THE WORLD BANK

DISCUSSION PAPER NUMBER 17 DECEMBER 2010

58903

DEVELOPMENT AND CLIMATE CHANGE

The **Social Dimensions** of Adaptation to Climate Change in **Vietnam**

THE WORLD BANK

DISCUSSION PAPER NUMBER 12 NOVEMBER 2010

ECONOMICS OF ADAPTATION TO CLIMATE CHANGE

The **Social Dimensions** of **Adaptation** to **Climate Change** in **Vietnam**

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November 2010

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ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
ARDC	Asian Disaster Reduction Center
CBRDM	Community-Based Disaster Risk Management
CCSFC	Central Committee for Storm and Flood Control
CH	Central Highlands
CtC	Challenge to Change
CRED	Centre for Research on the Epidemiology of Disasters
CRES	Center for Natural Resources and Environmental Studies, Vietnam National University
DANIDA	Danish International Development Agency
DARD	Department of Agriculture and Rural Development
DFID	Department for International Development (UK)
DONRE	Department of Natural Resources and Environmental Studies
DPI	Department for Planning and Investment
DRAGON	Delta Research and Global Observation Network
EACC	Economics of Adaptation to Climate Change
EM-DAT	Emergency events database
FHH	Female-headed household
GDP	Gross domestic product
GoV	Government of Vietnam
GSO	General Statistical Office
HCMC	Ho Chi Minh City
HEPR	Hunger alleviation and poverty reduction
HH	Household
IMHEN	International Meteorology and Hydrology Centre
ICARD	Information Centre for Agricultural and Rural Development
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for the Conservation of Nature
MAGICC	Model for the assessment of greenhouse-gas induced climate change
MARD	Ministry of Agriculture and Rural Development
MD	Mekong Delta
MoLISA	Ministry of Labor, Invalids, and Social Affairs
MONRE	Ministry of Natural Resources and Environment

MOST	Ministry of Science and Technology
MPA	Marine protected area
MPI	Ministry of Planning and Investment
MRC	Mekong River Commission
NAPA	National Adaptation Plan of Action
NCC	North central coast
NGO	Non governmental organization
NTP	National Target Program
NE	Northeast
NW	Northwest
OFDA	Office of Foreign Disaster Assistance
OCHA	Office for the Coordination of Humanitarian Affairs
PSD	Participatory scenario development
RRD	Red River Delta
SCC	South Central Coast
SCENGEN	Regional climate scenario generator
SE	Southeast
SEA	Strategic Environmental Assessment
SFPT	Storm and Flood Prevention Team
SLR	Sea level rise
START	System for analysis, research, and training
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
VHLSS	Vietnam Household Living Standards Survey
VND	Vietnam Dong

Note: Unless otherwise noted, all dollars are U.S. dollars.

ACKNOWLEDGMENTS

The social component of the Economics of Adaptation to Climate Change (EACC) study was developed through the joint efforts of the World Bank Social Development (SDV) and Environment Departments (ENV) and the LCR, AFR, EAP, and SAR regions of the World Bank; ESSA Technologies Ltd and the International Institute for Sustainable Development (IISD), Canada; and research institutions in Bolivia, Bangladesh, Ethiopia, Ghana, Mozambique, and Vietnam. The study was undertaken by a core team led by Robin Mearns and comprising Anne Kuriakose, Carina Bachofen, Nilufar Ahmad, and Minna Kononen (all SDV). An overall synthesis report of all six country reports has been prepared and is available at www.worldbank.org/eacc. The study was designed and implemented in close collaboration with the team leader for the overall EACC study (Sergio Margulis), and Ana Bucher, Laurent Cretegny, Urvashi Narain, Kiran Pandey, Robert Schneider (all ENV), and sector consultants.

The Vietnam country study for the social component was led by Robin Mearns and Anne Kuriakose (SDV), in collaboration with the EACC country team leader Benoit Laplante and country office sector liaisons Douglas Graham and Le Anh Tuan (both EASVS). The research team and report preparation was led by Pamela McElwee (Arizona State University), who coordinated field inputs from teams from the Centre for Natural Resources and Environmental Studies (CRES), Vietnam National University (Nghiem Phuong Tuyen, Le Thi Van Hue, Vu Thi Dieu Huong); Dragon Institute of Can Tho University (Nguyen Van Be, Le Quang Tri, Nguyen Hieu Trung, Le Anh Tuan, Le Canh Dung); and Challenge to Change UK (Le Quang Duat, Dang Thu Phuong, Nguyen Tri Dung, Graham Adutt). Support in methodology and workshop design and for training of trainers for the participatory scenario development (PSD) workshops was provided by Livia Bizikova (IISD) and Anne Kuriakose (SDV). A separate report is available summarizing this PSD work, along with a training of trainers manual at www.worldbank.org/eacc.

We could not have completed this work without the continuous logistical support provided by Hawanty Page (ENV), Grace Aguilar (ENV), Mustafa Pajazetovic, and Carmen Martinel (both SDV). We gratefully acknowledge editorial services provided by Robert Livernash, and production management provided by Danielle Christophe (SDV) and Robert Reinecke.

The Vietnam country study has benefited greatly from peer review comments and other feedback from World Bank staff, including Douglas Graham and Steven Jaffee, and from external peer reviewers, including Koos Neefjes, Richard Klein, and Maarten van Aalst.

Any remaining errors and omissions are entirely those of the country study team.

EXECUTIVE SUMMARY

Vietnam is likely to be one of the most significantly impacted nations in the world from climate change, due to its very long coastline, high dependence on agriculture, and relatively low levels of development in rural areas. The forecasted climate impacts to 2100 will likely be an increase in rainfall in wet seasons and decrease in dry of around 10 percent or more, increased intensity and frequency of storms and floods, and a likely sea level rise of at least 1 meter. Different regions in Vietnam are likely to have unique climate impacts, making a single national policy for adaptation difficult.

In additional to increased climatic impacts, Vietnam has also in recent years been undergoing national trends that may foretell increased vulnerability to these climate changes, including extensive losses of mangroves to shrimp farming for global export; declines in the diversity of crops harvested in many agricultural areas; household livelihoods that are becoming less diverse; commons that have been privatized; and social safety nets that have eroded, leaving households with more individual responsibilities. Current development trajectories are likely to clash with the realities of the changes likely from global climate change.

The social component of the Economics of Adaptation to Climate Change (EACC) study was aimed at identifying social vulnerability and adaptive capacity in particularly climate-impacted geographic regions of Vietnam and among particularly vulnerable peoples. Localized vulnerability is important to understand, as regional downscaling of long-term climate forecasts needs to be supplemented with detailed assessments of who within geographically vulnerable regions are the most socially and physically vulnerable. The project made assessments of adaptive capacity, deficits, and maladaptation based on the past experience of communities with variable climates. From this information, participatory scenarios were developed to help guide future adaptation, and to provide cost estimates of these future pathways. The aim of the study was to produce data, analysis, and advice for the overall EACC study on where the social assessment can help clarify questions of vulnerability, adaptation, and economic costs.

Work took place in late 2009 to early 2010, and was designed based on concepts that come out of the sustainable livelihoods analysis and environmental entitlements literature, particularly social vulnerability, resilience and adaptive capacity. Field research took place in four regions (Northern Mountains, Central Coast, Central Highlands, and Mekong Delta). Both national and local participatory scenario development workshops were also held in Hanoi and in the regions where the fieldwork took place.

Key outputs from the study include:

Identification of key socioeconomic and biophysical zones of vulnerability to climate change, and typologies of livelihood profiles of areas and communities that are climate vulnerable. The focus of local field research was to draw a more detailed picture of the types of people who are likely to be most vulnerable to future climate change, and how adaptation practices engaged in during past climate events might shed light on future adaptation choices and pathways, with a particular emphasis

on how social vulnerability might be reduced and future adaptive capacity built up. The analysis concluded that the Mekong Delta region has high exposure and moderate sensitivity; Central Highlands, moderate exposure and high sensitivity; Northern Mountains, low exposure and high sensitivity; Central Coast, high exposure and moderate sensitivity; Red River Delta, moderate exposure and low sensitivity; and Southeast Region, low exposure and low sensitivity.

Assessment of the policy and institutional framework for adaptation at the national, regional, and local levels. Vietnam adopted in December 2008 a National Target Program for Climate Change (NTP), but the document has little to say about how adaptation will take place and who will be the most vulnerable populations. Currently, government plans for vulnerability and adaptation assessment in the NTP tend to be focused on sector-wide and quantitative vulnerability assessment needs for the whole country, and on solutions that the government can implement through policy or financial planning, such as "hard" adaptation measures (sea dykes, reinforced infrastructure, more durable buildings). Little attention has been paid to social vulnerability or "soft" adaptation measures, such as increasing institutional capacity or the role of local action and social capital in building resilience.

