

Research Report

CLIMATIC HAZARDS, HEALTH RISK AND RESPONSE IN VIETNAM

CASE STUDY 2: MEKONG DELTA, VIETNAM



August 2007

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**A research programme funded by
UK Economic and Social Research Council**



Contents

| | |
|---|----|
| 1 Introduction | 2 |
| 2 Methods | 4 |
| 3 Study sites and their hazard profiles | 8 |
| 4 Health and climatic hazards: perceptions of risk | 19 |
| 5 Responding to health risks: household actions and institutional responses | 26 |
| 6 Synthesis | 41 |
| Appendices (organizations consulted & secondary sources) | 54 |

Please reference this report as:

Few, R., and Pham Gia Tran (2007). 'Climatic hazards, health risk and response. Case study 2: Mekong Delta, Vietnam.' Research report, University of East Anglia, Norwich, UK.

1 Introduction

This document reports on a research project carried out in the Mekong Delta in March 2006 as part of an international research programme on preparedness and response to the health risks that result from weather extremes. The project is a collaboration between the Overseas Development Group/School of Development Studies, University of East Anglia (UEA), UK and the Centre for Research on Social Development & Poverty Reduction (CRSDPR), University of Social Sciences & Humanities, VietNam National University - Ho Chi Minh City, Vietnam. It is funded by the UK Economic and Social Research Council (ESRC).

The project is one of two field studies in Vietnam, the other taking place in the Central Provinces. The focus in these studies is on how people who are exposed to climatic hazards perceive and cope with the health threats, and the factors that shape how they respond. Though funding limitations mean that the studies are relatively small-scale, they provide a first opportunity to target research on this theme. They entail primarily qualitative research on perceptions of health risk and analysis of household and community-level coping mechanisms of low-income populations vulnerable to hazards, focusing on those associated with threats to health.

The project in the Mekong Delta centred on household level research conducted in four local sites in and around two cities - **Long Xuyen**, An Giang province, and **Cao Lanh**, Dong Thap province. The four sites were: My Long ward and My Hoa Hung commune in Long Xuyen; and Ward 3 and My Ngai commune in Cao Lanh. The household level research was complemented by local key informant interviews, national-level investigation and collation of secondary data.

Rationale for the research

Different climatic hazards (flood, drought, thermal extremes and storm events) affect most regions of the globe and in many their impacts are likely to be exacerbated by the effects of climate change. The prospect of changes in the extent, magnitude and distribution of climatic hazards compounds an already severe socio-environmental problem in many regions, especially in developing countries where the state's capacity to provide widespread protection measures is often limited and where poverty and vulnerability to hazards may have a cyclical relationship. Vulnerability to hazard is now broadly recognized as a function not just of physical environment but, crucially, of social and political context. A key component of this social dimension is resilience: the capability of reducing risks through coping strategies and adaptive behaviour. This, in turn, is shaped by differential access and entitlement to economic, social and political resources.

One of the most complex and widespread impacts of hazards is on health. Climatic hazards bring both short and long term, direct and indirect health risks, including accident and injury, psychosocial disturbance, changes in exposure to vectors and pathogens, impacts on food supply and impacts on health care services. These risks are especially evident in developing countries, where mortality and morbidity outcomes are often concentrated among the poor and marginalized. Yet health aspects of hazards

tend to be under-researched and, other than short-term deaths and injury, under-reported.

Though much remains to be achieved, research on the potential public health impacts of climate change is now gaining momentum, through a combination of epidemiological research on current hazards and geographical modelling of changes in disease burden and hazard occurrence. Yet there is at present very little work analyzing response to health risks by people and institutions, and in particular the constraints and opportunities that shape capacity to adapt to the health challenges. Attention to the social, economic and political framing of vulnerability and resilience can provide the crucial complement to impact-focused epidemiological research on hazards by enhancing capacity to respond to the identified risks. Target populations of health interventions will benefit from a better understanding of current and potential coping strategies, leading to a strengthening of adaptive capacity at individual, community and structural/sectoral levels.

Vietnam is among the most hazard-prone countries of the world, facing annual risks from floods, tropical cyclones (storms and typhoons) and other weather-related hazards such as droughts, landslides and forest fires. Our review of previous research in Vietnam suggests there has been little work to date on perceptions and coping strategies relating to the health risks from weather extremes. The study reported in this document continues the process of addressing that important research gap.

2 Methods

The principle data collection method was semi-structured interviews with households – 12 in each selected city (6 per ward/commune) – plus a series of local key informant interviews. Inputs to the research also included national-level interviews (in national government, aid agencies, non-governmental organizations and academia) and secondary data (reports, papers, policy documents). Some of this data was collected during previous research activity on this theme in Vietnam.

Household interviews

Interviews were conducted with 12 households within each of the two study cities: Long Xuyen (An Giang province), and Cao Lanh, (Dong Thap province). In each city the interviews were split between two sites, with 6 in an urban ward and 6 in a peri-urban or semi-rural commune. These four sites were: My Long ward and My Hoa Hung commune in Long Xuyen; and Ward 3 and My Ngai commune in Cao Lanh.

A sampling frame was designed according to the characteristics of each site, with an element of purposive sampling to ensure sufficient respondents were selected from high-risk households. Sampling involved 3 stages.

a) In consultation with local key informants, the researchers first selected those sections of blocks or hamlets considered to most prone to flooding, including areas which had not yet received upgraded dyke systems.

b) Sampling of households also required that all should be of low-income status. The sampling process therefore next involved a listing of all households in the selected areas of low-income status. This was based on information provided by the local people's committees, which maintain lists of households that are classified as 'poor' under the ward-level HEPA (Hunger Eradication and Poverty Alleviation) program. The official poverty level defined by the Vietnam Government for 2006-2010 was for urban households earning less than 260,000 VND average income per person per month; for rural households the level was 200,000 VND*.

c) A target number of household interviews was then allocated for each selected flood-prone area, roughly proportionate to the number of low-income households within that area. Table 1 shows the number of households from different sections of each ward/commune. Within this sampling frame, a random selection was then made.

(*Note that the poverty standard is calculated based only on income and not on other assets/resources such as household facilities and access to infrastructure etc. Hence there were differences of living condition among the poor households in the study. Interviewers confirmed, however, that the standard of living of interviewees was consistently low compared with other households in the study sites. HEPA-listed households are eligible to apply for government assistance such as provision of credit, charity housing, free or reduced school fees and reduced health care payment for family members.)

Table 1 Household sampling strategy for the 4 sites

| <i>Long Xuyen</i> | | <i>Cao Lanh</i> | |
|------------------------------------|---------------------------------|-----------------|---|
| My Long | My Hoa Hung | Ward 3 | My Ngai |
| 5 in Block Pho Que 1 in Block 4 | 3 in My Long 2 3 in My Thanh | 6 in Block 3 | 2 in Hamlet 1 3 in Hamlet 2 1 in Hamlet 3 |

Interviews were conducted with one adult representative of each household (both men and women). Interviews were conducted in Vietnamese at the homes of the interviewees. The interview method was piloted and refined during a visit by the UK researcher (Roger Few). In order to simplify the process and create the conditions for a one-to-one dialogue, the subsequent interviews were conducted solely by the field researchers. Interviews were recorded for verification, and interview notes were subsequently translated into English for analysis.

All interviews were semi-structured, guided by a flexible question schedule, designed to elicit qualitative information on interviewees' perceptions of hazard/disaster events and attendant health risks and information about the forms of coping response at both household and communal level. The question schedule was based on the following list, translated into Vietnamese:

a) Information about household:

Who lives in the household (ages, gender)?
 What are the main occupations/sources of income?
 How long have you lived here? (How long in the commune/district?)

b) Perception of threats to health from weather extremes:

What are the main weather hazards/extremes affecting this area?
 What risks to health do you think result from different type of hazards? How do these arise?
 What are the most serious risks?
 How important do you think are the health impacts compared with other impacts of hazards?

c) Preventing/avoiding threats to health:

What information do you get to help you prepare for and cope with hazards?
 Have you made any changes to your home or surroundings to reduce health threats from hazards? What have you done and why?

Do you do anything to prepare for health problems at the start of the season/when hazard alerts are issued? What do you do and why?
 How do you cope with health threats when the hazard strikes?

d) Factors that affect ability to protect against health threats:

What do you have/do that has helped you prevent, prepare for and cope with health threats from hazards (your own resources – economic, social, material)?

How have others helped you prevent, prepare for and cope with health threats from hazards (community help/action, health services, local government help/action, projects by other organizations)?

What would you like to do but cannot/have not been able?

Why has this not been possible?

What would help you be better protected against health threats?

(What do you think would be the most important way to get better protection from health risks of hazards?)

Local key informant interviews

Local key informant interviews followed a similar procedure, with a slightly modified question schedule designed to develop an understanding of local hazard, health risk and policy contexts. These meetings took place at city and ward/commune level, with heads or senior representatives of local authorities and health facilities. Most took the form of group interviews. They were undertaken jointly by the Vietnamese and UK researchers. Table 2 provides a list of the interviewees for each site. Interviews with other city and provincial authorities undertaken during previous research in 2004 (see Few et al, 2004) also contributed to the discussions in this report.

Table 2 Local-level key informant interviews

| | <i>Long Xuyen</i> | <i>Cao Lanh</i> |
|-------------------------------------|--|---|
| <i>city level representatives</i> | - Long Xuyen Health Centre | - Cao Lanh Health Centre (4 reps) |
| <i>ward/commune representatives</i> | My Long: - People’s Committee (2 reps) - ward Health Station - block leader My Hoa Hung: - People’s Committee - commune Health Station | Ward 3: - People’s Committee - ward Health Station My Ngai: - People’s Committee - commune Health Station - farmers’ organisation |

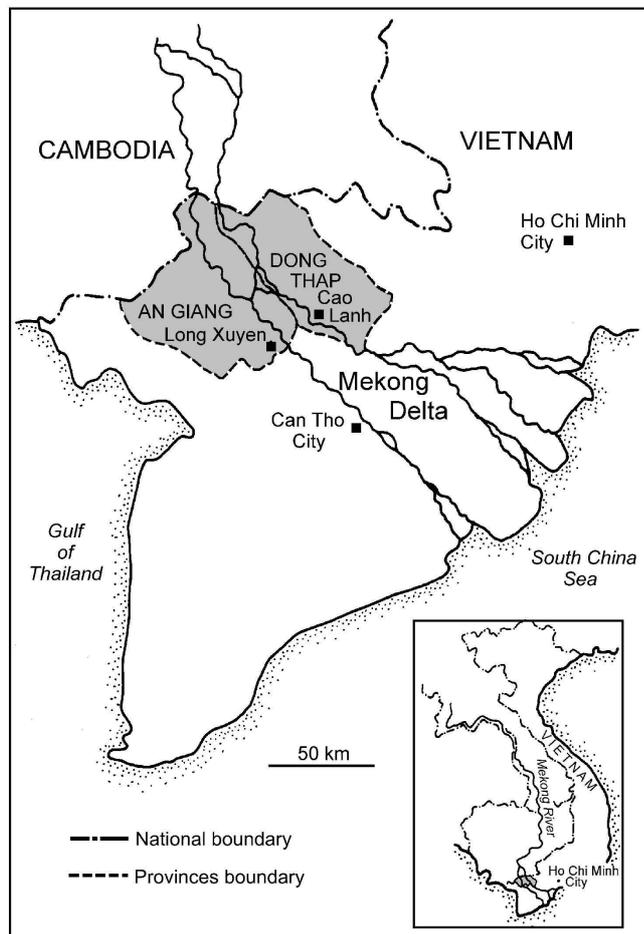
Analysis

Data from household and key informant interviews was annotated through a system of open coding of respondents' perceptions. In the case of the household interviews, a summary table of interview responses was also compiled based on these coding categories to aid synthesis of findings between interviewees. Compiling and comparing these different coded sources enabled the researchers to build qualitative insights into the process of response and adaptation to health risks by people and institutions, and the factors that shape how that process proceeds. Further insights and opportunities for triangulation of data were obtained by cross-reference with the national interview and secondary data sources.

3 Study sites and their hazard profiles

The cities of Cao Lanh and Long Xuyen lie in the heart of the Mekong Delta, each located on one of the two main branches of the Mekong that flow down from Cambodia, splitting further into a maze of distributaries as they progress toward the sea (Figure 1). Annual seasonal flooding most of the Delta region, usually between July and October, and the region recorded abnormally high flood levels in each of the years 2000, 2001 and 2002, creating disaster conditions in some areas. The Delta is only occasionally affected by tropical cyclones (typhoons) – the last major disaster was Typhoon Linda in 1997 – although lesser storms and strong winds can develop across the low-lying terrain. The flood season broadly coincides with the rainy season, and the intervening dry periods can occasionally result in relative drought conditions.

Figure 1 Study region



Flooding is part of the normal seasonal cycle in the Mekong Delta. Nevertheless, its impact on the environment, homes and infrastructure can constitute a 'hazard' to health even in years of average flood levels. Flooding affects both urban and rural areas. Some urban areas are protected by defences such as earth or concrete dykes, but many

peripheral and some central urban areas have incomplete structural defences as well as deficient drainage systems.

In both the study cities large sectors of the population do not have ready access to piped water and sanitation systems. Alternative sources of domestic water include river water, rainwater, open wells and communal taps in public buildings. In some cases river water is used for drinking (with or without treatment). Sanitation alternatives include open defecation, pit latrines, fishpond latrines and latrines with septic tanks. Although the pressure of urbanization in these cities is not great, the process of transformation of land use, from rural land to urban land, is increasing. This creates a need for construction of new urban infrastructure systems. At present, urban facilities and services are mainly distributed in the central areas. The following maps (Figures 2-3) indicate the location of the study region and of the specific study sites within the two cities.

