REPORT

RAINFALL, FOOD SECURITY AND HUMAN MOBILITY

CASE STUDY: VIET NAM

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UNITED NATIONS UNIVERSITY
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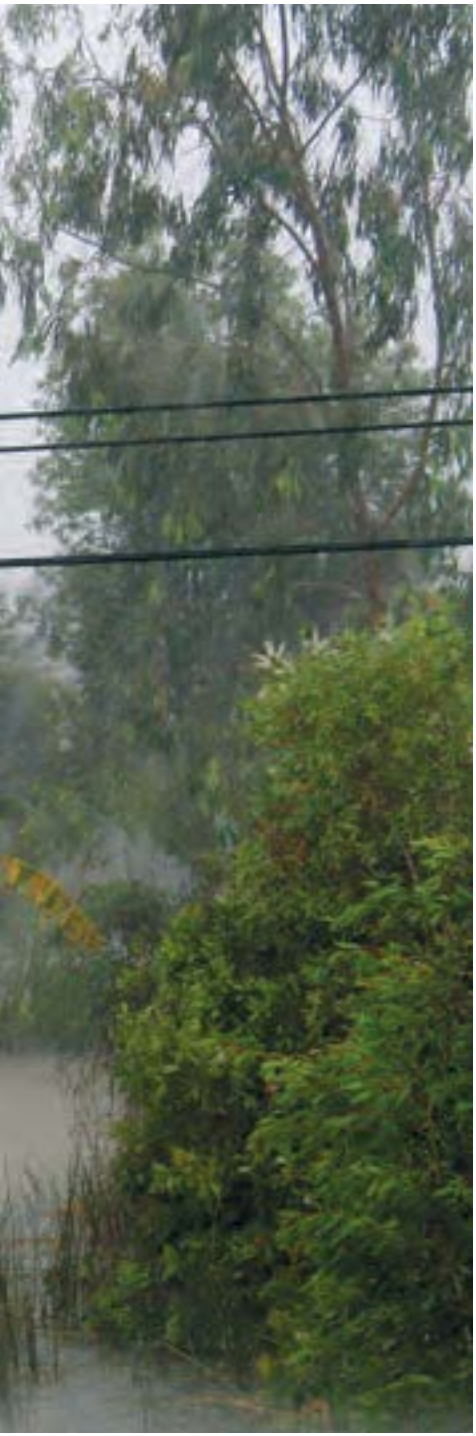

″Where the Rain Falls″ Project
Case study: Viet Nam

Results from Dong Thap Province, Thap Muoi District

Authors: Nguyen Viet Khoa, Nguyen Cong Thao and Kees van der Geest

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Abbreviations and acronyms

CPC	*Commune People's Committee*
DoNRe	*Department of Natural Resources and Environment*
GDP	*Gross Domestic Product*
GIS	*Geographic Information System*
IMHEN	*Institute of Meteorology, Hydrology and Environment*
IPCC	*Intergovernmental Panel on Climate Change*
MoNRE	*Ministry of Natural Resources and Environment*
NGO	*Non-Governmental Organization*
PPP	*Purchasing Power Parity*
PRA	*Participatory Research Approach*
UNU	*United Nations University*
UNU-EHS	*United Nations University Institute for Environment and Human Security*
VND	*Vietnamese Dong (US$1 = 20,000 VND)*

Executive summary

This report presents the findings of the Viet Nam case study of the "Where the Rain Falls: Climate Change, Hunger and Human Mobility" project. This research project looks at the linkages between changing rainfall patterns, food security and human mobility in eight developing countries. The central question this study seeks to answer is: "Under what circumstances do households use migration as a risk management strategy in relation to increasing rainfall variability and food insecurity?"

A mixed-method approach was used in this research, consisting of a household survey, Participatory Research Approach (PRA) methods, expert interviews and analysis of meteorological data. The research in Viet Nam took place in Hung Thanh Commune (Dong Thap Province) in the upper delta of the Mekong River. The research area is located about 135 km from the coast and is part of the commercial rice production region of the Mekong delta. This area is flooded annually, with peak flood levels usually occurring between September and November.* Rice cultivation is the main economic activity and fishing is an import secondary source of food and income, especially during the flood season.

The research revealed several changes in rainfall patterns over the past 20–30 years: the total amount of annual rainfall has increased; the rainy season lasts longer than before; rainfall has become less predictable; and the occurrence of extreme weather events, such as storms, heavy rainfall and thunder and lightning, has increased. Despite increasing annual levels of rainfall in the past 20–30 years, flood levels have decreased over the same period. This paradox can be attributed to the fact that flood levels depend to a large extent on rainfall patterns and water retention outside the research area, upstream of the Mekong River. Several dams have been constructed in the Mekong River in past decades, which lead to increased upstream water retention. The highest flood levels in the past 30 years were reached in 1995, 2000 and 2011, and the lowest in 1998 and 2010. At the time of the fieldwork for this research, between October and November 2011, the research area was experiencing the highest flood level in 10 years. The whole research area was inundated, except for a small strip of land along the main elevated road crossing the area. The annual floods carry benefits for people, such as soil enrichment, fishing and aquaculture, but can also be a threat to people's lives, properties and livelihoods, especially when floods are higher than usual.

More than half of the household survey respondents (62 per cent) have their own rice farm. The vast majority indicated that their rice yields are negatively affected by changing rainfall patterns and changing flood regimes. Nevertheless, they also report that rice productivity is increasing as a result of better seed varieties, improved techniques, increased usage of fertilizers and a higher frequency of cultivation. The latter can be attributed to dyke construction. Hence, the negative impact of climatic changes is to some extent offset by positive man-made agricultural changes.

Despite this positive development in rice productivity, 18.0 per cent of the respondents reported that their households had experienced hunger in the past year and 23.3 per cent in the past five to ten years. Among landless households, this figure was much higher: 41.3 per cent indicated that they had experienced inadequate food intake in the past year and 52.2 per cent in the past five to ten years. Food insecurity reaches its peak in the flood season, from September to November, particularly in the case of landless people. Most of them work as farm labourers and demand for labour is low in the flood season. About a third (30.7 per cent) of the surveyed households were landless, while land-scarce households – owning less than one hectare – made up 26.0 per cent of the household sample. The remaining households (43.3 per cent) owned an average of 2.4 ha of land.

Poor, landless and land-scarce households are most vulnerable to the adverse effects of changing rainfall patterns and flood regimes.

Within this group, out-migration is an increasingly important adaptation to multiple livelihood threats, including changing rainfall patterns and flood regimes. Although official migration figures at commune level are lacking, all evidence from the household survey, PRA sessions and expert interviews indicate that migration has increased sharply, particularly over the past 10 years.

The household survey revealed that in 90 out of 150 households (60 per cent), at least one current member had migration experience. A total of 168 household members had migrated. Men (63 per cent) migrated more than women (37 per cent). On average, migrants in the research site were 22 years old at the time of their first migration. Seasonal migration mainly occurs during the flood season, when there is less work in the community and young people who are no longer enrolled in school need to generate more income to complement the income generated from farming outside the flood season.

Almost half of the migrants move to destinations outside the Mekong Delta region, but still within the southern part of Viet Nam. They mostly go to Ho Chi Minh City, Binh Duoung and Dong Nai. Most of them are temporary migrants who work in industrial zones for longer than six months. People from Hung Than Commune who migrate within the province are mainly seasonal migrants who work as farm labourers or in local factories for periods shorter than six months. Their main destinations are Cao Lanh and Sa Dec. Others who migrate within the delta but outside the province primarily leave for the Long An Province.

In the questionnaire, respondents were given a list of 40 potential reasons for migration and were asked to indicate whether each reason was "important", "very important" or "not important". Their answers resulted in the following ranking of reasons for migration: (1) lack of income; (2) unemployment; (3) dissatis-faction with livelihood; (4) better job opportunities in the city; (5) lack of higher education opportunities; (6) floods; and (7) lack of farm land. The most important reasons for migration, such as lack of income, unemployment and unsatisfactory livelihoods, are influenced by rainfall variability. When survey respondents were asked whether changing rainfall patterns affect their household economy, 89.5 per cent of the respondents answered "yes", of which 35.9 per cent answered "yes, a lot". This is in line with findings from the Foresight report on migration and global environmental change (Foresight, 2011) and the EACH-FOR project (Jäger et al., 2009), which show that environmental factors tend to influence migration indirectly, mostly through economic drivers.

The groups most vulnerable to adverse effects of changing rainfall patterns, flooding and extreme weather events in this case study are clearly the landless and land-scarce farmers. They try to cope with situations of food insecurity by borrowing food and money (83 per cent of the households who had faced food shortage in the seven days prior to the survey). Others consume less expensive food (63 per cent), reduce meal size (50 per cent) or reduce the adults' food intake in favour of the children (36 per cent). Migration with the purpose of coping with food shortage is most common among members of landless (23.9 per cent) and land-scarce (20.5 per cent) households. In better-off households there is less pressure to migrate, but their members more often move for educational purposes. Poor and landless households primarily use remittances to buy food and to pay back their loans. The elderly, sick, disabled and people who are too poor in terms of human and financial capital are trapped. This category of people relies on external help from relatives in order to survive.

Adaptation strategies in response to floods specifically include raising the foundation of houses, diversification into non-farm and off-farm activities (seasonal migration), developing community-based saving schemes for small and landless farmers and increasing the education of children so as to enable them to gain secure future employment. This last option is less accessible for poor households, who often lack the means to further their children's education beyond secondary school level.

* The research was actually conducted in the aftermath of the worst flood in 10 years, which posed a number of challenges for the research and may have introduced a bias in some answers.

Section 1: Introduction

The "Where the Rain Falls: Climate Change, Hunger and Human Mobility" project, supported by AXA Group and the John D. and Catherine T. MacArthur Foundation, aims to improve the understanding of how rainfall variability affects food and livelihood security, and how these factors interact with household decisions on mobility and migration among groups of people particularly vulnerable to the adverse effects of climate change. The research focuses on perceived as well as measured changes in rainfall (e.g., extended dry or wet periods, droughts or floods, erratic rainfall) and shifting seasons. The impact of changing weather patterns on local food production, food availability and prices may lead to food insecurity and shortages. People have developed different strategies to cope with stress and variability related to food and livelihood security. The "Rainfalls" project is interested in understanding why people react differently to stress caused by changing weather patterns and food insecurity. One of the mechanisms used by people experiencing this stress is mobility, e.g., different forms of migration. Therefore, this research project seeks to explore the extent to which changing weather patterns influence people's decisions to migrate.

The "Rainfalls" project has three objectives:

(1) to understand how rainfall variability, food and livelihood security and migration interact today;
(2) to understand how these factors might interact in coming decades as the impacts of climate change begin to be felt more strongly; and
(3) to work with communities to identify ways in which to manage rainfall variability, food and livelihood security, and migration.

The "Rainfalls" project aims to answer the following three questions (related directly to the three research objectives above):

(1) Under what circumstances do households use migration as a risk management strategy in relation to increasing rainfall variability and food insecurity?

(2) Under what scenarios do rainfall variability and food security have the potential to become significant drivers of human mobility in particular regions of the world in the next two to three decades?

(3) In the context of climate change, what combination of policies can increase the likelihood that human mobility re mains a matter of choice among a broader range of measures to manage risks associated with changing climatic conditions, rather than "merely" a survival strategy after other pathways have been exhausted?

The project explores such policy alternatives in hotspot areas of the world.

This report focuses on research objective (1) and question (1). Fieldwork for the "Rainfalls" project has been carried out in eight countries in Asia, Africa and Latin America. In this report, the findings on Viet Nam are presented.

This report is structured as follows: Section 1 provides a brief introduction to the case study country and reviews existing literature concerning key variables and linkages (climate, economy and migration patterns). Section 2 uses secondary data for Dong Thap Province to examine the same variables and linkages at provincial level (the lowest level of geographic scale for which such data are available). Section 3 describes the methods used in this research and their limitations. Section 4 introduces the case study area and describes the criteria for selecting this research area. In Section 5, 6 and 7 the local research findings on rainfall, floods, livelihood, food security and migration patterns are presented. Section 8 focuses on the linkages between these variables. Section 9 provides a conclusion and in Section 10 some policy recommendations are described.

1.1 About Viet Nam

The Socialist Republic of Viet Nam is located in Southeast Asia, bordering China, Laos, Cambodia, the Gulf of Thailand, the Gulf of Tonkin and the South China Sea (see Figure 1).

Its largest cities are Ho Chi Minh City (formerly Saigon, 7.1 million inhabitants) and the capital, Hanoi (6.4 million inhabitants). The country's total land area is 331,698 km^2. With a population of 85,789,573 inhabitants in 2009, it is the fourteenth most populous country in the world. Viet Nam is densely populated, with 259 inhabitants per km^2 (Central Population and Housing Census Steering Committee, 2010). The most densely populated areas are in the low-lying deltas of the Mekong River in the south, and the Red River in the north. Millions of people live in areas that are prone to flooding, which makes Viet Nam a hotspot in terms of the impact of climate change and, most notably, sea level rise. The Mekong Delta is the most affected region, with 1.77 million ha of salinized land, accounting for 45 per cent of the Delta (Chaudhry and Ruysschaert, 2007).

Viet Nam has a coastline of 3260 km, excluding its islands. The terrain is low and flat in the south and in the Red River Delta in the north. The central and northwest parts of the country are mountainous. The climate is tropical in the south and monsoonal in the north, with a hot, rainy season (May to November) and a warm, dry season (December to April). The nature of environmental hazards varies widely between the upland and lowland areas.

Viet Nam is a lower middle-income country. In the past two to three decades, the country has changed from a highly-centralized

Figure 1: Map of Viet Nam, indicating Dong Thap Province. Source: Authors.

planning economy to a socialist-orientated market economy. This change was initiated with the "Doi moi" reform, which began in the mid-1980s. Since then, the economy has experienced rapid growth and integration in the world economy. The Vietnamese private sector mostly consists of small and medium-sized enterprises. In 2010, agriculture, forestry and fisheries contributed 20.58 per cent to national GDP; industry and construction 41.09 per cent; and trade and services 38.33 per cent. Although agriculture produces a smaller share of GDP than industry and services, it does employ the majority of the population.

Between 1990 and 2008, the Vietnamese economy grew by 5–10 per cent every year (Vuong and Tran, 2009). Despite increasing inequality in income levels, poverty has declined from 58.1 per cent of the population in 1993 to 14.5 per cent in 2008 (Van 2012, based on the Viet Nam Living Standard Surveys 1993 and 2008). In terms of human development, Viet Nam is ranked 128 out of 187 countries, with a Human Development Index of 0.593. The index has risen sharply over the past 10 years and so has per capita income, which was estimated at US$2805 purchasing power parity (PPP) in 2011. Life expectancy is 75.2 years.

1.2 Climate variability and change

Viet Nam is one of the world's most vulnerable countries in terms of climate change and extreme weather events because of its very long coastline, the frequent occurrence of typhoons, the strong dependency of its population on agriculture, relatively low levels of development in rural areas, and the fact that a large part of its population lives in densely populated, low-lying areas that are threatened by sea level rise. A one-metre rise, for example, would affect 10.8 per cent of the population (Dasgupta et al., 2007). Viet Nam's largest urban centre, Ho Chi Minh City, is also located in a very low-lying zone. Viet Nam has been identified as one of the top 15 countries in the world already vulnerable to natural hazards such as floods and storms in terms of number of people exposed and the scale of exposure (Dilley et al., 2005).

Similarly, Germanwatch ranked Viet Nam the fifth most-affected in an analysis of GDP loss and death as a result of extreme weather events between 1991 and 2010 (Germanwatch, 2011). Climate change is expected to exacerbate the frequency and intensity of such events in the future. Viet Nam has already sustained impact from climate change: the average surface temperature has risen by 0.7° C since 1950; the typhoon and flood seasons are longer than they used to be; and droughts in areas previously not vulnerable to aridity have been noted, as have increased incidences of heavy rainfall and storms (Carew-Reid, 2008; Phi, 2008).

In the south of Viet Nam, rainfall in the dry season (December to April) has not changed significantly over the past 50 years, while rainfall in the rainy season (May to November) has increased by 5 to 20 per cent. Maximum daily rainfall has risen sharply, particularly in recent years. The number of days of heavy rainfall has also increased. The increase in the number of heavy rainfall days is related to the rise in air temperature and sea surface temperature in the East Equatorial Pacific. Seasonal droughts have also tended to be more frequent over the last 50 years. Heatwaves have also become more common in the south of Viet Nam (MoNRE, 2009).