Local assessment of existing and potential adaptation options and practices. Multiple types of adaptation actions (social, institutional, physical, technological, investment, regulatory, market) and by multiple actors (different levels of government from village to national, international actors, local communities and community-based organizations, individuals, and the private sector) were assessed. Most adaptation options seen in the field sites primarily are aimed at response capacity and disaster risk reduction—such as activities in forecasting, weather monitoring—and managing climate risk, such as activities to climate-proof physical infrastructure. Long-term adaptation actions that address the drivers of vulnerability —such as adaptation options that reduce poverty and increase household resilience—or that integrate climate change into development planning were not yet seen. The most striking finding about adaptation options in the fieldsites was how different the strategies were, indicating that one-size-fits-all adaptation will not work for Vietnam. Different communities among the different regions will have different ideas about how best to match their development objectives to the realities of climate change impacts on these pathways. This includes the need for autonomous and planned adaptations, hard and soft adaptation, and community and individual adaptation.

Participatory scenarios of adaptation pathways that might be chosen in the future. Workshops on participatory scenario development (PSD) were conducted to identify and categorize adaptation pathways suitable for different livelihood groups. Participants in the workshops included members from vulnerable livelihood groups; they worked together to identify social costs and benefits of adaptation activities. Different scenarios resting on different visions and assumptions were played out to let communities and officials have a chance to assess the range of imagined futures that different communities envision, as well as a chance to cost out different approaches and make difficult choices about financial and social investments and outcomes. Overall, many adaptation options—either seen in fieldsite or proposed in workshops—were highly cost-effective and of moderate expense. These results can help policy makers make better, more inclusive choices about the range of adaptation responses to be considered in the future.

1. INTRODUCTION AND OVERVIEW

Vietnam has made great economic progress in recent years, growing on average 8 percent a year, along with making gains in reducing poverty, from nearly 60 percent of the population in 1993 to 16 percent in 2006 (VDR 2008). However, these developments are tenuous and are likely to be undermined by the effects of climate change. Vietnam is likely to be one of the most vulnerable nations in the world, due to its very long coastline, dependence on agriculture (more than 70 percent of the population is based in rural areas), relatively low levels of development in rural areas, and location of the largest urban center—Ho Chi Minh City—in a low-lying coastal zone. Vietnam has been identified as one of the top 15 countries in the world already vulnerable to natural hazards like drought and storms in terms of number of people and scale of exposure (Dilley et al. 2005); predicted temperature increases will exacerbate this condition to levels previously not experienced. Vietnam has already begun to feel the effects: the average surface temperature has risen 0.7°C since 1950; the typhoon and flood seasons are longer than they used to be; droughts in areas previously not vulnerable to aridity have been noted, as have increased incidences of heavy rainfall and flooding; and storms are tracking into new coastal areas (Carew-Reid 2008; Ho Long Phi 2008). The forecasted climate impacts to 2100 will be an increase in rainfall in wet seasons and a decrease in dry seasons of around 10 percent or more, increased intensity and frequency of storms and floods, and a likely sea level rise of at least 1 meter (GOV 2008). These future scenarios indicate Vietnam will have tens of millions of people who will be impacted.

In additional to increased climatic impacts, Vietnam has in recent years been undergoing national trends that may foretell increased vulnerability to these changes. These include extensive losses of mangroves, particularly in the Mekong and Red River Deltas, due to pressure from shrimp farming for global export (Le Thi Van Hue 2006; Luttrell 2001). Loss of these mangroves signals an increased vulnerability to tidal surges, hurricanes, and increased coastal salinity. There has been a general decline in the diversity of crops harvested in many agricultural areas due to single-crop patterns encouraged for export agriculture and a loss of traditional flood-resistant rice varieties to hybrid and HYV seeds (Le Hai Duong et al. 2007). An increase in clogging of irrigation canals due to water hyacinth infestation has been reported in the Red River Delta, exacerbated by runoff from overuse of chemical fertilizers, causing major problems for flooding and drainage (CRES unpublished data 2009). Household livelihoods are becoming less diverse in some regions due to a loss of supplementary income from commons that have been privatized, such as income from crabs, clams, worms in coastal flats, and medicines, foods and timber in forested areas, particularly for women (Le Thi Van Hue 2006; McElwee 2009). And the social safety net that was provided during the cooperative era has eroded, leaving households with more individual responsibilities for schools and health fees, and less likely to contribute to public collective activities like dyke maintenance (Adger 1999a, b).

While the government of Vietnam is increasingly recognizing the threats facing the country from climate change, there have been limited research programs focused on identifying social vulnerability and

addressing social aspects of adaptation in particular. Vietnam adopted in December 2008 a National Target Program for Climate Change (NTP), but the document has little detail about how adaptation will take place and who will be the most vulnerable populations (GOV 2008). Currently, government plans for vulnerability and adaptation assessment in the NTP tend to be focused on sector-wide and quantitative vulnerability assessment needs for the whole country, and on solutions that the government can implement through policy or financial planning. The main adaptation measures mentioned in the NTP are "hard" adaptation measures (sea dykes, reinforced infrastructure, more durable buildings) with some other measures, like resettlement, storm warning systems, and mangrove planting. Little attention has been paid to social vulnerability or "soft" adaptation measures like increasing institutional capacity or the role of local action and social capital in building resilience and adaptive capacity.

SUMMARY OF EACC PROJECT AND THE SOCIAL COMPONENT

The World Bank's ongoing Economics of Adaptation to Climate Change (EACC) study in Vietnam is currently developing cost estimates for adaptation responses based on climate simulations of future impacts combined with sectoral analysis of agriculture, water, fisheries, and forests, among others. The ongoing EACC study has four primary components:

- Climate projections and assessment of exposure, climate sensitivity, and potential impact through use of forecasted climate models
- Assessment of adaptive capacity, adaptation deficit, and maladaptation through study of past climate adaptation
- Estimation of the costs of future adaptations that will be necessary
- National assessment of adaptation to climate change (EACC Concept Note and Study Plan 2008).

The social component to the EACC analysis in Vietnam was modeled on similar vulnerability and adaptation analysis undertaken in the other EACC countries to date (Kuriakose et al. 2009). The social study has particularly focused on the assessment of vulnerabilities and past adaptations, based on the experience of communities with past variable climate events and trends, and was designed to contribute to the cost analysis and completion of the national assessment of adaptation by assessing future adaptation ability. In this we have been looking at institutional design, participatory processes, system flexibility, and social learning. From this information, participatory scenarios can be developed to help guide future adaptation and to provide cost estimates of these future pathways. By carefully identifying the social conditions that contribute to climate vulnerability—such as ethnicity, gender, economic class, occupation, and asset holdings—the social study is aimed at helping the overall EACC effort determine the cost-effectiveness of various adaptation strategies and their effects on the variety of at-risk communities across a range of physical landscapes.

STUDY RATIONALE AND APPROACH

The main research objectives of the Vietnam EACC social component study were:

(1) To identify key socioeconomic and biophysical zones in Vietnam and develop a typology and livelihood profile of areas and communities that are climate vulnerable. This can be done through reviewing the existing data on poverty, vulnerability, and climate change in Vietnam, and by speaking with experts in the area.
(2) To assess the policy and institutional framework for adaptation—at the national, regional, and local levels—through interactions with policy makers and other stakeholders.
(3) To classify different types of local social vulnerability to climate change through targeted fieldwork in selected vulnerable areas of the country from which livelihood typologies are developed.
(4) To work with local affected communities, policy makers, scientists, and other interested stakeholders to develop participatory scenarios of adaptation pathways that might be chosen in the future.
(5) To produce data, analysis, and advice for the overall EACC study on where the social assessment can help clarify questions of vulnerability, adaptation, and economic costs.

CONCEPTUAL FRAMEWORK AND KEY AREAS OF INQUIRY

The EACC-Social study, like other social assessments carried out under the EACC umbrella across the globe, focuses on several key concepts: livelihoods, vulnerability, and adaptive capacity.

Asset and Livelihood Systems

Many studies in recent years have focused on the idea of "sustainable livelihoods" as a useful framework in which to contextualize people's relationship with their environment (Scoones 1998; Leach et al. 1999; Pretty and Ward 2001). Livelihood simply defined refers to the way in which people make a living, taking into the consideration the many factors that contribute to shape their choices and alternatives. The sustainable livelihoods approach was the first one to focus on the multiple types of capital that encompassed development. These aspects included economic capital (the assets of households); human capital (the skills, education, labor ability, health and other types of physical capacity); and social capital (relationships, networks, affiliations, communities, and other ties upon which people draw in order to sustain their livelihoods) (Leach et al. 1999). In other words, rather than simply looking at production and income/expenditures data, livelihood studies have attempted to go beyond the economic or material basis of households by looking at a variety of other factors that influence household well-being, chief among them being dynamic social relations. From these studies emerge the need to understand the way in which institutions, social interactions, and economic opportunities shape, and are shaped by, livelihood systems.

Vulnerability and Climate Change

According to a widely used definition, "Vulnerability is the degree to which a system, subsystem, or system component is likely to experience harm due to exposure to a hazard, either a perturbation or stress/ stressor" (Turner et al. 2003). The IPCC has adopted this definition and has emphasized vulnerability is a function of *exposure, sensitivity, and adaptive capacity* (IPCC 2007). The most vulnerable people, therefore, are those who experience the most exposure to climate events, are the most sensitive, and who have the weakest capacity to respond.