Figure 2 Long Xuyen study sites

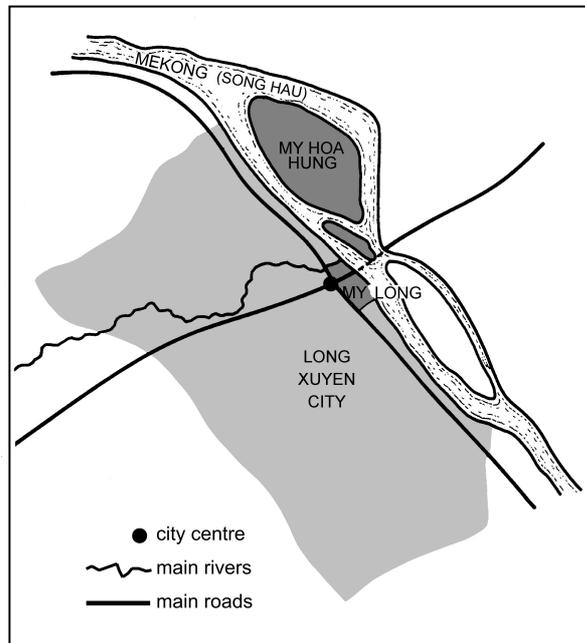
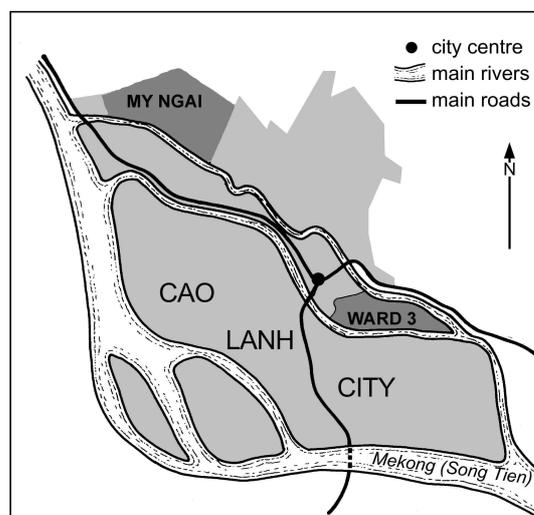


Figure 3 Cao Lanh study sites



Long Xuyen

Long Xuyen is a medium sized city with an area of 106.87 Km² and a population in 2006 of approximately 350,000. It is located on the western branch (Song Hau) of the Mekong river in the south of An Giang province. It lies approximately 130km from the coast. Flooding of parts of the city is an annual seasonal occurrence, with the influence of the tides creating twice-daily rises and falls in flood levels. Long Xuyen is made up of 9 urban wards and 3 peri-urban/semi-rural communes, two of which were selected for detailed study.

Long Xuyen Health Centre has responsibility for preventive health across the city. Box 1 provides perspectives from staff on the main health concerns affecting the city. Programmes to tackle diarrhoeal disease, dengue/DHF and also food safety (linked with water quality and food hygiene) are the main elements of the national programmes on health promotion emphasized in the city.

Box 1 Diarrhoea and dengue: perspectives from Long Xuyen Health Centre

According to the Centre staff, diarrhoeal disease is the principal health concern in Long Xuyen (and across much of the Delta), and a major focus for health education activities covering prevention and treatment. Its prevalence is mainly linked to water use. It occurs year-round, but incidence tends to be higher in the rainy/flood season and in the height of the dry season (when contributory factors are also shortages of water and food safety). There are many risk factors and children are especially vulnerable. Staff estimated that only 40% of the population of the city has access to piped water (which itself is not necessarily safe for drinking without further treatment). The remainder rely on river water, rainwater or well water. Water is treated commonly by just adding alum to clear the water (stored in large jars). Boiling to sterilize drinking water is often not carried out. Also, sanitation in the city is not well developed: many households do not have toilet facilities, especially in the outer areas, and may simply use river/canals or standing water. Another cause of water pollution is the production of catfish – fish are reared and processed on the Mekong here using floating rafts, and there is little or no waste treatment.

Dengue (and dengue hemorrhagic fever DHF) is a second major public health issue for the city, increasingly affecting adults as well as children. Dengue used to be present mainly in the rainy season, but now exists all year round, as long as there is presence of clean, still water in which the *Aedes* mosquitoes can breed. Water stored in jars seems to provide one of the main breeding sites, and hence the disease is also linked to water supply issues.

Site 1: My Long

My Long ward is located in the heart of Long Xuyen, between the city centre and the Song Hau (Mekong) river. The ward has approximately 3000 households, of which 133 were officially classified as below the new poverty standard at the time of the research. Many of the poorest and most flood-prone households live in small stilt houses on the river margin, within the block of Pho Que. Some of these homes represent informal residence. The urban location of the ward was reflected in the varied income sources of the 6 households interviewed for the study, including casual labour and small businesses such as motorcycle/cycle transport, selling of food items or lottery tickets, and sewing services.

Primary health care is provided by the ward health station, supported by the city and provincial health authorities. According to ward-level key informants, environmental health issues in the ward included areas of vacant land where stagnant water collects. They stated that water and sanitation facilities for the ward as a whole are relatively good, with most residents having access to clean water and a latrine in the home. Though piped water systems and household latrines exist in the ward, the household interviews made clear that they are not present in all households. Among the 6 household interviewees, 3 stated that they used river water (or standing floodwaters) for all their domestic needs and another 1 used river water for cleaning but took water from a pipe at the main road for drinking and cooking. Similarly, some residents said they paid to use latrines in neighbours' houses. The waste collection service also appears to operate partially – with some interviewees stating that they normally throw waste into the river.

Site 2: My Hoa Hung

My Hoa Hung commune occupies islands within the Song Hau, opposite the city centre and accessible by ferry and smaller boats. Though administratively part of Long Xuyen, it is more rural in character, consisting of lines of dwellings along roads and water channels, and with green space and ricefields between. The commune has four blocks, three of which are on the main My Hoa Hung island, including block My Long 2. The fourth block, My Thanh, is a separate islet accessible by small boat either from the commune centre or from the city. My Thanh islet is narrow and actively eroding on its western shore, where most homes are located. My Thanh is one of the poorer blocks, with a number of relatively unstable, stilt houses that are being actively considered for relocation. The total number of households in the commune that fell under the poverty measure was around 200. Occupations in the commune include rice farming, fishing, work for hire in these sectors and other trades such as boat transport and waste collection. A number of floating fish rafts are located close to the shores of both islands.

The health station lies in the centre of the commune, and access to it from My Thanh would require a boat journey. According to local health staff, only one third of commune households have access to clean water or possess sanitary toilet facilities (e.g. latrines with septic tanks). All 6 householders interviewed for the study stated that they rely on river water for most domestic uses (this may include drinking water). This was usually taken from rivers and channels at high tide, but during the flood season some households also took water from floodwaters. Households without sanitary latrines used either their own or neighbours' fish pond latrines, or simply used the waterways or the land. Domestic waste was burned or thrown into the rivers.

Hazards

Flooding was the principal climate/weather-related hazard discussed by **key informants** within Long Xuyen, although there was also some reference to health risks associated with dry season extremes (see next section). One city-level respondent also argued that researchers need to study how changes of climate may influence hazards in the region, as climate impacts heavily on the life of people, especially the poor.

According to local officials the typical flood season in the city lasted for 3-4 months from August into November, with peak heights in September and October. In My Long at such times low-lying houses could become inundated, and poorer households might be forced to relocate temporarily. The river is influenced by the tides, and so water levels rise and fall on an hourly basis. In some areas floods reached into some houses only around high tide. However, the fall of water was not complete and often left stagnant pools behind as it did so, including along unimproved roadways where it disrupted transportation. In parts of My Hoa Hung, peak floods in normal years entered low-lying houses, typically to a depth of 10cm. They also rose across unimproved roads, making transport difficult. My Thanh islet was particularly susceptible for two reasons: floodwaters commonly rose above floor level in the stilt houses along the banks; and the high river levels exacerbated the bank erosion and landslides that had forced households to evacuate and now threatened many others.

During extreme floods the impacts were much greater. Key informants spoke mainly of the 2000 floods, when inundation affected almost the entire area of both study sites. In My Hoa Hung the land surface was flooded to a depth estimated at 2-2.5 metres, with severe flooding of houses – even those on high stilts and raised foundations. In My Long roadways and houses were also covered, and the health station was inundated to a depth of more than 30cm that year. Infrastructure developments since 2000 – particularly raising of roads/dykes, and improvement of drainage systems – appeared to have reduced the susceptibility of many areas in the city to extreme floods (roadways typically run along the banks of waterways). However, these benefits had not reached all areas, and where roads had been raised they did not necessarily prevent houses becoming flooded even in normal years (by gradual flood incursion from elsewhere and/or by the accumulation of wet season rainwater) unless their foundations could be raised to similar heights.

The perspectives on hazard risk from the 12 **households** interviewed in Long Xuyen largely echoed those of the key informants. All listed flooding as the main hazard, although there was also mention of occasionally destructive storms and winds, and 3 respondents referred specifically to risks to health during dry periods (see next section). In the mid-river commune of My Hoa Hung, bank erosion associated with high floodwaters was also an important concern. Most spoke of the main flood season running some time between July and November, with a peak in September-October. However, there was also mention of flood risk during exceptional high tide dates in the dry season.

All 12 of the households interviewed experienced annual inundation of the home and/or its surroundings during the seasonal peak, with reported levels varying from the foundation up to 50cm above the floor of the house. In some cases moving around outside meant wading through waist-high water. One house reported that flooding of the home has been a recent phenomenon – only in the years since 2000. Another, however, described how improvement of the local dyke system had slowed flood effects.

The effects of seasonal flooding were richly described by the household interviewees. Some of these, especially those relating to health risks, are discussed in the following sections but it is useful here to set out the nature of the impacts on the home and livelihoods in general. Damage to houses was noted by 8 households, especially the deposition of mud and waste on floors, damage to timbers from soaking, and the problem of landslides damaging or destroying homes in My Thanh islet. People also referred to weak houses in the neighbourhood that had been collapsed by high winds. Some testimonials on the effect of seasonal floods on houses are provided in Box 2.

Transport difficulties during normal seasonal floods were raised by 6 households, with references to having to wade to reach main roads and ferries, building temporary bridges to roads from planks, and the perils of walking along waterlogged roadways. Partly as a consequence of the transport problems, 7 households (5 of the above) spoke of it being harder to maintain income during the flood season, because of difficulties finding customers, finding work for hire and travelling to fields. According to one interviewee: 'in flood time it is hard to work and plant crops. We have to catch fish to improve our meals at that time, and wait for the water to go down' [*interviewee LX8, My Hoa Hung*]

Box 2 Household statements on seasonal flood impacts: Long Xuyen

'In flood time, waste drifts into the home, as the water level comes up and down. Types of waste include water hyacinth's roots, plastic bags, bodies of dead rats, dirty dressing of wounds! Everyday, we gather waste and clean the house as the water level goes down.'

[*interviewee LX4, My Long*]

'The majority of houses here are stilt ones and they are built on the canal. Whenever inundation occurs, the wood pillars become wet, mouldy and decomposed, and planks of the floor are peeled off.'

[*interviewee LX6, My Long*]

'The landslides are powerful and cause broken houses. From 2000 to now, my house was moved three times after floods. We had to borrow to buy land costing hundreds of thousands [of VND] and were off work to move the house.'

[*interviewee LX10, My Hoa Hung*]

The major flood event of 2000 was mentioned by 4 householders, one of whom explained that the house was completely flooded. Only 1 householder talked of heavy impacts from the 2001 and 2002 floods, but another 2 spoke of an extreme flood in 1978. There was just 1 brief reference to the 1997 typhoon that hit parts of the Mekong Delta.

Cao Lanh

Cao Lanh is a city with an area of 97.2 Km² and a population in 2006 of 151,027. It is located on the eastern branch (Song Tien) of the Mekong river in the centre of Dong Thap province. It lies approximately 140km upstream from the coast. Seasonal flooding affects much of the lower-lying portions of the city area. Recent provision of dyke systems and raising of roads has taken place in some areas of the city, especially among the central wards. Outer areas of the city are considered rural in character, and it was indicated that the majority of the city's workforce is occupied in the agricultural sector. The administrative area of the city is made up of 6 wards and 7 communes, two of which were selected for detailed study.

Cao Lanh Health Centre administers the network of health stations in the city's wards and communes (see Box 3 for a description of the health care system in the two study cities). Outreach health care activities (and health care in emergencies) are carried out at local level by health station staff and block/village health workers. (NB Health workers are 'volunteers' who receive a small fee in cash or in kind for contribution to community-level disease monitoring, health education and preventive health campaigning e.g. promotion of immunization. They receive basic training and are part of an official network of health workers that extends in urban wards and rural communes throughout the country).

Water-related disease is a major concern for health staff, including infectious disease associated with water use, disease associated with contact with water and dengue fever associated with presence of suitable aquatic breeding sites for mosquito larvae. According to health centre staff, 40% of the city's population uses piped water and the rest rely on river water (treated with alum) or buy bottled water. Staff are also concerned about the link between use of agrochemicals (such as pesticides) in farming and the prevalence of skin disease (dermatitis) from human contact with water (in ricefields, when fishing, or when bathing in rivers and canals). Waste discarded into the environment (including rivers) is considered another problem, as there is insufficient waste collection service in urban areas and none in the rural sites.

Box 3 Health system functions in Cao Lanh and Long Xuyen

Since both cities are the major urban centres in each of their provinces (Dong Thap and An Giang), residents have access to different tiers of service within the public sector.

1 - Province-level

The Department of Health operates under the management of the national Ministry of Health and the provincial People's Committee, and serves the whole of the province. Its functions include administration of district and city health centres, and it provides higher-level treatment at a Provincial Hospital.

2 - City level

Each city has an administrative Health Authority, a General Hospital providing curative care, and a preventive Health Centre. These operate under the management of the provincial Department of Health and the city People's Committee.

The functions of the Health Centre include:

- Setting up a preventive health action plan under the national health programme (prevention of dengue, malaria, extending vaccination, tuberculosis, leprosy, STDs, goitre, malnutrition, HIV/AIDS, food safety, community mental health program) and other health programmes (such as family planning, health care in schools, vitamin A programme, flood mitigation and prevention etc); submission of action plan for management approval; collaboration with health care stations in implementing the action plan.
- Administering the preventive activities of health care stations.
- Technical support and training for health care stations.

3 - Ward/Commune level

Each ward and commune has a Health Station, under the management of the health centre and the ward/commune People's Committee. Its functions include:

- Setting up a preventive action plan under the national health programmes and other health programmes; submission of action plan for management approval; collaboration with local mass organizations in implementing the action plan.
- Administering the activities of health workers in blocks/villages.
- Provision of simple treatment.

In addition, urban residents also have the option of visiting private health care facilities, principally small private clinics, and/or opting for self-treatment with drugs from pharmacies.

Site 3: Ward 3

Ward 3 is located close to the centre of Cao Lanh, with a total population of approximately 10,000 people. According to local key informants the majority of the workforce is engaged in low-income occupations such as work for hire, selling lottery tickets, collecting waste and fishing for crabs and fish from canals (in the past traditional noodle-making was an important occupation). Of the three blocks within the ward, block 3 is the most prone to flood problems during the annual rise of the Mekong (block 2 was formerly severely flooded, but upgrading of the road and dyke system in the block in 2004 has reduced subsequent flood impacts).

The health station staff suggested that public perception of the need to protect against disease risk is improving, including intestinal diseases, skin disease and gynaecological disease. Ward health records suggest a gradual decrease in child malnutrition has been occurring in the ward (down from a rate of 23% in 2002, to 22% in 2004 and 21% in 2005), and staff put this down to health promotion activities targeting maternal and child health and nutrition. The incidence of dengue is not high (11 cases in 2002) but the level has not decreased year on year according to health staff, who indicated that surveillance suggests there may have been a change in the pathogen. Communication campaigns to help people prevent, identify and treat dengue are made 3-4 times per year, especially during times when water storage is common (such as April, July-August). All 6 households interviewed stated that they rely on river water, which they clean with alum in large jars and boil for drinking. Hygienic latrine facilities were not evident in the homes, and four households used either their own or neighbours' fish-pond latrines. Waste was burned and/or thrown into waterways.