Different emission scenarios up to the year 2100 of the Intergovernmental Panel on Climate Change (IPCC) show an increase in temperature and rainfall for Viet Nam, especially during the wet season. In the B2 medium emissions scenario, temperature increases by 2.3° C compared to the 1990s. The A2 high emission scenario, which is the current trend, shows a temperature increase of 3.6° C and a 6.6 per cent increase in annual rainfall. These increases in rainfall are expected to be concentrated in the wet season, while rainfall is predicted to decrease in the drier months. For the Mekong Delta, this decrease is estimated at 20 per cent. Increasing evaporation resulting from higher temperatures can result in a serious drought risk (Cruz et al., 2007). Sea level rise is a major threat to low-lying and coastal areas of Viet Nam. Without dyke enforcements and other preventative measures, a one-metre rise, which is becoming likely by the year 2100, would

inundate 9.3 per cent of the country's surface. In the Mekong Delta Region, 37.8 per cent would be inundated (UN Viet Nam, 2009). In addition, an increased intensity and frequency of storms is predicted (Cruz et al., 2007). If these future scenarios materialize, tens of millions of people will be affected. According to the IPCC, the Mekong Delta is one of the world's three extreme hotspots in terms of population vulnerability to sea level rise. The other two hotspots are the Nile Delta and the Ganges Delta. In each of these three locations, over a million people would need to relocate because of sea level rise by the year 2050 (Parry et al., 2007).

Flooding is an annual occurrence in large parts of Viet Nam, especially in the Red River and Mekong Deltas. During the months of heavy rainfall, water from the upstream sections of major rivers is added to local precipitation and saturates the earth. Rivers overflow and flood the broad plains of the river deltas. Floods in the Mekong Delta have a low discharge capacity, especially during high tide, and cause prolonged, deep inundation, riverbank erosion, salt intrusion and transportation problems. In the last 20 years, the Mekong Delta has endured several "bigger-than-usual" floods, particularly in 1994, 1995, 1996, 2000, 2001, 2002 and 2011. These high floods cause casualties and severe damage to houses and rice fields (see Tuan et al. (2008) for detailed information on the damage caused by different floods). During the fieldwork activities for this report, the Mekong Delta was experiencing the highest flood levels for 10 years, and the research area (Hung Thanh Commune) was entirely flooded, except for a small, elevated strip along the provincial road that crosses the commune. It should be noted that floods only cause havoc when they are beyond a certain level. Dun (2011) puts the mark at three to four metres for her study area in An Giang Province. For example, moderate floods, locally referred to as *ngập nông* (translation: nice floods), contribute to soil fertility and prosperity in the region (Dun, 2011).

Every year, seasonal typhoons – four to six on average – batter the coast before moving inland, causing casualties and material damage. It is anticipated that the number of heavy storms and typhoons to hit Viet Nam will increase both in number and intensity with the progression of global warming (Nguyen, 2007), though the evidence is still considered weak ("low confidence" according to the IPCC, (2012). The worst damage is caused when floods are accompanied by typhoons. Typhoons raise sea levels by many metres and cause storm surges along estuaries, flooding valuable cropland. Typhoons destroy buildings with their high-velocity winds, and generate waves that can damage sea dykes protecting coastal land holdings. The torrential rains that accompany typhoons can cause flash floods, which in turn cause significant damage.

Over the past 25 years, more than 13,000 people have been killed by natural disasters in Viet Nam (World Bank and GFDRR, 2010). Most of these disasters were weather-related. In 1996, a tropical depression of the coast of Thanh Hoa trapped thousands of fishermen at sea and over 600 lost their lives. In the same year, in the mountain province of Lai Chau, the hamlet of Lo Le was washed off the map by a flash flood, and 89 people were killed. In 1997, Typhoon Linda became the worst natural disaster in living memory. Skirting the tip of southern Viet Nam, this claimed almost 3000 lives and caused more than US$400 million of material damage (ibid).

1.3 Other environmental issues

In addition to climate change and climate-related natural hazards, Viet Nam is experiencing several other environmental pressures. Timber logging and unsustainable farming practices upstream of the Mekong and Red Rivers contribute to deforestation and soil degradation. This reduces the natural water retention capacity of soil upstream, which affects flooding regimes downstream. Dam-building upstream of the large rivers reduces the amount of water that reaches the deltas, and without proper coordination

between the different countries through which the Mekong and Red Rivers flow can cause serious havoc downstream. Water pollution and overfishing threaten marine life populations; population growth and high economic growth put increasing pressure on Viet Nam's forests and biodiversity; industrialization increases the risk of technological accidents and causes contamination of air and water; and rapid urbanization causes a mounting pressure on urban environmental services, such as waste management, in big cities such as Hanoi and Ho Chi Minh City.

1.4 Migration patterns

The "Rainfalls" project primarily looks at internal migration, over relatively short to medium distances, from rural areas to other rural areas, as well as from rural areas to urban areas. A distinction is made between *seasonal migration, temporary migration* and *return migration*. *Seasonal migration* involves annually repeated moves during particular periods of the year. It usually occurs at times of the year when there is less work at home and/or peak demands for labour are elsewhere, often in other rural areas. *Temporary migration* can be defined as a move from the household of origin during a period of at least six months to a place within the country or abroad with the purpose of working, studying or reuniting family, over a distance that compels the concerned person to settle at the destination. *Return migration* is defined as the "return of a once migrated household member over a sustained period of more than a year" (de Haas, 2003: 414).

Migration is not a new phenomenon in Viet Nam. Centuries ago, feudal kingdoms were encouraging southward migration for territorial expansion. During the French colonial period (1858–1954), various types of migration occurred. Circular movement of agricultural workers between rural areas during the transplanting and harvesting seasons was common in this era. Rural–urban migration increased sharply in the 1930s, 1940s and early 1950s because of urban expansion in big cities such as Hanoi, Saigon (Ho Chi Minh City) and Hai Phong. Migration from lowland to upland areas also became more popular during this period because French colonists needed large numbers of labourers for their upland plantations (Anh, 2008; Hardy, 2005). In 1954, after the victory of Vietnamese troops over the French in Dien Bien Phu, Viet Nam was divided into two regions, which made approximately 900,000 people move from the north to the south, and 100,000 from the south to the north (Duiker, 1983).

During the war between South Viet Nam and North Viet Nam (1955–1975), population movement was characterized by substantial regional differences. In the north, people were moved from cities to the countryside to escape bombing, while in the south people in the rural areas were forced to move to urban areas to prevent them from potential contact with Communist forces.

Following reunification in 1975, large-scale movement of southern people to their native villages occurred. In the same period, a large number of people (were) moved from overcrowded metropolitan areas to virgin lands with the establishment of new economic zones (Hardy, 2005). Migration to large cities was discouraged in this period. Until the Doi Moi reform process, which began in 1986, migration flows were heavily controlled by the government through strict implementation of the household registration system (*ho khau*). Essential government rations were only given to people who were officially registered in the area. Migration was further discouraged through very strict permission processes. The onset of the Doi Moi reform process facilitated a diversification of migration flows, as people no longer depended on government subsidies and rationing for their daily necessities. Since the mid-1990s, spontaneous migration has taken over from organized migration as the principal type of human mobility, and rural–urban migration has become more prominent. Millions of Vietnamese have left their villages and settled in cities and industrial zones during this period (Anh, 2008).

The 1999 Household Census showed that migration to urban areas comprised 53 per cent of domestic migration flows, of which 27 per cent migrated from rural to urban areas and 26 per cent from urban to urban areas. Ho Chi Minh City, Ha Noi, Hai Phong and Da Nang were the most popular destinations, but cities such as Can Tho, Long Xuyen and Ca Mau and economic centres such as Quang Ninh, Binh Duong and Dong Nai also became popular migrant destinations (Central Population and Housing Census Steering Committee, 1999). The 2009 census showed an important change in migration patterns, namely, an increase in rural–urban migration *within* provinces, especially in the southeast of Viet Nam. This is related to the establishment of new industrial parks in smaller towns that attract labourers from surrounding rural areas (Central Population and Housing Census Steering Committee, 2010).

The 1999 census also showed that almost *half* (47 per cent) of the total domestic migration flows involve movement to rural destinations. Most of these migrants come from other rural areas. The movement is usually from densely populated areas with low agricultural productivity to more sparsely populated areas with higher productivity. A good example is large-scale migration from the Red River Delta to the Central Highland.

According to the 2009 census, the Mekong Delta Region, in which the research area lies, has become Viet Nam's prime out-migration region. In 1999, the official out-migration rate was 24.59 per 1000 inhabitants. In 2009, the figure had more than doubled, to 56.7 out-migrants per 1000 inhabitants. This data involves people who had officially settled and registered in a different region in the preceding five years (UN Viet Nam, 2010).

Section 2:
Review of available regional data

The fieldwork for this research was carried out in the Hung Thanh Commune, Thap Muoi District, Dong Thap Province and Mekong Delta region. This section provides an overview of available information on rainfall, flood, economy and migration in the area from secondary sources. Most data was found at the Dong Thap provincial level. The survey area (Hung Thanh Commune; see Figure 2) is described in more detail in Section 4.2.

Dong Thap Province is located in the Mekong Delta Region of southern Viet Nam. The Mekong Delta, covering about 40,000 km^2, is a low-level plain. About 10,000 km^2 of the delta are under rice cultivation, making the area one of the major rice-growing regions of the world (Nguyen, 2007). After Thailand, Viet Nam is the second-largest rice-exporting country in the world. Encompassing less than a quarter of the country's population, the Mekong Delta produces 90 per cent of the country's rice exports (Warner et al., 2009).

Sections 2.1 – 2.6 look at climate data, the economy, agriculture and population and migration data for Dong Thap Province.

2.1 Rainfall distribution and trends

The climate in Dong Thap Province is tropical, with a marked wet season from May to November and a dry season from December to April. At the beginning of the wet season, mean monthly rainfall is between 150 and 200 mm and gradually increases each month until it peaks in October at approximately 280 mm. After this peak, rainfall drops sharply in November, and again in December, marking the start of the dry season. In January and February, rainfall is at its lowest, with average monthly amounts

Dong Thap map

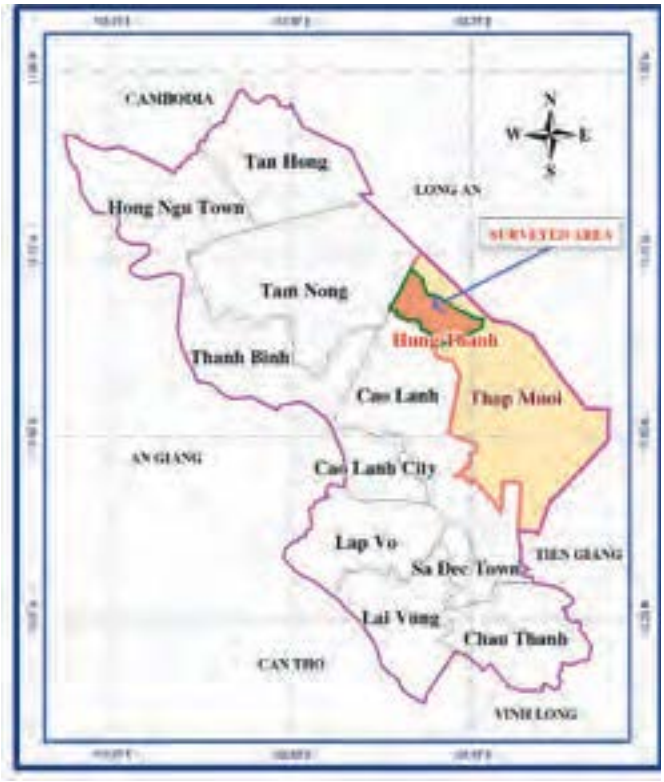

Figure 2: Dong Thap Province and Thap Muoi District. Note: The location of Dong Thap Province in Viet Nam is shown in Figure 1. Source: Tran Dinh Trong.

of less than 20 mm (see Figure 3). The meteorological data collected for this research are from Cao Lanh, which is the capital of Dong Thap Province, located approximately 35 km from the survey site.

Temperatures are relatively stable throughout the year, but in the rainy season temperatures are slightly lower than in the dry season. Average monthly temperatures range from 25 °C to 29 °C, while minimum temperatures range from 22 °C to 25 °C and maximum temperatures range from 30 °C to 33 °C.

Over the past 30 years, the annual amount of rainfall has gradually increased (see Figure 4). The highest amounts were recorded in 1999 and 2000 (just over 2000 mm) and the lowest in 1992 (996 mm). The 10-year inter-annual variability of annual rainfall, calculated as the standard deviation divided by the average, has increased from 10 to 15 per cent in the 1980s to around 20 per cent in the 1990s and 2000s (not shown in Figure 4). This change is in line with perceptions of the people we interviewed in the research area. They noted that rainfall has become less reliable (see Section 5). Increasing differences in the total amount of rainfall pose an important challenge to farmers and fishermen in the area.

2.2 Floods

Every year, large parts of Dong Thap Province are flooded. This occurs when heavy rainfall in the upstream section of the Mekong River is greater in volume than the river's discharge capacity. The flood season normally starts in June or July and ends in November or December. Peak flood levels usually occur in October. Flood levels depend to a large extent on climatic conditions upstream, in Tibet (China), Myanmar, Thailand, Laos and Cambodia. For the overall "Rainfalls" project, it is important to note that the research site for the Viet Nam case study differs from other country studies in that the environmental conditions in which people eke out a living and make their (non-) migra-

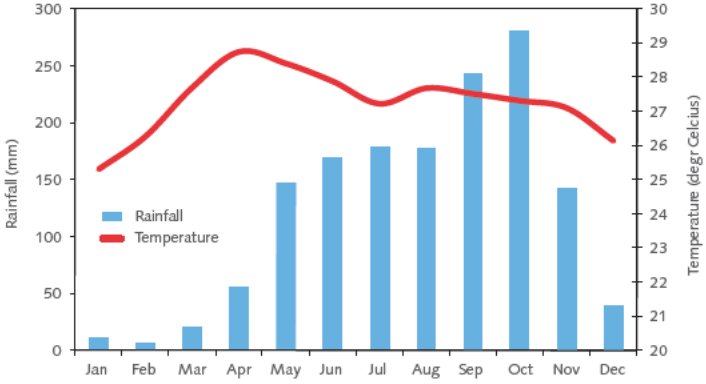

Figure 3: Mean monthly rainfall and temperature in Cao Lanh (1979–2008) Notes: Cao Lanh is the capital Dong Thap Province, approximately 35 km from the survey area. Average monthly temperature data are for 2000–2010.
Source: Cao Lanh Meteorology and Hydrology Station.

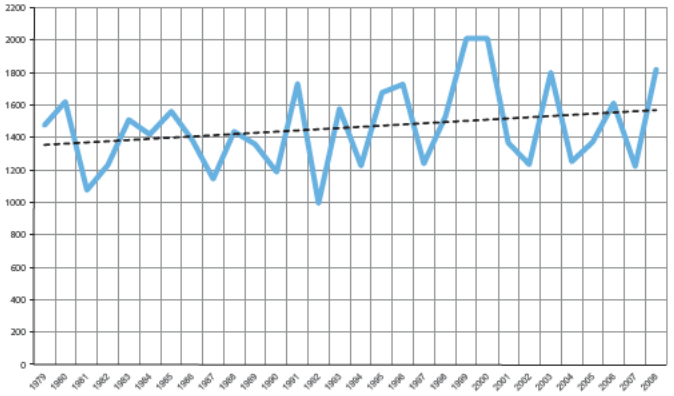

Figure 4: Annual rainfall (mm) in Cao Lanh (1979–2008).
Source: Cao Lanh Meteorology and Hydrology Station.

tion decisions largely depend on rainfall and water management *outside* the confines of the study area. This has implications for the analysis of the core linkages this research examines (rainfall – livelihood – food security – migration) and for the policy recommendations for reducing vulnerability to climate change.

Figure 5 shows average monthly flood levels for Cao Lanh Meteorology and Hydrology Station in two periods: 1991–2000 and 2001–2010. Flood levels are highest from September to November, peaking in October. Figure 5 also shows that flood levels for all months of the year have been lower in the 2000s than in the 1990s.

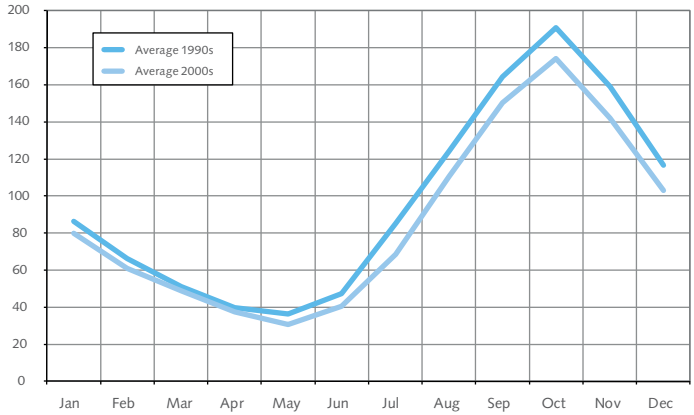

Figure 5: Monthly flood level (cm) in Cao Lanh; changes over past 20 years. Source: Cao Lanh Meteorology and Hydrology Station.