An extensive literature on social vulnerability, particularly coming from the hazards literature in geography and anthropology, has related how access to resources are distributed within and among communities, shaped by such factors as "poverty and inequality, marginalization, food entitlements, access to insurance, and housing quality" (Adger et al. 2004). Research in this area primarily focuses on "vulnerability mapping" to identify those (individuals, groups of people, communities, and regions) who are more susceptible to changes in livelihoods as a result of specific physical or climate hazards. Many researchers have tried to develop typologies of social vulnerability that are "hazard specific"— such as whether or not a household is situated on a coastal area or in a river floodplain—as well as more generic factors that often relate to general vulnerability, such as wealth status and levels of inequality, access to resources (financial, natural, and otherwise), health and labor, and social status vis-à-vis others. There is an increasing trend in the literature to use indexes of vulnerability scaled with a set of specific indicators (Downing et al. 2001). Some of these are data driven, while some are more theory driven (Vincent 2007).

A major challenge in vulnerability studies is that defining things that researchers believe will impact vulnerability and adaptive capacity are often hard to catch with single quantitative measures; an example would be a topic like governance. A further challenge is capturing the dynamic nature of vulnerability, as quantitative approaches are more likely to present a static snapshot of vulnerability at one point in time (Eakin and Luers 2006). A review by Adger et al. (2004) has identified a number of local and supra-local processes that can contribute to overall vulnerability (Table 1), but which are often difficult to capture in single quantitative indicators.

Adaptive Capacity and Sociospatial Approaches to Adaptation

Adaptive capacity is defined by Adger et. al. (2004) as "the ability or capacity of a system to modify or change its characteristics or behavior so as to cope better with existing or anticipated external stresses." This capacity can be variously defined as the capacity to absorb stress (either through resistance or adaptation), the capacity to manage and maintain basic functions during such stress, and the capacity to bounce back after stress. Addressing

TABLE 1. EXAMPLES OF PROCESSES THAT AFFECT VULNERABILITY

Local-scale processes	*Processes at higher scales*
Increasing labor migration	Population growth
Declining labor availability	Increasing/decreasing provision of services by the state
Loss of customary rights and change to "modern" tenure systems	Increasing penetration of global markets/ Reorientation of most production away from local circulation and reciprocity
Reduction of mobility in terms of grazing livestock	Relative declining value of rural products, both agricultural and nonagricultural
Increasing need for cash	Changing legislation and tenure systems
Increasing price of inputs	Declining biodiversity and forests/ expansion of agriculture
Privatization of land and resources	Declining indigenous knowledge
Monetization of resources and services/ increasing health and education costs	Increasing HIV/AIDS prevalence
Loss of access to communal resources	Urbanization
Increasing skill requirements for nonagricultural employment	Deagrarianization

Source: Adger et al. 2004.

such a large-scale global issue as climate change is particularly complicated when speaking of adaptive capacity in that action and adaptation must take place across economic sectors and at local, national, and even international scales among a range of actors and institutions.

Like measures of vulnerability, measures of adaptive capacity vary considerably. The climate change literature is filled with attempts to develop specific indices of adaptive capacity that take into account all the factors that may go into adaptation and enhancement of resilience to climate hazards, but it has proven difficult to develop simple typologies, especially when the data from on-the-ground field studies remains lacking (Kates 2000; Yohe and Tol 2002; Smit and Wande 2006). For example, in the vulnerability-resilience indicator model, adaptive capacity is measured by human resources capacity (i.e. literacy rates), economic capacity (i.e. GDP per capita and measures of income inequality), and environmental capacity (population density, pollution emissions, percentage of managed land) (Moss et al. 2001; Brenkert and Malone 2005). In another report specifically on adaptive capacity (Brooks et. al. 2005) and which looked at national-level indicators measured against vulnerability to climate-related disasters in past years, the capacity of countries to adapt to climactic events was most associated with strong developments in the fields of education (literacy rates), health (mortality rates), and governance and political rights. Another report on adaptive capacity in Southeast Asia used statistics of development indicators, such as the *Human Development Index* rankings, education, poverty incidence, income inequality, electricity coverage, irrigation, road density, and communication as indicators of adaptive capacity (Yusuf and Francisco 2009).

A sociospatial approach to adaptation tries to link the specific livelihood profiles found in geographically delimited areas to the ability of households and communities to be resilient to climatic changes. While individually people may or may not be able to adapt depending on their access to resources and entitlements (Adger et al 2005) , they are also constrained by what others are doing as well, and by norms on what types of behaviors and responses are appropriate, which are often gender-specific, age-specific, and social status-specific. Examples of culturally shaped adaptation responses might include informal non-monetary arrangements and social networks to cope with climate hazards that are extended to close kin and other relatives; community organization and communal responsibility; food-sharing expectations and networks; and local and long-distance support networks, such as migrant ties (Agrawal et al. 2008).

Policy and Institutional Framework for Climate Resilience

Because adaptation to climate change will potentially require changes in production and lifestyles, assessments of planning and policy making at all levels are usually part of any climate vulnerability study, and thus policy was also assessed by the Vietnam EACC-social study. The diversity of strategies for adaptation that will be required needs a policy framework to help facilitate adaptation, as well as favorable policies in related sectors that potentially impact on both vulnerabilities and space for adaptation in the future, such as through reference to land tenure policy, existing social protection measures, national to local governance structures, and the roles of informal and civil society in possible adaptation responses (Mani et al. 2008; Dovers and Hevri 2010).

Assessments of the policy environment related to adaptation usually entail an institutional analysis of key actors involved in climate adaptation, as well as reviews of policy implementation processes and outcomes. Both direct climate policies (in the case of Vietnam, primarily the National Target Program on Climate Change), but also the more general institutional setting in which adaptation will take place, is required. This part of the social study has an explicit linkage to the sectoral analyses being undertaken for the Vietnam EACC, which incorporates a review of related policy environments in the fields of agriculture, water, fisheries, and forests.

Civil society actors and the private sector are also key components of understanding institutional frameworks, such as through analysis of how useful local and national policy has been in creating an enabling environment for bottom-up adaptation practices. Such policy assessments usually address existing institutional capacities, ongoing functions related to climate vulnerability and adaptation, future plans in these areas and capacity needs going forward, and visions for overall adaptation pathways and economic costs of these choices (Lim et al. 2005; Klein et al. 2005).

2. SOCIAL DIMENSIONS OF CLIMATE CHANGE IN VIETNAM

Studies of the social impacts of climate change in Vietnam have been increasing in number in recent years, although the field does still lack national-level reviews and papers published in the international peer reviewed literature (for some of the only studies, see Adger 1999a; 2003). Because Vietnam has not submitted a National Adaptation Program of Action (NAPA) to the UNFCCC, as other countries included in the EACC study have, the data sets for Vietnam are necessarily more haphazard than might be the case elsewhere. The EACC social team decided to focus our attention on a few major studies (although none of them nationally comprehensive in themselves) to assess what might theoretically be physical and social vulnerabilities that Vietnam should pay attention to, and then construct our own preliminary index of vulnerability that takes into account all three dimensions: *exposure*, *sensitivity*, and *adaptive capacity*. Our approach has been to analyze where previous vulnerability and livelihoods studies have taken place, what methodologies were used to assess vulnerability, what they found in terms of the scale and scope of vulnerability, and then attempt to link overall understanding of these vulnerable regions to forecasted climatic effects available in regional and national climate models. Fieldwork undertaken to assess the local impacts in several regions of the country is explained further in section four.

Unfortunately one major challenge in matching social vulnerability generally to the physical vulnerability expected under climate change scenarios is the still relatively coarse-scale analysis of the regional and national climate projections. Whereas our assessment of the secondary literature on social vulnerabilities and livelihoods has relatively good coverage, down to the provincial level and oftentimes even at the district and commune, such focused resolution is not yet possible for our climate projections. Thus this report can only try to map the detailed social vulnerability data on much more broad climate forecasts. In this we are primarily dependent on the new Ministry of Natural Resources and Environment (MONRE) report entitled *Climate Change, Sea Level Rise Scenarios for Vietnam* (2009). However, this report does not allow speculation below the main eight or so agroecological regions of the country in terms of projecting physical vulnerabilities.

EXPECTED PHYSICAL IMPACTS OF CLIMATE CHANGE IN VIETNAM

The current state of exposure to climate impacts is best assessed by looking at past damage from climate-related disasters. Even in the absence of pressures from climate change, livelihoods of people in Vietnam have long been subject to natural disasters. From 1953 to 2010, nearly 25,000 people were killed by natural disasters, and 77 million people were affected in one way or another. Total estimated damage has been over $7 billion (Table 2). The number one climate hazard in terms of people killed, affected, and total damage are tropical cyclones (hurricanes), with over 80 different storm events and around 45 million people affected and nearly 19,000 killed from 1953–2010. This indicates that coastal areas, particularly in the northern half of the country, have the strongest exposure to the most common climate events. With a coastline more than

TABLE 2. DAMAGES FROM NATURAL DISASTERS IN VIETNAM, 1953–2009

Type of Event		*# of events*	*# Killed*	*# affected*	*Damage (000 dollars)*
Drought	Drought	5	–	6,110,000	$649,120
	avg. per event		–	1,222,000	$129,824
Flood	Unspecified	7	836	1,150,175	$13,400
	avg. per event		119.4	164,310.7	$1,914.3
	Flash flood	9	293	213,603	$59,200
	avg. per event		32.6	23,733.7	$6,577.8
	General flood	38	3,210	20,627,410	$1,946,925
	avg. per event		84.5	542,826.6	$51,234.9
	Storm surge/coastal flood	6	804	435,3316	$749,000
	avg. per event		134	725,552.7	$124,833.3
Mass movement	Avalanche	1	200	38,000	–
	avg. per event		200	38,000	–
	Landslide	5	130	1,074	$2,300
	avg. per event		26	214.8	$460
Storm	Unspecified	9	298	36,780	$1,035
	avg. per event		33.1	4,086.7	$115
	Local storm	7	144	4,450	$10,100
	avg. per event		20.6	635.7	$1,442.9
	Tropical cyclone	66	18,425	44,885,509	$4,334,470
	avg. per event		279.2	680,083.5	$65,673.8
Wildfire	Forest fire	1	–	–	–
	avg. per event		–	–	–
TOTAL			**24,340**	**77,420,317**	**$7,765,550**

Source: EM-DAT: The OFDA/CRED International Disaster Database, www.emdat.be.