Site 4: My Ngai

My Ngai commune lies on the north-east outskirts of Cao Lanh, close to the Song Tien river. It is largely rural in character, with mostly agricultural land-use and an economy dominated by farming. Its population in 2006 stood at 3,653 people. At the time of the research 68 households (roughly 10%) were classed as poor. There are three blocks in the commune, all of which suffer from flooding, with block 2 experiencing the worse disruption because of its low-lying land and poorly developed roadway.

Staff from the commune health station indicated a similar mix of health concerns as those for Ward 3. Malnutrition in children under five remained a major concern for health staff – running at 25% (the highest in Cao Lanh) – and was put down to persistent problems of low living standards, inattention to children's needs (earning income is the main household priority), and loss of income during floods. Staff added that river water was the main water source in the commune and fish-pond latrines were the norm (hygienic latrines with septic tanks were costly and many designs could not operate in low-lying areas where the ground is waterlogged for six months per year). Of the households interviewed, again all 6 relied on river water. Alum was used to clean the water and water for drinking was boiled, although it was clear that such treatment was not complete: it was suggested that not all families did so and that some did not necessarily do so all year round. Three households used neighbours' fish-pond latrines,

and one suggested that there was an average of three ponds for every 10 households. Waste was burned, buried or thrown into the canals.

Hazards

Flooding was the principal hazard recognized by **key informants** of Cao Lanh, bringing major effects to both the study sites visited in this research project. According to local officials river levels start rising in July and fall by November, with peak flooding in September and October. As at Long Xuyen, the water levels from hour to hour are affected by the tides, and so the flooding itself rises and falls in height during the peak season.

In Ward 3, only Block 3 tended to be severely affected during 'normal' years. During the hours around high tide, peak flood levels there were thought to range from 10cm depth over higher portions of land to 50cm depth over lower areas. However, the effects of flooding vary according to flow rate. In My Ngai, local officials explained that maximum depths of flooding from one 'normal' year to the next can vary by 20cm or so. In the lowest parts of Block 2 in the commune, houses commonly suffered flooding up to 40-50cm above the floor surface, with water heights reaching 80cm above the road outside. Across the fields water levels can reach over 1.8 metres. During extreme flood years, the impacts can be far greater. The last major flood in 2000 affected most parts of Cao Lanh, severely disrupting transport and livelihoods and impacting on most of the health stations in the city. Since then, programmes to upgrade dykes and roads have reduced the susceptibility of many areas, although annual problems remain in the areas of the city sampled for the study.

The perspectives on hazard risk from the 12 **households** interviewed in Cao Lanh largely matched those of the key informants. Flooding was seen by all as the principal hazard, with secondary mention of rainstorms, strong winds and dry periods. The main flood season was seen as some time between July and November, with a peak in September or October. According to 6 of the households this was also the time of the year when the worst storms and winds occurred. One interviewee also spoke of minor flooding during high tides at full moon at other times of the year. According to one person, the dry season peak (and hence drought risk) was in March-April.

All 12 of the households interviewed experienced regular inundation of the home during the seasonal peak, with reported levels varying from the height of the floor to 40cm above it. Some households reported flood incursion would take place twice daily throughout the season. Those households on low-lying land or close to rivers tended to be the worst affected. Even houses that had raised the floor level since 2000 still had a thin layer of water entering the house at peak times. Floodwaters also were extensive in the surroundings, especially in parts of My Ngai, where the fields were inundated during a normal season.

The effects of seasonal flooding were described by the household interviewees. Some of these, especially those relating to health risks, are discussed in the following sections but it is useful here to set out the nature of the impacts on the home and livelihoods in

general. Flood damage to houses was discussed by 5 households, especially the entry of dirty water, mud and waste into the home, damage to beds, and even danger of collapse for some of the weaker structures in the neighbourhood. An elderly woman living alone in Ward 3 stated: 'My god! Last time [2005], all places were inundated by floods and even I had to wade...some woman assisted me with a bed for sleeping as the old one became rotten' [*interviewee CL3, Ward 3*]. More people referred to high winds and storms when discussing housing damage, with 6 interviewees noting personal or neighbourhood damage to roofs and walls of weaker houses.

Transport difficulties during normal seasonal floods were raised by 4 households, all within My Ngai (Ward 3's central location diminishes this access problem). Of these 2 people regularly used boats for travel during the flood season, including taking children to school, because the roadways were flooded, and 2 people stating that they made a wood bridge or used boats to reach a main road that had been upgraded. Others in both sites stated that upgrading (including raising) of roads had made travel easier than before. However, it is likely that most of these households have to pass through some standing water outside their homes in order to reach the roads. A total of 9 households stated that it was more difficult to find work and maintain income during the flood season. One resident of My Ngai stated that he resorts to catching shellfish as there are few opportunities to work for hire; another stated that he cannot farm during the floods, and tries to earn a living from fishing in the inundated fields.

The major flood event of 2000 was mentioned by 8 householders, who saw this as the most extreme recent flood. People spoke of maximum flood depths in their houses ranging from 40-100cm above the floor. One resident whose house was inundated to one-metre depth, explained: 'We became poor after the flood of 2000. The flood totally destroyed our shrimp pond and we had nothing to do for business' [*interviewee CL9, My Ngai*]. Two householders also spoke of 2001 and 2002 as major flood years, and one remembered the extreme flood in 1978, when impacts were worsened because 'people did not respond to the emergency in time' [*interviewee CL4, Ward 3*]. No references were made to the 1997 typhoon event (NB people were not prompted to recall specific events).

4 Health and climatic hazards: perceptions of risk

Data specifically relating health outcomes to hazard events is not routinely collected in Vietnam, nor indeed is this standard procedure in any country. Linking cause and effect for environmental hazards through transmission pathways and taking account of confounding factors is a demanding task for epidemiology, and one beyond the scope of this research project. However, it is our contention that, in the absence of hard data, much important information can be gained from analysis of households' and health professionals' perception of disease risk and people's self-reporting of health impacts. Understanding perceptions of risks is also the first step toward analyzing health behaviour in relation to risks. This section examines data provided by households on health impacts of typhoons, floods and drought-related hazards, and sees how this compares with information provided by other sources, especially the key informants from the health sector.

Long Xuyen

Household perceptions and reported outcomes

For the household interviewees in Long Xuyen, the main health issue that they perceived as connected with climatic hazards was change in disease risk associated with water abundance. Flood times were generally perceived as of higher risk, although the sources of risk were not always clear. One interviewee suggested that river water was more contaminated during flood times and another suggested it was best to take water from the fields where it was cleaner. However, this was countered by another who believed river water was cleaner during floods because of the higher quantity of water.

Table 2 indicates the number of interviewees who listed different disease risks associated with flooding. Diarrhoeal diseases and skin diseases (dermatitis) appeared to be the most common cause for concern, mentioned by 8 and 9 householders respectively. Diarrhoeal diseases were seen as associated with unsafe water use, particularly failure to boil water sources for drinking, and also with bathing in polluted water. Particular risks to children from severe diarrhoea were noted by 2 interviewees. Skin diseases, often affecting the feet and hands, were understood to result from contact with contaminated water, although the source of the problem was not clear, with suggestions that it may be from domestic waste in ditches or pesticides carried in the water. According to one interviewee: 'In the flood season left-over pesticides accumulate in the water on fields or in stagnant pools... those who come to that place will have itchy feet or hands. As they come back home, people have to take a bath carefully with soap and then use lotion' [*interviewee LX8, My Hoa Hung*]. Another stressed that the condition tends to recur because of repeated contact with contaminated water, and that it can be a significant problem – after treatment with lotion it may be necessary to rest from work until the sores are healed. The risk of gynaecological infection from standing and working in polluted floodwater was also mentioned by one interviewee.

Table 2 Reference to health risks of floods by interviewees in Long Xuyen

| | <i>no. of households (n=12)</i> |
|-----------------------------|---------------------------------|
| drowning | 5 |
| injury | 6 |
| diarrhoeal diseases | 8 |
| respiratory diseases | 4 |
| skin diseases | 9 |
| dengue | 6 |

There were 4 householders, two from each site in Long Xuyen, who pointed to increased risk during flood times of **respiratory** ailments and symptoms, including colds, coughs, headaches and fever, with heightened risk noted for the elderly. There was little clarity over causes of the increased risk, although two people spoke of water contamination as a reason. **Dengue** and dengue hemorrhagic fever (DHF) was mentioned as a health risk associated with floods by 6 households across the two sites. One resident of My Long ward stated that the disease was not currently a threat in their specific locality, but another from the same site stated that two children in the family had suffered during 2005. It was understood that dengue was transmitted by mosquitoes, and 4 people claimed that mosquitoes are more abundant around homes during the wet season, particularly after the flood peak has subsided. One stated 'the number of mosquitoes is too much in the time of the water level coming down; mosquitoes are also a lot as they cannot live in the field [when it is flooded]' [*interviewee LX5, My Long*]. Another interviewee specifically linked the problem with stored water providing breeding sites.

A small number of deaths from **drowning** appeared to have occurred during floods in the study sites during recent years, and this risk was referred to by 5 householders. Drowning in water channels, however, was a danger at all times of the year. There were particular fears for safety of children. Risk of **injury** from walking in floodwaters was noted by 6 households, caused either by slipping on submerged roads or raised walkways, or by colliding with objects hidden by the water such as broken glass, nails or tree thorns. One interviewee suggested that those who wade to catch fish, crabs and edible snails are commonly injured by objects. Another said:

'In the locality, there is a wood bridge across the canal and it does not have a safety guard. It is usually inundated in flood time and people do not see anything as they walk on the bridge. So a slip and fall down to the river is common, especially for children, those who have poor eyesight, and careless people'. [*interviewee LX6, My Long*]

Of those householders interviewed in Long Xuyen, 3 people suggested that the latter part of the **dry season** could also be a period of elevated risk. Higher rates of diarrhoeal disease in the community were suggested by 2 householders, again associated with

unsafe water use, and higher incidence of colds and fevers was also mentioned by 2 households. Contrastingly, one further interviewee said that the same problems occurred in the dry season as in the flood season, but with lower prevalence.

Finally, problems of **stress** associated with hazards were mentioned by 8 households, including anxiety, impacts on sleep and (for one elderly resident) high blood pressure. The principal concerns expressed were fears about the impact of floods on houses and on income (including ability to travel), and fears for the safety of children.

Health sector perspectives

Senior health staff from Long Xuyen Health Centre and the My Long and My Hoa Hung Health Stations provided their own perspectives on the health risks associated with hazards. They concentrated particularly on infectious disease risk related to water, including diarrhoeal disease and dengue, but also discussed skin diseases, respiratory ailments, injuries and malnutrition. The representative of Long Xuyen Health Centre also pointed out that they could not be sure what the disease risk of floods really is, because they did not have the data.

Because of water supply, sanitation and waste problems in the city, Long Xuyen had many risk factors for **diarrhoeal** disease and children were regarded as especially vulnerable. During the flood season intestinal diseases (mainly diarrhoea, but also a little typhoid) were the main problem, as a result of the quality of water use. According to the My Hoa Hung staff, the key problem was contamination of floodwaters (especially from human and animal faeces deposited in rural areas), combined with lack of access to clean water sources. The representative of Long Xuyen Health Centre also confirmed that diarrhoea is a major risk in the dry as well as the rainy season, because of inadequate water supplies and food safety issues (associated with preservation of food and hygiene/sanitation deficiencies).

Staff at My Hoa Hung talked of **skin** ailments, including itching and fungal skin disease, arising from contact with water polluted by garbage and waste and by agrochemicals (fertilizer and insecticide) from the fields. People in regular contact with floodwater in their jobs and daily activities were particularly at risk, and it was believed that the symptoms were more serious in the case of contact with water polluted by insecticides. The same staff suggested that **respiratory** illnesses – such as cold and flu – were not a great problem in the commune, but this contrasted with staff at My Long Health Station who argued that in flood time, the main health risk was acute respiratory inflammation, especially among children.

Dengue was discussed as a significant local risk by representatives of all three health facilities. The connection with dengue incidence and floods, however, was by no means clear. Dengue occurs year-round and it may be the coincidence of the rainy season and the flood season that obscures the seasonal causality. According to the city health station, it is the use of stored water (and not floods) that is critical because water containers provide the main clean water sites where the mosquitoes can breed. In one year it was the worst flooded areas that tended not to have dengue. The staff of My Hoa Hung suggested that people in the commune collect and store rainwater in the rainy

season, and hence the availability of breeding sites rises during that season (*though the households in the study sites did not corroborate this*). Rains also produce pools of relatively clear, still water in fields, where mosquitoes can breed. It was suggested that after floods have come and gone the incidence of dengue actually falls.

Injury was regarded as common during floods, caused for example by contact with broken glass in deep water. However, people usually carried out self-treatment of these and they were seldom serious enough to warrant a visit to the health station. Child safety was also mentioned as an issue during flood times.

There were mixed opinions on the impact of floods on nutrition. The representatives of My Long Health Station stated that **malnutrition** associated with poverty is a problem in the ward, and that since floods affect household budgets – eg the need to repair the house and effect on income if people need to change occupation – they may increase the problem. Staff at My Hoa Hung did not consider malnutrition of children as a serious matter during flood time, because people could switch the balance of their diets: fish and crabs were readily available for people to catch for themselves, and the price of fish at the market also tended to be lower.

Cao Lanh

Household perceptions and reported outcomes

Among the household interviewees in Cao Lanh, most people perceived there was an increase in risks, including infectious disease risk, during flood times. One interviewee, for example, stated: 'I am unlearned and I don't know the causes of diseases, [but] I observed that more diseases are occurring in the flood season' [*interviewee CL7, My Nga*]. Another interviewee from the same commune, however, suggested that health risks then were more or less as normal. Table 3 indicates the number of interviewees who listed different disease risks associated with flooding.

Table 3 Reference to health risks of floods by interviewees in Cao Lanh

| | <i>no. of households (n=12)</i> |
|-----------------------------|---------------------------------|
| drowning | 7 |
| injury | 5 |
| diarrhoeal diseases | 8 |
| respiratory diseases | 4 |
| skin diseases | 7 |
| dengue | 4 |

Diarrhoeal diseases were listed as a common flood health risk problem by 8 householders (although one of these stated that incidence was low). Several people explicitly made the links between diarrhoea and water pollution, use of untreated river water and food hygiene. People had varying views on river water sources: 'It's too dirty all year round.... filled with water-fern, waste and dead bodies of ducks and chickens' [*interviewee CL1, Ward 3*]; '...we use water directly from the canal. There are many branches, leaves and waste, but I do not fear it as I am used to it. However, if I saw canal water with dead body of chicken or duck then I do not dare use it because of bird flu' [*interviewee CL10, My Ngai*]. One interviewee stated that it was only during the flood season that she boiled water for drinking because it was dirtier then. However, at that time she would simply take water from around the house rather than from the river channel itself. There were 3 people (from both sites) who perceived that river water was cleaner in the flood time, with one of them stating that some families only use alum in the dry season. From those people who expressed an opinion, it might be suggested that normal river water sources actually become cleaner during floods (pollutants are less concentrated), although the risk level may change because people take water from outside the rivers during floods.