Figure 6 focuses on flood levels in the peak flood months (September to November). It confirms that flood levels in these months are decreasing. This might seem surprising because the total amount of rainfall shows a rising trend. Lower flood levels in the 2000s are probably related to more water retention upstream. This is because several large dams have been constructed in the Mekong River in recent decades. The highest flood levels were reached in 1995 and 2000. Data for 2011 were not yet available, but flooding was very serious in that year, similar to the floods of 2000. The lowest levels occurred in 1998 and 2010.

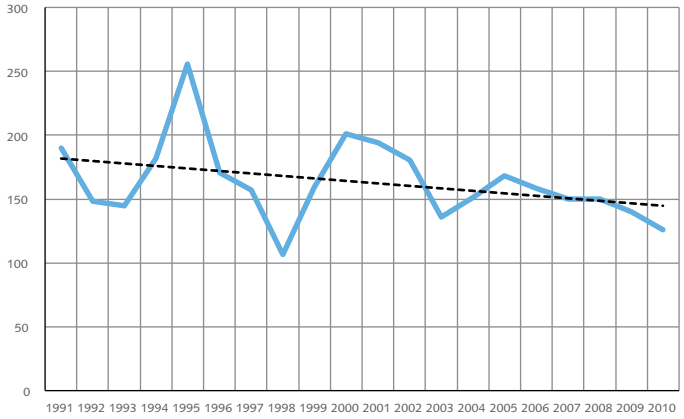

Figure 6: Mean flood level (cm) in Cao Lanh, September to November (1991–2010). Source: Cao Lanh Meteorology and Hydrology Station.

2.3 Seasonal shifts in rainfall

Figure 7 shows the average monthly rainfall for two decades: from 1989 to 1998 and from 1999 to 2008. The figure reveals that, in the last decade, there has been substantially more rain at the start of the rainy season (April–May); the month of July has been drier, possibly with more severe dry spells; and all dry season months have experienced higher rainfall. Another conspicuous difference between the two decades that are compared in Figure 7 concerns the month of October. From 1999 to 2008, average monthly rainfall was 80 mm higher than in the previous decade. These changes tally closely with perceptions of changing

rainfall patterns discussed in Section 5. Figure 7 further shows that the inter-annual variability of monthly rainfall has increased in six out of nine months. The largest increases were recorded for the months of April, July and December. This is consistent with people's perception that rainfall has become less predictable (see Section 5).

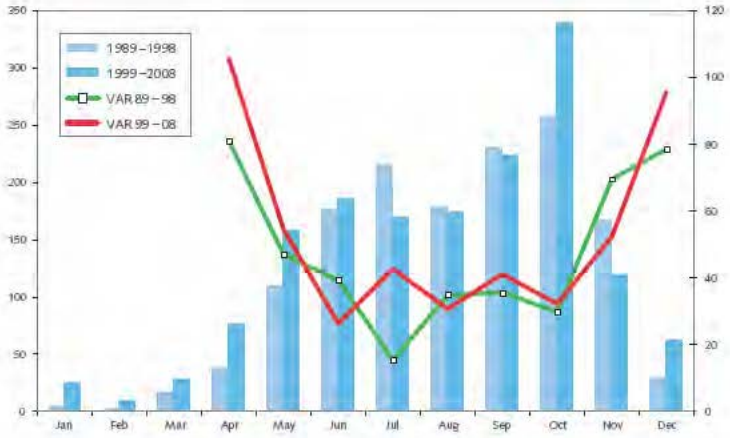

*Figure 7: Changes in monthly rainfall and inter-annual variability in Cao Lanh (1989–2008). Notes: Inter-annual variability is calculated as STDEV/AVERAGE * 100%. Inter-annual variability is only shown for months with substantial rainfall (April – December). Source: Cao Lanh Meteorology and Hydrology Station.*

2.4 Economy

Agriculture is the pillar of Dong Thap's economy, but it is slowly losing ground to industry and services. In 1995, agriculture still contributed 71.58 per cent to provincial GDP. In 2010, its contribution had dropped to 48.77 per cent. Over the same period, the contribution of industry and construction to GDP increased from 8.79 to 22.99 per cent, and services from 19.63 to 28.24 per cent (Dong Thap Statistical Office, 2011). The most important industrial zones of the district are in Sa Dec, Song Hau and Tran Quoc. These have attracted large numbers of labourers and businesspeople from within the province and elsewhere. Stimulating industrial growth and encouraging industrial activities to spread from the largest cities to provincial towns is an important strategy of the Vietnamese government. Although this may not be the main objective, the country can reduce its vulnerability to climate change by becoming less dependent on agriculture. However, it is not always clear whether industrial zones are planned in safe, flood-proof locations.

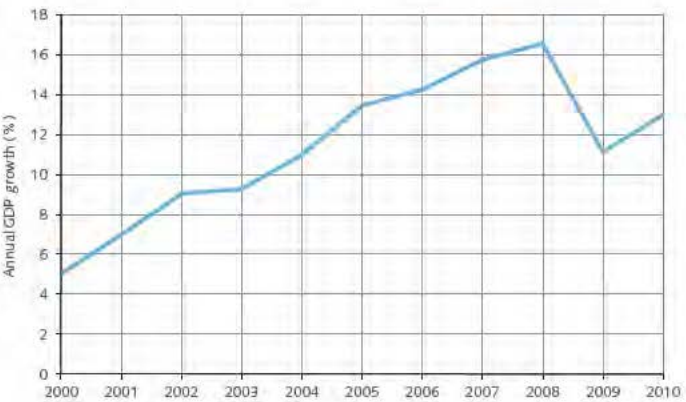

Figure 8: Annual GDP growth in Dong Thap Province at constant prices (2000–2010). Source: Dong Thap Statistical Office (2011).

In the 2000s, the province experienced strong and increasing GDP growth, from 5.04 per cent in 2000 to 16.56 per cent in 2008. In 2009 and 2010, GDP growth was lower, but still above 10 per cent (see Figure 8).

This is important to take into account when studying the influence of changing rainfall patterns on livelihood, food security and out-migration. Local livelihoods may be affected by increasing climate variability, but high economic growth and rapid development are probably more powerful forces in shaping migration decisions.

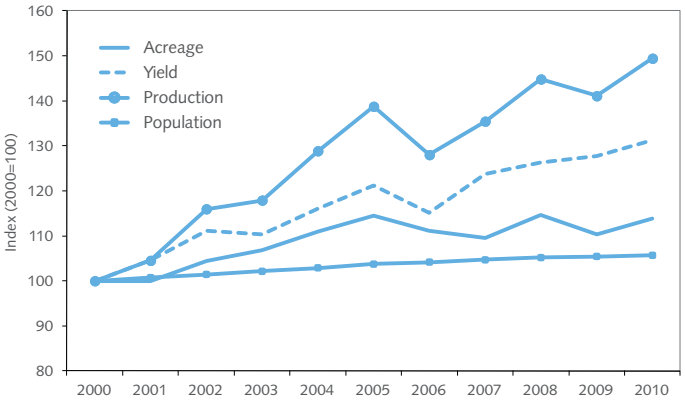

Figure 9: Rice production in Dong Thap Province (2000–2010)
Source: Dong Thap Statistical Office (2011).

2.5 Rice production

As mentioned above, much of the local economy in Dong Thap Province relates to primary production. In 2010, 73.3 per cent of the land area was used for agriculture[1]. Within the agricultural sector, paddy rice cultivation is by far the most important activity, occupying 88.7 per cent (218,857 ha) of all agricultural land in 2010. Over the past 10 years, no increase in paddy land has been discernible (Dong Thap Statistical Office, 2011). However, cultivation has become more intensive, allowing for several paddy harvests per year.

Figure 9 shows a steady increase in paddy production over the past 10 years. This growth is much faster than the growth of the population (also shown in Figure 9). Productivity growth results from higher yields (from 5 to 6 ton/ha) and – to a lesser extent – higher frequencies of cultivation (from 1.85 to 2.14 harvests per year). Higher yields result from the use of improved seed varieties, improved techniques and increased use of fertilizer. In 2010, the province produced a total of 2807 billion kg of rice, which amounted to about 1750 kg per capita.

The area cultivated with fruit trees and annual crops other than rice amounts to only 11.3 per cent of total agricultural land in Dong Thap Province. The main fruit crops are mango, longan and citrus. The main annual crops besides rice are maize, soya bean, sesame, sweet potatoes, vegetables and beans. Livestock also plays an increasingly important role in the economy of Dong Thap Province. Its contribution to total agricultural output increased from 7.75 per cent in 1995 to 11.28 per cent in 2010. The principal animals kept are pigs, poultry (including ducks) and, to a lesser extent, cattle (ibid).

2.6 Population and migration

In 2010, Dong Thap had a total population of 1,670,493 inhabitants and a population density of 496 inhabitants per km^2. This is substantially higher than the national average of 259 inhabitants per km^2. Over the past 15 years, population growth[2] in Dong Thap Province has slowed down from about 1.5 per cent per year to about 0.5 per cent (Dong Thap Statistical Office, 2011). This is the result of a decrease in natural population growth and the net-migration rate (see Figure 10). Net-migration rates[3], calculated

1 The Dong Thap Statistical Yearbook (2010) mentions the following other land uses: unused land (9.7 per cent), specially used land (8.4 per cent), homestead land (4.9 per cent), forest land (2.3 per cent) and water surge area (1.4 per cent).

2 In 1995, Dong Thap had a population of 1,478,494 inhabitants.

3 The Dong Thap Statistical Year book (2010) does not report in-migration and out-migration rates.

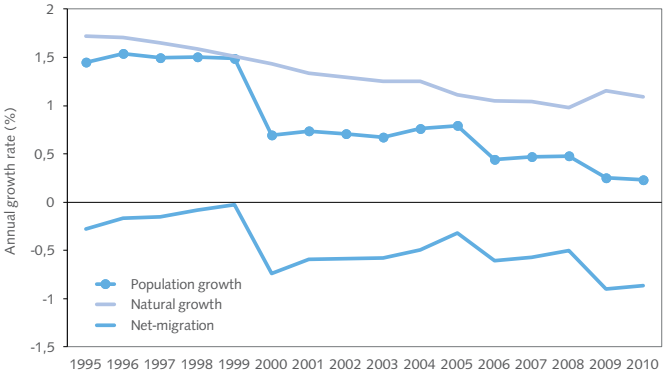

Figure 10: Annual population growth and migration rate in Dong Thap Province (1995–2010). Note: The annual net migration rate is calculated as the difference between total annual population growth and natural annual population growth. Source: Dong Thap Statistical Office (2011).

as the difference between total population growth and natural population growth (births and deaths), reduced from - 0.1 per cent in the late 1990s to - 0.6 per cent in the 2000s. In absolute numbers, in the 2000s, out-migrants outnumbered in-migrants by approximately 10,000 every year. In reality, this figure might be much higher because it excludes migrants who do not pass through the legal and administrative procedures connected to temporary change of residence (UN Viet Nam, 2010).

The year 2000 seems to have been a turning point. In that year, net-migration decreased from close to zero to almost - 0.74 per cent, after which it remained low (because of high out-migration rates) at - 0.5 to - 0.9 in most years. In 2000, Dong Thap experienced major floods. It could be that people lost their harvest and other assets and were forced to seek their fortunes elsewhere. The findings from Hung Thanh Commune, which are presented in this report, suggest that developments in the 2000s contributed to out-migration, such as concentration of agricultural land in the hands of fewer farmers, changing rainfall patterns, mechanization and increasing demand for industrial labour outside the province.

Between 1995 and 2010, the urbanization rate of Dong Thap Province increased from 13.1 to 17.8 per cent (Dong Thap Statistical Office, 2011). This is still substantially lower than the national average of approximately 30 per cent. The three largest urban centres in Dong Thap Province are Cao Lanh City, Sa Dec Town and Hong Ngu Town. The urban population has been growing much faster than the rural population. The establishment of industrial zones in provincial urban centres has created this development to a large extent. Instead of migrating to distant cities like Ho Chi Minh City, people increasingly find employment in urban centres nearby. Figure 11 shows that urban growth rates decreased sharply in the late 2000s, but it is not clear what caused this trend.

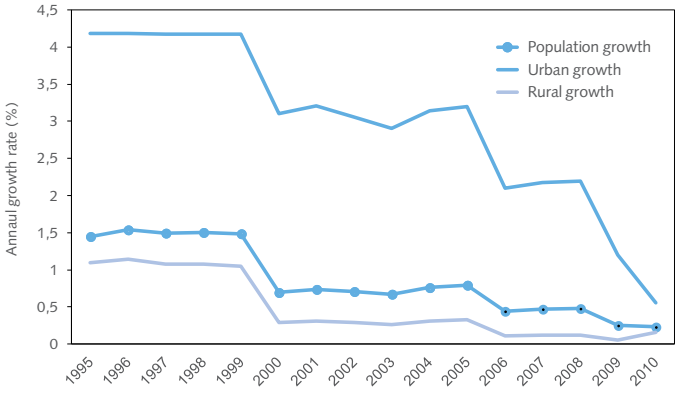

Figure 11: Rural and urban population growth in Dong Thap Province (1995–2010). Note: The Statistical Office defines urban population as people living in places with > 4,000 inhabitants. Source: Dong Thap Statistical Office (2011).

Figure 12: Photographic impression of the main research tools. PRA session (left side), expert interview (upper right corner), household survey (lower right corner). Source: Kees van der Geest.

Section 3: Methodology

3.1 Methods

This research employs a number of methods, including three main tools: household survey, PRA and expert interviews. Each method was pre-tested prior to the actual fieldwork. In addition to the three core methods, secondary data was collected from government agencies at different levels (local, district, provincial and national).

The research team consisted of one international researcher, three senior researchers, four junior researchers, one facilitator of CARE International in Viet Nam and two local facilitators. In addition, one representative of the Provincial Department of Natural Resources (DoNRe) joined the team in the field on several occasions. The fieldwork started on 16 October 2011 and lasted until 3 November 2011. Figure 12 gives a brief photographic impression of the main research tools in practice.

3.1.1 Household survey

The household survey consisted of a questionnaire that was administered among 150 households in three of the five villages of Hung Thanh Commune. It took a team of four surveyors, coordinated by one of the senior researchers, eight working days to reach the target of 150 households. On average, the interviews lasted one hour and 15 minutes. The questionnaire was designed for the eight country studies of the broader "Rainfalls'" project (Rademacher-Schulz et al., 2012). Prior to the survey, the questionnaire was translated into Vietnamese.

Table 1 contains some key demographic characteristics of the surveyed households. The data in Table 1 is arranged at village level. Section 4.2 will describe the survey sites in more detail. In Hung Thanh Commune, most households are male-headed (93.3 per cent). To avoid gender bias in our findings, we interviewed the wife of the household head in 57 of the cases. Before deciding to do this, we asked several villagers and Commune People's Committee (CPC)) staff whether wives are usually well informed about household resource allocation and decision-making. All of them confirmed that this is the case and some added that wives are often even more informed about household affairs than men. The total number of female interviewees was 67 (44.7 per cent), including 10 female household heads. For the selection of the 57 women who were not the household heads, no formal criterion was used. Their selection was based on availability. However, in the process, the number of women interviewed was monitored in order to ensure close to 50 per cent female respondents.

Table 1 shows some findings from the household survey related to poverty, land ownership and migration. It reveals that there are considerable differences between the three villages the researchers surveyed. The households interviewed in village 1 were clearly less well-off in terms of income and land-holding than the households interviewed in village 2 and, especially, in village 3. This is also reflected in their reasons for migration: in village 1 over 80 per cent of the migrants moved for economic reasons, while in village 3, migration for education was also common. Household data gathered by the commune authorities confirms that village 1 has the highest proportion of poor households.

Households interviewed	Village 1	Village 2A	Village 3	Total
Female-headed households	33	58	59	150
Female interviewees	2	4	4	10
Average age of the interviewees	16	27	24	67
Average household size (persons)	44.9	45.1	43.5	44.4
Average years of schooling of household head	4.1	4.3	4.1	4.2
Average years of schooling of household members aged 14+	5.0	4.2	5.8	5.2
Average monthly income/cap (US$)	6.0	6.3	7.1	6.7
Households below poverty line: • National (350,000 VND/cap/month) • International (US$1/cap/day)	53 7 (25%) 12 (42%)	60 11 (19%) 23 (40%)	70 6 (12%) 17 (33%)	62 24 (17.5%) 52 (38%)
Number of landless households	11 (33%)	18 (31%)	17 (29%)	46 (31%)
Number of land-scarce households (0.1–1.0 ha)	11 (33%)	14 (24%)	14 (24%)	39 (26%)
Average farm land-holding (ha)*	1.5	2.5	2.9	2.4
Households with migrants**	18 (55%)	39 (67%)	33 (56%)	90 (60%)
Main purpose of migration (%) Work Education Other	 84 10 6	 77 14 9	 60 32 8	 73 19 8

*Table 1: Key characteristics of surveyed households. *Calculated over households owning land. **Economic migrants are people who moved for work purposes, in contrast to those who moved for education. In the questionnaire survey, the purpose of migration was queried for each migrant. Source: Household survey (2011).*

3.1.2 Participatory Research Approach

The PRA consisted of group work in two-to-three hours sessions in which different aspects of climate, livelihood, food security, poverty and migration were discussed with local people. A total of 34 sessions were carried out, with groups of eight people on average. Examples of PRA exercises were: transect walks, resource mapping, wealth ranking, timeline of important events, risk ranking, perceptions of climate change, seasonal livelihood calendar, construction of Venn diagram on food security, mobility mapping and focus group discussions on coping with and adapting to climate change. A full list is provided in Annex I. In the selection of participants for PRA sessions, gender, age, wealth status and occupation were taken into consideration. Details of participants are provided in Table 2.