3,000 km long and covering 15 percent of the national land area, coastal areas of Vietnam are home to 18 million people, about 25 percent of the total national population. The second most hazardous climate events have been floods, with around 60 major events, 5,000 killed, and 25 million affected in the past half century. Table 3 notes the increasing amounts of damage that have been caused by recent storms and floods, although in terms of deaths older storms have been more serious.

Although exceptional climate events and disasters get the most attention, climate events are not climate change. In the latter case, there may be slow shifts in climatic indicators over long periods of time. Thus studies of exposure need to explore both the potential for increase in short-term exceptional climate events, as well as the long-term climatic changes, some of which may be potentially beneficial to some sectors. Figure 1 shows the current distribution of major climate events in Vietnam, and the following sections will assess the predicted long-term changes in climate exposure over the next 50 years. We note, however, that while physical exposure may seem a simple concept, it is not always agreed upon by all parties similarly. For example in stakeholder consultations in Can Tho to determine the affect of climate change on the catfish industry, officials and farm managers perceived sea level rise as the most serious threat facing livelihoods in the future, while farmers were more concerned about changes in everyday weather patterns, such as higher temperatures, early rains, floods, saltwater intrusion, and typhoons (Nagothu et al. 2009).

TABLE 3. TOP TEN CLIMATE DISASTERS IN VIETNAM

	Top 10 by # Killed			*Top 10 by total affected*			*Top 10 in terms of economic damage*		
	Disaster	*Date*	*No. Killed*	*Disaster*	*Date*	*No. Total Affected*	*Disaster*	*Date*	*Damage (000 $)*
1	Storm	Sep-64	7,000	Storm	15/09/80	9,027,174	Storm (Ketsana)	28/09/09	$785,000
2	Storm (Linda)	2/11/97	3,682	Storm	23/07/80	6,624,710	Storm	27/09/06	$624,000
3	Storm	26/09/53	1,000	Flood	Jul-00	5,000,004	Flood	27/10/08	$479,000
4	Storm	23/10/85	798	Storm	Oct-89	4,635,762	Storm (Linda)	2/11/97	$470,000
5	Storm	25/05/89	751	Flood	Aug-78	4,079,000	Storm	30/11/06	$456,000
6	Flood	25/10/99	622	Flood	25/10/99	3,504,412	Drought	Dec-97	$407,000
7	Epidemic	1/1/64	598	Drought	Dec-97	3,000,000	Storm	24/07/96	$362,000
8	Storm	24/07/96	585	Flood	7/9/85	2,800,000	Flood	10/11/07	$350,000
9	Storm	Sep-83	578	Storm	6/9/86	2,502,502	Flood	28/10/07	$300,000
10	Flood	Jul-00	460	Storm (Ketsana)	28/0909	2,477,315	Storm	2/11/09	$280,000

Source: EM-DAT: The OFDA/CRED International Disaster Database, www.emdat.be.

Future predictions are also harder to assess than past damages and exposures. Currently, climate downscaling is taking place through modeling run by MONRE offices. The primary models used by MONRE involve application of MAGICC/SCENGEN software and the statistical downscaling method. These model scenarios for Vietnam are developed based on different emission scenarios: low (B1), medium (B2), and high (A2) using a baseline period of 1980–99 from the IPCC 4th Report. A recent MONRE report on this ongoing modeling concludes that the B2 medium emissions scenarios are most likely, and thus what other Vietnamese ministries should base their future planning on (MONRE 2009).

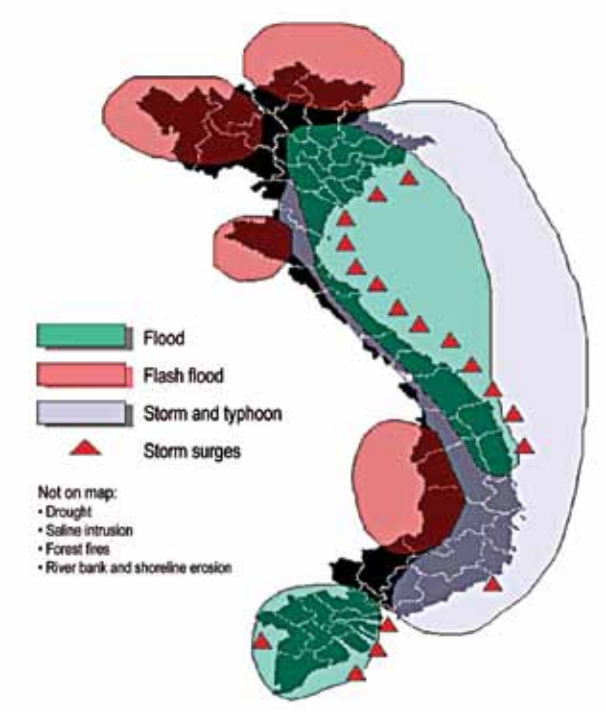
Temperature Vulnerability

Observational data regarding local temperatures have shown clear increases. Vietnam has experienced an annual average temperature rise of between 0.5n and 0.7°C from 1958–2007. Winter temperatures have seen the greatest changes, and the Northern part of the country is warming faster than the south (MONRE 2009). In some areas temperatures are increasing even more rapidly. For example, temperatures increased 0.78° C in HCMC from just 1977–2006, which was nearly twice the rate of the surrounding Mekong Delta, indicating a strong influence from the urban heat island effect (Ho Long Phi, 2008). The average temperature in inner HCMC in the dry season is now on average 5°C higher than in surrounding rural districts (Hung et al. 2006). Hanoi is estimated to be 0.8°C hotter on average than it was on average in the 1931–40 period (MONRE 2009). There has also been an observed decrease in the number of cold fronts affecting the northern provinces during winter, but a rise in anomalous and longer cold spells, such as the one that hit in Jan/Feb of 2008 and lasted for 38 days, killing thousands of livestock.

The forecasted predictions are that by the end of 21st century, temperatures in Vietnam will rise 2.3°C relative to the average of 1980–99 under medium emissions scenarios (Table 4). The increase in temperature would be in the range of 1.6°C to 2.8°C in different climate zones. Temperatures in northern and northern central climate zones of Vietnam would increase faster than those in southern zones. In each climate zone, winter temperatures would increase faster than summer ones (MONRE 2009).

Main areas vulnerable to exposure. All areas of Vietnam are predicted to experience a temperature increase, but

FIGURE 1. GEOGRAPHIC DISTRIBUTION OF PRIMARY CLIMATE EXPOSURE HAZARDS IN VIETNAM



Source: Natural Disaster Mitigation Partnership.

the phenomenon will be heightened in major urban areas due to the urban heat island effect. The elderly may be especially vulnerable to health ailments in higher temperatures, given relatively low rates of use of air conditioning in Vietnam, especially among lower income classes. The lack of green space and planted trees for shade and cooling in central cities like Hanoi and HCMC also exacerbates the heat problems.

Storm and Typhoon Vulnerability

Since the 1950s, there have been over 200 typhoons that have affected Vietnam, although not all of them have been large. In an average typhoon season, about 30 typhoons usually develop in the northwest Pacific, of which around 10 are based in the South China Sea. Of this number, on average 4–6 will make landfall on or near Vietnam, although there have been years when 10 or more have hit, such as in 1964, 1973, 1978, 1989, and 1996 (CCSFC 1999). Observed changes in storms in Vietnam to date have indicated a larger number of high intensity monsoon storms, a tendency to hit further south than in the past, and for the typhoon season to extend further into the late fall (GoV 2003; MONRE 2009).