The second most common disease problem associated with floods appeared to be **skin** disease, mentioned by 7 households (with 2 making the link with contact with polluted water). One described how skin disease could lead to several days off work while it was treated. Another talked of skin eruption and shedding on feet and hands and stated that: 'Skin disease is more severe in the flood season than in the dry season, and it tends to become more serious such as appearance of nettle-rash on the skin' [*interviewee CL7, My Ngai*]. There was also one reference to risk of gynaecological infections during flood times.

Risk of increase in **respiratory** diseases was noted by 4 householders, all from My Ngai, with some reference to heightened risk for children and the elderly. Only one interviewee suggested a reason for this increased risk, stating that it was caused in children by prolonged contact with water. **Dengue** risk was mentioned by 4 households in all. Only one of these households was from Ward 3, and another resident of the ward claimed that the disease was not currently present in the locality. However, interviewees from both sites spoke of increased abundance of mosquitoes during or after the floods, and two in My Ngai spoke of the need to avoid daytime mosquitoes by using bednets when resting or eating: 'we drink tea in the morning in the net, and have dinner in the afternoon in the net also' [*interviewee CL9, My Ngai*]. The one resident from the urban site who spoke of dengue described how two of his children were severely affected by dengue in 2005. He said the parents did not recognize the severity of their condition until 'their teeth were bled, and then we brought them to hospital. The doctor said that if they came to hospital 1-2 hours later the treatment could have failed and they could have died' [*interviewee CL4, Ward 3*].

Though a rare occurrence, risk of **drowning**, was a major concern for households in the flood season, mentioned by 7 households. All but one of these interviewees specifically referred to dangers for children. One said the dangers were particularly high for those families living along rivers and canals, and said 'there is the case of a mother who held a child tightly in her arms, but doesn't know why the child still fell into the water' [*interviewee CL2, Ward 3*]. In some cases drowning incidents were put down to

carelessness on the part of parents for younger children, or the fact that parents had to leave children to look after themselves while they went out to work. It was suggested that swimming is a favourite pastime during the flood season and that, though most children have learned to swim by the age of six, the risks of playing in water remain high.

Risk of **injury** was noted by 5 households, with reference mainly to striking sharp objects when wading through water, such as broken glass, thorns and shells. People were particularly at risk when fishing for shellfish and edible snails during the flood season. One interviewee also spoke of risk of snakebite when moving through water in fields and canals.

Only 2 households spoke specifically of elevated risks during the **dry season**, both of them from My Ngai. One said there was a problem of diarrhoea caused by poor river water quality when the water levels were low, and also spoke of cold and headaches being common, especially among children. Another argued that diseases became more prevalent, citing especially symptoms such as fever and cough, but linked this especially to the extreme tide events toward the end of the dry season in May and June. A third interviewee, however, argued that risks in the dry season were lower.

Stress and related emotional trauma was mentioned by 6 households in all within the Cao Lanh study sites. Anxiety over maintaining income, potential damage to homes and child safety were common causes of stress, and there was also mention of concerns about diseases and food supply. One householder said that in the flood season his wife (who has a chronic illness) cannot find work and he must take care of the whole family of two adults and four children: concerns over income, food, disease and schooling 'resulted in sleeplessness, strain and quarrel between members of the family' [*interviewee CL9, My Ngai*].

Health sector perspectives

Staff from Cao Lanh Health Centre and the Ward 3 and My Ngai Health Stations added their perspectives on health impacts of hazards in the city. Representatives of the city Health Centre believed that many health problems increased during floods but explained that data on levels of increase is limited by the frequency of health station reports (quarterly), which do not show monthly details for disease treatments. They differentiated two zones of the city in terms of environmental sanitation and disease risk. In the semi-rural, peri-urban areas of the city, where waste collection services were not available and people simply threw waste into waterways, the floodwaters were freely able to wash away the waste. In urban areas with dyke systems, but often insufficient drainage and waste collection, the floodwater gets trapped and becomes stagnant and polluted. Therefore, the disease risk may be higher in some urban areas.

Intestinal diseases – principally general diarrhoeal diseases but also rare cases of typhoid and cholera – were perceived to rise during the flood season by members of all three health facilities. **Diarrhoeal disease** affected both adults and children through the wet and dry seasons, but the incidence was higher during the floods than at other times

of the year. Staff at My Ngai Health Station estimated that it rose about 20% compared with the dry season.

Health staff from each of the facilities also discussed the risk of **skin** diseases and associated gynaecological diseases, including fungal infections. The conditions may result from regular contact with polluted water through activities such as traveling through water, catching crabs and fish, and bathing in canals and rivers. Though present in wet and dry seasons, skin diseases tend to increase during floods. Part of the reason may be that the high waters bring agrochemical residues such as fertilizer waste from the fields into the city. Skin disease leads to inflammation and may result in high body temperatures – people feel uncomfortable, but they can generally continue to work, so they suggested the disease was not a very severe problem. Staff at Ward 3 also spoke of the risk of eye infection – caused in part by washing the face with polluted water. Interestingly the problem of eye infections has been raised in research elsewhere in Vietnam where people spoke of greater risk of ‘red eye’ (conjunctivitis) during flood events, but none of the respondents in any of the sites for this study raised the issue.

Staff at the Health Centre also saw regular contact with water during floods as a reason for elevated levels of **respiratory** diseases, including the common cold. Staff here and at My Ngai Health Station also believed that the incidence of **dengue** was higher than in the dry season. The My Ngai staff suggested that the disease increased about 50% during the flood season of 2005. This may be because water trapped in the dyke systems and the soaking of timbers in houses provide additional mosquito breeding sites. However, the link with floods may also be coincidental in that the main cause could be the rains which coincide with the floods. Staff in Ward 3 were more circumspect, stating that the disease does not seem to follow seasonal cycles and that dengue peaks are just as often during the dry season. Malaria was not generally seen as a threat, though it may exist at low levels in parts of the city.

Staff at My Ngai Health Station confirmed that **injury** frequently happens during floods because of collision with sharp objects in the floodwaters. There was also brief mention of child **malnutrition** problems by health station staff. Representatives of My Ngai Health Station felt that difficulties of securing work during floods could result in loss of income and food shortages in the home. However, staff from Ward 3 saw no clear relation between malnutrition and flooding.

5 Responding to health risks: household actions and institutional responses

This section, the main focus of the study, examines the actions people take to protect themselves from the health risks of climatic hazards and how they perceive the support they gain from governmental and non-governmental organizations to prevent, cope with and recover from health impacts. It also relates household perspectives to the information on responses provided by the key informants. This material is organized under particular categories of action or 'response themes', most of which include actions that may be taken before, during and after events (ie at different phases of the hazard/disaster cycle). Most of the information refers to responses to seasonal floods, but there are also references to extreme flood events, as well as to other weather hazards such as storms and strong winds.

As context to this discussion, it should be noted that a governance structure for disaster preparedness and emergency management exists in Vietnam, with strategic policy directives at national level and a nested system of institutions from national to local level. Key in this system are the Committees for Flood and Storm Control (CFSC) at national, provincial, district and commune levels. These joint committees have representation from different sectors and institutions, including the health sector. The committees have responsibility for updating flood management and disaster preparedness plans for the administrative areas each year. The plans are intended to set guidelines for different sectors, and set out a series of tasks to be undertaken before, during and after hazard events, indicating which sector or institution should undertake them. As well as planning emergency response activities, the plans may include both structural and non-structural mitigation measures, such as: monitoring and maintenance of dykes, provision and maintenance of emergency boats and equipment, training of volunteers, public dissemination and mechanisms to support households to strengthen homes, recover lost income or relocate from high-risk sites. Local key informants generally state that the effects of floods have reduced in many urban areas since 2000 because of the gradual increase in construction of dyke systems. However, the foregoing sections show that flood problems clearly remain in many areas, and provision of local dyke systems may have brought some further impacts of its own.

General information on hazards and response

Long Xuyen

Out of the 12 householders interviewed in Long Xuyen, 9 noted that they received information on hazard avoidance, early warning, flood levels and means to cope with floods. The most common information source was through radio and television, which were mentioned by 7 interviewees. Two of the interviewees living on My Thanh islet in My Hoa Hung, said that typically warnings would be heard first by those with radios and TV sets and then spread by word of mouth to other residents. Information from newspapers was mentioned by 3 people, and flood risk prevention leaflets were mentioned by 2 householders, one of which explained that he would then paste the leaflet on the wall so that the information could easily be followed. There was no mention

of loudspeaker announcements in this regard. Indeed, 3 householders (including two from My Thanh islet) stated that they did not have loudspeakers in the vicinity.

In My Hoa Hung, 3 householders also spoke of attending local level meetings about flood hazards. None of the interviewees in My Long mentioned this, and one stated that he had never received an invitation to a communication session on this theme. However, local key informants in the ward stated that flood preparedness entailed staff of the People's Committee, the health station and mass organizations holding joint meetings at local level (blocks, groups of cells) to provide information, warnings and raise awareness about flood risks.

Cao Lanh

In Cao Lanh, 8 householders described receiving information on weather forecasts, flood level, and preparedness advice. Of those who explained the source of the information, 4 stated it came via radio and television announcements, with one stating that it was often the elderly who heard the radio bulletins and then passed them on to others by word of mouth. Loudspeaker announcements were also mentioned by 3 people here, although one of these stated that the loudspeaker was not located close to the community and was not always audible. Another interviewee also stated that the People's Committee loudspeaker was too far from his home to hear. The importance of flood warnings and awareness of flood risks was explicitly emphasized by 2 of the households.

Health risk information

Long Xuyen

Together with general hazard information, questions to interviewees focused particularly on provision of information on the health risks posed by floods and other hazards. Of the 12 household respondents in Long Xuyen, a total of 5 mentioned education efforts by the health stations and local authorities in relation to preventing flood-related health problems including disease prevention, safe water storage, removal of unused vessels (for mosquito control) and childcare during floods. These were provided via leaflets, loudspeakers, local level meetings or household visits.

Staff of the two health stations also discussed health communication activities before and during flood times, with health staff and a network of local health workers drawn mainly from mass organizations visiting communities to provide outreach on health impacts of floods and especially on diarrhoea prevention and treatment. Box 4 provides further information from key informants on general health education activities.

It is important to note, however, that 6 householders stated they did not receive health information on health risks from floods and 3 of these plus one other interviewee prioritized receiving more communication from the health sector, including outreach direct to households on disease prevention during floods and on general health protection. It was suggested, however, that there are also barriers to health promotion: 'people with low education.... are not enthusiastic in accessing information on health and disease' [*interviewee CL6, My Long*]. Another interviewee suggested that people often do not pay attention to health risk information in flood times as they believe they already have sufficient knowledge.

Box 4 General health education activities: Long Xuyen

Health education efforts in Long Xuyen were described by the health facility key informants. At city level, communication relies mainly on 'passive' methods of information provision such as broadcasts and leafleting. Representatives of the city health centre described how funding limitations make major outreach activities difficult, particularly campaigns via television and newspapers which are prioritized only for epidemics because of costs. Even use of radio and loudspeaker announcements is costly, although some education is carried out this way using the network of loudspeakers through the wards and communes. Given these limitations, an important means of providing information is via advice and leaflets given when people attend health facilities. It was suggested that direct distribution of leaflets to households is ineffective, but that people are more likely to take and read leaflets when they are visiting health staff and already feel susceptible to illness.

At ward/commune level, health outreach takes place and functions mainly via a network of health workers organized and supervised by the health station. On average there are 2 health workers per block/village (each of which is composed of 300-500 households). Much of the education effort is devoted to main programmes such as diarrhoea, dengue and food safety. Health workers provide information to households on how to prevent, identify and treat disease. For diarrhoeal disease – a top priority – the advice includes using readily available, temporary means of rehydration such as coconut water and rice water with salt to relieve symptoms until people can gain access to medicines for treatment.

Cao Lanh

In Cao Lanh, 10 householders described receiving preventive information from the health sector and/or local groups on topics such as water hygiene, mosquito larvae, environmental sanitation, food safety and child safety. Some people, however, seemed to refer to general routine information rather than flood-related health education. Mechanisms for the delivery of this information included leaflets and posters, loudspeakers and speaker cars, community visits and local meetings. There were widely differing perspectives on the regularity of these activities – one interviewee describing them as occasional, another saying there would be loudspeaker announcements every two-three days, and a third stating that activities took place before, during and after the floods. The last of these described how local health workers play an important role, and that many who can give up their time for this are older, experienced and enthusiastic people who often combine the advice with conversation to make the communication process less formal.

Local key informants from the health stations confirmed that they start flood-related health education activities before the start of the flood season and continue them during and after, using leaflets, posters, loudspeaker broadcasts, neighbourhood meetings and

household visits by health workers on health protection, environmental sanitation, water use and disease prevention. Staff at My Ngai health station described how the national Ministry of Health expects each commune to have loudspeaker broadcasting access for health education, but explained that competition for airspace from other sectors means that they cannot always broadcast as frequently as is recommended.

Several household interviewees expressed concerns over levels of knowledge regarding health and hazards. Clearer and more regular communication was advocated by 4 people, on issues such as food and water hygiene, and with a targeting of the poor, elderly. A gap in knowledge was perceived by some people, with one saying 'I am unlearned, and I don't know the causes of diseases. [But] I observe that more diseases are occurring in the flood season' [*interviewee CL7, My Ngai*]. There was a need expressed to strengthen the role of volunteers in health promotion, because of the limitations of receptivity to more passive mechanisms such as leaflets and loudspeaker announcements. One interviewee felt that leaflets did not necessarily match the reading skills and awareness of people with low levels of education, and another that loudspeakers are only heeded by those with high awareness of health issues or those who are not busy with work. Comments that there is no need for health risk information came from just 2 interviewees, with one stating that preventive 'health communication is not necessary as people here are accustomed to living with floods; they will [simply] get treatment as they become sick ' [*interviewee CL10, My Ngai*].

Evacuation

Long Xuyen

Evacuation from homes was seldom discussed by research participants, most of whom concentrated their discussion on response to 'normal' seasonal floods, which are seen as phenomena to 'live with' rather than from which to retreat. Only one of the interviewees in Long Xuyen made reference to evacuation, stating that children are not routinely evacuated in the flood season as in some rural areas of the region. (In severe flood years, a higher number of urban people may be forced to evacuate from their homes, but data on evacuations was not available to this study. In the province as a whole, the number of inundated houses in the non-extreme flood year of 1999 was 68 houses, compared with 151,867 houses in 2000, 32,951 houses in 2001 and 20,743 houses, according to statistics provided by the Department of Agriculture and Rural Development).