Number of sessions	34
Total participants	264
Poor (%)	37
Average age	41
Female	134
Farmers	244

Table 2: Description of PRA participants.
Source: Household survey (2011).

3.1.3 Expert interviews

A total of 15 expert interviews were held, of which two were at the national level, four at provincial level, four at district level and five at commune level. The experts were mostly people who worked within organizations and institutions involved in the environment, agricultural production or socio-economic development. Others were people with in-depth knowledge of the research site. The interviews were semi-structured. A topic list with questions about climate variability, livelihood, food security, human mobility and the interplay between these themes was used. The expert interviews were usually held with individuals, but in some cases they took the form of focus group discussions (e.g., at district and provincial headquarters of DoNRE). A list of expert interviews is provided in Annex II.

3.2 Research limitations and practical challenges

The research in Viet Nam benefitted from a detailed research protocol and field guide (Rademacher-Schulz et al., 2012), developed for the wider "Rainfalls" project and implemented in eight country studies. However, as with any research, this study has its limitations.

The first limitation derives from the timing of the research, which was conducted in the aftermath of the worst flood in 10 years. The whole commune was inundated except for the houses along the elevated main road. Information from informal interviews in Hung Thanh Commune revealed that the 2011 floods were at their highest point in early October. During the two weeks that the research team spent in the field (late October and early November), the water level gradually receded. No atmosphere of widespread disaster was evident in the community, but many houses off the main road were still partly under water and food aid was distributed to the poorest households in the area. The people living in inundated houses tended to stay put rather than opting for temporary relocation. Although some may have

had no alternative, a common reason for people to stay in their houses was to protect their property and belongings and to be able to look after their fish cages.

For ethical and security reasons, the team was not allowed to travel by boat to interview households who were busy coping with or recovering from the floods. Only houses along the main road could be reached overland. Therefore, and because pure random sampling was not possible (see below), the sample of households we interviewed cannot be called statistically representative for Hung Thanh Commune. In order to reduce this bias in the sample, researchers interviewed heads of households living in flooded areas when they accompanied their children to school by boat or when they came to the commune for shopping and other activities. In site selection, the methodology of the "Rainfalls" project distinguishes between a centrally located base camp village and more remote and usually smaller satellite villages. In the case of the Viet Nam study, this distinction could not be maintained because the settlements along the only reachable road were all similar in terms of size and accessibility.

Random selection of households was not possible because so many houses were flooded at the time of the survey. Local authorities do have a list of all (2000+) households in the commune and in each of the five villages, but there was not enough time to determine exactly which of these households could be reached. This would have been necessary to create an adjusted framework for random sampling. Instead, the survey team explained to local authorities that the questionnaire respondents should reflect the population of the area in terms of socio-economic status, age, gender and occupation. Two staff members of the CPC were assigned on a full-time basis to assist the research team in selecting households. It is not entirely clear whether the two CPC staff had their own selection criteria in addition to the criteria they were provided with beforehand. However, ultimately, the survey team had the impression that the sample was quite representative of different types of household, especially with regard to wealth status. This impression was based on observation of tangible wealth indicators, such as the quality of houses and means of transport. Still, the authors acknowledge that the lack of randomness in the selection of households makes the survey results less reliable.

A second limitation is related to the time and resources available for the research. The team – consisting of 10 members – had only a few weeks for fieldwork. This was deemed sufficient to conduct an in-depth study of the climate–livelihood–migration nexus in a very limited geographic area. The selected study site is representative for upper delta localities, but for a better understanding of the relationship between climate, livelihood and migration in Viet Nam, similar studies would need to be carried out in upland, lower delta and coastal localities. In such places, the situation is different and, in some cases, more pressing. Floods in upland areas usually occur in a less predictable manner and are more forceful, resulting in land erosion, loss of property and often loss of life. The lower lying delta areas and places that are located on the coast are facing problems of salinization (salt water intrusion) and other direct threats presented by sea level rise.

The third limitation is related to the core questions and methodology of this research, which looks at how rainfall variability affects people's livelihoods, food security and migration patterns. In the Vietnamese study area, local livelihoods and migration patterns are largely influenced by rainfall patterns and trends outside the research area, upstream of the Mekong Delta. The main independent variable (rainfall variability) in this research was studied locally, using rainfall data from a nearby weather station and qualitative data on perceptions of changes in the local rainfall pattern. A strong link between rainfall, livelihood and migration may exist but the scope of this research did not allow capturing all the scales at which the relationships operate.

The fourth limitation is related to the household survey instrument. The household survey was designed for research in highly diverse ecosystems and areas with widely varying socio-economic

conditions in the eight countries featured in the "Rainfalls" project. Inevitably, not all sections of the instrument used were equally relevant to the study area and some issues that are of relevance to this particular study area were not covered adequately by the questionnaire (e.g., resettlement and aquaculture).

The fifth limitation was the availability of statistical data at commune, district and provincial levels. Detailed data exist but were difficult to access as authorities were not always willing to share these with the team or they needed more time to prepare the data. This was particularly problematic at the onset of the fieldwork when we needed a list of households and their locations for random sampling. The authorities said that it would take weeks to compile such a list. Because of the limited time available for the fieldwork, researchers had to refrain from random sampling and resort to purposive sampling.

Throughout the research, efforts were made to involve local, district and provincial authorities in the research activities and to inform them about the project's objectives and data needs. Local authorities provided two facilitators who assisted the team in the selection of households for the survey and participants for the PRA sessions. A high-ranking officer of the Provincial Department of Agriculture and Rural Development joined the research team in the field several times. After finishing the fieldwork, the senior researchers presented the preliminary findings to provincial authorities. Ultimately, the cooperation was quite fruitful and researchers assessed that they had obtained most of the data needed, except for reliable migration statistics.

Section 4:
Introduction to the case study area

4.1 Criteria for selection

A matrix with nine criteria was used to select a site for this research. The criteria were mostly related to rainfall variability, dependence of local livelihoods on natural resources, migration propensities and some practical criteria such as travel distance and presence of CARE activities in the area. Lastly, it was important that the activities of the research team did not coincide with peak labour demands in the agricultural cycle. Hung Thanh fitted all the criteria. However, the area is located in the higher parts of the Mekong Delta, at about 135 km from the coast, and is less threatened by sea level rise and salinization than other parts of the delta. Moreover, Hung Thanh is a major rice-producing area and productivity has increased substantially over the past decade. Low food security is not a major issue for most households in Hung Thanh Commune. Distress migration as a result of climate change, salinization and extreme weather events may be more common in other parts of the Mekong Delta (e.g., Ben Tre Province). Still, as will become clear in the rest of this report, there are important developments in the area that interplay with climate variability to push people to migrate to urban centres. Prominent among these are increased landlessness and the mechanization of agriculture.

4.2 Description of survey site

Hung Thanh Commune is a typical rural settlement of the Mekong Delta Region, where rice cultivation and fishing are the main sources of livelihood. An elevated tarmac road (No. 844), which was completed in the mid-2000s, passes through the commune and provides dry ground for building houses. The road also attracts small businesses, such as shops and cafés. On both sides of the road are rice paddy fields, which were inundated at the time of the research.

Hung Thanh Commune consists of five settlements: village 1, village 2a, village 2b, village 3 and village 4. Village 2a is the centre of the commune, where the commune office, primary school, secondary school, clinic and local market are located. Pupils can attend school in the commune up to age 15. Those who want to further their education have to move to the district capital My An, 25 km from the commune. The market of Hung Thanh (see Figure 14) is quite small and primarily serves local clients. Most of the goods sold in the market are foodstuffs (fish, meat, vegetables and condiments), with a few shops selling clothes, medicines and simple utensils.

Villages 1, 2a and 3 were selected for our research[4] (see Figure 13). The choice of these three villages was made after discussions and consultation with local authorities who informed us that village 2b could not be reached overland and that researchers could only access a limited number of houses in village 4. The commune has a total of 8745 inhabitants belonging to 2,105 households. It shares borders with Truong Xuan Commune to the east, Cao Lanh and Tam Nong districts to the west, and Truong Xuan and Thanh Loi Communes to the north. The total land area of Hung Thanh Commune is 5812.44 ha, of which over 80 per cent is used for rice cultivation (4,795 ha). Other land uses are aquaculture (261 ha), forest (253 ha) and residence (503 ha).

4 The villages of Hung Thanh Commune are not named but they are numbered.

Surveyed Area Map

Figure 13: Research area: Hung Thanh Commune
Note: The coloured villages were studied for this research.
Source: Tran Dinh Trong.

The population density is 150 inhabitants per km^2 (data provided by the CPC. Figure 14 gives a brief photographic impression of Hung Thanh Commune during the flood season.

All inhabitants of Hung Thanh Commune are Kinh Vietnamese. This group constitutes 93.3 per cent of the population in Dong Thap Province (Dong Thap Statistical Office, 2011). At commune level, no data was available on religion. In the sample of 150 households, 52 per cent indicated that they had no religion; 41 per cent were Buddhist; 4 per cent were Caodaist; 2 per cent followed the Hoa Hao tradition; and 1 per cent was Protestant. There was quite a marked difference between villages: in village 3, almost two-thirds of the population was not religious, while in village 2a, the proportion was about one-third. Village 1 took an intermediary position.

Figure 14: Photographic impression of Hung Thanh Commune: Hung Thanh market (page 40), flooded graves (page 41, left), fishing for this evening's meal (page 41, upper right corner), dyke (middle right corner), water lilies drying on the main road (lower right corner), flooded houses (page 42/43).
Source: Kees van der Geest.

Section 5: Rainfall variability

Section 2 discussed changes in rainfall patterns and flood levels based on data from the Provincial Meteorological Station in Cao Lanh (approximately 35 km from the Hung Thanh Commune). In this section, findings on local people's *perceptions* of climate change and flood levels are presented.

5.1 Rainfall distribution and trends

People's perceptions of changes in the local climate are quite detailed and diverse. However, four perceptions of change over the past 10 to 20 years stood out in the PRA sessions: (1) the rainy season comes earlier and lasts longer; (2) total rainfall has increased; (3) there are more extreme weather events now; and (4) the climate has become less predictable.

The household survey asked whether or not respondents had observed any changes in rainfall over the last 10 to 20 years. The vast majority (139 out of 150) did perceive changes. Only one respondent saw no change at all, and 10 said that they did not know. The diverse answers to this open-ended question were similar to findings from the PRA sessions. According to most respondents, the total amount of rainfall has increased; the rainy season lasts longer; rainfall has become less predictable; and the occurrence of extreme weather events, such as thunderstorms, has increased. In several follow-up questions, respondents were asked about their perception of specific changes. The results are shown in Tables 3 and 4.

	More drought /dry spells?	More flood?	More heavy rain?	More extreme weather events?
Yes, a lot more	10	5	5	14
Yes, more	76	123	124	115
Same as before	33	11	14	3
No, less than before	5	3	1	1
Not existed at all	17	0	0	0
"Don't know"	5	4	3	5
Missing values	4	4	3	12
Total	150	150	150	150

Table 3: Perception of climatic changes over the last 10 – 20 years. Source: Household survey (2011).

What is clear from Tables 3 and 4 is that people perceive that the total amount of rainfall as well as the length of the rainy season has increased. This is in line with the meteorological data presented in Section 2. People also noted an increase in the occurrence of heavy rainfall events. The findings on droughts and dry spells are less clear. When people were asked directly whether or not such events had become more common, half of them answered in the affirmative (see Table 3). However, when they were asked to indicate the major changes in rainfall patterns (without specifying the specific categories), only 22 mentioned longer dry spells (see Table 4). Table 3 also shows that people felt that flooding was more severe nowadays compared to 10 to 20 years ago. This finding is contrary to the flood level data from the meteorological station in Cao Lanh, which showed a decreasing trend in flood levels (see Section 2). It is quite plausible that the big floods of 2011 influenced this perception. In the category "*other*", most respondents perceived an increase in the occurrence of heavy rains accompanied by strong winds/storms and thunderstorms.

5.2 Floods

The focus group discussion on flood changes revealed that the flood season is currently perceived to start and end later. Peak flood levels are also perceived to occur later than they did before the year 2000 (see Table 5). The timeline exercise further revealed that people remember three years (1978, 2000 and 2011) in which the whole commune was inundated except for the narrow strip of land along the elevated road.

Rainfall change	Yes
Longer rainy seasons	92
Shorter rainy seasons	2
More rains	120
Longer dry spells	22
Shorter dry spells	3
More dry spells	1
Other	24

Table 4: Perception of rainfall changes over the last 10–20 years. Source: Household survey (2011).

Before 2000	2000–2011
Flood time came earlier, usually late May	Flood time comes later, usually early June
Flood time ended earlier, usually in October	Flood time ends about 15 days later, early November
Peak flood level was usually reached in September	Peak flood level usually occurs in late October

Table 5: Perceptions of flood changes: Source: PRA.

The PRA session on livelihood risk ranking revealed that the ideal flooding regime for most households in the area is one in which flood levels are not too high (causing damage to houses and other property) and not too low (not enough sediment and fewer fish), and one in which rain falls more gently – without heavy winds that blow rice plants down, and without thunder and lightning that make it difficult for people to go out and work.

Section 6: Livelihood and food security

6.1 Sources of livelihood

Households in the Hung Thanh Commune are highly dependent on agricultural production. Paddy rice is the main crop, with two annual harvest cycles. The PRA session on cropping patterns and expert interviews revealed that, before the mid-1990s, people in the commune only had one rice harvest per year. Since the late 1990s, the government has invested heavily in the development of irrigation in the area, the introduction of new rice varieties and the application of modern farming techniques. The crop period has been shortened to three months, which enables several rice crops a year and results in higher production. The first crop (Dong Xuan crop) starts in November and is harvested in February, while the second crop (He Thu) is grown from March to June. July to November is the flood period, so less farming occurs. In some parts of the commune a third crop (Thu Dong) can be grown because of a recently constructed farm dyke system that prevents fields from being flooded and helps to irrigate farm land during the dry season. Farmers who grow a third crop have different timing for planting and harvesting rice: the first crop (Dong Xuan) is planted in October and harvested in January; the second (He Thu) is planted in late January and harvested in April; and the third (Thu Dong) is planted in April and harvested in July.

According to the Hung Thanh Commune report of 2011, average rice productivity is seven tons per hectare in the first crop (Dong Xuan), five tons in the second (He Thu) and six tons in the third (Thu Dong). The higher yields in the first crop, as local people

explain, result from soil enrichment after the flood period (August to November). Lower yields in the second crop result from drier, hotter conditions and crop diseases. Apart from rice, some households plant lotus, water lemon or taro during the second rice crop (He Thu) when rice yields are relatively low. This is a new practice that people learned very recently from farmers in An Giang, a neighbouring province. It brings additional income and enriches the diet. Moreover, it is a risk-spreading strategy. Unfortunately, at the time of writing, the local government does not have data on these crops.

Rice farming is mostly carried out with manual labour (planting, weeding, pesticide spraying). However, combine harvesters were introduced in the commune in 2008 and are gaining popularity, especially among large-scale farmers. Young people in the area are increasingly abandoning rice farming to work in industrial zones or in non-farm jobs. For them, these activities are more interesting, more promising and less tedious than the hard, physical labour on the farm. Middle-aged people do most of the farm work, and machines are gradually replacing manual labour (information from the Hung Thanh Commune report of 2011).

Fishing is a secondary income source for local people, especially during the flood season when there is less farm work. Fishing is practised in two forms: (1) net/rod fishing in local canals, lakes, rivers and flooded rice fields; and (2) aquaculture. The flood period is the best time for fishing and all respondents of the household survey affirmed that they derive food or income from fishing in the flood season. Findings from local expert interviews and PRA sessions also support this statement. During the survey period, the research team observed trucks coming from neighbouring areas to the commune to purchase fish from local people. Some people just fish around their house for their meals, while others use boats to go fishing on their flooded rice fields, typically at night. In the PRA sessions, people estimated that one person can earn about 200,000 Vietnamese Dong (VND; US$10) per trip. Fish-raising (aquaculture) is also widespread in the Hung Thanh Commune. Many people in the area have cages in which they keep fish for sale. The household survey did not include separate questions on fish-raising so exact numbers are not included[5]. However, we know from the PRA sessions and informal conversations that it is common for households in the area to raise between 1,000 and 5,000 fish per season. Cat fish and mud fish are the most commonly cultivated types. The fish are fed with purchased feed and small fish. In addition to fish cages, which were relatively small-scale, local expert interviews revealed that approximately 15 households in the commune have shrimp farms. These were relatively wealthy households who could afford the high investment needed to start such an enterprise. Some households also raised frogs.