Typhoons bring with them a myriad of events. Winds at sea often reach 60m/s, although this usually slows to 30–40 m/s when they make landfall. Precipitation accompanying typhoons has been recorded as high as 100–300mm/day and some hurricanes have brought total rainfall amounts of between 500–1,000mm (UNEP 2000). Storm surges are also a problem; in the past 30 years nearly half of all hurricanes have been accompanied by surges of over 1 m. With large surges, dikes can

TABLE 4. PROJECTED CHANGES IN ANNUAL MEAN TEMPERATURE (°C) RELATIVE TO THE 1980–99 PERIOD, MEDIUM EMISSION SCENARIO (B2)

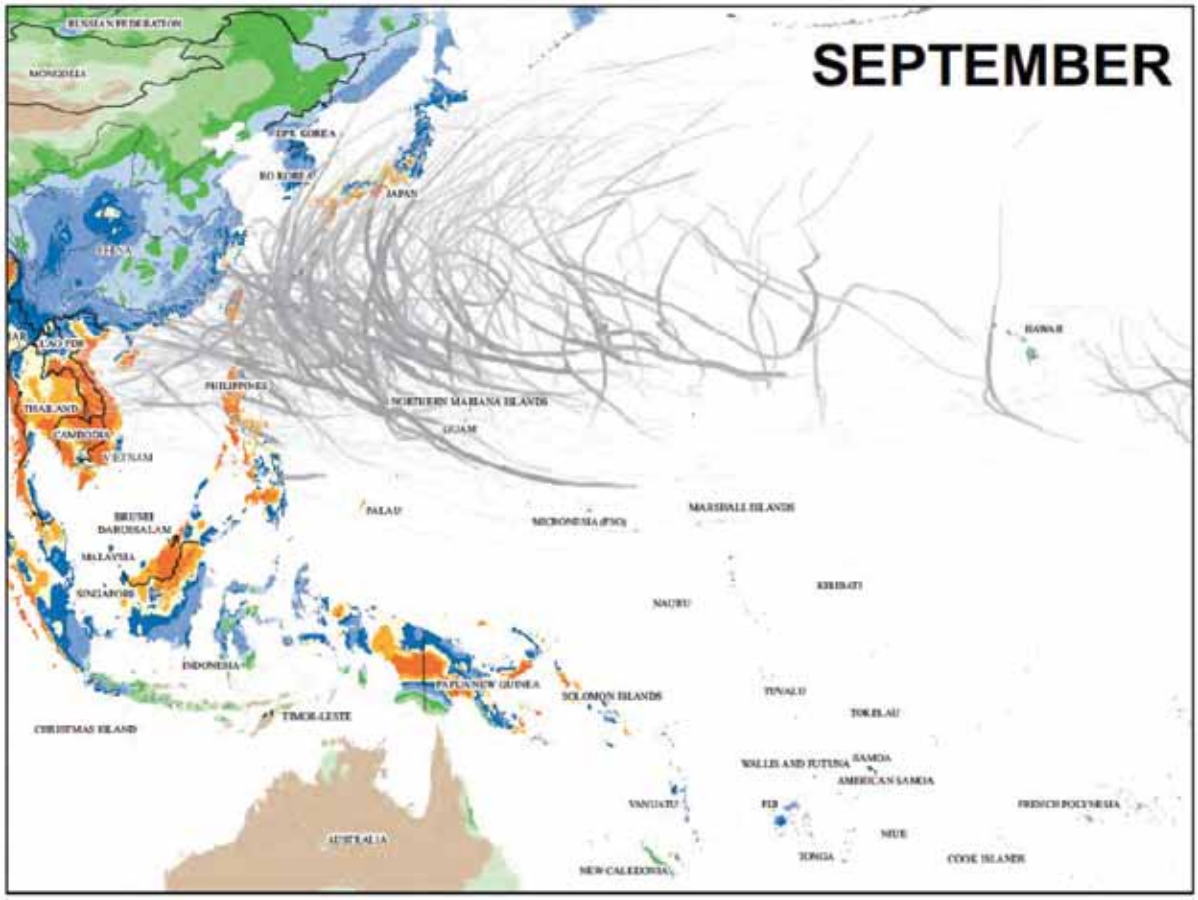
	Decades in the 21st century								
Climatic region	*2020*	*2030*	*2040*	*2050*	*2060*	*2070*	*2080*	*2090*	*2100*
North West	0.5	0.7	1.0	1.3	1.6	1.9	2.1	2.4	2.6
North East	0.5	0.7	1.0	1.2	1.6	1.8	2.1	2.3	2.5
North Delta	0.5	0.7	0.9	1.2	1.5	1.8	2.0	2.2	2.4
North Central	0.5	0.8	1.1	1.5	1.8	2.1	2.4	2.6	2.8
South Central	0.4	0.5	0.7	0.9	1.2	1.4	1.6	1.8	1.9
Central Highlands	0.3	0.5	0.6	0.8	1.0	1.2	1.4	1.5	1.6
South	0.4	0.6	0.8	1.0	1.3	1.6	1.8	1.9	2.0

Source: MONRE 2009.

easily be overtopped. Deaths from hurricanes have averaged 250 people every year, with some especially damaging ones like Typhoon Linda in 1997 that killed over 4,000. Linda was considered to be the worst storm to hit Vietnam this century, and was compounded by the storm landing at high tide in a place where there was little experience with typhoons and few means to communicate to fishermen at sea. Total damages were estimated to be $600 million (Duong Lien Chau 2000).

Regional climate models indicate that typhoons may continue to track further south under global warming scenarios, and the season for storms will likely extend, meaning areas that have not typically suffered from storms (the southeastern portion of the country and HCMC) may increasingly be vulnerable. Figure 2 shows the patterns of hurricane paths in past history, indicating southern-hitting storms have been quite rare. Unfamiliarity with storms can lead to heightened social vulnerability, as was highlighted in a recent Oxfam report on the impacts of hurricane Linda in Ben Tre province, where citizens had never in their lifetimes experienced a large typhoon. Families had houses that could not withstand the winds, and many households had not prepared anything in advance of the storm, not knowing how bad it was likely to be (Oxfam 2008).

FIGURE 2. PRECIPITATION AND FREQUENCY OF STORMS IN SOUTHEAST ASIA, 1956–2006 IN START OF MONSOON SEASON (SEPT).



Source: OCHA Regional Office for Asia-Pacific.

Main areas vulnerable to exposure. All coastal areas, with particular attention to southeastern and Mekong Delta coastal communities that are unfamiliar with storms.

Flood vulnerability

The Dartmouth Flood Observatory maintains a database of significant flood events worldwide since 1985. Vietnam is listed as having 96 flood events during that time period, caused by storms/typhoons as well as rainfall events or other reasons. This puts Vietnam in between the flood risks of neighboring countries: for example, the Philippines recorded 283 flood events in the same period, while Thailand recorded only 53. In general, three major geographical divisions can be made with regard to flood vulnerability in Vietnam: in the North, the Red River/Thai Binh river system; in the Central Coast, small-scale coastal river systems; and the Mekong/Dong Nai river system in the South.

In the Red River Delta (RRD) and Thai Binh river systems, there have been a number of major floods this century, the biggest being the great flood of 1971. Floods from both rains and typhoons are extremely serious in the RRD, because of the high population densities of people living there, and the proximity of much of this population to either river streams or to the sea in coastal areas. The major causes of floods in RRD include a dense system of rivers, low-lying topography, sea level rise, difficult circulation of flood water caused by degraded quality of water supply and drainage systems, pressure on the dike system caused by rapid urbanization and high population growth, and limited capacity in weather forecasting. From 1976 to 2003, floods in the RRD inundated 2.7 million ha of agricultural land, caused the destruction of 22,766 ships, and devastated 13.4 million houses. In total, the economic damage has been estimated at $3.5 billion (Dang 2004).

In the Central provinces, there is regular annual flooding, with particularly big floods in places like Hue and Hoi An city, such as the 1999 floods in Thua Thien Hue that killed 700. The short slopes and deforestation in many central provinces makes these floods very dangerous, especially when storms are matched with heavy rainfall, which causes rivers to rise rapidly on the steep slopes down to the sea.

The Mekong Delta also receives regular floods, with exceptional-scale floods being recorded in years such as 1961, 1966, 1978, 1984, 1991, 1995, 1996, and 2000 (CCFSC 1999). These large-scale floods can easily destroy hundreds of thousands of hectares of crops; for example, a 2000 flood damaged nearly half a million ha of agricultural and 16,000 ha of aquaculture land (ADB 2007). Flooding is at its most dangerous in the Mekong Delta when large water volumes (such as that dumped by a storm) hit; if there are long periods of rainfall; or high tides push water in canals to rise and reduce their ability to drain. While the Delta has long tried to "live with the floods" through adapting farming practices to the regular floods, thousands of hectares of land are still inundated most years (Nguyen Huu Ninh 2007).

Flash floods are also a problem, and seem to be increasing in some northern mountainous areas. This is mostly likely related to deforestation in these areas, combined with high volumes of rainfall. Patterns of change in precipitation from the beginning of the instrumental record (early 1900s) until now do not show consistent patterns of change. Annual rainfall has decreased over the north, on average, while increasing over the south. The overall average has been a 2 percent decrease from 1958–2007, but again, this hides more significant local trends (MONRE 2009).

The overall predictions for the end of the 21st century under medium emissions scenarios are that the dry seasons will get drier. For the rainy season, it is predicted that precipitation trends will be for large volumes in shorter periods, exacerbating floods in places that already experience them. In northern areas, rainfall is expected to increase at a higher rate than that of southern ones (MONRE 2009). Overall, it is expected that by 2050 there will be increased rainy season precipitation in the Red River Delta and Mekong Delta of 10–20 percent. There will, however, be decreased precipitation predicted for the Central Highlands and south-central coast. In the dry season, the forecasts are for a decrease in precipitation in the Northern Mountain region of around 10 percent; a 20 percent decrease in the Central Highlands and South-Central Coast; and a decline of 10–20 percent downstream of the Mekong River Delta (MONRE 2009). Taken as an average, however, the annual precipitation in all regions is expected to rise, particularly in the North (Table 5).