Cao Lanh

A few more references to evacuation were made in Cao Lanh although in a very localized sense. Taking shelter and sleeping at neighbours' houses if necessary was mentioned by 2 householders in My Ngai, and another in Ward 3 said that the household would move to the roadway to take shelter if floodwaters came too high. There was also mention of a rescue boat being used during the extreme flood of 2000 to evacuate some households in more remote, low-lying sites. Key informants in My Ngai explained that an area in front of the People's Committee office has been designated as a shelter site where tents can be pitched for people who may have to be evacuated in a severe flood. Households will be able to shelter there temporarily until the waters recede. Those

households with large boats will be asked to help move people from remote parts of the commune to the site: the commune authority does not have a boat of its own to use for this purpose.

Home safety

Long Xuyen

When asked about efforts to secure homes and improve their household's physical safety during floods and other weather hazards, 5 interviewees in Long Xuyen referred to efforts made to strengthen and protect the structure. This included use of ropes tied against trees to protect the house from wind, and sand-bagging to prevent bank erosion leading to landslides under the house. Foundation raising had been achieved by 1 household and it was mentioned that credit from the local authority was available for this. A total of 5 households were looking to do more to repair, strengthen or raise the house, but generally needed assistance through donations or credit. One specifically stated that raising the floor would help them avoid contact with dirty water and disease sources. Two riverside residents (one in each site) wished to move house to a safer location. All 3 interviewees from My Thanh also mentioned that it was local authority policy to move households from eroding bankside locations on the islet.

Where entry of floodwaters could not be prevented, efforts were also made to try to reduce contamination of homes and human contact with the water. Erection of a waste guard was mentioned by one householder, 5 took steps to raise furniture (by using objects such as banana tree trunks) and 2 mentioned sleeping in hammocks above water level.

Cao Lanh

In Cao Lanh, 7 interviewees spoke of strengthening the house against wind and floods, including fastening weak parts of the structure with ropes during the flood season. One of these had also raised the house's foundation and another would cut tree branches near the house as a protective measure against accidents during high winds. No fewer than 10 households wanted to do more to strengthen or raise their homes, with 6 of those wishing to raise the foundation and one also wanting to build an embankment around the house to protect it. Support in terms of materials and labour may be available for the poorest or most vulnerable households. The importance of consolidating houses was also noted by local key informants.

Efforts again were made to protect occupants and possessions from incoming floodwater, mud and waste. Fencing was put up to act as a waste guard by one household, 6 households mentioned raising furniture (e.g. using timber from garden trees), 3 mentioned sleeping above the water (one had placed beds on planks, but had not needed to do so recently), and 5 laid raised planks as walkways in the home.

Child safety

Long Xuyen

High incidences of child drowning deaths during the extreme floods of 2000 and 2001 highlighted the ongoing risks to children during flood times, and child safety was a major concern expressed by households in the study sites. In Long Xuyen, 6 households took special vigilance over child safety during floods, including keeping careful watch over them at night, confining children at home, and escorting and sometimes carrying them to school. One interviewee stated: 'children have to be managed carefully because if they fall down accidentally into the canal they will be swept away by the floodwater' [interviewee LX8, My Hoa Hung].

Parents that can afford to send their children to kindergarten have an effective means of protection for their children by day, but as one householder pointed out this is not possible for the poor. As a response to this problem, a system of 'flood kindergartens' that can be opened to guard children of poorer families was recently established in many parts of the Mekong Delta. One resident of My Hoa Hung stated that such places were organized by the local authority in 2004 and were welcomed by parents, but that this activity was not continued in the following year. The key informants in My Long explained that they also have such a facility in the ward and will prepare and open it if flood conditions become severe.

Cao Lanh

Issues of child safety were also prominent in Cao Lanh, although only 3 households discussed positive steps to reduce risks by watching over children to prevent drowning, escorting them to school or sending them to flood kindergartens when these are available. Key informants in Ward 3 described how volunteer teams are organized by the women's union and the block committees to keep children safe during floods at designated flood kindergarten places. The teams receive medical kits and are visited by health station staff who also carry out medical checks on the children. The importance of such facilities was emphasized by one householder who appeared not to have access to a flood kindergarten and said that he needed to send his children to a regular kindergarten but this was not possible because of lack of money.

It was also emphasized that children living in the area needed to learn how to swim as soon as possible. Two householders in My Ngai spoke of swimming classes that have been arranged for children, although one stated they had stopped in 2004. The other stated that the classes were effective in themselves but that an important effect had been assisting people to pay more attention to flood risks.

Water/sanitation

Long Xuyen

Household resources and behaviour in relation to drinking water and human waste are other critical aspects that can mediate the health impacts of floods and other hazards. Sectionx 3 and 4 of this report has already provided detail on levels and forms of water

use and sanitation in general, and the brief discussion here of responses in relation to flood risk should be read in conjunction with those. In Long Xuyen, few special measures are taken to protect water sources during floods. One household mentioned that at this time they would buy piped water from neighbours or use bottled water, and another stated that the health sector used to distribute water treatment tablets in the past but no longer do so. Most people appear to carry on usual water treatment habits in the flood season, and there were differing views over changes in the quality of river water in flood times.

Aspiration to improve household toilet facilities partly because of flood problems was mentioned by 2 households, and the city health centre representative also pointed out the need for better latrines that are usable in both wet and dry seasons in the area. However, as one interviewee pointed out, the cost of hygienic latrine construction remains beyond the means of the poor. Local key informants in My Hoa Hung, however, stated that government credit is available to construct improved latrines (e.g. with septic tanks) via the HEPA (Hunger Eradication and Poverty Alleviation) programme.

Cao Lanh

Again, there were varying perceptions in Cao Lanh of the quality of river water sources during floods, but special efforts were made to treat water in flood time by 4 households, including use of alum to clean, and boiling and purification tablets to disinfect water sources. One of these households, however, only used alum and did not boil, and seemed surprised that this was not necessarily sufficient to prevent diarrhoea in the households, which in some cases had required hospital visits. Local health staff from My Ngai explained that efforts had been made by the women's union to get members to buy water filters but uptake had been slow. They added that the only programme in regard to both water and sanitation was education – there were not the means to invest in change of technology.

Some 4 householders discussed the use of chloramin-B tablets for water purification, explaining that it had been distributed in the past to households, but that it had been unfamiliar to people, unpopular in its smell/taste and that the supply to households had discontinued. One householder explained that instructions on how to use the tablets had been insufficiently clear particularly for people with poor education: 'people were not familiar to use it; they did not understand and use the correct dose' [*interviewee CL9, My Ngai*]. Health sector staff from both sites confirmed that distribution of chloramin-B had stopped in 2004 in Dong Thap province (and in 2002 in An Giang), and that the recommended treatment for river water was now alum plus an alternative water treatment product available from pharmacies.

Mosquito avoidance

Long Xuyen

As earlier sections discuss, mosquito-borne disease – especially dengue and DHF – is a major health concern in the region, although the precise links between seasonality and floods remains unclear. Among the householders interviewed in Long Xuyen, 3 said they took steps to avoid mosquitoes in the home, through use of mosquito nets and burning

incense coils to prevent bites. According to local health staff, promotion of mosquito bite avoidance, use of household insecticide sprays to kill mosquitoes and control of breeding sites for larvae are key aspects of dengue prevention campaigns, both during the flood season and in general times. Dengue prevention is a major topic for health promotion and is relayed in part through the block/village health worker networks.

Cao Lanh

In Cao Lanh, 5 householders described efforts to avoid mosquito bites in the home during the flood season. Only one household mentioned use of incense/coils, but all used mosquito nets, with 2 describing how they would also use them during daylight such as when having meals or taking shelter there after 3pm in the afternoon (NB the dengue carrier *Aedes* is a daytime mosquito). During extreme floods such as in 2000, bednets have also been supplied to some households as part of the external relief effort. One household also mentioned mosquito control (spraying) activities by the health sector after floods. Health staff from Ward 3 indicated that they conduct three to four communication campaigns through the year for dengue, aimed to help people prevent, identify and treat the disease. Box 5 provides further information on dengue control from health sector interviews across both Long Xuyen and Cao Lanh.

Box 5 Dengue control by the health sector in Long Xuyen and Cao Lanh

Local key informants discussed how the health sector responds to incidences of dengue. The health centre in Cao Lanh explained that action to control dengue depends on the local impact level of the disease. There are four official impact levels: for levels 1 and 2 they mobilize the community to reduce breeding sites for the larvae through environmental cleansing such as removing unused containers, and unblocking drainage channels. For levels 3 and 4, the health sector at city and ward/commune level intervenes with control methods such as spraying. Staff from My Long health station stated that routine monitoring of environmental conditions for the larvae (including potential breeding sites such as containers) and monitoring of potential disease cases is carried out largely at a neighbourhood level through block committees and volunteers. If an outbreak occurs, health staff will come to the risk area to carry out surveillance and report to the local authorities. If action is agreed, then they undertake spraying of breeding sites – a response that needs extra support from People's Committee resources.

According to the Long Xuyen health centre dengue control ultimately depends on the level of infrastructural development. In the city, prevalence of the disease is reduced by concretization of land and provision of clean, piped water – both of which reduce potential aquatic breeding sites (pools and stored drinking water). Hence dengue is linked to the urbanization process – with provision of infrastructure not keeping pace with urban growth.

Environment clearing/cleansing

Long Xuyen

In Long Xuyen, a total of 10 of the householders interviewed took some steps to clear or cleanse their immediate environment in the flood season. Of these six took preparedness actions before floods including clearance of waste from ground around the home, clearance of waste and unblocking of ditches, and cutting back of plants around the home. (For some of these households such actions were regular and not just confined to the flood season). During floods, 4 households (all in My Long) mentioned removing waste from the home and cleaning the floor after flood incursions, if necessary on a daily basis. Action after floods to remove waste from the surroundings of houses were also mentioned by 2 households. Another said that efforts were made by local groups to clear the environment after the flood season, although this was incomplete. The key informants in My Long spoke of environmental cleansing activities organized by health staff, mass organizations and block committees to clear waste and clear ditches.

Removal of waste by households raises issues of disposal. Though some of the householders spoke of burning waste, it appears that waste is often collected and dumped into waterways and at least one of the interviewees indicated that he threw garbage into the nearby river. The accumulation of garbage in the environment is a chronic problem recognized by some households. One stated: 'but my residential place is polluted and dirty, and how can I keep good health' [*interviewee LX8, My Hoa Hung*].

Cao Lanh

Comments on environmental sanitation efforts in relation to floods were mentioned by just 4 households in Cao Lanh. Of these, 3 took action before the advent of floods to remove and/or burn waste from their immediate environment, and 3 regularly cleared and cleaned their houses of waste entering the home during flood times. One of the households prioritized removal of a pool of dirty, stagnant water close to their house as a measure to reduce health risks. Key informants from Ward 3 had spoken of efforts to mobilize communities to collect garbage and dredge ditches clear for water flow, as part of flood risk prevention activities in the ward.

Medicines

Long Xuyen

Though floods may be associated with increases in disease risk, preparing stocks of medicine in advance of needing them does not seem to be the norm for these households, even for those affected by floods most years. In Long Xuyen, 3 of the householders said that they keep some basic medicines and dressings and another interviewee thought that some neighbours might do this, but 7 stated they did not have medicine reserves (no medicine cabinet) and that they would just obtain the medicines as and when they needed them. Their urban location meant that they could readily access pharmacies and groceries (and one mentioned use of traditional medicines). Those few who did keep medicines had remedies for coughs, colds, pain and diarrhoea – and suggested that this was particularly important for treating illness that might arise at

night. One interviewee said that her medicine cabinet 'does not only serve members of the family but also neighbours, especially for emergency cases on nights when there is bad weather' [interviewee LX3, My Long]. Wish to have a medicine cabinet, especially for those being take ill at night, was mentioned by 2 households.

Support from the health sector in terms of free distribution of medicine during flood times was mentioned by 2 householders from My Hoa Hung. Health Station staff from the commune spoke specifically about diarrhoeal medicine, which was formerly distributed and people had become accustomed to using it. However, that programme of provision had now stopped and so they suggested people use coconut water as an immediate substitute instead until medicines could be obtained. In My Long, no householders spoke of medicine distribution, and 2 householders stated there was no such support. Another from My Hoa Hung wanted to see distribution of medicines during flood times. Finally, 2 householders said that during severe floods medicines were included in the relief donations to the poor (both from local residents and from relatives in Ho Chi Minh City).

Cao Lanh

In Cao Lanh, none of the interviewees mentioned having medical reserves and 9 specifically stated they did not have them. Generally people obtained medicine when they needed it, from health stations, pharmacies or from neighbours. However, 5 householders stated that their wish to have adequate reserves of medicine for cold, fever and diarrhoea. Modern medicines were commonly used for problems such as skin disease and diarrhoea, but 4 people also mentioned using traditional medicines for such complaints. One interviewee suggested that effective remedies for diarrhoea included: holding dry tea leaves in the mouth; drinking tea boiled with mandarin peel and ginger; drinking hot, thick black coffee; or eating the leaves of guava. One householder from My Ngai stated that distribution of medicines was organized by the health sector, and staff from the commune said that people could request medicine kits from the Health Station. Medicines were also included in emergency assistance from neighbours and external donors during severe floods, according to 2 householders.

Use of health care services

Long Xuyen

Access to health services provided by health facilities is another key aspect of health-related response to floods and other hazards. Household interviewees in Long Xuyen indicated that in both normal and flood times a mix of services is used. Self-treatment is the norm for minor conditions, but if further advice, care or treatment is needed people may visit the local health station, go direct to high level facilities in the city (general hospital/health centre or provincial hospital) or visit private doctors. In My Hoa Hung the 3 interviewees from the main island indicated that they visit the commune's health station. However the 3 interviewees from My Thanh islet seldom use the health station, and instead travel direct across the river to the hospital in Long Xuyen if a condition become severe and they can afford to seek professional treatment. The reasons they cited for not using the health station were inconvenience (access is by boat), quality of care, bureaucracy and that it treats only minor diseases. In My Long, 3 householders said they use private doctors rather than the health station, because of quality of care.

There was little knowledge among householders of any special measures taken by the health sector in relation to floods, other than one mention of medical check-ups being provided at flood time. One householder suggested that free check-ups and medicine supplies needed to be provided for the poor during flood times. Local key informants from the health stations, however, discussed a series of activities undertaken before, during and after floods, and highlighted how they worked in this regard with health workers and members of the VNRC. As part of preparedness, emergency health teams for assisting the public would be set up in advance (in My Hoa Hung this consisted of four teams each with 4-5 members and a first aid team with use of an emergency medical boat when needed). During and after floods the teams would provide first aid where needed, monitor people's health status and report disease outbreaks to the health station. Medical checks could also be provided free of charge either at the health station or via visits to homes if people had severe conditions. These health sector activities were also supported by the health centre/general hospital in Long Xuyen.