Local farm labour is an important source of income for landless and land-scarce households in the community. They sell their labour to wealthy farmers with large paddy fields, both in the village and in neighbouring communes, who do not undertake farm work themselves. Also, landless and land-scarce households assist medium-scale farmers during times of peak labour demand. They primarily sell their labour during planting and harvesting periods, which usually lasts for two weeks per crop. The average daily wage is around 80,000 VND (US$4) for women and 100,000 VND (US$5) for men. In times of emergency or food shortage, poor/landless households often call on the wealthier households with whom they have an employment relationship to ask for loans. Such loans are usually short-term, with an interest rate of 5 per cent per month. This is quite high compared to the bank rate of 1.5 per cent per month (PRA and expert interviews).

5 The questionnaire contained some questions about fishing, but not about fish cultivation. With hindsight, the questions on livestock production could have been used to collect information about aquaculture. In an open question about the three main sources of income for households (Question 802), only seven mentioned aquaculture. In addition, four households mentioned fish-raising among "other sources of income" (Question 801).

N = 150	Source of income now (households)	%	Source of income 10 years ago (households)	%	Change (%)
Agriculture	97	64.7	110	73.8	–9.2
Farm labour	67	44.7	72	48.3	–3.7
Fishing	48	32.0	55	36.9	–4.9
Livestock	37	24.7	46	30.9	–6.2
Trade/business	31	20.7	23	15.4	5.2
Remittances	26	17.3	4	2.7	14.6
Renting out land	13	8.7	0	0.0	8.7
Salary	8	5.3	4	2.7	2.6
Aquaculture	7	4.7	3	2.0	2.7
Factory labourer	5	3.3	2	1.3	2.0

Table 6: Changes in principal income sources at the household level. Notes: Each households could mention up to three income sources; percentages for "income sources 10 years ago" were calculated for 149 households because of one missing value. Source: Household survey (2011).

It is quite common for people in the Hung Thanh Commune to supplement income by migrating to work outside the area. Within the sample of 150 households, there were 90 households with at least one member who had migrated at some point. Over two-thirds (69.6 per cent) of all migrants moved for work. Off-farm jobs are a relevant source of income for those who are landless, land-scarce and/or poor. PRA sessions and expert interviews revealed that monthly income for industrial jobs in destination areas like Ho Chi Minh City and Binh Duong is around 2,000,000 to 3,000,000 VND (US$100–150). Calculated per day, industrial wages are quite similar to what a farm labourer can earn in the Hung Thanh Commune (US$4–5/day). However, demand for farm labour is unstable. Besides migration for work in industrial jobs, people also migrate from Hung Thanh seasonally for farm work and fishing, usually within the province. Less than a quarter of the households surveyed (22.7 per cent) received remittances.

About 20 per cent of the households in the survey sample mentioned trading and non-farm activities as one of their three main income sources. Examples are small businesses like cafés, restaurants, retail shops, beauty salons, mechanic shops or other services. Others were street vendors and lottery ticket sellers. People from outside the community who own some businesses commute back and forth daily between their home and the commune.

Table 6 shows the changes in households' principal income sources over the last 10 years. A clear finding from this analysis is that income sources are becoming more diverse. The income sources that were most common 10 years ago (agriculture, farm labour, fishing and animal husbandry) are slowly losing importance. More and more households derive income from other sources, such as remittances, local non-farm activities, renting out land, aquaculture and salaried employment. The sharpest increase was found in remittances, which is an indication that migration is becoming more common.

6.2 Food security and coping strategies

According to local experts, food shortage is not common in the Hung Thanh Commune. The commune is located in the prime rice-producing area of Viet Nam. For those who have farming land, the two-crop farming system provides sufficient food for consumption and sale. For those who are landless, there are alternative economic activities, such as farm labour, fishing and trading, which generate money to buy food. The local experts further emphasized that, in addition to having enough of the staple food rice, people also have access to a high quality and nutritious diet because of the availability of vegetables and fish in the commune.

Just like the expert interviews, findings from PRA sessions indicate that food security is not a major problem in the commune. Some households do face occasional food shortage, but such periods tend to last only for a few days. Moreover, those who face a shortage can quite easily gain access to food and money by borrowing from neighbours and relatives who they repay when being able to do so. Kinship and neighbourhood are the two important features of social support networks in the research area. In addition, government agencies and non-governmental organizations (NGOs) sometimes provide a safety net through loans and food aid.

Contrary to the expert interviews and PRA sessions, the findings from the household survey indicate that a sizeable group of households regularly face problems accessing food. Almost half of the respondents had experienced food shortage in the last 12 months, and almost one in four in the past seven days (see Table 7).

Food shortage in the…	Landless (%) N = 46	Land-scarce (%) N = 39	Owning > 1 ha (%) N = 65	Total (%) N = 150
… past 7 days*	50.0	25.6	4.6	24.0
… past year	80.4	51.3	10.9	43.0
… past 5–10 years	89.1	82.9	30.4	66.1
Inadequate food intake in the…				
… past year	41.3	15.4	3.1	18.0
… past 5–10 years	52.2	23.1	3.1	23.3

Table 7: Proportion of households facing food shortage by period and land holding. Note: The household interviews were conducted in October, at the peak of the lean season. Source: Household survey (2011).

Table 7 and Figure 15 show that food security is closely related to land ownership. Landless and land-scarce households face food shortage much more often than households with over one hectare of land. Figure 15 further shows that food shortage is most common in the peak flood season (September to November), especially for landless and, to a lesser extent, land-scarce households. This is because there is very little demand for farm labour in those months. Among the households who regularly face food shortage, 73 per cent were in this situation for two or three months a year (there were no significant differences between land-holding groups). Among the 36 households (24 per cent) that faced shortage in the week prior to the survey, borrowing food or money was the most common coping strategy (adopted by 30 households at least once in seven days of food shortage), followed by reliance on less expensive food (23), limiting rations (18) and reduction of food intake by adults to make sure children get enough (13). Reduction of the number of meals (1) and reduction of the number of people eating at home (1) were not common strategies.

The household survey contained an open question about causes of food shortage in the past five to ten years. In the same question, respondents were asked what they did to deal with the situation. A qualitative analysis of the answers given to this open question revealed the following causes of food shortage at household level (in descending order of importance):

(1) Landlessness or land shortage
(not enough land to meet food needs);
(2) Not enough demand for farm labour in the flood season;
(3) Crop failure resulting from insect plagues, crop diseases or unexpected flooding;
(4) Unemployment or irregular income and low wages;
(5) Reduced income from trade and non-farm activities because of flooding;
(6) Reduced demand for labour because of mechanization;
(7) Pregnancy and having small children to take care of (high dependency);
(8) Illness or death of a household member
(less time to work, more medical and funeral costs);
(9) Increasing expenditure on education and healthcare.

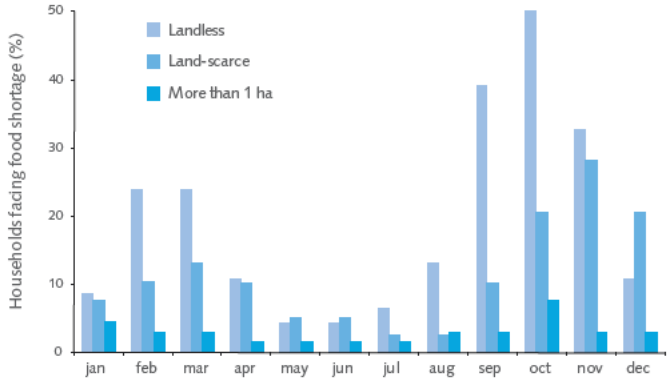

Figure 15: Households "regularly" facing food shortage per month and by land holding. Note: Facing food shortage could mean that own production fell short or that the household did not have enough money to buy food.
Source: Household survey (2011).

The qualitative data shows that flooding is a significant cause of food insecurity. Unexpected or "higher than usual" floods can cause harvest loss as well as fewer opportunities to make a living from farm labour and non-farm activities during the flood season.

The open questions also required respondents to examine their short-term strategies for coping with food shortages. Borrowing money or food (usually rice) from neighbours was most common. Whereas in some cultures borrowing food is perceived as an embarrassing action to take, and hence an indication of severe food insecurity (Maxwell and Caldwell, 2008), this does not seem to be the case in the study area. Rather, lack of food or money to buy food seems to be a transitory problem for most households. They could return what they borrowed within a few weeks or a few months without jeopardizing long-term livelihood security. Another non-erosive[6] coping strategy, common among land-scarce households, is increased reliance on farm labour and fishing. Some respondents mentioned that they sold livestock to buy food and in other households a member seasonally migrates, which reduces the pressure on food stocks and generates income to buy food. The most detrimental strategy to deal with food shortage, mentioned by three households, was the sale of land.

A way of looking at the *severity* of food security problems in the Hung Thanh Commune is to consider the proportion of people who actually experienced hunger/inadequate food intake when faced with a production or income shortfall. Among the households who face shortage, some have more adequate coping strategies than others. For respondents who indicated that they had experienced inadequate food intake (see Table 7), the situation was more severe. Almost one out of five households (18.0 per cent) had experienced this in the past year and 23.3 per cent in the past five to ten years. Among landless households the situation was even more alarming: 41.3 per cent and 52.2 per cent indicated that they had experienced inadequate food intake/hunger in the past year and in the past five years, respectively.

6 Erosive coping strategies are responses to crises that compromise future livelihood security (de Waal, 1989, cited in van der Geest and Dietz, 2004).

Strategy used to deal with food shortage	Frequency
Rely on external help	71
Reduce food consumption	43
Increase income	32
Reduce expenditure	23
Migration of household members	20
Selling assets	4
Modify food production	3

Table 8: Coping strategies.
Source: Household survey (2011).

As well as the open question regarding people's strategies to cope with food insecurity adopted in the past five to ten years, the survey also looked at strategies in a more systematic way (see Table 8). The importance of borrowing money/food was confirmed (part of "External help"). External help mostly came from neighbours and friends (mentioned 43 times) and from relatives (mentioned 29 times). Support from government agencies and NGOs (always CARE International) were each mentioned 10 times. The questionnaire did not go into detail about the migrant status of relatives who provided assistance in times of food shortage. However, information from the PRA sessions on coping strategies and the Venn diagram on migration indicated that migrants are regularly called upon for assistance. Moreover, household survey data on remittances shows that poor and landless households primarily use the money that migrants send to buy food and to pay back loans – loans that are often taken to buy food in times of need[7]. Migration of household members was also a common strategy to cope with food shortage, especially among landless (23.9 per cent) and land-scarce (20.5 per cent) households.

Each of the coping strategies mentioned in Table 8 was examined in more detail using a follow-up question. The category "reduce food consumption" included the following option: "send a household member somewhere else". None of the respondents mentioned this category. Within the category "increase income", the most common strategy was to expand existing activities. Only four households mentioned "selling assets", but it remains an important category because three were farm households who were forced to sell their land. The 20 respondents who mentioned migration as a coping strategy were asked about destinations (rural/urban/international) and durations (seasonal/temporary; less or more than six months). All categories had quite similar returns, except international destinations (only one). In the category "reduce expenditure", most households economized on non-essential items such as alcohol and cigarettes. Still, seven had to reduce expenditure on either education (4) or healthcare (3).

The coping strategies discussed in this section involve short-term responses to immediate food shortages. It is important to distinguish these short-term coping strategies from *adaptation* or *adaptive strategies*, which are longer-term responses to more permanent changes in livelihood contexts. More permanent changes can relate to the environment, socio-economic developments, demographics and government policies. It should be noted that a strategy such as migration could be a short-term response to unusual events (coping) as well as an adaptation to more permanent changes (Davies, 1996; van der Geest and

7 Twenty out of 46 landless households had received remittances. Sixteen had used this money to buy food and 14 to pay back loans. Among the 22 poor households that had received remittances, 12 had bought food with the money and 10 had used remittances to repay debts.

Dietz, 2004). The survey included one question addressing motivation for migration from the research area. In response, 52 respondents thought that people mostly migrate in times of crisis (coping); 61 thought that migration had become a normal income strategy (adaptation); and 17 mentioned both. In Section 8.2, long-term adaptation to climate change is discussed.

The findings concerning food security in Hung Thanh Commune vary according to data source. According to local experts and PRA session participants, food insecurity is not a major issue, but the household survey revealed that instances of food shortage and hunger are quite frequent among a sizeable part of the population, especially amongst the landless and land-scarce. During the fieldwork, several people in the commune were asked to explain this discrepancy. Their responses yielded two insights: (1) experts have a different perception of food security at the household level because they tend to look at macro level; and (2) respondents may tend to make their own situation appear worse than it is in reality in the hope of receiving some kind of support. Prior to the questionnaire interviews, the research team explained that this was not the case, but this possibility cannot be ruled out.

6.3 Poverty

Information collected from expert interviews reveals that land ownership and the quality of one's house are principal indicators of wealth. Very wealthy people have over 20 hectares of farm land, a large concrete house and a car. Village leaders estimate that there are about 20 truly wealthy households in the three villages surveyed. Those who are considered average usually have several hectares of farming land. The poor are the landless, the land-scarce and elderly people without support from children or grandchildren.

The PRA sessions on wealth ranking yielded similar results. In local people's perception, farm land is the most important indicator of one's economic status. Households with less than one hectare are considered poor; those who have one to four hectares are considered average and those who have more than four hectares are considered wealthy. As well as land, the quality of one's house is another important indicator of wealth. Concrete and multiple-storey houses are signs of wealth, while having a small, wooden house is a sign of poverty. The exceptions are poor households who live in concrete houses that were built by the government for resettlement purposes. Owning a television or mobile phone were signs of wealth some years ago but are now fairly common (see Table 9).

	Frequency (n = 150)	%
Mobile phone	122	81.3
TV	134	89.3
Motorbike	122	81.3
Residential house	142	94.7
Electricity	149	99.3
Piped water	117	78.0

Table 9: Asset ownership. Source: Household survey (2011).

Refrigerators, computers, air conditioners, "fancy" mobile phones and flat-screen televisions are the new signs of wealth. Ownership of several boats and good motorbikes is also limited to the wealthy. The poor have no boats and use bicycles or cheap Chinese motorbikes. Poor diets and a higher incidence of illness

are other indicators of poverty, and so is small family size. A list of 97 poor households who received emergency support from CARE International in Viet Nam revealed that most of these households had only one or two members, while there were very few having more than four members.

In the PRA sessions and expert interviews, no one mentioned that female-headed households are more likely to be poor. The survey sample of 150 households included only 10 female-headed households. These households had above-average income and were more likely than other households to own land. They did not report a higher incidence of food shortage and they did not describe experiencing more severe impacts of flooding and rainfall changes.

The questionnaire inquired about the assets households owned and their access to amenities such as electricity and potable water. Some key assets are shown in Table 9. The results show that most households do own assets, such as mobile phones, televisions and motorbikes. Almost all households own the house they live in, and connection to the electricity grid is almost 100 per cent. Access to piped water is also high, at 78 per cent.

The household survey confirmed that there is a strong link between land ownership and poverty (see Table 10). Over 80 per cent of the landless households earn less than one dollar per capita per day. Among the 63 households owning at least one hectare of farmland, only seven (11.1 per cent) were in the lowest-income group.

	Poor < US$1/cap/day	Average US$1–2/cap/day	Wealthy > US$2/cap/day	Total
Landless	33 (80.5%)	6 (14.6%)	2 (4.9%)	41 (100%)
Land-scarce	12 (36.4%)	13 (39.4%)	8 (24.2%)	33 (100%)
Owning > 1 ha	7 (11.1%)	23 (36.5%)	33 (52.4%)	63 (100%)
Total	52 (38.0%)	42 (30.7%)	43 (31.4%)	137 (100%)

Table 10: Land-holding and income group.
Note: There are 13 missing values for income/cap.
Source: Household survey (2011).

Section 7: Migration and human mobility patterns

Hung Thanh Commune experiences both in- and out-migration. The focus of this research is on the latter, but some attention will be given to the arrival of people from outside the commune, too. A reliable assessment of migration rates at commune level turned out to be impossible for two reasons. First, although there is a registration system for people who want to relocate, this system only covers a fraction of the actual migration flow. Hence, no reliable migration data was available at the commune level. Second, a reliable, sample-based estimate of out-migration rates, based on the household survey, was not possible because the survey only covered information on the migration experiences of *current household members*[8]. Hence, there is no information on the migration of entire households.

The household survey did yield reliable data on the rate of in-migration, which turned out to be quite common. Approximately four out of every ten (40.9 per cent) household heads were not born in the commune. Most immigrants came from within Dong Thap Province (28.2 per cent), particularly from Cao Lanh

8 The following household definition was used in this research: "a group of people who are generally but not necessarily relatives, who live under the same roof and normally eat together, including individuals who live for part of the year or the entire year elsewhere, without having established their own family (with spouse and/or children) in that other place" (de Haas, 2003: 415). Thus the household excludes relatives who migrated out of the household more permanently and who started their own households in their destination areas.