TABLE 5. CHANGES IN ANNUAL RAINFALL (%) RELATIVE TO 1980–99 PERIOD, MEDIUM EMISSION SCENARIO (B2)

	Decades in the 21 century								
Climatic region	*2020*	*2030*	*2040*	*2050*	*2060*	*2070*	*2080*	*2090*	*2100*
North West	1.4	2.1	3.0	3.8	4.6	5.4	6.1	6.7	7.4
North East	1.4	2.1	3.0	3.8	4.7	5.4	6.1	6.8	7.3
North Delta	1.6	2.3	3.2	4.1	5.0	5.9	6.6	7.3	7.9
North Central	1.5	2.2	3.1	4.0	4.9	5.7	6.4	7.1	7.7
South Central	0.7	1.0	1.3	1.7	2.1	2.4	2.7	3.0	3.2
Central Highlands	0.3	0.4	0.5	0.7	0.9	1.0	1.2	1.3	1.4
South	0.3	0.4	0.6	0.8	1.0	1.1	1.2	1.4	1.5

Source: MONRE, 2009.

With the predicted increase in total annual precipitation, flood dangers are expected to increase in many areas. The Dragon Institute of Can Tho University and South East Asia START Regional Center have simulated the change of temperature on other climate events in the Mekong Delta to the 2030s. Figure 3 indicates the expansion of the depths of flood areas, particularly into newer regions in the southern part of the delta.

Main areas vulnerable to exposure. All areas of Vietnam are predicted to experience precipitation changes, but the strongest effects are likely to be the increased rainfall in the wet season, particularly for the Mekong Delta, and decreased rainfall in the dry season for the Central Highlands and South-Central Coast.

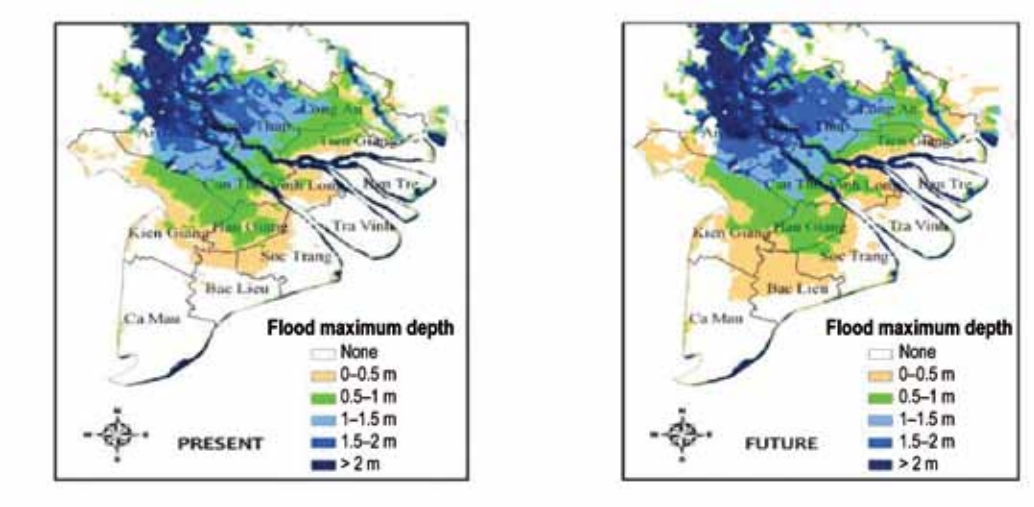
Drought Vulnerability

The high seasonality of rainfall in Vietnam means that the rainy season often brings five to six times as much precipitation as during the dry season (MRC 2004). Droughts can occur in every part of Vietnam, but have been concentrated in recent years in the central and southern parts of the country. The winter-spring crops (January–March) are usually most affected. Drought also appears to be on the increase; the areas of Vietnam affected by drought doubled from 77,000 ha in 1979–83 to 175,000 ha in 1994–98 (ADB 2007). The 1997–98 El Niño-related drought was one of the most widespread and worst droughts Vietnam has experienced; it resulted in 74,400 ha of coffee farms being drought-damaged (UNEP 2000), and domestic and agricultural water supplies in several central coastal provinces were at bare minimal levels for 2 years. The drought also set the conditions for forest fires in the Central Highlands and the Mekong Delta; thousands of hectares of plantations were damaged (ADB 2007). In the whole Mekong Delta, 15,900 ha of winter crops were lost to drought and saltwater encroachment. The total loss from drought in 1997–98 was estimated at 5,000 billion VND and affected 3 million people.

Since that El Niño year extreme event, droughts have continued to occur. In 2002, there was a drought in the Mekong River Delta. The North-Central Coast had a serious drought in 2003, along with some drought in both the Northeastern and Northwestern mountains. The year 2004 was almost uniformly dry for almost the entire nation, with more severe drought along the South-Central Coast and the Central Highlands. In 2006 there was moderate and severe drought along both the North-Central and South-Central coastal regions, as well as the Northwestern Uplands and the Red River Delta.

Droughts have a particularly damaging role in the Mekong Delta, where they contribute to increased salinization as well as the direct affects of drought. In Ben Tre province, officials estimate that saline water has moved upward about 60km inward from the sea during the dry seasons, an increase of 10 km in the past 5 years. Ben Tre agriculture officials estimated that in one year

FIGURE 3. FLOOD BOUNDARY IN THE MEKONG RIVER DELTA, 1980S AND 2030S (SIMULATED)



Source: DRAGON and START, 2010.

(2005), salinity caused 570 billion VND worth of damage, and resulted in 16,000 households having no freshwater (Oxfam 2008).

Main areas vulnerable to exposure. All areas of Vietnam are predicted to experience precipitation changes, but the strongest effects of drought are likely to be the decreased rainfall in the dry season, particularly for the Central Highlands, Central Coast, and Mekong Delta.

Vulnerability to Sea Level Rise

In a recent report, the authors noted that Vietnam may be one of the top five countries in the world likely to be most affected by sea level rise (SLR), with "potentially catastrophic" consequences (Dasgupta et al. 2007). Observed sea level rises from tidal gauge data from Vietnam indicates about a 3mm/yr sea level rise from 1993–2008, while longer term (50 year) data from a site at Hon Dau oceanographic station indicate a 20 cm rise (MONRE 2009). The National Meteorology and Hydrology Centre (IMHEN) predicts a rise for Vietnam of 35 cm by 2050, 50 cm by 2070, and 100 cm by 2100 under high emissions scenarios. The low-end scenarios predict a rise of 28 cm by 2050 and 65 cm by 2100 (MONRE 2009), although the high-end estimate of 1 m or more cannot be ruled out.

TABLE 6. PROJECTED SEA LEVEL RISE (CM) RELATIVE TO 1980–99 PERIOD

	Decades in the 21 century								
Scenarios	*2020*	*2030*	*2040*	*2050*	*2060*	*2070*	*2080*	*2090*	*2100*
Low emission scenario (B1)	11	17	23	28	35	42	50	57	65
Medium emission scenario (B2)	12	17	23	30	37	46	54	64	75
High emission scenario (A1FI)	12	17	24	33	44	57	71	86	100

Source: MONRE 2009.

TABLE 7. TOP 10 PROVINCES OF MEKONG DELTA, BY PERCENT LAND AREA INUNDATED BY 1 M SLR

Province/City	*Total area (km^2)*	*Flooded area (km^2)*	*Percentage of flooded/total area (%)*
Ben Tre	2.257	1.131	50.1
Long An	4.389	2.169	49.4
Tra Vinh	2.234	1.021	45.7
Soc Trang	3.259	1.425	43.7
Ho Chi Minh City	2.003	862	43.0
Vinh Long	1.528	606	39.7
Bac Lieu	2.475	962	38.9
Tien Giang	2.397	783	32.7
Kien Giang	6.224	1.757	28.2
Can Tho	3.062	758	24.7
Total	29.827	11.474	38.6

Source: Carew-Reid (2009).

A recent assessment of a 1 meter sea level rise asserts that 5 percent of the country's land area would be "permanently inundated," affecting six of Vietnam's eight agro-ecological regions and 39 of 64 provinces, with around 8 percent of the total population affected. Some 2,000 communes (out of a total of 10,000) were identified as being at risk of partial or full inundation. The biggest impacts would be felt in the Mekong Delta and Ho Chi Minh City, with Long An and Kien Giang provinces having the most land inundated (up to 50 percent). Forty-three percent of Ho Chi Minh City is at risk of inundation, and many poor people have been identified as living in these inundation zones (Carew-Reid 2008).

