necessary to inform
potential investors about different measures to consider risks and hazards. The needs of disadvantaged groups, such as women, the elderly and children, should be built into these assessment tools.

The City People’s Committee can work with the Advisory Team, mobilising funds and integrating different sources of funding and resources to climate change adaptation activities; for example, developing international cooperation, coordinating national funding, developing community support spirit, utilising local labour and local contributions as an additional source in projects. Mobilisation of community resources will also offer an opportunity to increase income.

The city also needs to think about advocacy to address the vulnerabilities of the urban poor. Environmental events, such as clean, green community, or garbage sorting campaigns are a good way to raise awareness and to develop skills. Social corporate responsibility should be encouraged to utilise resources from the private sector such as being a sponsor, organiser or campaigner. These activities need to be promoted as regular updates on climate change adaptation activities.

Furthermore, the information on coping measures, and emergency and response training organised by relevant agencies should be shared between city communities. The information on city adaptation activities should also be shared with other cities in the region. The government staff should strengthen their capacity to analyse community priorities and to understand community willingness so their knowledge can be integrated within socioeconomic and environmental policies and actions.

Component 3 – Reduce vulnerability of the city

In order to reduce vulnerability of the city, it is crucial to improve physical infrastructure and urban planning/management. The goals of this component are to improve basic infrastructure, to establish vulnerability maps for the city and flood risk maps for land use. The findings illustrate that construction needs to be more resilient to floods and other natural events. In addition, air pollution, traffic congestion and accidents caused by flooding need to be reduced. The case study research has shown that local floods are caused by human behaviour such as canal encroachment, littering that blocks drains or house extensions. These causes need to be addressed to improve people’s quality of life and further reduce vulnerability.
The Advisory Team will work with relevant agencies to improve basic infrastructure for flooded areas to provide more access to people, prevent damage to existing public infrastructure and plan for development in the long run. Water supply, drainage, waste collection, street lighting systems and access to poor areas need to be improved. Schools and kindergartens need to be improved so that children do not suffer during school time and parents can access schools or kindergartens during floods. Besides, new drainage systems and maintenance work of the existing drains should be integrated into planning.

High risk areas of the city will be established to identify and target vulnerable areas. This should be available so that investors and people can refer to this information for future development. These profiles will be integrated into socioeconomic planning of the city. Media organisations can help propagate information on TV and radio.

The existing land use maps should be reviewed and updated, marking flood depths in residential areas. Besides, promotion of green infrastructure practices will be integrated into urban planning.

The number of multi-functional schools and healthcare units should be increased to provide infrastructure and temporary shelters. Offices of People’s Committee or other organisations in the areas should also be upgraded to be functional as temporary shelters for the community, when needed. Maps of potentially flooded areas should be introduced to communities so they can plan housing construction or renovation. Information on safe levels, appliances to be used, services to be connected, doors, foundations, etc. should be publicised. The Advisory Team can work with expertise groups and relevant agencies to propagate community and public information. The common issue shared between research communities in this study is disorganised construction including public land encroachment and unplanned construction. Furthermore, the security and diversity of livelihood is increased by community led programs that can identify and prioritise community problems and actions to be taken.

The city and other stakeholders can support and facilitate appropriate training and techniques such as housing design, renovation or rehabilitation of local drains.

Moreover, health risks and healthcare in the flood season should be incorporated into city programs of water supply, sanitation, and epidemic disease prevention.
Data of migrant movements to the city should be established and integrated into public service supply planning and land use planning, in order to avoid overloading systems and congestion of the poor in low lying areas. Also, the numbers should be limited in each area to control population in flooded or high risk areas.

It is necessary to have a plan controlling the illegal occupancy of premises to canals, rivers, ponds and empty land. Construction of flood control projects should engage vulnerability assessment to avoid local flooding during and after construction.

**Component 4 – Community Participation**

The research findings reveal that livelihoods of residents living in the research communities are not sustainable; they are threatened by increasing floods and pollutions. The causes are diverse and complex between humans and nature that have weakened community resilience to risks and hazards.

Given the analysis of livelihood capitals in chapter 5, the need to develop separate strategies to improve human and social capital is critical.

Research results indicate that the majority of people are working in the informal sector without social protection and their income is affected by floods. They are also threatened by lack of proper skills to join the formal sector. This component of the strategy aims firstly to develop communication between the local authority, mass organisations and community by establishing a Community Liaison Unit. This unit provides information on technical / financial support, and guidance from the government and other institutions to ensure that what communities do is appropriate and improves their lives. In addition, it will promote effective liaison between the community and the Ward People’s Committee. All community needs of different groups will be comprehended by this unit. Knowledge of community development and consultation skills will be required for its members. This unit would report directly to the Ward People’s Committee and Advisory Team to seek recommendations and advice.

Finally, in case the contact is not developed regularly, it is hard to gain complete trust from the community. Therefore, this liaison unit will have regular meetings to update community about any activities planned and how they will be implemented. This is also a chance to understand how people
think about them. The feedback from these meetings and regular contact with the community will be reported to the Ward People’s Committee and Advisory Team.

Community participation is enhanced by improving knowledge and awareness of vulnerability and risk. Information education communication programs should be designed and implemented to raise public awareness and knowledge of risks, gender vulnerability, flood impacts and health protection at the community level. District and Ward People’s Committee will assist the Advisory Team to cooperate with mass organisations, disseminating information and training to the community.

An important factor is that the community should be encouraged to map out their vulnerability areas. The District People’s Committee can establish district profiles of vulnerability and encourage community to participate, from planning to mapping out activities. The community understands their vulnerability more than outsiders, and their local knowledge should be incorporated to identify areas of high risk sensitivity and vulnerability.

Regarding protecting the environment, community can participate in planning/implementing and supervising related activities. The District Ward People’s Committees work with mass organisations to mobilise community participation in the establishment of community environmental protection plans. By participating in these actions, community knowledge on environmental protection will be also improved.

The case study findings show that not only community but also ward and district authority do not know what to do if an unexpected event occurs. A model of community early warning systems will help community and local authority prepare in advance for risks and hazards. District and Ward People’s Committee should work with mass organisations and community to identify maximum levels of disaster that are likely to occur, then define warning levels, to identify needs and establish warning centres and communication means for staff involved. The communication means can be radio or noticeboards at community centres or Ward People’s Committee office. In addition to this system, community needs to be more pro-active in coping with unexpected events. By establishing an emergency response service, community can be familiar with what to do in emergency situations. Youth Union can be a main actor to be in charge of emergency response activities such as door
knocking, evacuation of the elderly or disabled, provision of first aid, etc. Emergency drills to practice and train are important to both community early warning systems and emergency response services because they improve knowledge and provide a better response for community. Community also draws lessons from these practice drills to be better prepared in future. Community may have experience and knowledge to cope with risks and natural hazards in the future; however, their knowledge and experience need to be shared with other communities in their district, their city and other cities in the country. The Advisory Team should organise contacts and meetings for community to meet and share their knowledge and experience. Community initiatives can also be learnt from each other; however, geographical characteristics and similar hazards should be a starting point to meet with other community, or community may think there is nothing relevant to share in their life. The local authority should work with NGOs and mass organisations to mobilise people to establish a community fund. This fund will be used, for example, to clean drains, fix community roads or for marking dangerous flood areas. The fund will be deposited in the bank and gather interest. Later, the fund can be loaned to other communities. By doing so, community independence will be developed and community will feel more confident in solving their own problems.