District; 10.7 per cent migrated from elsewhere in the Mekong Delta Region; and 2.0 per cent were born abroad (Cambodia). Many of these in-migrants were children of people who had moved out of Hung Thanh Commune in the past because of the war between South and North Viet Nam. The occupational profile of in-migrants is quite similar to that of the native population (see Table 11). However, they are more likely to be engaged in farming, livestock keeping and trade/non-farm income, and are less likely to be students or factory labourers. Land ownership is similar between native and migrant households.

In expert interviews and PRA sessions, some concern was raised about the settlement of migrants from outside the commune. Landlessness is an increasing problem, and the so-called *Xâm Canh* or "invasive farmers" compete with local residents for ownership of farm land. Similarly, those who settle in Hung Thanh to sell their farm labour compete with local labourers for employment opportunities, which are simultaneously decreasing as a result of mechanization.

Occupation	Born in commune (n = 256)	%	In-migrant (n = 123)	%	Total (n = 379)	%
Agriculture (crops)	128	50.0	73	59.3	201	53.0
Farm labour	83	32.4	41	33.3	124	32.7
Fisherman	36	14.1	18	14.6	54	14.2
Trade/Non-farming income	27	10.5	17	13.8	44	11.6
Student	26	10.2	2	1.6	28	7.4
Factory labourer	12	4.7	2	1.6	14	3.7
Livestock	7	2.7	13	10.6	20	5.3
Other	31	12.1	14	11.4	45	11.9

Table 11: Occupations of in-migrants and those born in the commune (aged 15–64). Notes: Only present household members were taken into account; more than one occupation could be mentioned for each household member. Source: Household survey (2011).

Indicators	Village 1	Village 2A	Village 3	Total
Households with migration experience	18	39	33	90
Total number of migrants	32	83	53	168
Economic migrants	26	61	30	117
Educational migrants	3	11	16	30
Gender of migrants				
• Male	18	53	35	106
• Female	14	30	18	62
Average age at first migration	22	23	21	22
Average years of schooling of migrants	6.4	6.9	9.5	7.6
Marital status of migrants				
• Single	17	45	35	97
• Married	13	35	18	66
• Other	2	3	0	5
Type of migration				
• Temporary*	17	50	40	107
• Seasonal	15	33	13	61
Migration status				
• Current	13	35	36	84
• Returned	19	48	17	84

Table 12: Migration indicators per village.
**Temporary migrants were those who moved for periods of less than six months. Source: Household survey (2011).*

In Table 12, based on the survey findings, some key indicators of out-migration are presented at village level. The table shows that people who migrate from Hung Thanh Commune are more often men (106) than women (62) and more often single (97) than married (66). On average, migrants were quite young (22 years old) at the time of their first migration. Most migrate temporarily for work purposes (labelled "economic migrants" in Table 12). Half of the household members with migration experience were current migrants. Migration for education was most common in village 3, which also had the highest proportion of current and non-seasonal migrants (e.g., people who migrate for periods of more than six months).

Destination type	Frequency	Valid %
Within Dong Thap Province	44	26,7
Other province in the Mekong Delta region	41	24,8
Elsewhere in the country	75	45,5
Abroad	5	3,0
Missing values	3	-
Total	168	100.0

Table 13: Migrant destinations (N=168).
Source: Household survey (2011).

Table 13 lists the destinations of migrants who leave Hung Thanh Commune. Almost 50 per cent migrate out of the Mekong Delta Region, mostly to Ho Chi Minh City (49) and the industrial centres of Binh Duoung (10) and Dong Nai (9). These destinations are still within the southern part of the country. For those who migrate within the province, Cao Lanh (21) and Sa Dec (6) were the most popular destinations. For people who migrate to other provinces within the Mekong Delta Region, Long An Province (18) is most popular. The destinations of migrants in the commune vary per migration type. For *seasonal migration*, destinations are often within the province where people work as farm labourers or in local factories. For *temporary migration* (more than six months), popular destinations are Ho Chi Minh City and Binh Duong, where people work in industrial zones or go on to higher education.

International migration is not common in Hung Thanh Commune. Only five members of the total household sample had ever migrated to Cambodia or Malaysia. In expert interviews and PRA sessions, the issue of international marriage migration was raised several times. This involves Vietnamese women who typically marry Taiwanese men. One household head whose daughter had married a Taiwanese man estimated that a total of approximately 40 women from Hung Thanh had migrated internationally for marriage, mostly to Taiwan, but also to South Korea, Japan and Malaysia.

The PRA sessions concerning livelihood and coping strategies revealed that migration is viewed as an important way to supplement local income, especially for landless and land-scarce households. Both villagers and experts expect migration to increase in the future because of pressure on local livelihoods, increasing industrial employment opportunities and changing occupational preferences of the youth. Most viewed migration as a positive development, but they also expressed concerns. Many young migrants in the village lack the necessary training and skills to migrate "successfully". This explains why many are working

in unstable and low-wage jobs in local factories and industrial zones further away. Meanwhile, high accommodation and daily need costs in destination areas reduce savings to levels far below what their families in the place of origin might expect. Information gathered from expert interviews and PRA sessions indicated that many young migrants could barely support themselves, let alone send remittances. Additionally, young migrants' lack of life experience makes them more vulnerable in urban areas. An additional concern raised in PRA sessions is that it is difficult for young migrant women to find a suitable husband because they spend long hours working in factories.

While young migrants are struggling away from home, their parents remain in the villages without the daily care they might otherwise receive from their children. In several PRA sessions and expert interviews, it was reported that elderly people face health problems more often nowadays, especially during the flood season. The responsibility for labour that requires physical strength, such as house maintenance, has now fallen to the elderly.

The household survey yielded several indications that out-migration from Hung Thanh Commune is quite a recent phenomenon, which has increased sharply over the past decade. First, none of the respondents recalled any migration from the commune prior to 1990. Second, the first migrant in households with migration experience was more often a child (50 times) than a parent (25 times). Third, 91.1 per cent of the household members with migration experience had made their first trip after 2000 and 71.5 per cent post-2005. Also, in the question that inquired about the contribution of migration to the welfare of households in the village 10 to 20 years ago, only 8.2 per cent thought that it was important or very important versus 27.4 per cent currently. Additionally, when asked about changes in migration patterns, the vast majority mentioned a sharp increase in out-migration in the past five to ten years, especially for young people. Other often mentioned changes were an increase in migration of women (but still less than men) and an increase in the duration of migration trips. Finally, as described in Section 6.1, remittances have increased sharply over the past 10 years. Nearly three out of ten households (29.5 per cent) interviewed have received remittances and more than two out of ten (22.1 per cent) have received remittances in the past 12 months. For 60.5 per cent of the recipient households, remittances constituted a substantial or intermediate part of their total income[9].

9 Twenty-one respondents mentioned exact amounts (average: US$68; range: US$13–250), but the time-frame was not specified in the question so it is not possible to identify whether these are total annual amounts, total monthly amounts or single transactions.


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Section 8: Linking rainfall variability, food security and migration

This section focuses on the linkages between climate variability, livelihood, food security and migration. First, the impact of climate variability on food and livelihood security is examined; second, livelihood adaptation to changes in the local climate is discussed; and, third, an evaluation is carried out regarding how climatic factors interact with other drivers of out-migration.

8.1 Climate and livelihood

Tables 14(a) to (e) look at the impact of natural hazards and changing rainfall patterns on food production and livelihood. Table 14(f) shows how households have coped with climate-related stresses.

Flooding, storms and heavy rainfall are the most common hazards people in the Hung Thanh Commune face (see Table 14(a)). The impact of these hazards on livelihood is primarily related to crop cultivation and damage to houses (see Table 14(b)). Flooding and prolonged, heavy rainfall have a further, negative impact on livestock, fishing, demand for farm labour and local trade. Lastly, they cause water-borne diseases[10].

When the respondents were asked to qualify how badly their livelihoods were affected by changing rainfall patterns (more rain, longer rainy season, more variable rainfall, more extreme rainfall events; see Section 5), the majority indicated that the effect was felt "only a little" (see Tables 14(c) and (d)). This was the case for food production (56.4 per cent), as well as for the economic situation of the household (57.4 per cent). However, about three out of ten households felt the impact "a lot" and this proportion was higher for poor (45.8 per cent), landless (39.5 per cent) and land-scarce households (40.5 per cent). The most common impact of changing rainfall patterns, except for the landless, was a reduction in crop yields (see Table 14(e)). However, in an earlier question that inquired about changes in rice yields, 84 per cent indicated that crop yields had increased over the past five to ten years. Only six per cent noted a decline in crop yields, and according to 10 per cent of the respondents, crop yields had remained the same. Hence, it can be concluded that, although some changes in rainfall patterns do affect crop yields negatively, this negative impact is offset by an overall trend of increasing yields caused by improved seeds and techniques.

Among the poor and landless, the impact of changing rainfall patterns on household economy was mostly felt in the reduction of the demand for farm labour and declining fish sales. It was explained that the number of rainy days has increased as well as the occurrence of heavy rainfall accompanied by storms and lightning. On such days, they cannot go out to work and have no income. Since many of the poor and landless are *living from hand to mouth*, with little buffer capacity, a day without income can be a day with inadequate food intake. The increase in the number of rainy days and storms also affects income from trade and business. Most households who experience this were landless, but they were usually not among the poorest. Most commonly they were people with small shops.

10 These negative impacts were mentioned in the "Others" category in Table 14(b).

	Frequency
Flood	122
Storm/wind/excessive rain	56
Drought	19
River bank erosion	3
Cold wave	1
None	17

Table 14: Impact of and coping with climatic hazards

(a) Household affected by natural hazards?

	Frequency
Crops affected/destroyed	77
House or other property damaged	74
Loss of livelihood	35
Other	33
Death of livestock	27

(b) Impact of hazard on livelihood

	Frequency
Yes, a lot	34
Yes, but only a little	62
No, it does not affect us	14
N/A	39
Don't know	1
Total	150

(c) Does changing rainfall affect your food production?

	Frequency
Yes, a lot	46
Yes, but only a little	82
No, it does not affect us	15
N/A	7
Total	150

(d) Does changing rainfall affect the economic situation of your household?

	Frequency
Lower crop yields	78
Fewer sales of fish	24
Less demand for labour	17
Increasing food prices	12
Less livestock production	9
Less income from trading	5
Other	9

(e) If yes, in what form?

	Frequency
Adjust food purchase/meals	21
Borrow from neighbours	18
Migrate temporarily	8
Formal loan	6
Take child out of school	2
Sell assets (incl. land)	0
Other	56
Nothing	17

(f) Strategies to cope with natural hazards.

Source: Household survey (2011).

As was shown in the section on food security and coping strategies, most households in the Hung Thanh Commune presently seem to have quite adequate capacities to cope with negative impacts of climate hazards. Common strategies were to temporarily adjust food habits and to borrow money or food (see Table 14(f)). Eight mentioned that they migrate temporarily in response to livelihood pressures caused by changing rainfall patterns. Most coping strategies were in the category "Other". These strategies mostly involved: (1) physical adjustments to houses; (2) reliance on relief support; (3) seeking support from migrant relatives; (4) engaging in other economic activities, especially fishing; and (5) on-farm adjustments to reduce rice lodging. Some of these strategies are actually not short-term coping strategies to deal with food shortage, but rather medium to long-term adaptations to more permanent changes in the livelihood context[12].
The next section will study such adaptations in more detail.

12 This is certainly true for (1) and (4). For (3) it depends on whether diversification of income sources is temporary, simply to deal with a present food crisis. When coping strategies become permanent features of people's livelihood, the term adaptation is used (Davies, 1996; van der Geest and Dietz, 2004).

8.2 Adaptation to climate change

Whereas the household survey gathered in-depth information about people's short-term responses (coping strategies) to food shortage, whether or not caused by climatic factors, the information on longer-term adaptation to climate change is scantier. Some important changes in local livelihoods can be identified, such as diversification into non-farming activities (see Section 6.1) and increased migration (see Section 7). However, it is difficult to determine to what extent these changes can be attributed to variances in the local climate. Environmental change usually interplays with other – mostly economic – drivers of livelihood diversification and migration.

One question in the household survey explored agricultural change in response to food shortage and another looked at reliance on alternative income sources in times of scarcity. Only three households reported changes in cropping strategies, so not much is known about on-farm adaptations. Meanwhile, more advanced techniques in rice production might to a large extent have offset negative impacts of climate change on crop yields. Twenty-five households said that they had "expanded existing livelihood activities" in response to food shortage. A question asking about reasons for changes in income sources in the past 10 years could have yielded insights related to climate adaptation, but few households were able to answer this question, and most reasons they mentioned were related to particular household events (e.g., the death of a husband, sickness, old age or migration of a household member).

Expert interviews and PRA sessions yielded more information on adaptation to climate change. The authors' experience during the PRA sessions was that people found it difficult to mention medium- and long-term responses to changing climatic conditions and changing flood regimes. The general attitude was that people "just lived with the conditions they faced". One could say that there was little awareness of, or knowledge about, viable responses to climatic changes in the research area. Still, the livelihood risk ranking exercise yielded several adaptation strategies, for example:

- People are increasingly raising their houses and livestock shelters to avoid damage caused by floods. According to flood-level data from the Meteorological and Hydrological Station, the trend is towards lower flood levels, but survey respondents perceived an increasing trend, influenced by the severe floods of 2011;
- During the flood season, there is less work in the community. For young people who are no longer attending school, seasonal migration to other agricultural areas and urban centres is becoming a common livelihood strategy, which helps to supplement income from farming activities;
- For similar reasons, several handicraft groups have been established to generate income during the flood season;
- Community-based saving schemes are increasingly used by small farmers to insure themselves against low crop yields and by landless farm labourers to bridge periods during which there is less work;
- The community protects the nearby *Cajaput* forest as it is seen as a form of protection against heavy storms and damaging flood waves.

The expert interviews yielded three insights on current adaptations and two desired adaptations. First, people are making an increased effort to educate their children in the hope of securing future employment outside climate-sensitive sectors. School dropout rates have decreased and people are willing to invest more resources in education beyond the secondary school level. Second, in order to protect people's lives in the event of flooding, children are increasingly sent to swimming lessons. As most

victims of flooding in Viet Nam are children. The local government supports this initiative financially. Third, community-based transportation and emergency support teams have been established for all five villages of the commune. Each team consists of three to four volunteers with one boat. In the flood season, they help children of poorer households (who have no boat) to go to school and also act as an ambulance. Villagers have the mobile phone numbers of the volunteers in case of emergency.

The expert interviews also revealed two desired adaptations, which could be considered policy recommendations by policy-makers themselves. First, local experts suggested that a concrete dyke system should be constructed as soon as possible. The dyke system would protect rice fields in the commune from flooding and enable a third crop regardless of flood levels. The dyke system would also help local people to irrigate their crops better during the dry season. Clearly, this is a higher-level intervention than the household adaptations discussed above. Second, local experts recommended financial support to fishermen to enable them to buy better boats that they can use regardless of flood levels and weather conditions. This would increase productivity in the sector and lift fishing from a source of subsistence to a viable income-generating strategy.

In theory, climate change can also have a positive impact on existing livelihood sources and provide opportunities for new sources of income. In the questionnaire, people could identify positive impacts of changing rainfall patterns on local livelihoods. However, only one respondent said that higher rainfall caused an increase in rice production (compared to 83 who noted a negative impact) and none mentioned positive impacts on livestock production or fishing. In the PRA sessions, when discussing the (high) flood of 2011, people did indicate that it had a positive effect on fishing and on soil fertility, as more sediment was deposited.

8.3 Climate and migration

This section looks at how rainfall variability and other climatic factors interact with human mobility. This question is closely related to the central objective of the "Rainfalls" research project, which aims to discover under what circumstances households use migration as a risk management strategy in relation to increasing rainfall variability and food insecurity.

A good starting point is to look at the survey findings on drivers of migration. The questionnaire respondents were asked to indicate the importance of 40 potential causes of migration. The most common reasons given for migration were:

(1) lack of income;
(2) unemployment;
(3) dissatisfaction with livelihoods;
(4) better job opportunities in the city;
(5) lack of higher education opportunities;
(6) floods; and
(7) lack of farm land (see Table 15).

Some of the prime causes of out-migration include an important climatic signal. As shown in Section 8.1, changing rainfall patterns have a negative impact on rice production, household economies and local livelihoods. These in turn are important drivers of out-migration. As Black et al. (2011) underline in their framework for understanding the effect of environmental change on migration, environmental factors tend to influence migration indirectly, mostly through economic drivers (the same point is made in Foresight, 2011; Jäger et al., 2009). Climate variability affects local livelihoods and the prime reasons to migrate are related to lack of livelihood security or low living standards at home.