Floods potentially can cause disruption to the functioning of health facilities and problems of physical access to them. Perspectives on this from the health sector in both cities are provided in Box 6. One householder from My Hoa Hung pointed out that the health sector has access to a boat but it is not used to transport patients.

Box 6 Flood impacts on local health facilities

Local key informants in the health sector discussed whether and how floods impacted on the health facilities and their functions. The health stations in both sites in Long Xuyen are not impacted greatly by floods, either in terms of access to them or damage to infrastructure. Though the My Long Health Station was flooded up to knee-level in the extreme flood of 2000 it continued to function, and it now has a raised foundation and floor to prevent floodwaters entering. Floods can, however, have an impact on services to the community, making it more difficult to carry out normal outreach work and travel to the households of vulnerable people, even during normal flood levels. Access to the My Hoa Hung Health Station was difficult for people during the 2000 flood: the road access was flooded and a temporary bridge had to be constructed (the road has since been raised). Staff also organized mobile health teams that set up bases in higher places for people to visit – in some cases access to these had to be by boat.

In Cao Lanh, most of the health stations were impacted by floods prior to 2000 and poor roads limited access for people, according to the Cao Lanh Health Centre. But since 2000 programmes to upgrade roads and health stations have reduced these problems, and the dependence on boat transport during floods has lessened. The Ward 3 Health Station now has good road access and suffers very little flood impact, although now that a dyke system has been built around its site if a flood does develop a pump will be needed to remove the water. Staff at My Ngai Health Station also said the facility itself is not impacted, but that access still has to be by boat during deeper floods and many poor people without boats cannot get access. They did not have the resources to organize full mobile health teams, just the services provided by health workers and other volunteers.

Cao Lanh

Householders in Cao Lanh also discussed their use of health facilities, with no great difference between normal times and during floods. Again, self-treatment was the normal first course of action, and there was then a mix of facility usage for more serious problems. In Ward 3 health station use was not high among the people interviewed: one interviewee would instead go directly to the hospital and another only used private doctors – both citing quality of care issues. Of those 3 householders who did use the local health station, one indicated they did so only rarely, and another would go there only to obtain medicines. In My Ngai, 4 people said they would use the health station, and 2 would opt for the city hospital if the condition was severe, such as for acute diarrhoea or DHF. There were also 2 interviewees who would use private doctors. One of these said they would only use the private sector for quality of care reasons, but, interestingly, another householder said they would only use the health station, because the quality of care there was better and the service cheaper.

The only health sector responses to flood risk identified by householders related to medicine and water treatment distribution and insecticide spraying (see earlier sections) rather than provision of care services. The lack of a health sector boat available to transport patients to and from the clinics during floods was mentioned by 2 householders (one from each site), although one said there had been one operating in previous years. Local key informants, however, described a series of activities taken before, during and after floods (see Box 7). They again emphasized the role of health workers and volunteers in this, and explained the importance of building capacity among these groups to carry out health promotion work.

Box 7 Local health sector activities relating to floods: Cao Lanh

Local key informants from Cao Lanh Health Centre and from the two health stations in Ward 3 and My Ngai described how an action plan of disease prevention and care is set up by the health sector each year before the flood season, designed to guide activities before, during and after the floods. The preparedness phase actions include: preparing materials to use for health education; setting up emergency teams at commune and block level (consisting of health staff and volunteers); preparing medicine reserves and emergency medicine kits (based on estimates of numbers of people likely affected); and preparing facilities and equipment. The city level staff said that the latter included preparation of a health sector boat to carry patients to hospital. Planned actions during the floods included having health officers on duty round the clock, ready to provide treatment at any time, provide regular reports on the health situation to higher levels, and make requests for support if needed. At this time the network of health workers would intensify their health communication work to communities and make household visits to assist people in preventing identifying and treating diseases – activities that continue into the post-flood phase. After the flood, the health sector would also help coordinate neighbourhood efforts in environmental cleansing.

Relief/recovery assistance

Long Xuyen

In both the short and longer term following hazard events, households may receive assistance provided by external sources, local institutions and communal help. Householders in Long Xuyen discussed relief efforts from outside the community, with 7 people stating that donations of rice, noodles and money may be provided to the poor from donors in HCMC and/or via the local authority (according to one householder this is a normal yearly provision). However, 3 said there was little or no assistance provided and one stated that the relief donations were only provided at the commune centre, not direct to households. Another stated that during disastrous floods the Red Cross provides assistance, and the key informants at My Hoa Hung stated that external agency support could include medical check-ups.

Key informants from both sites described mechanisms from local institutions to provide relief after floods have impacted. This includes both food relief and economic support for poor households. According to staff from My Hoa Hung, the People's Committee establishes a 'mercy rice fund' (rice stocks with a minimum value of 10 million VND per block), which can support households facing difficulties in flood times and in the Vietnamese New Year festival. It can also act as an emergency reserve fund in severe floods before external aid arrives. Provincial assistance is also available, including 'Project 31', which was established in 2002 to improve and strengthen living conditions of the poor in the flood season as well as to implement the 'Living with floods' policy of government. Households registered in the poorest category under HEPA and whose livelihoods are impacted heavily by floods may be eligible for assistance from Project 31, including provision of a boat for fishing and travel, provision of fixed-term credit with low interest for generating income and provision of free vocational training.

Aside from this form of assistance, 6 households spoke of receiving general support and assistance from neighbours in the community during flood crisis times, including in one case financial support. One householder from My Thanh islet stated that people basically have to rely on mutual assistance.

Cao Lanh

All 12 householders from Cao Lanh discussed provision of relief from outside the community in the form of rice, noodles, other food items, blankets, clothes and money. This was a yearly event, not confined to flood times, according to 3 of the households, while 2 interviewees stated that money and blankets were only provided in severe floods. External groups such as donors from HCMC and Buddhist groups were suggested as the source by 7 interviewees, but it seems the donations are generally provided via the local authority, either from the office or direct to households in severe floods. Local key informants confirmed that many charitable donations came from HCMC and also from businesses in the province, even during normal floods. Requests had been made for relief assistance from external agencies but no support had been provided to date.

One householder believed that relief activities had reduced in recent years because of some of the structural flood risk reduction measures that had been put in place, including local dyke systems and development of residential clusters. Another saw relief as necessary but no solution: 'Relief will not solve people's need. However, people would face starvation if they did not receive relief' [*interviewee CL9, My Nga*].

Mutual assistance and support from neighbours in the form of food and money was again emphasized, though here by just 3 households. Key informants from Ward 3 confirmed that people would provide food for suffering neighbours, and that lists of those impacted are prepared by the block committees.

General risk reduction

Long Xuyen

It is important to recognize that protection of health may also stem from people's broader actions and priorities for risk reduction, including wider aspects of livelihood and wellbeing relating to levels of income, assets and supporting infrastructure. For Long Xuyen we have seen already that strengthening and raising homes and protection of possessions are commonly the priority actions. For some in particularly hazardous riverside locations the priority is to move house: 3 of the householders interviewed wished to do so, including one from My Long, who was living informally on the river margins and wanted to move to a better site (and be able to register the household to gain formal residence status). Interviewees from My Thanh islet spoke of the current policy to move households from the eroding riversides there, and this was confirmed by the local staff at My Hoa Hung who described the creation of two resettlement sites ('residential clusters') for them in the commune. Up to the time of the research, 120 households had already resettled there. The sites are constructed by the province authority and the commune People's Committee is in charge of administrative management. The price of the house is decided by the Province and households pay by installments. For poor households who cannot afford the payments, the state allows them to occupy the sites but they have no housing ownership certificate. Households illegally occupying land face the additional problems that they receive lower compensation when they have to move from a hazardous site and they are not eligible for inclusion in the resettlement programme.

The importance of maintaining transport links, especially for maintaining income, was also raised by householders, including ownership and preparation of boats and reinforcement and raising of roadways. Monitoring and upgrading the quality of roads so that they can function during floods was also part of flood prevention plans discussed by local officials. In residential areas this is often integrated with the creation or improvement of dyke systems, because the local network of minor roadways tends to run along the tops of the dykes. Major dykes and embankments are the responsibility of the state and 2 of the interviewees in My Long prioritized improvement of river embankments to protect their homes and health.

According to officials in My Hoa Hung small temporary dykes may also be built by farmers to protect their crops. But these are only built if necessary because farmers need the annual flood to fertilize the soils and they are dismantled once the risk is over.

They also discussed other preparedness actions by people to protect their income during floods, including preparation of fishing nets so that farmers can switch occupation if necessary and/or catch fish for subsistence (oversupply of fish to markets during the flood season is not a problem as fish can be used for fishmeal).

Cao Lanh

Several household interviewees in Cao Lanh similarly interpreted reducing health risks in terms of wider priorities. Action and aspirations to strengthen and raise houses have already been discussed above. Interviewees also discussed transport issues, including preparing boats for travel (e.g. repairing leaks), wishing to have access to a boat, and strengthening the simple 'monkey' bridges across canals as flood preparedness measures. Two householders wanted the roadways in front of their houses to be raised. One of them described how negotiations are under way with the local authority to raise the small road nearby which annually becomes inundated, but agreement has not been reached by all households because of the financial contributions they have to make. Local key informants in My Ngai also described how farmers in the commune may construct temporary dyke systems to protect their rice crops during peak flood levels.

6 Synthesis

This section draws together findings on perceptions of hazards, health risks and responses across the study sites and points toward priority actions to reduce health risks from hazards and strengthen people's coping capacity. It represents a first-stage analysis, aimed to synthesize key aspects of the findings and to draw out primary lessons for dissemination. Further levels of analysis and theoretical elaboration will be developed in subsequent publications.

Hazards

All four of the study sites face annual physical threat from rising water levels in the Mekong River. Though flooding is a part of the normal seasonal cycle in the Mekong Delta, and, indeed, is integral to the agricultural productivity of the region, every year brings attendant hardships for households directly exposed to the rising water. During the peak months of September and October, residents in low-lying or poorly-protected houses in both cities (often lower-income households) may experience flooding not only of surrounding land but also entry of water into their houses with peaks heights at each high tide. In some houses depths of 40-50cm above the floor were experienced at the peak periods. In extreme years such as 2000, flood levels could be much higher – as much as a metre depth in some houses. Although floods are the principal hazards affecting the cities, residents are also exposed to occasional storms, high winds and heavy rainfall, and may face relative drought conditions in the dry season peak (around March or April).

The population in both cities effectively 'live with' annual floods and experience, to varying degrees, the effects of flood. Hence, it is easy to discuss flood hazards at the household level. One interesting outcome of this study as compared with a previous visit in 2004 was that, when asked to do so, most respondents referred primarily to normal flood years rather than the extreme events of 2000, 2001 and 2002. It seemed that, with two further years having passed, the effects of these extremes no longer dominated people's perspectives in the way they had in the earlier study. Indeed, though the most extreme event of 2000 was mentioned by 12 out of 24 household interviewees, only 3 referred to the less-extreme 2001 and 2002 events (3 people also spoke of a major event in 1978).

There was a clearly expressed recognition by most households that flooding can bring negative impacts, especially for the poorest and most vulnerable households. Many residents of My Thanh islet, the erosion of which is exacerbated by high water, appear to face particularly acute threats from the annual floods. As the main discussions on health aspects show, potential health effects are widely expressed. It is important to note, however, that they may not necessarily be overtly prioritized by households (see Box 8). Interviewees also referred commonly to disruption of livelihoods and income, disruption of transport (particularly access along minor roads), damage to houses and possessions, and contamination of homes. Coping with floods can be a time-consuming task. One interviewee described having to clear garbage and mud from the house at least twice per day, explaining 'during flood, the water goes up and down two times per day and waste remains after the water has gone down' [*interviewee LX2, My Long*].

Box 8 Household perspectives on the importance of addressing health risks

Of the householders interviewed, only 2 made strong statements stressing the need to pay attention to health risks during floods. One from Cao Lanh emphasized the need for careful water and food hygiene, for reserving medicine and for reinforcing the home to prevent injury, adding: 'health is gold; definitely, flood season influences the living and health of community very much' [*interviewee CL2, Ward 3*]. A resident of Long Xuyen stated that the most important aspects of flood preparedness are in relation to health.

In contrast 5 of the householders stated that health risks were not significant in floods and that action to protect health was therefore not important. A resident from Cao Lanh suggested that action on health is only needed when people actually become sick. Two householders from Long Xuyen argued that potential health impacts are minor compared with the risk of damage to homes.

Some other interviewees recognised that health risks could be significant but talked explicitly about health being of low prioritization for households compared with impacts on livelihoods and damage to their homes. A resident of Cao Lanh did not see health as a determinant factor on behaviour during floods. She suggested that receiving health information on floods is important, but the job is the first priority and people must face risks to go out and earn. Another interviewee in Long Xuyen explained that people often wrongly delay treatment of health problems, and acknowledged that ill-health itself impacts on earning power, but inevitably they have to prioritize economic activities. He added: 'no job means no money and having no food; if you have no food to eat how can you be in good health?' [*interviewee LX12, My Hoa Hung*].

Health risks

One of the findings from the household interviews was that interviewees generally showed a good understanding of how health risks can arise from flooding and other climatic hazards. Awareness of risks was certainly not perfect, but at both sites there was a widespread recognition of the links between typical seasonal changes in the environment and potential disease outcomes, as well as the perhaps more obvious connections between extreme events and increased morbidity. The interview with one resident concluded with the words: 'Diseases occur in the disaster and therefore, the more disasters are mitigated, the more diseases are reduced' [*interviewee CL2, Ward 3*].

Increased risk of diarrhoeal disease was raised consistently as a priority issue, by both householders and local key informants. Two thirds of the interviewees (16: 8 from each city) associated flooding with diarrhoeal disease risk, and 3 interviewees also pointed to heightened risk during low water in the dry season (one of these explicitly claimed that

the threat was highest during the dry season). Health staff in Cao Lanh suggested that the rate of diarrhoeal disease incidence rises about 20% in the floods – a significant, though perhaps not dramatic, increase. Most householders expressed understanding of a connection between contamination of waters by waste and fecal matter and risk of infection, citing bodily contact with polluted water (including bathing) and unsafe use of river water sources (failure to boil or treat water) or poor food hygiene as mechanisms of transmission. For example, local people believed that throughout the year water in the high tide is cleaner than in the low tide. Some households also stated that they collected water far from their houses for their daily activities as they believed that water close to residential areas usually was contaminated by household waste. Key informants explained that floodwaters may serve to spread waste (especially from latrines) but also that water supplies may be inadequate in the dry season and pollutants in channels may become more concentrated. Indeed, there were conflicting perceptions among householders on whether river water sources are cleaner in the flood or the dry seasons: for example, discussions in Cao Lanh suggested there are possible reductions in pollution concentration in the flood, but that people may take water from closer to home rather than the deeper channels. Different households perceive seasonal changes in water quality differently – in part this may be dependent on very localized conditions such as proximity to sources of pollution.