Component 5. Increase accessibility to employment

A critical aspect of vulnerability and a key part of the strategy is increasing competency in the labour market to promote income diversification. Access to employment needs to be provided to the poor and unemployed in the communities by establishing local job creation centres, job database and computer access. Provision of business management skills should be given to people including women. The course should be offered at a low cost and free to poor families. The City PC works with the Advisory Team to create an employment network to employment companies and agencies to understand employment demands and provide training for employment. A job database should be established to update employment information from the employment network and employment centres, District and Ward PC to provide more access to formal employment to city community.
Component 6. Cross cutting issue – Gender

The findings showed that women more frequently head the household than men. Women are busy taking care of family, earning income and protecting their properties during floods. However, they provide ad hoc solutions to flood impacts, income generation and health protection. And sometimes, these solutions can create an impact on their wellbeing. By incorporating gender in this strategy, it aims to improve livelihood and reduce natural hazard impacts for women. The strategy suggests establishing women’s groups to discuss and learn about environmental issues including green practices (e.g. rainwater harvesting, using energy efficiently, or sorting garbage at home). In addition, the mass organisations work with the community liaison unit to disseminate information about healthcare services available in the city, reproductive healthcare and waterborne diseases. A critical factor is women’s earning capacity, which should be strengthened to minimise them participating in the less secure informal sector. Mass organisations, the community liaison unit, NGOs and the Advisory Team should work and plan, training soft skills such as computer use or business management for women. The information to access loan and credit for the poor should be disseminated to community. Self-support and training groups can be organised, so that women can share their knowledge and information in their daily lives such as obtaining loans, credit or jobs. Mass organisations and the community liaison unit should facilitate the activities of these groups from the start.
Table 9.1 Proposed Community Based Adaptation Strategy for HCMC, Vietnam

<table>
<thead>
<tr>
<th>Goal</th>
<th>Key Responsibility (Who)</th>
<th>Purpose (What)</th>
<th>Key Actions How</th>
<th>Time frame When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component 1. Governance Development (to support community adaptation)</td>
<td>HCMC People’s Committee</td>
<td>Prepare a list of multi stakeholders</td>
<td>Based on the HCMC Climate Change Adaptation Plan to identify different departments involved. Work with local government at district level to identify suitable local units and organisations to be involved. Work with NGOs to consider their inputs into specific tasks of mitigating/adapting to climate change and flooding in the city and community. Mass organisations such as Women’s union, Veteran’s union, Youth Union and Fatherland Front to be consulted about participation. Media is used to propaganda, promote and educate city residents on different issues regarding to policy, projects and knowledge on climate change and urban floods.</td>
<td>5 years</td>
</tr>
<tr>
<td>Identify main stakeholder</td>
<td>HCMC People’s Committee</td>
<td>Define clear responsibility to each main stakeholder to avoid overlapping and overloading responsibility</td>
<td>Work with potential multi stakeholders to identify what they can contribute and how they can contribute to mitigation and adaptation programs/activities at different level. Prepare a list of responsibility/tasks carried out by each agents. Assign a relevant department to lead</td>
<td>5 years</td>
</tr>
<tr>
<td>Identify key agents and tasks</td>
<td>HCMC People’s Committee</td>
<td>Establish advisory team including members from city/district government, media organisations, NGOs. This advisory team will be in charge of policy planning and</td>
<td>Representatives from city/ district government, private/public sectors, NGOs, Mass organisations (Women’s union, Youth Union, Veteran’s union, Fatherland Front Committee), media and representatives from expertise group. Work with District and Ward People’s Committee to select</td>
<td>5 years</td>
</tr>
<tr>
<td>Component</td>
<td>Description</td>
<td>Timeframe</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Component 1</td>
<td>Professionals, government and community</td>
<td>5 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expand network of professionals</td>
<td>The Advisory team will coordinate and facilitate cooperation between different agencies and community.</td>
<td>5 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide learning opportunities to professionals</td>
<td>Work with research institutes, universities, relevant departments in the city to assign senior staffs who get involved in related issues of flooding, risk reduction or affected communities in the city to join this group. Organize regular monthly meetings to share knowledge, research ideas and project implementation to each other.</td>
<td>5 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establish close coordination between existing government agencies</td>
<td>Work with District government, private/public sectors, NGOs, Mass organisations (Women’s union, Youth Union, Veteran’s union, Fatherland Front Committee), media to introduce new position/section within existing organisations to be in charge coordination of risk/flooding mitigation/adoption. To report directly to the Advisory team</td>
<td>5 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Component 2. Capacity building (to plan, prepare, implement and monitor local activities for related climate change issues and urban floods)</td>
<td>5-10 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge development for staff in private and public sectors</td>
<td>Assess and address training needs of risks, preparedness, mitigation and adaptation at different organisations at different level including business sector Training of Trainer (ToT) and other special trainings for mass organisations. Fatherland Front will coordinate to assess training needs of mass organisations. NGOs can be responsible to establish training plans/activities and timeframe for training.</td>
<td>3-5 years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Component 3. Reduce vulnerability of the city (Improvement of Physical Infrastructure and Urban Planning/Management)</th>
<th>5-15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Improve basic infrastructure</strong></td>
<td>The Advisory Team Relevant agencies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component 3. Reduce vulnerability of the city (Improvement of Physical Infrastructure and Urban Planning/Management)</th>
<th>5-10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Raise awareness of risks and hazards</strong></td>
<td>Advisory Team Relevant agencies District and Ward PC DPI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component 3. Reduce vulnerability of the city (Improvement of Physical Infrastructure and Urban Planning/Management)</th>
<th>5-10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advocacy to address vulnerabilities for the urban poor</strong></td>
<td>Advisory Team District and Ward PC</td>
</tr>
</tbody>
</table>

| Develop effectiveness and efficiency in risk management | The Advisory Team Relevant agencies | Ensure related climate change, risk awareness and knowledge is incorporated into city plans. | The City PC issues guidelines to consider risk map and vulnerability profiles for planning activities. The advisory team disseminates information to make sure all infrastructure improvement/investment projects refer to vulnerability profiles and maps. | 5-10 years |

<p>| Develop effectiveness and efficiency in risk management | The Advisory Team Relevant agencies | Ensure knowledge of preparedness and rescue work is developed | Organize drill practices for staff and in-charge personnel in different organisations at different level including business sector and mass organisations. Organize professional workshops to plan activities, share knowledge and experience in preparedness and rescue work. Information of these programs needs to be publicized by media. | 5-10 years |</p>
<table>
<thead>
<tr>
<th><strong>City Vulnerability Map</strong></th>
<th>City government</th>
<th>Establish map of vulnerable and high risk areas in the city (not only flood but also land subsidence, saline, high population etc)</th>
<th>Planning department works with the advisory team and expertise group to map risk areas and establish city vulnerability profile. Data should be available for public access and maintained by advisory team. Media will help promote the accessibility of these files.</th>
<th>5-10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>City Flood risk Map</strong></td>
<td>Advisory Team, Expertise group</td>
<td>Update land use map with flooding areas</td>
<td>Advisory team coordinates with relevant agencies, District and Ward PC to mark flood depth areas in residential areas.</td>
<td>5-10 years</td>
</tr>
<tr>
<td></td>
<td>Advisory team, Relevant agencies, District and Ward PC</td>
<td>Increase number of temporary shelters in community</td>
<td>Design of multi-functional schools and healthcare centers in new development areas. Improve and upgrade schools/healthcare centers/ People’s Committee offices to be functional as temporary shelter to community.</td>
<td>5-10 years</td>
</tr>
<tr>
<td><strong>Improve construction quality to be resilient</strong></td>
<td>Advisory Team, Expertise Group, Relevant agencies, District and Ward PC</td>
<td>Promote green design</td>
<td>Advisory team facilitates work with relevant agencies and expertise group to organize workshop/events introducing models of using efficiency energy, plants and open space in building and construction.</td>
<td>10-20 years</td>
</tr>
<tr>
<td></td>
<td>Advisory Team, Relevant agencies, District and Ward PC</td>
<td>Reduce damage and cost of rebuilding/renovation. Strengthen house structures</td>
<td>Entail models of flood resilience into design of new residential housing, residential housing renovation or public infrastructure. Ex, safe level, appliances, services, doors, foundation ..etc.</td>
<td></td>
</tr>
<tr>
<td><strong>Minimise air pollution, traffic congestion and accidents in flooding areas</strong></td>
<td>Advisory Team, Expertise Group, Relevant agencies</td>
<td>Develop use of public transport</td>
<td>Advisory team coordinates with relevant agencies to expand and standardize existing bus system and metro system to encourage people using public transport.</td>
<td>5-15 years</td>
</tr>
</tbody>
</table>
### Component 1. Control unplanned development