Reasons to migrate	Very important	Important	Not important	Score*
Not enough income	30	45	26	105
Unemployment	28	46	27	102
Not satisfied with livelihood	37	16	48	90
Better job opportunities in the city	30	29	42	89
No school for my children in the village	27	25	49	79
Floods	29	9	63	67
No land available for farming	13	40	48	66
Attractions of the city	27	12	62	66
Overfishing	24	10	67	58
The quality of life in the city is better	21	11	69	53
I want to build up my own life in the city	24	4	73	52
Work related to my skills is not available	17	17	67	51
Increasing food prices in the market	23	5	73	51
Insufficient healthcare services in the village	22	3	76	47
Decline in crop production for household consumption	19	5	77	43
Less financial resources to buy food/staples	18	6	77	42
Gaining independence	19	3	79	41

Reasons to migrate	Very important	Important	Not important	Score*
Less crop production for sale	19	3	79	41
Decline in fish production for sale	20	0	81	40
Decline in fish production for household consumption	19	1	81	39
Unreliable harvest	14	10	77	38
No land available for grazing	11	15	74	37
Heavy rainfall events	17	3	81	37
My friends already live in the city	15	3	83	33
Insect plagues	14	3	84	31
Shifted seasonal rainfalls	12	6	83	30
Less animal produce for sale	13	3	85	29
Storms	12	4	85	28
No relatives and friends in the village	11	4	86	26
Decline in animal production for household consumption	11	2	88	24
Longer drought periods	9	3	89	21
No permission available for fishing	6	8	86	20
Increase in drought frequency	8	3	90	19
Poor water quality	8	2	91	18

Reasons to migrate	Very important	Important	Not important	Score*
Water shortage	7	3	91	17
Poor soil quality/soil degradation	8	1	92	17
Conflict over natural resources	6	4	91	16
Family reasons (e.g., death of parent)	5	1	95	11
Earthquake	0	0	101	0
Mudflow	0	0	101	0

*Table 15: Reasons to migrate (in descending order of importance). *"Score" calculated as: (freq. "very important" *2) + (freq. "important" *1). Source: Household survey (2011).*

Tables 16 and 17 look at two important drivers of migration from Hung Thanh Commune: landlessness and poverty. The tables distinguish between migration for economic reasons and migration for education. It is shown that the poor and landless are more prone to migrate for economic reasons while wealthier households are more likely to have educational migrants. As described in Section 8.1, many landless and poor households also indicated the severe impact of changing rainfall patterns and flood regimes, while other households tended to experience only moderately negative impacts. For non-poor households, climatic changes in the area are not yet a real threat to their livelihoods. When members of such households migrate, this is more likely to be in response to opportunities elsewhere. The livelihoods of the poor and landless, on the contrary, are much more vulnerable to changes in the climate and, for this group, migration is an important option.

Land-holding	Frequency	Economic migrants in household	Educational migrants in household
Landless	46	31 (67%)	4 (9%)
Owning 0.1 to 1.0 ha	39	16 (41%)	5 (13%)
Owning > 1 ha	65	21 (32%)	15 (23%)
Total	150	68 (45%)	24 (16%)

Table 16: Migration and land ownership.
Source: Household survey (2011).

Income group	Frequency	Economic migrants in household	Educational migrants in household
< US$1/cap/day	52	31 (59%)	5 (10%)
US$1–2/cap/day	42	19 (45%)	4 (10%)
> US$2/cap/day	43	10 (23%)	13 (30%)
Total	137*	60 (44%)	22 (16%)

Table 17: Migration and income.
**There are 13 missing values for income/cap/day.*
Source: Household survey (2011).

Section 9: Summary and conclusion

Viet Nam is extremely vulnerable to the impacts of climate change. Sea level rise threatens the livelihoods of millions of people in the densely populated Mekong Delta. In addition, a rise in extreme weather events puts many people at risk and is already damaging both life and property. The area surveyed for this research is located in the upper delta of the Mekong River, approximately 135 km inland, and experiences annual flooding. "Higher than usual" floods caused by changing rainfall patterns and water retention locally and in the upstream portion of the Mekong River are a severe threat to life and livelihood. This research demonstrated that people are experiencing negative effects from floods and changing rainfall patterns on their livelihoods and that there is substantial out-migration. Poor, landless and land-scarce households are most vulnerable to the negative impacts of changing rainfall patterns and flood regimes. Within this group, migration is becoming an increasingly important strategy to deal with insecure livelihood conditions at home.

The research revealed several changes in rainfall patterns over the past 20 to 30 years:

- the total amount of annual rainfall has increased;
- the rainy season lasts longer nowadays;
- rainfall has become less predictable;
- people in the area perceive an increase in the frequency of extreme weather events such as storms, thunder and lightning (although no hard data are available).

The Hung Thanh Commune experiences flooding every year. Peak flood levels usually occur from September to November. Flooding can have negative impacts on people's lives but it also confers benefits to people living in this area (soil enrichment, fishing and aquaculture). Although annual rainfall in the research area has increased, flood levels show a decreasing trend. This is because flood levels in the area are more dependent on rainfall (and water retention) in the upstream section of the Mekong River than on local rainfall in the research area. In years of heavy rainfall upstream and locally, flood levels are highest, and can cause a great deal of damage to life and livelihood. Without adequate policy responses, increasing variability of flood levels (more floods that are too high or too low) could become a major future threat to this part of the Mekong Delta.

Climate change scenarios for the 21st century predict that the Mekong Delta will experience higher temperatures, more rainfall in the rainy season, less rainfall in the dry season, more extreme weather events and a sea level rise of approximately one metre by 2100. A one-metre sea level rise would not inundate Dong Thap Province (as opposed to lower-lying parts of the delta); however, it would reduce the Mekong River's discharge capacity and increase the frequency of high floods. Actual flood levels would further depend on developments upstream of the Mekong River (water retention and rainfall patterns).

The research area is part of the commercial rice production region of the Mekong River Delta in Viet Nam. Rice cultivation is the main source of livelihood in the area. In the sample of 150 households who were interviewed for this research, 62 per cent had their own rice farm. Those who did not cultivate rice either rented out their land to other rice farmers or they owned no land, in which case they mostly sold their labour to rice farmers or engaged in fishing or trading. The household survey revealed that rice yields are negatively affected by changing rainfall patterns and flood regimes. However, according to government statistics and local farmers, rice productivity is increasing because of better seed varieties, improved techniques, increased use of fertilizer and a higher frequency of cultivation made possible by dyke construction. Hence, the negative impact of climatic changes is partly offset by more positive agricultural changes.

Despite increasing agricultural productivity, the livelihoods of many households in Hung Thanh Commune are under severe pressure. This group mainly consists of landless households and people who do not have *enough* land and access to viable non-farm activities to attain food and livelihood security. For daily subsistence, they primarily depend on selling their labour to bigger farmers. With the increasing mechanization of agriculture and reduced demand for farm labourers, many of these households have few other options than to migrate to areas where their labour is in higher demand. Some send out individual household members to supplement local income and, in other cases, entire households migrate. Lastly, there is a group for whom migration is not a viable option because of old age, sickness or lack of means, contacts and skills to migrate. Such "trapped" populations will mostly depend on help from relatives, neighbours, NGOs and/or state agencies for survival.

Expert interviews, PRA sessions and the household survey yielded contradictory findings on food security. According to experts, there are no major food security problems in the area. In PRA sessions, people told us that poorer households occasionally face shortage, but they can usually gain access to food by borrowing from neighbours or relatives. By contrast, the household survey showed that a considerable group of households does quite regularly face shortages of food or shortages of money to buy food. For about half of them, such situations are quite transitory and easy to solve but the poorest 20 per cent, most of whom are landless, do experience inadequate food intake from time to time and are forced to use more "erosive coping strategies". This group is of the greatest concern in the context of climate change. The poorest are the most vulnerable and, without adequate support, their capacity to adapt is limited.

Migration from Hung Thanh Commune is increasingly common because of increasing pressure on local livelihoods, increased demand for industrial labour outside the commune and less strict political restrictions on migration. More and more people from Hung Thanh Commune, men as well as women, find work in industrial zones, especially in Ho Chi Minh City. Seasonal migration for farm labour and fishing is also common, especially among poor and landless households. Migration for education is common among wealthier households.

The major drivers of migration are lack of income, unemployment, landlessness and changing livelihood preferences. Such economic drivers are influenced by climatic factors. A majority of the questionnaire respondents noted adverse effects of heavy rainfall, seasonal shifts and a higher frequency of rainy days on crop yields and non-farm income sources. Many indicated that the impact was felt only moderately, but most poor and landless households indicated a more severe impact. Their livelihoods are more sensitive to the vagaries of the weather and they are more often forced to use coping and survival strategies that are detrimental to long-term livelihood sustainability.

As well as the indirect impact of rainfall variability on human mobility, fieldwork also revealed a very direct link between flooding and migration. During the flood season, there is less work in the community and many young people use this time to seasonally migrate.

At first sight, important drivers of migration from Hung Thanh Commune, such as lack of income, unemployment and dissatisfaction with local livelihoods, are push factors pertaining to migrants' home areas. However, each of these factors has a pull element as well, as people are increasingly aware of the opportunities that exist outside their home area in a country that is experiencing sustained, high economic growth, especially in industry.

The central question this study tried to answer is: "Under what circumstances do households use migration as a risk management strategy in relation to increasing rainfall variability and food insecurity?" A key insight from the fieldwork in Viet Nam is that households are more likely to use migration as a risk management strategy if they face difficulties attaining livelihood security locally because they do not have enough land, because there is not enough demand for farm labour or because they lack the skills and investment capital for generating a viable local non-farm income. In addition, other factors that make the use of migration as a risk management strategy more likely are: the existence of attractive migrant destinations with a high demand for labour; the *ability* to migrate (e.g., household members of a productive age, some financial means, low cost of migration, etc.); and the absence of political barriers to migration (which still exist in Viet Nam, but have been greatly reduced since the reforms of the mid-1980s).

It is difficult to assess the impact of different future climate change scenarios on migration patterns in the research area. On the one hand, a more pronounced negative impact of sea level rise and changing rainfall patterns on local livelihoods could push more people out of the area. On the other hand, Dong Thap Province could become an important destination area for migrants from areas that are even *more* severely affected by climate change. Much will depend on interventions by the Vietnamese government and NGOs to make the local economy more resilient to climate change.

Section 10:
Reflections for policymakers

This research yielded several insights that are relevant for state agency and NGO policies and interventions that aim to reduce people's vulnerability to climate change in the Mekong Delta. Such policies and interventions should reduce people's exposure to the negative impacts of climate change and increase their capacity to cope with extreme weather events and adapt to longer-term changes. Migration and remittances have the potential to play an important role in people's adaptive strategies. However, migration can also be a "last resort" in the face of environmental and other stresses. Such distress migration should be avoided because it is usually accompanied by much human suffering and it undermines the long-term sustainability of other livelihoods.

Exposure to negative impacts of climate change in the Mekong Delta depends chiefly on extra-local conditions such as rainfall patterns and water retention upstream of the Mekong River. Effective coordination between the different countries in the river's catchment area can help reduce the likelihood of detrimental floods. For agricultural livelihoods in the Upper Mekong Delta, the annual floods are of pivotal importance. They enrich the soil and provide irrigation water for rice cultivation. They also provide fish, which is a key ingredient in the local diet and a source of income during the flood season. For people in the area, it is important that the annual floods are neither too high nor too low. Although flood levels mainly depend on natural conditions (rainfall), there is much room for improving water infrastructure to manage flood levels. In addition, progress can be made in flood monitoring and communication. For people to be able to "live with the floods", it is essential that information about flood levels reaches them in time (via early warning systems).

To increase the *adaptive capacity* of people in the Mekong Delta, it is important that a climate change component is incorporated into all socio-economic development programmes. In other words, before implementing a project or intervention, its impact on the adaptive capacity of the more vulnerable groups in society, in particular, should be assessed. If projects are likely to increase people's vulnerability to changing rainfall patterns and floods, they should be reconsidered.

This research has shown that landless, land-scarce and poor households in the research area experience the most severe negative impact of climate changes and are most likely to migrate for economic reasons. This is not necessarily a bad thing. Migration can contribute to a sustained improvement in livelihood security for migrants themselves, their children and their relatives at home. Migration can be an essential element of adaptation strategies. With ongoing processes of agricultural mechanization and industrial growth, the aim should not be to keep people in place, but to make sure that they are well-prepared and that their migration has a good chance of being "successful". Their rights in the migration destination should be protected and, prior to migration, education and vocational training should provide them with the skills to migrate more successfully. The establishment of industrial zones outside Viet Nam's metropolitan areas, in provincial towns, is an important step in making the migration option more accessible and likely to contribute to reduced vulnerability to climate change (but vulnerability to other human security threats may increase). If people are well-prepared for migration and if they do not move as a last resort or mere survival strategy,


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they are likely to make a positive contribution to national development and reduction of climate change vulnerability.

Given the fact that poor, landless and land-scarce households are most vulnerable to climate change and most likely to migrate, it would make sense to prioritize these groups in projects and interventions that aim to improve people's adaptive capacities. This could be done by focusing on *local* livelihood options, for example by assisting them to set up non-farm income-generating activities or by helping them to upgrade their fishing and aquaculture activities, but also by improving their migration options.

Resettlement of people from flood-prone areas to nearby higher ground, which is already taking place, can save lives and reduce damage to houses and other property. However, when people are forced to leave their ancestral land and move to resettlement clusters, this often involves a loss of livelihood opportunities. An example discovered in the Hung Thanh Commune was that – for sanitation reasons – people were not allowed to keep livestock around their houses in the resettlement areas. Prior to relocation this was an important source of income for these families. When people's livelihood options are curtailed and are not given due attention in resettlement policies and practices, they are likely to be ineffective in addition to exacerbating people's vulnerability.

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Annex I:
Participatory Research Approach exercises

Date	Activities and tools	Participants
20/10	AM: Transect walk, resource map, wealth ranking PM: Livelihood risk ranking	Key informants Farmers (men and women)
21/10	AM: Livelihood risk ranking PM: Livelihood risk ranking	Men and women with non-farm activities Poor people, landless, farm labourers (men and women)
22/10	AM: Timeline and trend analysis PM: Coping strategies	Key informants Farmers (men and women)
23/10	*Sunday*	
24/10	AM: Coping strategies PM: Coping strategies	Men and women with non-farm activities Poor people, landless, farm labourers (men and women)
25/10	AM: Cropping pattern and Venn diagram on food security PM: Cropping pattern and Venn diagram on food security	Male farmers and men with non-farm income Female farmers and women with non-farm income
26/10	AM: Migration/mobility map PM: Venn diagram on migration/mobility	Male migrants Male migrants
27/10	AM: Migration/mobility map PM: Venn diagram on migration/mobility	Female migrants Female migrants
28/10	AM: Impact diagram and focus group discussion PM: Impact diagram and focus group discussion	Male farmers Female farmers
29/10	AM: Focus group discussion on future strategies	Farmers (men and women)

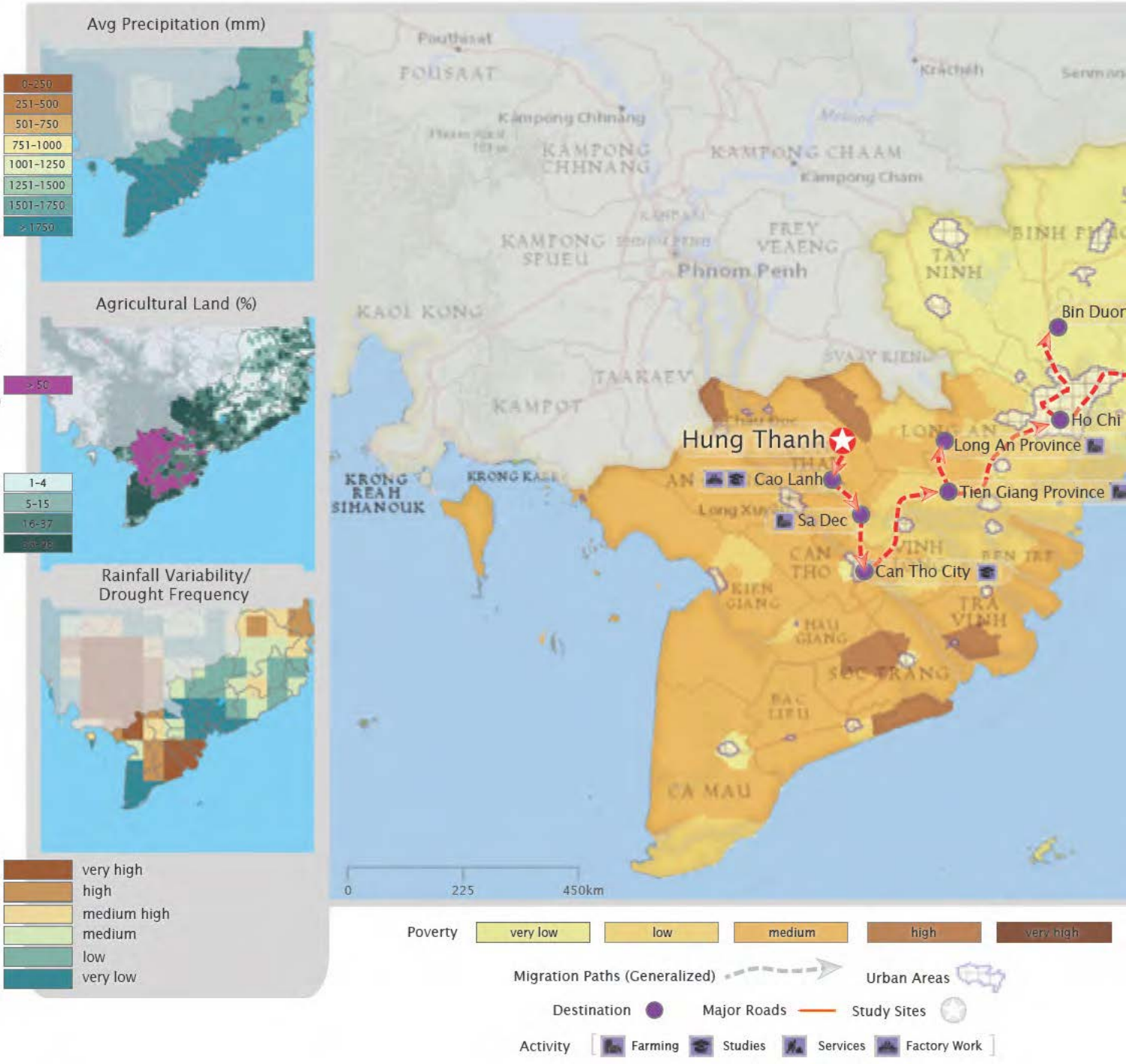
Note: Each PRA exercise was conducted twice and in different localities.