Skin disease was also commonly listed as a flood season hazard. Again, two out of three householders (16) across the two cities referred to this, with some householders and local key informants explaining that the symptoms can be severe for sufferers in extreme cases. People generally recognized a connection between contact with polluted water and increased risk of contracting skin diseases. As well as fecal and other waste, agrochemicals (fertilizers, pesticides) flushed from fields during floods was seen as a pollution source that might cause skin disease – by householders and local key informants alike.

Respiratory diseases and dengue were associated with floods by roughly one in three householders (8 and 10 respectively) across the two cities. Cause of increased respiratory disease was not so clearly expressed, although prolonged contact with water or humid conditions is likely to be implicated. Children and the elderly were seen as most vulnerable, and some of the health staff confirmed a belief that rates were higher in the flood season. A small number of householders (4) also associated respiratory disease with the dry season. Dengue is a major national and local health sector concern, and rates are reportedly highest in the Mekong Delta according to one national-level interviewee. Though several householders suggested that there is a link with floods and dengue – in that mosquitoes become more prevalent, especially after floods when water recedes but leaves pools and water-filled microhabitats behind – the linkage remains unclear and key informant interviews did not provide clarity. Stored water is generally assumed to be an important breeding site for *Aedes* mosquitoes, and the use of this is not clearly linked with the seasons. Water trapped in discarded containers and other sites may increase during floods, but possibly also during rains (the rainy season and flood season tend to coincide). While most local health staff felt that there was at least a rainy/flood season link with dengue, some argued there was no seasonal pattern at all.

As well as infectious disease risk, concerns over risk of drowning and injury during floods were also widely expressed (by 12 and 11 householders respectively). Child drownings were a tragic issue raised during the 2000, 2001 and 2002 floods, and though they are very rare events in most years, many families were concerned for children's

safety during the flood months when water levels are high and currents may be strong. Injuries were generally seen as commonplace during flood times, with accidental falls and collisions with submerged objects resulting from the movement of people through water as they go about their lives in flood conditions. Those engaged in net fishing and shellfish collection who spent much time wading through floodwaters were regarded as especially at risk of injury. Similar risks apply to people harvesting rice and wild vegetables in flood conditions.

Loss of income and resulting risk of malnutrition has been raised as a flood-related issue by national-level interviewees. This was corroborated by health staff at two of the study sites but staff at the other two sites did not see a link existed (in My Hoa Hung it was suggested that people could readily turn to fishing during floods to supplement food sources). None of the householders specifically mentioned malnutrition as a health consequence of flooding, but it is likely that this question was not adequately explored in the interviews. Certainly there was discussion by household interviewees of economic difficulties during floods, which, for the poorest at least, is likely to be a risk factor for malnutrition. Finally, stress factors were also apparent at the household level, with more than one in two interviewees (14) referring to increased anxiety, fears and/or intra-household tension as a result of the dangers and damage associated with flooding and its livelihood impacts. Without detailed and complex study it is not possible to ascertain the extent, but it is at least plausible that these stresses may lead in some cases to mental health outcomes.

Vulnerability to health impacts was seen to differ between household members, with children and the elderly often most at risk, but also to some extent between households. Variation in livelihood assets was a prime factor, although one interviewee did claim 'God loves the poor and so they have few diseases' [*interviewee CL4, Ward 3*]. There was also a recognition by householders that vulnerability is differentiated by factors such as house location and local environment. We return to some of these themes at the end of this section.

Lastly, it is important to note that health problems are clearly not only associated with flood disasters. As a national-level interviewee emphasized, extreme floods and normal floods bring the same diseases – though the chance of an epidemic is higher in the former. Normal floods are seen in many senses as positive (e.g. for crops) and something to which people and society are 'adapted', but they still bring risks that may challenge household coping capacity, in relation to health at least.

Household coping mechanisms

Most householders were able to identify in broad terms what puts their health at risk during hazard events. Here we synthesize findings from the interviews on the types of response people make to combat health risks, before, during and after events strike. We also begin to see how constraints on coping capacity mean that though many know what actions would be beneficial they cannot or do not always follow it through in practice. In part this appears to be a function of shortfalls in awareness of how to avoid or reduce risks in practice – certainly there were many calls from householders and key informants alike for more education program/activities to increase awareness both in adults and

children. But inability to take action may also be linked with insufficient opportunity, assets and resources.

Almost all households (21 out of 24) were able to identify some kinds of actions they take in advance of hazards: mostly preparedness measures taken at the start of the flood season or when hazards are imminent, but also a few longer-term mitigation actions. In terms of home safety, 12 people took steps to strengthen and secure the structure of the house against floods, bank erosion and winds and floods, although only 2 had already achieved the key measure of raising the foundation to mitigate flooding. A total of 15 interviewees stated that they wanted to be able to do more to strengthen and raise their homes. Preparedness for rising floodwaters included raising furniture to prevent damage (mentioned by 11 households), and clearing waste and debris from around the house and neighbouring ditches in order to reduce later spread of contaminants (9). Only 3 households had any kind of medicine cabinet (all in Long Xuyen), and, though some households expressed a desire to have a reserve of basic medicines, the standard practice was to acquire medicines only as and when they are needed (from pharmacies, health facilities or from neighbours that do have a medicine cabinet).

When floods are established, households employ a variety of coping mechanisms to minimize health-related impacts – it is notable, however, that no single one of these actions was referred to by a majority of interviewees. To minimize contact with water and debris in the home, 5 households (all in Cao Lanh) described laying planks on blocks to move about, 2 erected waste guards in front of doors, 7 described clearing waste brought into their homes by floods (in some cases on a daily basis) and 3 householders mentioned evacuating family members (and key possessions) to take shelter elsewhere. Child safety in the local environment was a key concern, and 9 interviewees described being extra vigilant over their children during flood times.

Just 5 householders that were interviewed mentioned taking special measures to ensure safety of water supplies during floods (in other words, water hygiene practices were ‘as normal’). All but one of these was from Cao Lanh, where 4 people described taking extra care to clean or boil water before use. Use of river water was commonplace throughout the year in both cities, with water typically taken from local watercourses and stored in large jars outside the home, in many cases with alum added to help clean the water. According to one household: ‘the water in a jar is enough for the family for 2-3 days; when it is empty we clean the jar and pour water in again’ [*interviewee CL7, My Nga*]. Nevertheless, interviews with other households and local key informants suggest that unsafe water use remains a major problem in these communities – one that may in some cases be exacerbated by flood impacts. Avoidance of mosquitoes is another aspect of preventive health in which people can take action. A total of 8 householders described using bednets and/or incense coils during the flood season, including some usage of bednets during the daytime. Curative health care patterns are little changed by floods – largely because access to health facilities changes relatively little in these urban areas. For minor cases the first recourse at all times is self-treatment, with modern or traditional medicines. If medical consultation is required, people may access local health stations, private practitioners or go direct to higher level city hospitals – though 7 of the interviewees indicated they would only rarely visit health facilities or did not mention accessing health services at all.

It is notable that many people were not familiar with the idea (or responsibility) of preparedness, though in practice most did undertake some preparedness activities. Several interviewees with particular economic difficulties suggested that they are unable to undertake any preparation, and just have to take impacts as they come, including health impacts. According to one household: 'I have no ability and condition to prepare. Basically, what must be must be and every year is the same. I wait for the water to get down and clean the floor to sleep' [*interviewee CL1, My Long*]. Reasons stated for this inability to prepare for floods ranged from having to prioritize looking for earnings to physical frailty. However, another interviewee with informal residence in the same ward indicated a greater sense of self-responsibility in relation to preparedness: 'I have arms and legs and therefore I have to self-create the conditions to live and should not rely on the help of others' [*interviewee CL5, My Long*].

Support from local institutions

The two communes and two wards that make up the study sites each have the same organizational structure to manage disaster risk (the CFSC, in close cooperation with the people's committee and the VNRC) and to provide health care to people (the CHS), with support from district, provincial and national tiers in each of these sectors. These institutions are intended to engage in preparedness/mitigation activities as well as coordinate emergency response itself. Hence there are activities such as pre-designated flood kindergartens and plans for provision of rescue boats in extreme floods at least in some of the sites, together with provision and coordination of relief activities including supply of medicines. Further examples of response activities by local institutions during both normal and extreme floods are noted below. However, it should also be recorded that not all households were satisfied with current preparedness and response activities. There were general criticisms, for example, of inadequate preparedness within the health sector, and specific complaints such as the cancelling of swimming classes for children.

Information provision is one of the key services expected from these institutions. Across the sites, 17 of the household interviewees confirmed that they received general information on hazards (early warnings, flood levels) and how to prepare and cope with risks. Radio and television announcements were often the principal means by which people came to receive this information. The press, leaflets, loudspeaker announcements and public meetings (e.g. at block/cell level) were also mentioned, although it is clear that the last two do not reach all households. Some 15 householders specifically discussed education efforts in relation to health risks, although in some cases people seemed to be referring to general rather than hazard-related risks. Flood-related health education included disease prevention advice on water use, food safety, environmental sanitation and mosquito breeding sites, delivered via leaflets, posters, loudspeaker announcements, community meetings and visits by local health workers. The VNRC also emphasizes careful preparation of educational materials on health risks. In both cities, however, there were calls for more clearly understandable and more regular health education activities on flood risks, especially for poor households and the more vulnerable individuals. Local key informants confirmed that improved education and awareness-raising can play a critical role in reducing health risk, and is seen as the most sustainable risk reduction action. According to a health staff in one site:

“The best way is communication – if we provide information on diseases of the flood and how to prevent them then people will be the main actors and the CHS only the facilitator– but this must be carried out before, during and after floods.”
[*local key informant, Ward 3*].

Other aspects of health promotion, environmental health and health care provision by local institutions in relation to floods were discussed by a few householders, although none of these activities appeared to have a high profile across the communities. Some organized environmental cleansing was said to take place before and after floods, via mobilization of the mass organizations and community members. Local authorities also undertook spraying of mosquito breeding sites, although in general only in high-risk sites. Water purification tablets (chloramin-B) were formerly distributed during flood times, but local key informants confirmed this had discontinued in both sites by 2004 and that uptake of the tablets had not been very successful. There also appeared to be little direct distribution of medicines to households during floods, although free medical kits from the CHS may be made available on request. Few households were able to identify specific health care activities undertaken in response to floods, other than some increase in medical check-ups and availability of medical kits. Local health staff from both cities, however, described how their disaster preparedness activities include planning emergency provisions that can be set in motion in the event that an extreme flood occurs. These may include mobile emergency health teams, medical boats, medicine reserves and 24-hour staffing of health facilities. In common with the nation as a whole, there are few mitigation activities for health infrastructure itself. Though the facilities themselves are seldom impacted directly other than by extreme floods, in some sites floods can often cause access problems for local populations who need medical attention.

Broader aspects of support for risk reduction include schemes coordinated by local authorities to support improvements in the safety of people’s homes, including credit assistance or provision of material and labour for strengthening houses. Again, the VNRC is also engaged in house strengthening initiatives. My Hoa Hung is one site where residential clusters have been built for the resettlement of households from particularly hazardous locations such as the eroding banks of My Thanh. In both cities there was strong interest and support among householders for the progressive extension of upgraded roads and dyke systems to reduce flood impacts and protect livelihoods (see Box 9). According to one resident: ‘in the past, water came here from many different directions but now with the dyke system here water comes to the area with lower speed and less strength’ [*interviewee LX9, My Hoa Hung*]. However, in some cases, the existence of dykes may itself lead to water entrapment, stagnation and disease risks.

Box 9 Raising roadways in the study sites

The issue of raising local roads (connecting hamlets to the main roads within the ward/commune) was discussed many times during the research. These roads are the principal means of travel to and from the residential areas, and raising them so that they remain above flood level is seen as crucial to enable people to continue with their livelihoods during floods and be able to ensure access to health stations. Raising roads can reduce flood-related injury, ensure waste disposal and other services can access residential areas, and in some cases may also reduce flood

impact. In hamlet My Long 2 within My Hoa Hung commune, for example, people perceived raised roads also functioning as dykes, preventing water from the canal coming directly into their houses especially at the time when flood waters are going up quickly and strongly.

When roads are raised, the extreme flood level reached in 2000 is used as a benchmark - on the principle that the road should be built higher than that identified height. Since 2002, there has been much road-building and upgrading in the localities. The cost of these works is typically shared between the state (via the local authority) and households, at a ratio of 50/50 or 60/40. The level of contribution set for each household is calculated based on the number of metres of roadway in front of the house (ie equivalent to the width of the property). Local key informants in My Hoa Hung estimated that for one metre of upgrading the cost for a household is 20,000VND per year (1.25USD) for 5 years. Agreement between residents is usually needed before the local authority initiates the works.

After a road is raised, households located along the road may raise the floor height of their homes. In Ward 3 of Cao Lanh city, for example, some interviewees explained that they are waiting for a road-raising programme to be initiated and that they will then raise the foundations of their houses. In the rainy season, houses that have floors lower than the road may suffer increased inundation as water falling on the road flows down into their house. It was observed by the study team that it is mainly the more wealthy households that have raised their houses: the poorest households can seldom afford to contribute money to both building the road and raising their floor heights. In My Ngai commune poorer families explained that they were willing to prioritise participating in the road upgrading so that their daily activities are more convenient and children can access school easily.

Upgrading is also needed because in the suburban areas of small and medium sized cities like Cao Lanh and Long Xuyen most (unimproved) roads lacked or had deficient drainage systems – transverse pipes to allow floodwater to pass from one side of a roadway into the river system. This is considered one of the main impediments to reducing flood impacts. In flood-affected urbana dn peri-urban areas natural and traditional forms of drainage based on topography and river/canal systems may not be sufficient to solve the problem because drainage is impeded by roads and other constructions.

What shapes coping capacity?

Coping capacity is the ability to prevent, minimize, manage and recover from the impacts of hazards. Differences in coping capacity within and between societies plays a key part in shaping people's vulnerability. Despite the widely-held perspective that the Mekong Delta population is a society accustomed to 'living with floods', it is clear from this research that even in terms of livelihood strategies there are some people who suffer even during regular seasonal floods. For health risks, the evidence suggests that coping and adaptation is still further from being complete, either among households or among health-related institutions.