<table>
<thead>
<tr>
<th>Activity</th>
<th>Implementing organisation</th>
<th>5-15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit new urban development in high risk areas</td>
<td>Advisory Team, Expertise Group, Relevant agencies, District and Ward PC</td>
<td>Planning and advisory team work to establish data of migrant movement and areas to propose limit level of population in each area. Integrate data of migrant into planning for public service supply and land use</td>
</tr>
</tbody>
</table>

### Component 2. Reduce human causes to risks and local flood

<table>
<thead>
<tr>
<th>Activity</th>
<th>Implementing organisation</th>
<th>5-15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimise the illegal construction over canals/rivers/alleys/roads</td>
<td>Advisory Team, Expertise Group, Relevant agencies, District and Ward PC</td>
<td>Encourage community participation in urban management by establishing construction supervision team in each residential block (khu pho) to report violation cases to Ward and District PC. District and Ward PC should deal and solve these reports in time to ensure the participation is encouraged</td>
</tr>
<tr>
<td>Minimise local flood caused by construction projects</td>
<td>Advisory Team, Expertise Group, Relevant agencies, District and Ward PC</td>
<td>Establish requirements to carry out vulnerability assessment prior construction. Apply safe technical solution for draining water from construction. Community construction supervision team will supervise and report to District/Ward PC and Advisory team</td>
</tr>
<tr>
<td>Raise awareness on domestic solid waste management.</td>
<td>Advisory Team, Expertise Group, Relevant agencies, District and Ward PC</td>
<td>Advisory team coordinates IEC programs/activities to educate community regarding to impacts of littering, ways to sort out garbage, improve garbage collection services, appropriate materials to sort out garbage</td>
</tr>
</tbody>
</table>

### Component 4. Community Participation

<table>
<thead>
<tr>
<th>Activity</th>
<th>Implementing organisation</th>
<th>1-5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecting to local authority and relevant stakeholders</td>
<td>District PC, Ward PC, Mass organisations at district and ward level, Community representatives</td>
<td>Community Liaison Unit</td>
</tr>
<tr>
<td>Enhance knowledge and awareness on</td>
<td>Advisory Team, District and Ward PC</td>
<td>Develop IEC programs and related activities</td>
</tr>
<tr>
<td><strong>vulnerability, climate change, hazards and risks.</strong></td>
<td>Mass organisation</td>
<td>District/Ward PC cooperates with mass organisation to disseminate relevant information and trainings to community. Incorporate issues of risks, impacts, mitigation and adaptation to school curriculums.</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td><strong>Establish District Profile of vulnerability</strong></td>
<td>District PC Ward PC Mass Organisations at district and ward level Community Liaison Unit</td>
<td>Encourage community to participate in planning/implementation and supervision Improve community’s knowledge on issues of vulnerability, risks and hazards</td>
</tr>
<tr>
<td><strong>Establish Community Environmental Protection Plan</strong></td>
<td>District PC Ward PC Mass Organisations at district and ward level Community Liaison Unit</td>
<td>Encourage community to participate in planning/implementation and supervision Improve community’s knowledge on issues of environmental protection</td>
</tr>
<tr>
<td><strong>Establish Community Early Warning System</strong></td>
<td>District PC Ward PC Mass Organisations at district and ward level Community Liaison Unit</td>
<td>Encourage community to participate in planning/implementation and supervision Improve community’s knowledge on issues of planning and preparedness. Help community and local authority response better to hazards and risks.</td>
</tr>
<tr>
<td><strong>Establish Emergency Response Services</strong></td>
<td>District PC Ward PC Mass Organisations at district and ward level Community Liaison Unit</td>
<td>Empower community to response in disasters/hazards</td>
</tr>
</tbody>
</table>
| Develop Sister Community Model | District PC  
War PC  
Mass Organisations at district and ward level  
Community Liaison Unit | Engage different communities in sharing and learning each other regarding to information, experience and solutions for community’s risks and hazards | The Advisory team will coordinate with other stakeholders to provide District and Ward PC contacts of other communities who have good/bad examples on how to cope with risks and hazards. District and Ward PC organize trips to those having similar geographical characteristics and issues. | 1-5 years |
| Community Fund | District PC  
War PC  
NGOs  
Mass Organisations at district and ward level  
Community Liaison Unit | Enhance community self resilience | Local authority will coordinate with NGOs to guide community establishing a community saving fund to spend for community benefits, not to any individual. Mass organisations help disseminate information of community fund’s benefits. | 5-10 years |
| Component 5. Increase accessibility to employment | | | | |
| Increase competency in employment market | HCMC People’s Committee Advisory Team  
District and Ward PC  
Relevant agencies for employment | Enhance soft skills to community including provision of internet access and internet use | Establish local job creation centers, job database and computer access to job  
Organize pro-poor training courses to community for job seeking skills including application, CV, computer…etc.  
Organize pro-poor training courses for business management /job training | 5-10 years |
| Increase more jobs in market | HCMC People’s Committee Advisory Team  
District and Ward PC  
Relevant agencies for employment | Provide more access to employment | Work with relevant agencies including private sector to find out what employment and requirements to be met; to establish database. | 5-10 years |
## Cross Cutting Issues – Gender

<table>
<thead>
<tr>
<th><strong>Encourage women’s participation</strong></th>
<th>Advisory Team District and Ward PC Women’s union Community liaison unit</th>
<th>Improve women’s role in related activities in community</th>
<th>Establish women groups to discuss about environmental issues</th>
<th>5-10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protect women’s health</strong></td>
<td>Advisory Team District and Ward PC Women’s union Community liaison unit</td>
<td>Improve green practices and knowledge for women</td>
<td>Provide trainings and information on water saving including rainwater harvesting. Provide trainings and information on sorting and processing domestic garbage. Provide trainings and information on using energy efficiently (home appliances and washing habit).</td>
<td>5-10 years</td>
</tr>
<tr>
<td><strong>Strengthen women’s earning capacity</strong></td>
<td>Advisory Team District and Ward PC Women’s union Community liaison unit</td>
<td>Protect and diversify income</td>
<td>Organize pro-poor training programs on job skills. Relevant agencies at ward level disseminate and support women to access information of loan and credit. Organize self support /self training groups Develop existing support network in community.</td>
<td></td>
</tr>
</tbody>
</table>
9.4. Responsibilities for implementation

The proposed strategy applies to HCMC in Vietnam from the city government, NGOs and relevant organisations at the local community level. This section will discuss how the stakeholders will be involved in the strategy. For each stakeholder, it is necessary to identify their responsibility, scope of work and function relating to environmental hazard mitigation and avoidance. The responsibilities and organisations mentioned below are suggestions resulting from research findings including secondary data. They should be considered as an initial start for people who work in the field who can action them.