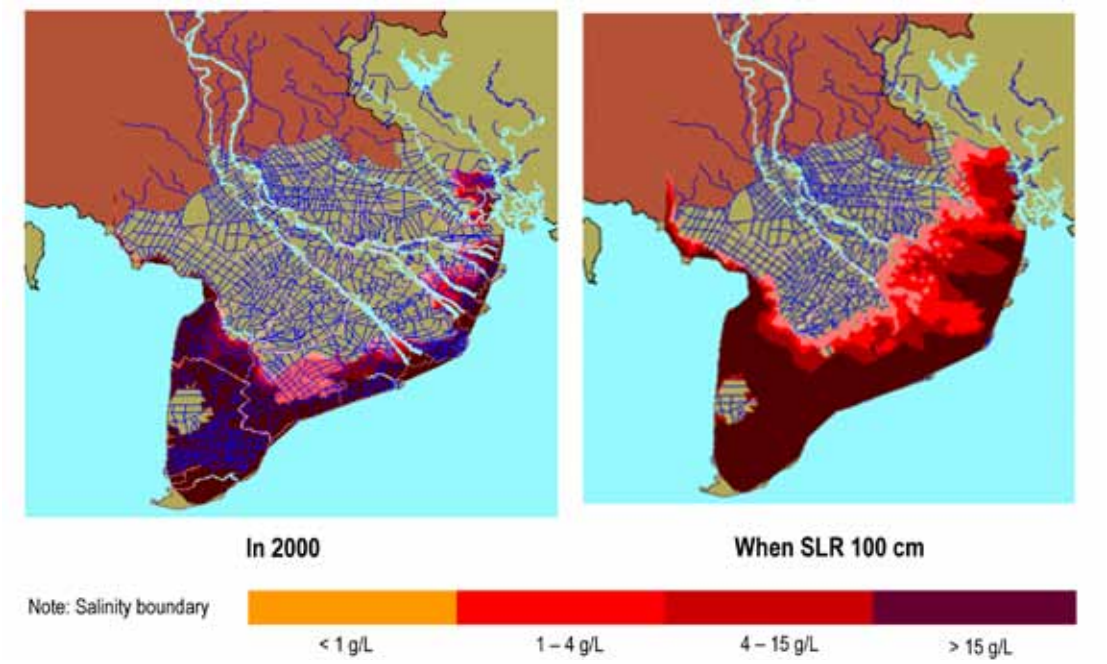
SLR will likely also increase salinity of shallow coastal aquifers, from which much drinking water is drawn. Seawater is now found about 30–50km inland from the Red River Delta and up to 60–70km in the Mekong Delta (Figure 4). This increasing salinity can also affect mangrove growth. In addition, coastal erosion is a problem; estimates are that erosion in many areas is on the order of 5–10m per year, and in some areas as much as 1 km. The worst sites of erosion are the mouth of the Ganh Hau River in the Mekong Delta, the mouth of the Van Ly in Nam Dinh of the RRD, and Tuy An district of Phu Yen in the South-Central Coast (Pham Thi Thuy Hanh 2007). Land subsidence has also been noticed in some urban and peri-urban sites, which could be further affected by SLR (Ho Long Phi, 2008).

Main vulnerable areas. Coastal areas, particularly below 1 meter (Figure 6). In terms of large populations, in Ho Chi Minh City, a SLR of just 50 cm, added to a flood-tide of about 1.50m, causes a temporary rise in the water level of +2.00 m. This would lead to a flooding of 300 km^2 of the city, with up to 71 percent of the land area and 62 percent of the population being regularly exposed. Estimates indicate that 6 percent of the land area, 15 percent of infrastructure, and 500 major business enterprises in HCMC would be inundated with a 1m SLR (Carew-Reid 2008).

OVERVIEW OF SOCIAL VULNERABILITY IN VIETNAM

Social vulnerability relates primarily to how access to resources are distributed within and among communities. While physical vulnerabilities may be geographically mapped with some precision, it is social vulnerabilities that often are much more difficult to assess and to identify clearly because they do not easily fit into definite geographic spaces. For example, natural events (such as heavy rains or floods) are often compounded by poor local water management (such as inadequate pumps or release of water from a reservoirs). The same phenomenon, like floods, also may not consistently affect the same production sectors, some of which may be more sensitive to climate than others. Similarly, in some areas poor households may be the most vulnerable, while in other areas it is the better off, who have more to lose

FIGURE 4. SALINITY BOUNDARY IN MEKONG RIVER DELTA IN 2000 AND PROJECTED FOR 1M SLR



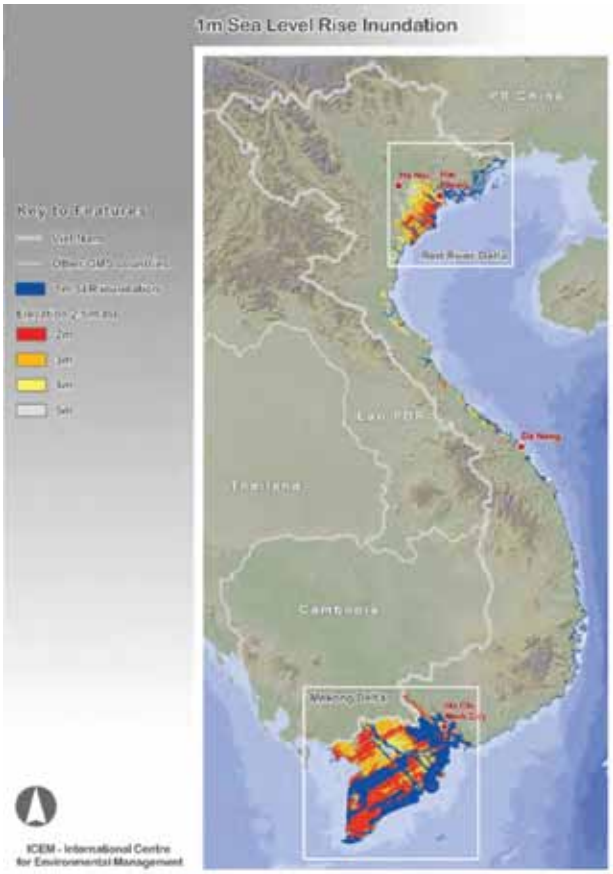
Source: DRAGON 2010.

financially in flood damage. These varying vulnerabilities make it very difficult to put forth comprehensive national-level plans, and indicate downscaled, community-level assessments are likely to be most useful.

In interviews with prominent scientists and policy makers on the question of whether Vietnam has a standard classification for areas with different levels of vulnerability to climate change and a system for prioritization, our interviewees have confirmed there is no such classification. Several of those interviewed noted that studies on climate change are often donor-driven; thus, they are conducted in places where the donors are more interested, and have been haphazard thus far. The Ministry of Labor, Invalids and Social Affairs (MoLISA) does maintain an official classification of "vulnerable" populations in general (but not specific to climate change), for whom special safety net services are targeted. These vulnerable peoples include invalids, elderly without relatives, orphans, and laborers with limited schooling (Poverty Task Force 2002). These groups of people are identified regularly by state officials in local MoLISA departments and given special priorities to social safety net programs like health insurance cards and educational subsidies (MOLISA/UNDP 2004).

To these official indicators we can add a number of other indicators of general vulnerability identified in livelihood assessments and participatory poverty assessments over the past 15 years: women, children, ethnic minorities, the illiterate, those who suffer food shortages, those under the poverty line, the disabled, families with many children, and those in remote areas (Poverty Task Force 2002). These indicators of social vulnerability come from a number of different studies. For example, in the 1990s there were a number of participatory poverty assessments conducted by NGOs with assistance from the World Bank, and many of these studies looked carefully at the conditions of rural poverty (World Bank 1999). More recently there have been several studies which of tried to look specifically at the issue of climate change and vulnerability in Vietnam. Work led by the University of East Anglia,

FIGURE 5. IMPACTED AREAS OF VIETNAM FROM A 1M SLR



Source: Carew-Reid 2008.

particularly Neil Adger (1999a, 1999b, 2000, 2003) and Adger et al. (2005) has emphasized factors of poverty and dependence on livelihoods to climate-sensitive economic activities (particularly farming and fishing) as a proxy for household sensitivity to climate change, and has emphasized the strong role of institutional change, such as the erosion of collective support for mangrove planting and dike repairs that were a part of the Doi Moi process. Some recent climate change and vulnerability reports based on new field data were done by NGOs (i.e. Kyoto University and Oxfam 2007; Oxfam 2008). In the following subsections, we look at factors of sensitivity that were identified in the literature review, and apply them to the case at hand in Vietnam.

Poverty

Poverty relates to vulnerability and the sensitivity of livelihoods to risks because it structures access to entitlements and resources. For example, those who are poor may live farther away from good quality natural resources, have little ability to absorb risk, and have trouble recovering once a risk happens (DFID 2004). The poor tend to have less diversity of income sources, and less access to credit to fill in income gaps, which likely increases their risk of disaster when one of their sources is strongly affected by climate. Vulnerability to shocks, whether they be climate or otherwise (such as health or unemployment shocks) has long been identified as one of the major challenges for the poor in Vietnam (Poverty Task Force 2002). While the poor are not necessarily the only people impacted by climate risks, they tend to have less resilience, such as less access to insurance and less ability to rebuild or move away from affected areas. They are more likely to live in shoddy or substandard housing that is vulnerable to climate events and be more exposed to health hazards because of the occupations available to them (Few and Pham 2010). Given that households in recent surveys (such as Oxfam 2008 and World Bank 2009) already cited weather as one of their primary vulnerability and risk factors, the rise in extreme weather events that is likely in the next 50 years should be a source of great concern. Recent successes in poverty reduction in Vietnam have the potential to be undermined by the effects of climate change.