As with most aspects of hazard impact in developing countries, economic factors have a fundamental role in shaping the ability to cope with health risks. For households, economic difficulties create resource constraints that prevent successful coping and may affect people's underlying health status. Box 10 provides a series of statements from interviewees on the role of poverty in limiting coping with health risks. Poverty can particularly constrain the ability to prepare for hazards, and force people to prioritize earning an income over health protection. The poor may also be more exposed to flood hazards via inability to raise their houses, housing location in relation to flood geography, and their involvement in occupations such as shellfish collecting and tending ricefields. One householder suggested that the poor are more susceptible to risks because they cannot stay at home during floods but have to go out into the fields to maintain income. The same resource-deficiency affects the supporting institutions too. Hence, the health centre in Long Xuyen does not have the funding to carry out major health education outreach at city level via radio or loudspeaker, and the local authorities in Cao Lanh can undertake little investment directly in improved water supply and sanitation systems. Poverty, in this sense, is both individual and collective.

Box 10 Poverty, coping capacity and health risks

'In the flood season, if you have no boat you are like one who has no feet'
[interviewee CL11, My Nga].

'I don't know what I could do – if I have money everything is easy'
[interviewee CL7, My Nga].

Statements like those above underline the importance of poverty as a key determinant of vulnerability and coping capacity. Explicit linkages between economic poverty and risk were made by many interviewees. One from Ward 3 strongly valued protection of health and safety during floods but explained that poverty limited her ability to cope. Unwilling to use credit because of fear of repayment problems, she had to rely on assistance from local government and social organizations. Two interviewees, one from each city, explicitly stated that looking after health had to come second to securing income. Several interviewees spoke of not always having money for medicine or being too poor to afford health care treatment. There were also references to prohibitive costs for the poor of sending children to kindergartens and building hygienic toilet facilities.

Nevertheless, it should be noted that even better-off families face health risks and may have serious concerns they cannot necessarily manage. One family in My Long that has the benefits of piped water, septic tank, and a medicine cabinet, still has problems with flood incursions into the home, incoming waste, abundant mosquitoes and emotional stress during the flood period.

But, as this research shows, economic factors alone do not provide all the explanation. For example, even the less-poor households may suffer household contamination from daily incursions of floodwaters during a normal seasonal flood. Other factors play their

part too. Individual vulnerability obviously is conditioned by personal factors such as health status, disability, gender and age (commonly children and the elderly are seen as of heightened susceptibility to injury and disease). But there also factors that operate at a household level.

One obvious factor is the physical location of a household in relation to the distribution of hazard effects: a factor that is linked with, but not controlled by, poverty. In a positive sense, the urban location of these sites means households here have fewer problems of transport and access to health facilities during floods than rural households may have. However, the density of urban settlements creates other risks in relation to environmental health and sanitation. These risks vary from area to area and from block to block. In My Hoa Hung, waste and chemical pollution from the floating fish rafts was seen as a major concern for water supplies (although it is not clear how this is affected by seasonal changes). Health staff in Cao Lanh pointed to potentially ironic problems of high floodwaters becoming trapped and stagnating in some blocks where urban dyke systems have been created for flood protection. The physical location of My Thanh islet makes it a special case – many residents there are at physical danger from the rapid bank erosion, and access to almost all services necessitates boat transport. Here, and in other sectors of the study sites, access to loudspeaker information can be a problem for certain households.

Cultural and social factors may also play an important role in shaping vulnerability and coping capacity. It has been argued that certain risk-raising behaviours such as use of river water, fishpond latrines and 'monkey bridges' result from adherence of some people to cultural traditions – although it may clearly also be linked with ability to afford alternatives. Other, perhaps more subtle, cultural influences have also been suggested. Staff at Long Xuyen suggested that people who live within urban dyke systems can lose a culture of coping:

'They tend to have the mentality that they are protected and they lose the sense of self-protection from floods, including preparedness such as having a boat for travel in floods and children learning to swim. Future generations lose customs and so lose the culture of living with floods – but they still live in the disaster area'.
[local key informant, Long Xuyen]

Other local key informants within the city, emphasized that a positive psychosocial response can lie in developing the mentality of 'living with flood' (accepting that you will suffer to some extent and learning to live with that). There is a notion (in effect, politicized through government policy) that such a mentality can improve societal preparedness, through a willingness to work together to reduce risks. Certainly, response to hazard and disaster in the Mekong Delta is marked by high levels of voluntary involvement, via mass organizations and communal actions. It is also important to note the work of the network of block/village health workers, which may be heightened during emergencies, as well as the mutual assistance between neighbours in providing relief and shelter to flood-affected families. Though there are societal norms at work in this respect, the degree of social cohesion is likely to vary from one community to another.

Knowledge of health risks and means to prevent them is a key facet of coping capacity. It may be closely related to level of general education and literacy, and some household interviewees pointed to the existence of major information/communication barriers for

those they regarded as poorly educated. It can also be related to variations in the quality of institutional education and outreach provision. Improvement in preventive health education was advocated by respondents at all levels in the research, and may indeed be particularly important given the shortage of funds for other critical measures such as improving water supply and sanitation. However, though incomplete, awareness of health risks and the means to reduce those risks was fairly high among the household interviewees. It is important to recognize that health behaviour is constrained not just by limits to understanding, but also by limits on people's ability to act on the knowledge they have. It was pointed out by one national-level interviewee, for example, that poor people evacuated from their homes to higher ground during floods often do not have the means to store food safely – they may then either decide to prioritize nutrition (and face disease risk) or prioritize food safety by eating only instant noodles (and risk poor nutrition).

The reference again to poverty and prioritization brings us to a final point. Householders commonly articulated better protection for their family's health during hazard events in terms of wider livelihood factors: income-raising and asset-strengthening. This was one reason that the upgrading of roads so that they are readily passable during floods was so often highlighted – as well as reducing chances of injury and enabling better waste collection, improved roads could ensure residents can continue to access urban employment opportunities. An improved income base can improve ability to provide a strong, safe home, adequate food, water and medicines, and ready access to a television or radio for receiving early warning messages. All would contribute to health protection during hazards. It can also be argued that they will lead to improved health status in general, which will carry over into greater resilience during disasters for individuals. For the population, lower disease prevalence during normal times would reduce the chance of outbreaks emerging during the disruption brought by hazards. As one national-level interviewee underlined, flood health issues are potentially more readily solvable if there is already good public health.

There is a strong argument that in order to tackle hazard risks, public authorities, other sectors and mass organizations, NGOs, and governmental donors should pay most attention to solving the root causes of the problem and concentrate on improving people's lives in general and health related issues in particular. However, given that there are difficulties and uncertainties associated with all development initiatives, and that vulnerability to hazards is not solely governed by poverty, we also think it important to promote specifically hazard-related actions. In order to distance this report from general development goals, Table 4 presents a series of priority actions relating to hazards that may be appropriate for both internal and external investment in Vietnam.

Table 4 Some priority actions - listed by household and key informants

| | |
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| General information on hazards/response | Ensure all households receive timely warnings and understand the risks related to floods and other hazards |
| | Provide advice to households on preventing and avoiding risks that is appropriate to their capacities: ensure advice can be acted on |
| Health risk information | Where possible, provide outreach activities direct to households on health impacts and measures to avoid them |
| | Ensure health risk information is delivered effectively and advice is targeted to the audience through training of block/village health workers to take an active role in making sure all people can comprehend and follow the advice |
| | Promote studies to increase understanding of the links between floods/hazards and disease, and of the potential changes in health risk associated with climate change |
| Home safety | Provide credit and other assistance for poor families to strengthen and raise their homes |
| | Seek low-cost technical innovations for mitigation of damage to houses and infrastructure |
| Child safety | Maintain the system of flood kindergartens so that they are prepared for use in each flood season |
| | Reinstate and extend provision of free swimming classes for young children |
| Water/sanitation | Continue health education efforts with regard to safe water use |
| | Extend and promote public/private schemes to access deep well-water and provide piped water networks |
| | Promote and assist with provision of low-cost improved latrines (usable in both wet and dry seasons) |
| Environmental health | Extend waste collection services to areas not yet served |
| | Promote and organize communal environmental cleansing activities, especially before, during and after floods |
| | Continue health education efforts on mosquito avoidance and removal of containers that may act as mosquito-breeding sites |
| Health care services | Provide free medical check-ups and distribute medicines for poorer households during the flood season |
| | Strengthen the role of local health workers to include the identification of diseases and first-aid treatment during emergencies |
| | Ensure each health facility in flood-prone areas has a 'medical' boat available to ensure all households and individuals can access health facilities |

| | |
|-------------------------------|---|
| | |
| General risk reduction | Assist households to own and maintain a simple boat for use during the flood season |
| | Consider and plan further upgrading of roads and dyke systems (but avoid exacerbating entrapment of floodwaters) |
| | Assist the most exposed or vulnerable households to relocate home to safer sites |
| | Support preparedness for alternative livelihood options during floods (such as preparation of fishing nets, manufacture of handicrafts) |
| | Provide low-interest credit and free vocational training for alternative livelihoods |

Appendix 1:

National organizations consulted in the Vietnam studies

During the course of the research projects in Vietnam, interviews were held with national-level key informants at the following institutions:

Department of Preventive Medicine, Ministry of Health, Government of Vietnam, Hanoi

Disaster Management Center, Ministry of Agriculture and Rural Development, Government of Vietnam, Hanoi

Ministry of Construction, Government of Vietnam, Hanoi

Natural Disaster Mitigation Partnership, Hanoi

United Nations Children's Fund (UNICEF), Hanoi

World Health Organization, Ho Chi Minh City

DFID Vietnam, Hanoi

Vietnam Red Cross (VNRC), Hanoi

Care in Vietnam, Ho Chi Minh City

Save the Children UK, Hanoi

Oxfam Great Britain, Hanoi

Centre for Environment Research, Education and Development (CERED), Hanoi

Hanoi School of Public Health, Hanoi

Institute of Hygiene and Public Health, Ho Chi Minh City

Department of Social Work, Thang Long University, Hanoi

Appendix 2:

Reports/documents relating to disaster impact and management collected for the Vietnam studies

- Adam Fforde and Associates Pty Ltd (2003): *Report on Residential Clusters Research in An Giang, Dong Thap and Long An Provinces in the Mekong Delta, Vietnam*, Report for CARE International in Vietnam.
- Beckman, M., Le Van An and Le Quang Bao (2002). Living with the floods: coping and adaptation strategies of households and local institutions in Central Vietnam, SEI/REPSI Report Series no. 5, Stockholm Environment Institute.
- Communist Party of Vietnam (2005). *Resolution of the political bureau on the protection, care and promotion of people's health in the new situation*, Resolution no. 46-NQ/TW dated 23 February 2005, Communist Party of Vietnam, Hanoi.
- Dang Quang Tinh (2003). Flood kindergarten: community need to community solution. In World Disaster Reduction Campaign *Living with risk: turning the tide on disasters towards sustainable development. Information kit*.
- Dang Van Chinh (2003) *Report on Health Sector Damage caused by Flooding in Central Viet Nam 2003*, World Health Organisation, Western Pacific Regional Office.
- Dao Xuan Hoc (2003): Flood control for the Dong Thap Muoi Delta. *Proceeding of the International Seminar on Flood Management, Hanoi 17-21 Nov. 2003*, pp71-84.
- Esposito, C (2002) *Moving Heaven and Earth: experiences of poor communities recently exposed to disasters in Vietnam* CARE International Vietnam and World Health Organization Western Pacific Regional Office, Vietnam.
- Government of Vietnam (2001). *Second National Strategy and Action Plan for Disaster Mitigation and Management in Vietnam – 2001 to 2020* (draft), Government of Vietnam, Hanoi.
- GSO (2006) *National Statistics Yearbook 2005*, Socialist Republic of Vietnam, General Statistics Office, Statistical Publishing House, Hanoi.
- Jabry, A (ed) (2002) *Children in disasters: after the cameras have gone*, Plan UK, London.
- Le Minh Nhat (2003) Flood disaster management in Red River Delta. *Proceeding of the International Seminar on Flood Management, Hanoi 17-21 Nov. 2003*, pp93-96.
- Le Van Tuan (2003) Rapid assessment on flood preparedness related to emergency health care in Angiang Province, 2002, *Proceeding of the International Seminar on Flood Management, Hanoi 17-21 Nov 2003*, pp97-104.
- MARD (2003). Living with floods in the Mekong River Delta of Vietnam. *Proceeding of the International Seminar on Flood Management, Hanoi 17-21 Nov. 2003*, pp85-92.
- NDM-Partnership (2003?) *Urgent interventions needed to stabilise the lives of people in poor villages*, 'previous news' item on NDM-Partnership website www.ccfsc.org.vn/ndmp-website/default.htm, accessed 22/05/07.
- NDM-Partnership (2003) 'Disaster preparedness plans of VNRC', *NDM-Partnership Newsletter*, June 03, pp2-4.
- NDM-Partnership (2006) *Rapid joint assessment of response needs due the Typhoon Sangsane in Central Vietnam*, Synthesized Report, Natural Disaster Mitigation Partnership – Disaster Management Working Group.

- Neefjes, K (2002) *Lessons from the floods: voices of the people, local authorities, and disaster management agencies from the Mekong Delta in Viet Nam*, Discussion paper, Viet Nam Red Cross and the International Federation of Red Cross and Red Crescent Societies.
- Norton, J. and Chantry, G. (2002) *More to lose: establishing community capacity to reduce vulnerability to economic loss caused by storm damage to houses in central Viet Nam*, paper prepared for ADPC Workshop 'Best Practices in Disaster Mitigation', Bali, September 2002.
- Norton, J. and Chantry, G. (2007) *More to lose: reducing family vulnerability to floods and storms in Central Vietnam*, article on NDM-Partnership website www.ccfsc.org.vn/ndmp-website/default.htm, accessed 22/05/07.
- Oxfam GB (2005) *Assessment of the impact of drought in Ninh Thuan province, Vietnam*, Oxfam GB, Hanoi.
- Pham Thi Lan (2000): *Need assessment in response to flood disaster in Mekong River Delta*. Unpublished report. Save the Children in Vietnam, Hanoi.
- Save the Children (2003). *Child drowning in the Mekong Delta: current situation and solutions*. Save the Children in Vietnam, Hanoi.
- Tran Thanh Tung, Le Phan Hong Anh, Nguyen Tuan Hap, Tran Thi Thanh Nhan, Dinh Thi Hong Quyet, Hoang Thanh Sang, Trinh Thi Thu Thao, Doan Dang Bao Tran, Tran Minh Tri, Vo Thi Nhat Tam, Nguyen Doan Vu Tuyen, Tran Thi Doan Trinh and Nguyen Tran Thanh Quyen (2005) *The fact of flooding and living with flood of rural residential community in An Giang province*, Research report Department of Geography, University of Social Sciences and Humanities, National University of Ho Chi Minh City.
- UNICEF Vietnam (2002) *Psychosocial impact of child drowning deaths in the Mekong River Province of Dong Thap: a preliminary assessment*, United Nations Children's Fund, Vietnam, Hanoi.
- WHO (2006) *Rapid assessment of health infrastructure damage caused by Typhoon Xangsane in Central Viet Nam October 1st 2006*, Report, WHO Western Pacific Regional Office.