9.4.1. Local community

Community is the main participant at unit or ward and it should be involved in any planning so they become more aware, informed and educated regarding flooding and climate change in the city. Their local knowledge and broad experience will always be an important factor to any planning in the city, especially risk reduction or preparedness plans and implementation. Within the communities, students are considered as an important messenger in the relationship of family, school and society. They can be involved in information, education and communication activities to convey information to their families and their communities.

The community leader is respected among the community. This person will participate in the city taskforce and guide community on policy and implementation. Women in the community are also highlighted, as they mostly participate in all environmental events and they are active members of mass organisations in the city.

9.4.2. Mass organisations

As active participants in government’s policy implementation process, mass organisations include Women’s union, Fatherland Frontier Association, Veteran Association and Youth Union from city to ward level. These organisations have large memberships in the city, and they play key roles in the community in HCMC and the two research communities in this study. They also assist the city
government to educate community in areas of public health, environmental protection and sanitation. They support urban poor families and connect them to job opportunities.

In the research communities under study, the Women’s Union actively played a key role in providing loans to women, encouraging women to participate in environmental events, and raising women’s awareness of domestic violence or health protection. In addition to the Women’s Union, support and help from members of Frontier Fatherland Unit, Veteran’s Union and Youth Union are mentioned repeatedly by respondents in these research communities. These organisations can help monitor and evaluate activities relating to climate change and flooding in HCMC.

9.4.3. **State and private entrepreneurs**

Another crucial necessity is the active engagement of entrepreneurs in the city and at risk districts in climate change and environmental programs or events. The research found that entrepreneurs have the potential to help and support but they are not active members. The research communities also stated that entrepreneurs may be a good resource for improving their living environments.

State and private entrepreneurs can support and promote relevant climate change policies, using local resources and funding for local climate change and risk reduction activities.

9.4.4. **Professional organisations**

Most professional organisations including national organisations are based in HCMC. These organisations are interested in conducting research on climate change and flooding in HCMC and other urban cities in Vietnam. They have researched policies on strategy, planning and implementation. They support policy makers at city and national levels. The research found that some organisations and universities have different research projects relating to climate change and vulnerability of HCMC. They can support professional knowledge to the policy makers, integrating climate change knowledge into policy planning. They can also help local community to apply different technical knowledge and skills to minimise flooding impacts as well as other environmental hazards.

For example, they can advise the city government about vulnerability and poverty; integrate planning and appropriate methods to increase green space; maintain soil surface in people’s houses; or provide basic technical knowledge for cleaning drains to prevent or minimise serious flooding.
These organisations, as suggested from the research, can be HCMC Institute of Development Studies, Institute of Southern Development or universities based in HCMC who have undertaken little research to date on climate change impacts, flooding impacts and poverty in HCMC. In addition to these research institutes, international research networks such as Delta Research and Global Observation Network and Asian Cities Climate Change Resilience Network participate (ACCCRN, 2014). These organisations have research activities regarding climate change impacts in Vietnam and they can help gain more advanced knowledge and techniques to support at risk communities.

9.4.5. Non-Government Organisations (NGOs)

In HCMC, there are many local NGOs supporting the poor with finance, job creation and community development. Some also run job creation programs for the poor. These organisations should be recognised as an important resource to support the poor’s resilience. They also have activities encouraging community participation processes to empower the poor. And they provide support and funds for feasible infrastructure projects suggested and planned by community. Examples of local NGOs are Capital Aid Fund for Employment of The Poor (CEP), Centres of Social Protection for the Disabled or The Association of City of Vietnam (ACVN). These organisations work effectively and actively in poverty reduction and support the disabled in HCMC (DFAT, 2014; DOLISA, n.d.).

From the author’s experience working with different donors, international NGOs such as CARE International, Oxfam, ActionAID or ENDA can help work with community to find out their needs or priorities, so that a plan of action can be achieved practically. They also have funding to help fill the shortfall in budgets that is always an issue with the local authority and communities. In addition, international aid from the World Bank, ADB, AusAID (Australian Government), DANIDA, JICA (Japan) and DFID (Britain) can also provide technical and professional help for HCMC to strengthen capacity, or to establish climate change adaptation programs. These organisations can be considered an additional funding source for risk management activities in the city.

9.4.6. Media organisations

The case study findings have shown that most people in the communities have a TV or radio. Some also like going to a morning café to read newspapers. It is an opportunity to integrate the climate
change message and education to people through media. However, these organisations have not provided adequate information to help people understand vulnerability, cause, prevention and preparedness for flooding and other natural hazards.

Media organisations, such as HCMC Television Station, HCMC Radio Station and local magazines, are considered key stakeholders because they help communicate and educate people on climate change issues including vulnerability, impacts, public health, sanitation and clean water.

9.5. Review of the strategy

The strategy has proposed potential activities to be engaged in planning and implementation so that community can improve their livelihoods and withstand natural hazards. This strategy has also incorporated different key agencies and professional organisations to support community and to build trusting relationships between key stakeholders. By engaging community in planning activities, the strategy improves the community’s motivation, knowledge and awareness. The application of this strategy can be escalated in other urban areas in Vietnam in future.

The ideas of this strategy have been discussed with different international and local experts in Vietnam. As the author is based in Melbourne, Australia, the communication was via emails. Most experts commented that the national government should be one of the key stakeholders in the proposed strategy. However, given the limitations of this research (see section 5.8 in chapter 5), the strategy only focuses on city and community levels to explore opportunities to improve the adaptive capacity of the urban poor in coping with floods and other environmental events.
Chapter 10

Reflection On The Research

10.1. Introduction

The previous chapters presented the conceptual and empirical analyses in this thesis. The culmination of this work is the case study of the situation of poor communities in Ho Chi Minh City. The ideas and proposed strategy were sent to five local experts included government authorities, and to four international experts, who have been engaged in city flood control activities and programs. However, no feedback was received from any of the local experts. Given the results from this case study, and that in most cases the findings rely on information from individuals (especially their interpretation of their personal situations), this limits the applicability of the results to other cities and communities in Vietnam. While the research approach has introduced subjectivity, the strength of the research design is that it used multiple sources of data to produce reliable results.

Research limitations and strengths have been noted above and discussed in chapter 5, section 5.8, and within that context this chapter will outline the significance of the case study findings. Beginning with a focus on key findings and insights, with their connection to the research aim and objectives introduced in Chapter 1, this chapter moves through the discussion of possible directions for further research, to empirical and theoretical contributions of the research, and finally, lessons learnt.

10.2. Insights of the research

This thesis has critically examined the theoretical and practical aspects of community based adaptation in developing countries. This thesis set out to answer the main research question: What is an effective adaptation strategy to support poor communities to, at least, mitigate the natural hazards in Ho Chi Minh City, Vietnam?