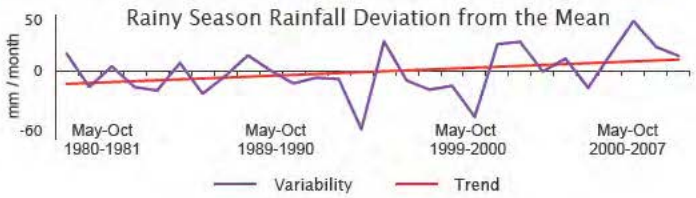
Annex II:
List of expert interviews

Number	Name	Gender, age	Organization
National level			
1	Nguyen Anh Tuan, PhD	Male, 54	Institute of Environmental and Sustainable Development Studies
2	Nguyen Quang Hiep, PhD	Male, 47	National Institute of Meteorology
Provincial level			
3	Pham Thi Nghia	Female, 53	Department of Agricultural and Rural Development
4	Dang Ngoc Loi	Male, 53	Department of Agricultural and Rural Development
5	Nguyen Dinh Phim	Male, 53	Department of Agricultural and Rural Development
6	Nguyen Van Duong	Male, 30	Department of Agricultural and Rural Development
District level			
7	Nguyen Van Ngot	Female, 49	Chief, Department of Economy
8	Tran Quang Tu	Male, 57	Department of Labour and Social Affairs
9	Nguyen Thi Thuy	Female, 33	Department of Agricultural and Rural Development
10	Vo Tri Ngot	Male, 38	Department of Natural Resources and Environment
Commune level			
11	Nguyen Thi Dung	Female, 52	Chief, Women's Union
12	Pham Van Ut	Male, 56	Chief, Farmers' Union
13	Nguyen The Du	Male, 40	Chairman, Commune People's Committee
14	Nguyen Van Thanh	Male 58	Chief, Village 3
15	Nguyen Thi Kim Ngan	Female, 53	Chief, Village 2A

Annex III:
National research team composition

Lam Dao (interpreter)
Le Canh Dung
Tran Dinh Trong (GIS)
Tran Than Viet (CARE)
Tran Tu Van Anh
Vo Van Tuan
Vu Lan Huong (CARE)
Vu Van Toan
Vuong Ngoc Thi


Avg Precipitation (mm)
0-250
251-500
501-750
751-1000
1001-1250
1251-1500
1501-1750
> 1750
Agricultural Land (%)
Irrigated (%)
> 50
Rainfed (%)
1-4
5-15
16-37
Rainfall Variability/
Drought Frequency
very high
high
medium high
medium
low
very low
Poulsaat
Kampong Chhnang
KAMPONG CHHNANG
KAMPONG CHAAM
Kampong Cham
KAMPONG SPUEU
FREY VEAENG
Phnom Penh
TAY NINH
KAOL KONG
TAKAEV
KAMPOT
KRONG REAH SIHANOUK
KRONG KAEP
Hung Thanh
Cao Lanh
Sa Dec
Can Tho City
Long An Province
Tien Giang Province
Ho Chi
Bin Duon
CAN THO
KIEN GIANG
HAU GIANG
SOC TRANG
TRA VINH
BAC LIEU
CA MAU
0
225
450km
Poverty
very low
low
medium
high
very high
Migration Paths (Generalized)
Urban Areas
Destination
Major Roads
Study Sites
Activity
Farming
Studies
Services
Factory Work



Annex IV

The main map shows the principal destinations and occupations of migrants from Hung Thanh Commune, based on focus group discussions and the household survey. Migrants who move to nearby rural destinations tend to work as farm labourers or fishermen, while migrants with more distant destinations are more likely to work in factories or move for educational purposes. The district and regional capitals (Cao Lanh and Can Tho City respectively) are also important destinations for students from the research ara. Almost all migrants from Hung Thanh Commune remain in the southern part of Viet Nam. The colours in the main map depict poverty levels. The research area has medium poverty levels, and migrants mostly move to areas with low or very low poverty levels. The graph in the lower-right corner shows that average rainfall during the monsoon months has increased over the past three decades. It also reveals that inter-annual variability of rainfall has increased substantially in the last 15 years. This is confirmed by farmers in Hung Thanh Commune who reported that rainfall is becoming more and more unpredictable and they perceived this as a serious threat to their food and livelihood security. Besides more variable rainfall, people in the research area experience a range of other livelihood pressures, such as land scarcity and lack of alternative income opportunities. With high demand for industrial labour elsewhere in the country, more and more people decide to migrate out of the area.

Note: The maps (and associated rainfall variability graphs) produced for each case study report were developed using data sets from multiple sources. Each map provides the location of each research site along with contextual data on rainfall amounts and variability, poverty and agriculture. For a full list of sources please see chapter 9.2 of the Where the Rain Falls Global Policy Report (Warner et al., 2012).

Source: CIESIN (2012).

References

Anh, D.N. (2008). Labour migration from Viet Nam: Issues of policy and practices. Working Paper No. 4, Regional office for Asia and the Pacific, International Labour Organization.

Black, R., and others (2011). The effect of environmental change on human migration. *Global Environmental Change* 21, pp. 3–11.

Carew-Reid, J. (2008). *Rapid assessment of the extent and impact of sea level rise in Viet Nam.* Melbourne: International Centre for Environmental Management (ICEM).

Central Population and Housing Census Steering Committee (1999). *The 1999 Population and Housing Census: Sample results.* Hanoi.

_____ (2010). *The 2009 Viet Nam Population and Housing Census: Major findings.* Hanoi.

Chaudhry, P., and G. Ruysschaert (2007). Climate change and human development in Viet Nam. Human Development Report Office Occasional Paper 2007/46. New York: United Nations Development Programme.

Cruz, R.V., and others (2007). Asia. In *Climate change 2007: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, eds. Cambridge: Cambridge University Press, pp. 469–506.

Dasgupta S., and others (2007). The impact of sea level rise on developing countries: A comparative analysis. World Bank Policy Research Working Paper 4136. Washington, DC: World Bank.

Davies, S. (1996). *Adaptable livelihoods: Coping with food insecurity in the Malian Sahel.* London: Macmillan.

Dilley, M., and others (2005). Natural disaster hotspots: A global risk analysis. World Bank Disaster Risk Management Series No. 5. Washington, DC: World Bank.

Dong Thap Statistical Office (2011). *Statistical Yearbook 2010*.

Duiker, W.J. (1983). *Viet Nam: Nation in Revolution*. Boulder, CO: Westview Press.

Dun, O. (2011). Migration and displacement triggered by floods in the Mekong Delta. *International Migration* 49, no. S1: pp. e200–e223.

Foresight (2011). *Migration and global environmental change: Final project report.* London: Government Office for Science.

Germanwatch (2011). *Global Climate Risk Index 2012. Weather-related loss events and their impacts on countries in 2010 and 1991 to 2010.* Available from http://germanwatch.org/klima/cri.htm.

Haas, H. de (2003). Migration and development in Southern Morocco: The disparate socio-economic impacts of out-migration on the Todgha Oasis Valley. PhD thesis, University of Amsterdam.

Hardy, A. (2005). *Red hills: Migrants and the state in the highlands of Viet Nam.* Singapore: Institute of South East Asian Studies.

IPCC (Intergovernmental Panel on Climate Change) (2012). Summary for policymakers. In *Managing the risks of extreme events and disasters to advance climate change adaptation: A special report of Working Groups I and II of the Intergovernmental Panel on Climate Change*, C.B. Field, and others, eds. Cambridge: Cambridge University Press, pp. 1–19.

Jäger, J., Frühmann, J., and S. Grünberger (2009). *Environmental change and forced migration scenarios (EACH–FOR) final synthesis report.* Available from http://www.eachfor.eu.

Maxwell, D. and R. Caldwell, (2008). The coping strategies index: Field methods manual (2nd ed.). New York: USAID, WFP, CARE, FIC and TANGO.

MoNRE (Ministry of Natural Resources and Environment) (2009). *Climate change and sea level rise scenarios for Viet Nam.* Hanoi.

Nguyen, H.N. (2007). Flooding in Mekong River Delta, Viet Nam. Human Development Report Office Occasional Paper 2007/53. New York: United Nations Development Programme.

Parry, M.L., and others, eds. (2007). *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge: Cambridge University Press.

Phi, H.L. (2008). Impacts of climate changes and urbanisation on urban inundation in Ho Chi Minh City. Paper presented at the 11th International Conference on Urban Drainage, Edinburgh.

Rademacher-Schulz, C., and others (2012). Rainfall variability, food security and human mobility: An approach for generating empirical evidence. Intersections No. 10. Bonn: United Nations University Institute for Environment and Human Security (UNU-EHS).

Tuan, L.A., and others (2008). Floods and salinity management in the Mekong Delta, Viet Nam. In *Challenges to sustainable development in the Mekong Delta: Regional and National policy issues and research needs*, T.T. Be, B.T. Sinh and F. Miller, eds. Stockholm: Sustainable Mekong Research Network, pp. 15–68.

UN Viet Nam (2009). *Climate change fact sheet: The effects of climate change in Viet Nam and the UN's response.* Hanoi.

_____ (2010). *Internal migration: Opportunities and challenges for socio-economic development in Viet Nam.* Hanoi.

van der Geest, K. and T. Dietz (2004). A literature survey about risk and vulnerability in drylands, with a focus on the Sahel. In *The impact of climate change on drylands*, Dietz, T., Rueben, R. and J. Verhagen, eds. Dordrecht: Kluwer, pp. 117–146.

Van, T.Q. (2012). Poverty Dynamics: Evidence from Rural Viet Nam. DEPOCEN Working Paper Series No.2012/9. Hanoi: Development and Policies Research Center (DEPOCEN).

Vuong, Q.H. and T.D. Tran (2009). Financial turbulences in Viet Nam's emerging economy: Transformation over the 1991–2008 period. In *Contemporary issues in finance*, S. Jagadeesha and S. Deene, eds. New Delhi: Excel Books, pp. 43–61.

Waal, A. de (1989). Is famine relief irrelevant to rural people? IDS Bulletin 20, no. 2: pp. 63–67.

Warner, K., and others (2009). *In search of shelter: Mapping the effects of climate change on human migration and displacement.* Bonn: UNU, CARE, CIESIN, World Bank and UNHCR.

Warner, K., and others (2012). Where the Rain Falls: Climate Change, Food and Livelihood Security, and Migration. Global Policy Report. Analysis and Main Findings of the Where the Rain Falls Project. Bonn: United Nations University Institute for Environment and Human Security (UNU-EHS) and CARE.

World Bank and GFDRR (Global Facility for Disaster Reduction and Recovery) (2010). *Weathering the storm: Options for disaster risk financing in Viet Nam.* Washington, DC: World Bank.

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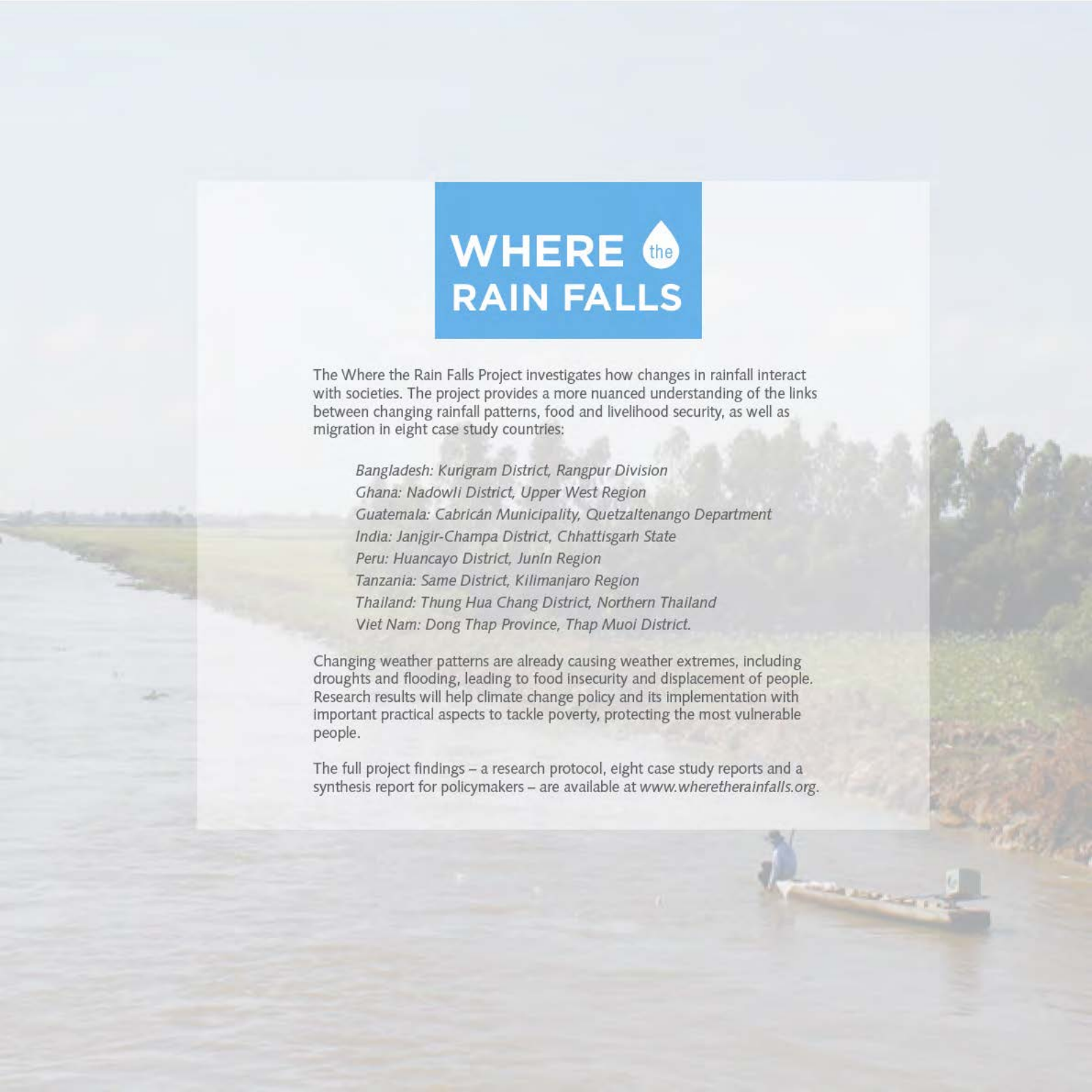

WHERE the RAIN FALLS

The Where the Rain Falls Project investigates how changes in rainfall interact with societies. The project provides a more nuanced understanding of the links between changing rainfall patterns, food and livelihood security, as well as migration in eight case study countries:

Bangladesh: Kurigram District, Rangpur Division
Ghana: Nadowli District, Upper West Region
Guatemala: Cabricán Municipality, Quetzaltenango Department
India: Janjgir-Champa District, Chhattisgarh State
Peru: Huancayo District, Junín Region
Tanzania: Same District, Kilimanjaro Region
Thailand: Thung Hua Chang District, Northern Thailand
Viet Nam: Dong Thap Province, Thap Muoi District.

Changing weather patterns are already causing weather extremes, including droughts and flooding, leading to food insecurity and displacement of people. Research results will help climate change policy and its implementation with important practical aspects to tackle poverty, protecting the most vulnerable people.

The full project findings – a research protocol, eight case study reports and a synthesis report for policymakers – are available at *www.wheretherainfalls.org*.