In order to address this question, five objectives were identified: (1) examine the vulnerability of urban poor; (2) identify coping strategies applied or planned by local, national and international communities (see chapters 2,3 and 8); (3) analyse these situations and understand community needs (see chapters
4,5,6 and 7); (4) and (5) with the contributions of professionals, propose an effective community based adaptation strategy for the urban poor community in Ho Chi Minh City, Vietnam (see chapter 9). Through the process of developing the adaptation strategy (chapter 9) a wide range of data have been collected, which sheds light on the roles of government agencies and communities, and which provides understanding of community adaptation generally.

Based on the case study of urban flooding in Ho Chi Minh City, I conclude that urban poor communities in Vietnam are vulnerable to changing climate. Their vulnerability is more social, rather than a physical or environmental phenomenon. The vulnerability of the research communities studied is mainly within the context of unstable livelihoods. Importantly, the lack of access to socioeconomic and political resources limits their ability and capability to withstand environmental risks. From the community’s perspective, flooding and vulnerability are closely connected, but of relatively minor importance. However, the primary driver of their vulnerability is lack of adequate support from government and financial resources.

Nevertheless, these findings reveal the gaps between local people and city officials’ knowledge, cooperation, participation and bottom-up actions. In order to bridge these gaps, changes to governance structure, more community engagement in planning, and improved relationships between community and other institutions (e.g. professional organisations, NGOs and city government) are needed. The following six components form the basis of the proposed adaptation strategy (see Chapter 9) that will assist in bridging these gaps:

- Component 1. Governance Development will identify key players and tasks to be done in an effective adaptation plan;
- Component 2. Capacity Building will bridge the gaps between local experience, knowledge and awareness in both public and private sectors;
- Component 3. Reducing Vulnerability of the city will come from improved physical infrastructure and urban planning/management to minimise risks in existing and potential flood prone areas;
- Component 4. Community Participation will utilise the community’s local knowledge, to empower their voice in planning process and to develop their awareness on vulnerability and risk management;
- Component 5. Increased accessibility to employment will provide more access to better socio economic conditions so that livelihoods can be more stable and more resilient to risks and hazards; and
- Component 6. Gender equality will encourage women’s participation in adaptation activities and promote women’s position in the political and social system.

At an implementation scale, from the research come insights that can facilitate better communication with poor communities to expand their adaptive capacity, in addition to reducing their exposure to floods and other natural events. In particular, while the main role of local authority at the community level is to implement programs and activities designed by the city government, there are some potential contributions that local communities can take part in. These contributions are noted in the following section.

10.2.1. Role of local government in effective community engagement

The research found out that community would be more engaged in adaptation actions if the local staff in government agencies appeared to be more helpful and resourceful. To date they have demonstrated enthusiasm but they lack deep understanding of climate vulnerability and resilience issues. The local authority understand their community well, however, their position does not allow them to take actions to help community. As they cannot take a more active role to make decisions about coping measures, they also appear less accountable to community.

The findings indicate that local government staff’s knowledge about community and their administrative area can be encouraged, and they can take initiatives in local adaptation programs and activities. These personnel resources can help city government to: identify potential high risk locations; examine priorities to be developed in their management areas; assess flood levels or climate trends in their areas; take initiatives in minimising traffic jams in flooding time; and take a leadership role in encouraging people’s participation in community adaptation plans. They can contribute to
decisions about the best options for their community. Further, they can play an effective role in connecting community to local city government.

City government is important in making decisions about what can be done for development of the urban area. However, in order to encourage local community participation and initiatives, the city government needs to set priorities and budget for local adaptation activities. To assist with carrying through these plans, development programs must attract international and national sponsors to support community adaptation activities and strengthen local capacity.

Further, the capacity of staff needs to be strengthened, so that the concepts of end point vulnerability can be gradually added to present perceptions of starting point vulnerability. For instance, improving infrastructure to minimise vulnerability of flooding can comprehend the linkages between climate vulnerability, poverty and resilience, so that implementation will be more focused on socioeconomic and political aspects. By doing so, knowledge of community risks and vulnerability can be appreciated and included in adaptation activities. When the knowledge is developed and retained, local staff in government agencies can give more appropriate and comprehensive support that will help community build their resilience and adaptation level.

10.2.2. Awareness and community resilience

Disseminating information on how other community based adaptation activities contributed to an increase in the preparedness level of community, in coping with natural hazards, is important. By developing connections with other community in the city and other provinces, people can share their experiences and stories. Their awareness of vulnerability and coping measures will thus be improved. For example, a model of sister district or sister city can be established with different city districts or other cities of Vietnam where meetings can be organized to encourage people speaking their experience and taken measures to cope with natural hazards.

Additionally, community vulnerability mapping or emergency units conducted by community members will help increase community awareness levels in case an environmental hazard happens. The research showed that raising awareness tends to focus on propaganda and simple instructions to community, who do not have adequate knowledge on vulnerability and risks. Therefore, it is crucial to
design awareness programs for all relevant stakeholders including community and the staff of different agencies, so the message of adaptation and resilience can be conveyed effectively and more deeply. Further, information of floods, risks and vulnerability has not yet been integrated in education programs in schools. The young students who attend these schools are both part of the community and its future; they also need to understand their community and threats, so that knowledge and awareness can be built for future generations. For example, environmental lessons about human actions that lead to urban flooding, related health care activities and how people can help to prevent or to cope with flood should be brought into school lessons.

10.2.3. Enhancement of adaptive capacity

The research identified that adaptive capacity, vulnerability and hazard specific risks are closely linked. In the communities under study, flooding was not their only or most highlighted concern, as they also expressed pressure from socioeconomic, human and institutional issues. The specific issues that constrained adaptive capacity were: poor health conditions and low skills (human capital); access to employment and financial insecurity (financial capital); poor community infrastructure and housing quality (physical capital); and support from institutions and government (social capital). Improving community infrastructure (specifically drainage systems), housing quality (technical advice for better housing design and construction), strengthening livelihood options and the healthcare system will assist in coping with natural hazards. Importantly, encouraging social networks among community members will help improve adaptive capacity to increasing floods.

The analysis demonstrated that merely a structural approach cannot strengthen adaptive capacity in poor communities. However, it can be allocated to non-structural measures such as management, supervision and community capacity building. Indeed, community adaptation will be improved if socioeconomic, political and environmental interests are integrated in adaptation programs and activities. As an example, community representatives can be supervisors of construction happening in their community. In order to help them perform best in this role, relevant agencies could design a checklist of environmental protection issues and train community how to use and act on these checklists. By engaging them with similar activities, community capacity will be enhanced over time.
10.2.4. More access and more resources needed

Findings from this research indicate that flood risk is a minor concern for the communities, since they have had their own coping strategies for a long time. However, access to technology, materials, finance, government support and neighbour’s help are the most important needs to reduce their vulnerability. Likewise, technical modification of housing design and land level is important for adaptation to flooding. All these areas of improvement are linked to financial and government resources. Yet the findings identified that most people do not have access to these resources. Those who are better off have more access to resources and thus they are more adaptive to floods. These people could afford to raise the level of house floors, upgrade house facilities or place cement and paving stones in their yards. In this case, external assistance in the form of cash, materials, labour, or technical advice from NGOs, private sector and government officers are important element of community adaptation. Hence, engaging these organisations in community adaptation was an important element to create more access to community and consequently, community vulnerability and adaptive capacity could be addressed. For example, NGOs can advise on construction models, private companies can donate materials or money to buy materials and government officers can work with NGOs to make sure the technical implementation is legally approved.

However, there is no guarantee that these external resources will become available. In the long term, community should be more self-reliant. Social capital is noted as a strong element of adaptive capacity in the communities under study. Mutual help between community members remained strong during flooding periods. In order to provide access to social capital and related resources, it is important to encourage collective activities such as community funds, neighbourhood support or women’s groups. NGOs also can help develop the community sustainability by guiding community to set up these activities. Access to social capital can be improved by establishing a community liaison unit that will help monitor flood causes and impacts, as well as coordinate actions between community and other institutions. These will encourage community participation and reinforce social capital in the community.
10.2.5. Urban poor community are continually exposed to human induced and natural vulnerabilities

Chapters 6 and 7 have highlighted the main components of vulnerability the urban poor community are exposed to. Lack of adequate access to livelihood capital has made their daily life a struggle and this has exaggerated their level of vulnerability. This research shows that the urban poor community will continue to be exposed to multiple stressors and different impacts, while specific impacts have been examined. In particular, floods have a strong negative impact on people’s health, education, business and wellbeing. Critically, people working in the informal sector have little ability to deal with shocks and stresses, as their capital relies on business from others.

10.2.6. Women’s critical role in community and family is undermined

The research identified that the domestic and productive roles of women are undervalued. The female economy, based on managing family expenses and home business, is critical in determining a household’s wellbeing. They engage themselves in the economic activities of their family, which provides a better household safety net.

In the case study, women also carry out some activities such as observing different household and community rituals, assisting neighbours with preparing for upcoming flood events, and assisting family members in organising proper meals for school or work. Women also form close kinship relations within or outside their community and this increases job opportunities for other family members.

10.3. Suggestions for further research

As this thesis provides wide ranging issues, I am convinced that further research will be more diversified and extensive. Specifically the findings of this research provide the following insights for future research that will assist in the development of a deeper understanding of vulnerability:

- Knowledge of climate vulnerability and capacity of resilience and adaptation within urban poor communities and local authorities is needed, so that community resilience and support from authorities will be more effective;
• Climate related behaviours, perceptions of risks and cultural practices influence to community adaptation are necessary to reveal how the integration supports or limits local capacity to learn and adapt to environmental events;

• Effective communication system including communication skills are required to deliver professional knowledge and practices on vulnerability, resilience and adaptation to local community.

• The effectiveness of poverty reduction programs implemented in Ho Chi Minh City and the influence of mass organisations with regard to poverty reduction will provide a buffer zone so that livelihoods can be strengthened in poor communities;

• The linkages between livelihood capitals and adaptive capacity, especially social capital and local culture, are crucial to understand the urban context in Vietnam and poor communities. The livelihood diversity of the poor should also be further examined to integrate in development planning, so that community resilience is protected and developed. The migration pattern also needs further investigation to ensure everyone living in the city will not be excluded from planning and implementation processes.

• For the purpose of linking this research to policy development, it is suggested that qualitative research approaches focus on starting point vulnerability should be developed and applied, rather than scientific approaches, that merely focus on addressing end point vulnerability.

Further, in respect to the outcomes of this research and the proposed strategy (see chapter 9), it would be beneficial to assess the relevance of the six above listed components used to develop the proposed strategy for other flood prone communities in different cities. The correlations between each component should be validated in other cities in Vietnam and developing countries in Asia, ensuring the significance of these components and that each activity can be applied in local adaptation. Also, as this strategy is currently an untested model, it is important to have an evaluation of a local strategy employing this approach to verify or to modify the model.
10.4. Contribution of the research

This section presents the importance of this research, balancing the world of theory and practice that highlights the potential engagement of different stakeholders in the policy making process. It also reinforces the importance of local organisations with regard to adaptation.

10.4.1. Theoretical contribution

This research enriches the existing knowledge of livelihood, resilience and adaptation sourced in the literature. Information from this research can be used to develop targeted interventions aimed at diversification of livelihood capital, and cultural practices of adaptation, risk appraisal and risk reduction in urban areas in Vietnam and other developing countries in future. Importantly the findings presented in this thesis confirm the idea that adaptation actions can be developed and flourish at different levels and scales in society (City of Melbourne, 2009).

Further, the case study supports the idea that understanding the complexity of livelihood should be understood, and case study is an effective way to examine vulnerability, resilience and adaptation of the urban poor. The findings of this research also add to a growing body of literature on utilising livelihood frameworks to access vulnerability context, transformative processes and livelihood outcomes in the community (see Carney et al.,1999).

Taken together, the findings of this research contribute to identifying key issues for building community adaptation of Ho Chi Minh City. As noted in section 6.3.4 in chapter 6, community has the potential to help themselves. This reinforces Kokawa’s (2003) findings of the role of self-help groups and neighbour’s support as “the power of humanity”.

In addition, the findings presented in section 7.4 in chapter 7 confirmed that community is able to carry out adaptation actions in future. Therefore, it is crucial, as suggested by Uy et al. (2011), that local practices and knowledge need to be involved at the beginning of planning so that community can understand the whole process and become the main driver in future.

Furthermore, the empirical findings of this research strongly reinforced Bryan et al’s (2013) viewpoint of the importance of a close interconnection between livelihood, community resilience and institutional support. Specifically, the study confirms that for successful community adaptation to be
achieved, activities are required such as good government mechanism, staff capacity, development of physical infrastructure, urban planning management, active participation, increased accessibility to employment and mobilisation of women’s participation to adaptation programs/projects.

Finally, this research makes a contribution to the literature on vulnerability and urban flooding in developing countries and further supports the idea that climate vulnerability and risk reduction need to develop a better coordination tool to incorporate community participation in designing community response strategies (Patt et al., 2008).

10.4.2. Policy contribution
To my knowledge, this research is the first attempt to engage different stakeholders at city and local levels in Vietnam. It incorporates government, private and public sectors, NGOs, mass organisations and community to adaptation activities in the context of Ho Chi Minh City.

In addition, the research provides additional evidence with respect to the influence of institutional support from city authority, local government, the private sector, NGOs and civil organisations. In other words, the support from these organisations can have a direct effect on adaptation capacity of the urban poor community and this relationship should not be underestimated in future research. Among these organisations, both local government and mass organisations play an important role in enhancing resilience and incorporating resilience into planning and action.

10.4.3. Contribution to practice
This research has contributed to local adaptation planning activities. For example, it is the first attempt to explore the context of most flooded urban areas in Vietnam, to understand how the poor are dealing with increasing floods and what gaps need to be filled in the administrative system. This research also analysed the key actors of vulnerability reduction and adaptation activities in city programs. The proposed strategy indicates what steps need to be taken to reduce risks and enhance adaptive capacity of community.

In addition the results provide better understanding of the relations between climate-related resilience and urban livelihoods to different national and international agencies including NGOs. The proposed strategy will be an important reference for these agencies to design their agendas and better implement
their climate change adaptation projects at the local level in Vietnam and in other developing Asian countries.

By attempting to bring local community and city authority together, this thesis identifies proposals to mitigate flood impacts in Ho Chi Minh City. However, the connection and cooperation suggested may be a major challenge to government management in Ho Chi Minh City.

10.5. A final word

The findings from this research will serve as a basis for a developed community based adaptation strategy in HCMC in the future. This study is an important step in assessing community vulnerability and livelihood, to highlight the needs of understanding constraints, opportunities and institutional influences for the urban poor community in the policy planning process. In order to avoid high costs of ineffective adaptation programs, urban residents should be encouraged to participate in the process of designing the policies from the outset.

To a large extent, the findings from this research has answered the question: **What is an effective adaptation strategy to support poor communities to, at least, mitigate the natural hazards in Ho Chi Minh City of Vietnam?** Adaptation and vulnerability reduction do not necessarily mean responses to a specific environmental event. Rather, it is a more proactive process of improving access to livelihood capital, and strengthening the socioeconomic and political aspects of community.

For researchers, professionals and local authorities of urban areas, these findings embody knowledge of urban flooding impacts that can be addressed and can empower community to self-reliance in the future. Also, the findings have potential application to other communities that have not experienced natural events, as a preventative tool. Further the research outcomes demonstrate that planning needs to be based on local context specific information. This planning requires patience and communication skills (listening and talking to people) to deeply understand the community’s priorities and needs.
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APPENDICES

Appendix 1: Questionnaire and questions used in the survey
Appendix 2: Demographic data
Appendix 3: Socioeconomic data
Appendix 4: Observed flood times in the research communities
Appendix 1. Socioeconomic and community adaptation in urban flooding areas

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This is an initial study for a PhD thesis on Community Based Adaptation in context of urban flood in Ho Chi Minh City. Information collected will be served as data for PhD thesis, details of respondents and interviews will be processed privately and securely.

GENERAL INFORMATION

DATE: ….……./2011 No:……………………

District: ___________ Ward ___________ Block _______ Unit ___
Street ______________________________________________

Age: …………..              Sex: 1- Male       2- Female

Household Category: 1- female headed   2- Elderly headed over 70
3- Disable headed   4- None of these

I. Socioeconomic Condition

I.1 Members of family

I.1.1 Number of people living here: …………………… people

<table>
<thead>
<tr>
<th>No</th>
<th>Related to household header</th>
<th>Age</th>
<th>Main occupation</th>
<th>Additional occupation</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Household header</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
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<td>6</td>
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<td>7</td>
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<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.1.2. Main income by : ________________________________________________

1.1.3. Average income of the family: ........................................... VND

I.2. Length of resident …………………….years.
I.3. Living conditions

I.3.1. House:

I.3.2. Present conditions of your house

I.3.3. Ownership:

I.4. Opportunity to use public utilities and family (present)

I.4.1. electricity:

I.4.2. Water:

I.4.3. Drainage

I.4.4. Toilet

I.5. Household Amenities

<table>
<thead>
<tr>
<th>No</th>
<th>Properties</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Car</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Motorbike</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Washing machine</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>TV</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Fridge</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>DVD/VCD</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Gas stove</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Air con/fan</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Computer</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Other (stated clearly)</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

I.6. Finance and Expenses

I.6.a. Does your family get a loan or financial support? 1- Yes 2- No

I.6.b. Financial support and loan

Reason to get loan and from whom?

I.7. Do you think your family’s income is stable? 1- Yes 2- No 3- Not stable

I.8. Why do you choose this location to live?

I.10. What do you think about your future in the next 10 years?

I.11. What will you do if you have extra money? (give me your priorities)

1: .................................. 2: ...................................... 3: ...................................................

II. Flooding/Rain and related issues

II.1. Impacts of flood and rain to urban life
II.1.1 Flooding characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Mostly flooded month</th>
<th>Time to be flooded</th>
<th>Level</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>What season</td>
<td>Dry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any unexpected flooding events for the last 5 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Month stated clearly

II.1.2. House and Property

II.1.2.1. Is your house flooded?  
1- Yes  
2- No

II.1.2.2. If yes, how long was it flooded for:  
1- 2-3 hours  
2- Half Day  
3- Whole day

II.1.2.3. Impacts of flood to housing:

II.1.2.4. Environment issues

II.1.3. Finances

II.1.3.1. If you need to fix your house to cope with flood/roof leaking, where can you get the money?

II.1.3.2. Is your income affected by flood?

II.1.3.3. Please explain why your income affected if you said YES

II.1.3.4. Cost to fix house because of rain/flood  
1- not much  
2- a bit  
3- Very costly

II.2. Life

II.2.1. What do you concern in rain/flood

II.2.2. How do you view flooding now and 5 years ago?

II.3. Health risk

II.3.1. Does flood influence to health?

3.2. What are diseases related to floods?

3.3 Do you prepare any health protection measures to cope with rain/flood? Please list them all

3.4. Does local authority or other organisation support health protection in rain/flood. Please list?

3.5. Do you think IEC is important? Why?

3.6. Do you think local authority should support to cope with flood and rain? Why?
III. Coping measures

III.1 What do you do in rains/flood? List out all coping measures

..............................................................................................................................................................

III.2. Do you think we need broadcasting system to inform coming flood/rain events in your community? Why?

..............................................................................................................................................................

IV. Awareness

IV.1. Do you think flood is a serious problem of your community and the city? Why?
..............................................................................................................................................................

IV.2. Do you think what is the main reason for being flooded in your community?

IV.3. If you are suggested to propose solutions for flood, what priorities will you do?

1....................................... 2...................................... 3...........................................................

IV.4. Do you know any city flood control programs? Please list them all

IV.5. Will you willing to participate in any flood control program in your community?

IV.6. Have you heard about climate change?

IV.7. If yes, please list some events?

IV.8. How do you update your information about climate change or flood?

IV.9. What first appears in your mind when you hear “flooding”?

..............................................................................................................................................................

IV.10. What problems did you and your community cope in hot weather?

IV.11. What causes do you think for hot weather?

IV.12. What do you propose for coping with heat?

IV.13. Who is key player in managing flood and environmental events? Please list?

IV.14. If your neighbor needs help, will you willing to? How?

V. Women role in the family (asking women in the family)

V.1 Women participation

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Not important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who decides expenses and income of the family?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Who participate in public meetings?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Who decide fixing house or leveling up the ground floor?

If your family needs a loan, who will go and find the loan?

V.2 What do women usually do at home (1)……………………(2)………………………..(3)…………………………

V.3. Do women participate in local authority’s events? Please list if Yes

V.4. What are priorities of women in life

1:

2:

3:

V.5. If women decide expenses, what are the 3 important things will you pay?

1: ……… 2:…………… 3:……………..

Thank You For Your Time
Appendix 2. Demographic data

Data from these tables come from questions 1.1.1, 1.1.2 and 1.2 in the questionnaire (Appendix 1).

Table A2.1. Age distribution of males and females in the research communities

<table>
<thead>
<tr>
<th>Age range</th>
<th>Binh Thanh community</th>
<th>District 8 community</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>%</td>
<td>F</td>
</tr>
<tr>
<td>25-30</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>31-35</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>36-40</td>
<td>1</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>41-45</td>
<td>1</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>46-50</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>51-55</td>
<td>2</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>56-60</td>
<td>2</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>61-65</td>
<td>1</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>66-70</td>
<td>1</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>71-75</td>
<td>2</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
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<td>15</td>
</tr>
</tbody>
</table>
Table A2.2. Education level of respondents

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Binh Thanh community</th>
<th>District 8 community</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>%</td>
<td>F</td>
</tr>
<tr>
<td>Illiteracy</td>
<td>1</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Primary</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Secondary</td>
<td>3</td>
<td>30</td>
<td>3</td>
</tr>
<tr>
<td>High School</td>
<td>6</td>
<td>60</td>
<td>7</td>
</tr>
<tr>
<td>Graduate</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>100</td>
<td>15</td>
</tr>
</tbody>
</table>

Table A2.3. Main income source of the family

<table>
<thead>
<tr>
<th>Main income source</th>
<th>Binh Thanh</th>
<th>District 8</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. Interview</td>
<td>%</td>
<td>No. Interview</td>
</tr>
<tr>
<td>Self-Employment</td>
<td>10</td>
<td>40</td>
<td>5</td>
</tr>
<tr>
<td>Casual work</td>
<td>6</td>
<td>24</td>
<td>9</td>
</tr>
<tr>
<td>Permanent staff</td>
<td>9</td>
<td>36</td>
<td>6</td>
</tr>
<tr>
<td>Part time worker</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>100</td>
<td>25</td>
</tr>
</tbody>
</table>
Table A2.4. Length of residence

<table>
<thead>
<tr>
<th>Length of Residence</th>
<th>Binh Thanh</th>
<th>District 8</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. Interview</td>
<td>%</td>
<td>No. Interview</td>
</tr>
<tr>
<td>1-5</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>6-10</td>
<td>5</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>11-20</td>
<td>2</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>21-30</td>
<td>2</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>31-49</td>
<td>10</td>
<td>40</td>
<td>2</td>
</tr>
<tr>
<td>51-70</td>
<td>5</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>100</td>
<td>25</td>
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</tbody>
</table>
Table A2.5. Linkage between education level and type of job

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Retired with pension</th>
<th>Housewife with no income</th>
<th>Household small stall and shop</th>
<th>Permanent staff in companies</th>
<th>Workers worked based on availability of products</th>
<th>Street vendor and casual worker</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No schooling</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Primary</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Secondary</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>High school</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Graduate</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Not finish primary school</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Not finish secondary school</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Not finish high school</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Colleges</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>2</td>
<td>18</td>
<td>11</td>
<td>8</td>
<td>10</td>
<td>50</td>
</tr>
</tbody>
</table>
Appendix 3. Socioeconomic data

Data from these tables come from questions 1.1.3, 1.3.1, 1.5, 1.6, 1.7 and II in the questionnaire (Appendix 1)

Table A3.1. Average income level for research communities

<table>
<thead>
<tr>
<th>Income level</th>
<th>Binh Thanh Community</th>
<th>District 8 Community</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. Interview</td>
<td>%</td>
<td>No. Interview</td>
</tr>
<tr>
<td>Extremely low income group 450,000-1,000,000</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Very low income group 1,100,000-3,500,000</td>
<td>12</td>
<td>48</td>
<td>10</td>
</tr>
<tr>
<td>Moderate low income group 3,600,000-5,000,000</td>
<td>5</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>Low income group 5,100,000-9,000,000</td>
<td>4</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>Better off group 9,100,000-25,000,000</td>
<td>3</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>100</td>
<td>25</td>
</tr>
</tbody>
</table>

Table A3.2. Accessibility to sources of loan

<table>
<thead>
<tr>
<th>Source for loan</th>
<th>Binh Thanh Community</th>
<th>District 8 Community</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>F</td>
<td>M</td>
</tr>
<tr>
<td>No loan at all</td>
<td>8</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Friends or Neighbors</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Relatives</td>
<td>0</td>
<td>1</td>
<td>6.7</td>
</tr>
<tr>
<td>Informal lenders</td>
<td>0</td>
<td>1</td>
<td>6.7</td>
</tr>
<tr>
<td>Banks</td>
<td>1</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Social welfare</td>
<td>0</td>
<td>0</td>
<td>6.7</td>
</tr>
<tr>
<td>Local government's credit fund</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Others</td>
<td>1</td>
<td>10</td>
<td>6.7</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>15</td>
<td>100</td>
</tr>
</tbody>
</table>

230
<table>
<thead>
<tr>
<th></th>
<th>Binh Thanh</th>
<th>District 8</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>%</td>
<td>F</td>
</tr>
<tr>
<td>Stable</td>
<td>3</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>Not stable</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Not really</td>
<td>7</td>
<td>70</td>
<td>11</td>
</tr>
<tr>
<td>stable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>100</td>
<td>15</td>
</tr>
</tbody>
</table>
Table A3.4. House ownership characteristics

<table>
<thead>
<tr>
<th>House ownership</th>
<th>Binh Thanh Community</th>
<th>District 8</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female headed (%)</td>
<td>Elderly (%)</td>
<td>Disable (%)</td>
</tr>
<tr>
<td>Owner</td>
<td>85</td>
<td>86</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>91</td>
<td>91</td>
<td>67</td>
</tr>
<tr>
<td>Rent</td>
<td>7.7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>0</td>
<td>33</td>
</tr>
<tr>
<td>Stay without ownership or rent</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Family house</td>
<td>7.7</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: For each community and total, the data needs to be read by column. For example, in Binh Thanh Community, the percentage of Female headed household own the house is 85%, rent house is 7.7% and stay in their family house is 7.7%. These add up to 100%.
Table A3.5. Access to basic infrastructure

<table>
<thead>
<tr>
<th>Assets</th>
<th>Binh Thanh</th>
<th>District 8</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. interview</td>
<td>%</td>
<td>No. interview</td>
</tr>
<tr>
<td>Electricity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meter</td>
<td>24</td>
<td>96</td>
<td>25</td>
</tr>
<tr>
<td>Source from neighbor</td>
<td>1</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water meter</td>
<td>22</td>
<td>88</td>
<td>22</td>
</tr>
<tr>
<td>From neighbor</td>
<td>2</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Well water</td>
<td>1</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>Drainage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connected to the drainage system</td>
<td>10</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Drain to river or pond</td>
<td>15</td>
<td>60</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>Toilet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biogas</td>
<td>2</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Pit toilet</td>
<td>14</td>
<td>56</td>
<td>12</td>
</tr>
<tr>
<td>On river or lake or pond</td>
<td>9</td>
<td>36</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>100</td>
<td>25</td>
</tr>
</tbody>
</table>

Table A3.6. Household assets

<table>
<thead>
<tr>
<th>Assets</th>
<th>Binh Thanh</th>
<th>District 8</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (%)</td>
<td>No (%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes (%)</td>
<td>No (%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes (%)</td>
<td>No (%)</td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Motorbike</td>
<td>92</td>
<td>8</td>
<td>92</td>
</tr>
<tr>
<td>Washing Machine</td>
<td>60</td>
<td>40</td>
<td>16</td>
</tr>
<tr>
<td>TV</td>
<td>96</td>
<td>4</td>
<td>96</td>
</tr>
<tr>
<td>Fridge</td>
<td>72</td>
<td>28</td>
<td>80</td>
</tr>
<tr>
<td>DVD/VCD/CD Player</td>
<td>68</td>
<td>32</td>
<td>72</td>
</tr>
<tr>
<td>Gas Stove</td>
<td>80</td>
<td>20</td>
<td>84</td>
</tr>
<tr>
<td>Fan/air conditioner</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Computer/laptop</td>
<td>40</td>
<td>60</td>
<td>12</td>
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</table>

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Appendix 4. Observed flooding

Table A4.1. Flooding months in the research communities

<table>
<thead>
<tr>
<th>Months experienced in floods</th>
<th>Binh Thanh</th>
<th>District 8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (%)</td>
<td>No (%)</td>
</tr>
<tr>
<td>Jan</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Feb</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>March</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>April</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>May</td>
<td>8</td>
<td>92</td>
</tr>
<tr>
<td>June</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>July</td>
<td>56</td>
<td>44</td>
</tr>
<tr>
<td>August</td>
<td>64</td>
<td>36</td>
</tr>
<tr>
<td>Sep</td>
<td>72</td>
<td>28</td>
</tr>
<tr>
<td>Oct</td>
<td>44</td>
<td>56</td>
</tr>
<tr>
<td>Nov</td>
<td>24</td>
<td>76</td>
</tr>
<tr>
<td>Dec</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>