Poverty in Vietnam has been the subject of many recent in-depth analyses. Poverty is measured by a standard government measure; according to Decision 170/2005/QĐ-TTg, poor households in rural areas have a monthly income per person of below 200,000 VND and below 260,000 VND for urban areas. Areas with households below this standard are considered poor. There has been a strong reduction in overall poverty in Vietnam in the past 20 years, with the fraction of households living below the poverty line at less than 15 percent in 2006, compared to over 58 percent in 1993 (VDR 2008). But despite the overall direction of declines in poverty, pockets of inequality remain. For example, the gap between those with the highest incomes and those with the lowest has increased

(Swinkels and Turk 2004). Furthermore, poverty is now regionally concentrated in mostly rural and ethnic minority-dominated areas. For example, while only 14 percent of the total population, ethnic minorities currently account for 44 percent of the poor and 59 percent of the food-hungry (World Bank 2009). The main vulnerable regions for poverty include the Northern Mountains, the Central Highlands, and the North-Central Coast, which remain poorer than the rest of the country in terms of percentages of people in poverty (Table 8 and Figure 6). In terms of total numbers of poor, however, the Red River Delta and Mekong Delta are important because of their large populations and consequently large absolute numbers of poor people.

While poverty is often associated with increased climate risk, this is not in and of itself the only possible indicator of sensitivity. There are many examples where wealthier households can also be very sensitive to climate risks. In recent research conducted by CRES in the Red River Delta, wealthier households had higher amounts of damage in absolute terms because they often invested in more risky economic schemes (i.e. aquaculture ponds, large flocks of ducks, etc). As a result, it actually took the rich longer to recover from floods than middle-income or poor households.

Main vulnerable areas. Poverty taken in terms of percentages of the population indicate mountainous areas with ethnic minorities are most vulnerable (Northern Mountains and Central Highlands). But in absolute numbers of poor, the RRD and Mekong Delta remain significant as well. And some wealthier households are also likely to be sensitive to damage, as well as urban ones. Furthermore, areas with substandard housing (Mekong Delta) and few household assets are also likely to be at risk.

Climate-Sensitive Resource Dependency

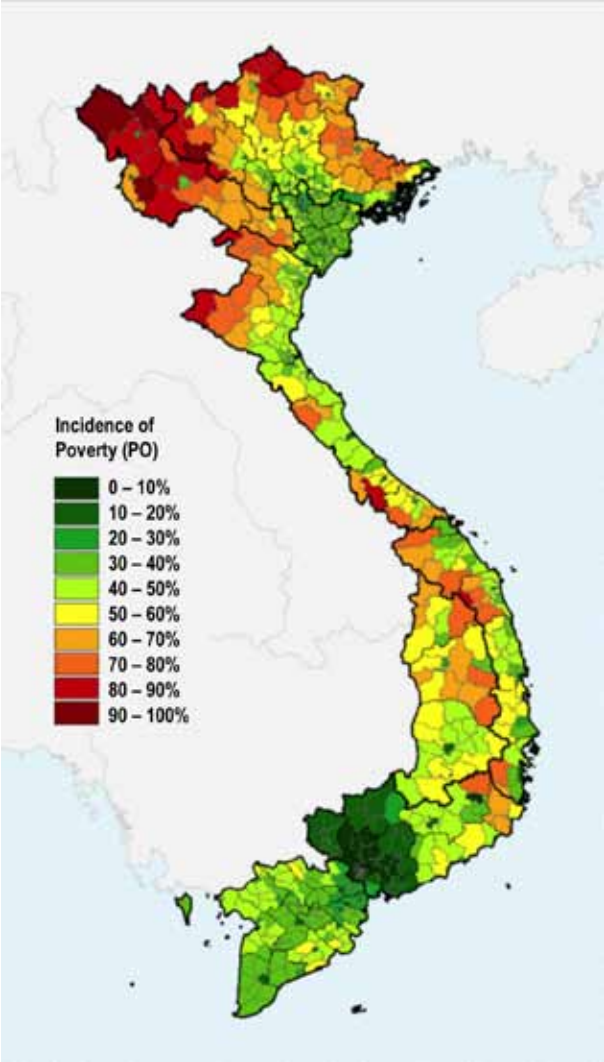
When households' livelihoods depend on a small number of sources of income without much diversification, and when those income sources are in fields that are highly climate dependent, like agriculture and fishing, households can be said to have climate-sensitive resource dependence (Adger 1999). Agriculture and fishing make up significant parts of the overall economy of Vietnam, a topic explored in more detail in the Vietnam EACC studies for these sectors. Rice is by far the largest single crop, accounting for 43 percent of gross agriculture produced in 2007, while other significant crops include tea, coffee, rubber, peanut, cashew nut and black pepper for export, and corn, sweet potato, cassava, vegetables, beans, and fruits for local consumption (Nguyen Lanh 2009). While irrigation is

TABLE 8. INCIDENCE OF POVERTY BY REGION (% OF TOTAL HH WHO ARE CLASSIFIED AS POOR)

Region	*1993*	*1998*	*2002*	*2004*	*2006*
All of Vietnam	58	37	29	20	16
Northern Mountains	82	X	X	X	X
North East	X	62	38	29	25
North West	X	73	68	59	49
Red River Delta	63	29	22	12	9
North Central Coast	75	48	44	32	29
South Central Coast	47	35	25	19	13
Central Highlands	70	52	52	31	29
South East	37	12	11	5	6
Mekong Delta	47	37	23	16	10

Source: VHLSS data in World Bank 2009.

FIGURE 6. POVERTY MAP OF VIETNAM INDICATING POVERTY INCIDENCE TO DISTRICT LEVEL



Source: Minot et al. 2004, based on 1999 Population and Housing Census data and VHLSS data.

widespread in the rice sector in particular, there are still significant portions of the country in which rain-fed rice dominates, particularly in areas outside the two main deltas. Clearly the changes in precipitation predicted under climate change have the potential to significantly affect crop yields, as the EACC sectoral report on agriculture has made clear.

Fishing is also highly climate dependent. Storms can bring salinity into aquaculture areas and damage the health of animals. Particularly for small farmers, it can be difficult to recover from climate events, as suggested by the consolidation of shrimp farms into large and larger holdings as smallholders are squeezed out and forced to sell their lands to cover debts (Adger et al. 2002). Overall, about half a million people in Vietnam get most of their income from fishing, and another 2 million have fishing-related income. The value of fisheries' exports has increased dramatically in recent years, as the EACC aquaculture sectoral note explains.

The livestock sector is particularly important to many poor households, who count buffalos and pigs among their most important assets (World Bank 1999). When these assets are lost to disease or climate events, this can be one of the most significant sectors causing a decline in household livelihoods (Poverty Task Force 2002).

The forestry sector is a relatively small sector of the economy, and provides only small amounts of income in most regions (Table 9). It can, however, be an important informal safety net sector and provide income when other sectors like agriculture fail (Sunderlin and Huynh 2005; McElwee 2008). Climate damage to forests, such as dry weather leading to forest fires, can thus be an additional stressor to poor households.

A final measure of sensitivity in the climate-dependent resource sector is the impact of macroeconomic shocks and vulnerability to changes in global trade (Poverty Task Force 2002). As Vietnam is a relative newcomer to the World Trade Organization (since 2007), integration of production into world markets is relatively new, and some sectors can be very vulnerable. For example, the coffee sector has shown its strong vulnerability to world price drops (ICARD and Oxfam 2002).

Main vulnerable areas. Provinces with a large number of households dependent on rainfed agriculture (Northeast, Northwest, North and South-Central coasts, Central Highlands) and households with little or no diversification of income sources (Northwest, Northeast, Central Highlands) are likely the most vulnerable. Provinces with high numbers of fishing-related businesses are also sensitive (Mekong Delta, Central Coast).

TABLE 9. DEPENDENCY ON DIFFERENT INCOME STREAMS BY REGION

Region	*% HH involved in Agriculture*	*% HH involved in Fishing*	*% HH in forestry*	*% HH in industry*	*% HH in services*	*Other*
All of Vietnam	66.5	4.4	0.2	10.2	14.9	3.8
North East	83.5	0.8	0.5	3.7	9.5	2.0
North West	91.0	0.1	0.4	1.0	6.9	4.0
Red River Delta	58.2	1.8	0.02	16.5	17.0	3.0
North Central Coast	72.5	3.6	0.3	6.0	11.8	5.8
South Central Coast	61.5	7.3	0.3	10.9	15.2	1.0
Central Highlands	88.7	0.12	0.06	2.1	8.1	0.9
South East	51.3	2.8	0.2	19.5	23.4	2.7
Mekong Delta	61.8	11.0	0.2	8.4	16.6	1.8

Source: 2006 Rural, Agricultural and Fisheries Census.

Ethnic Minorities

Vietnam has 54 official ethnic groups. The largest minority group, the Tay, has nearly 1.5 million members, while the smallest, the O Du, has barely 300. These ethnic minority groups share some things in common; 75 percent of Vietnam's minority populations live in two regions, the Northern Mountains and Central Highlands, and most minorities remain rural residents. This means that minorities are potentially more sensitive to climate events by virtue of being more likely to be farmers and to live in rural areas. They are also more likely to be poor, as noted earlier. But ethnic minorities face specific factors of vulnerability that other rural or poor areas might not.

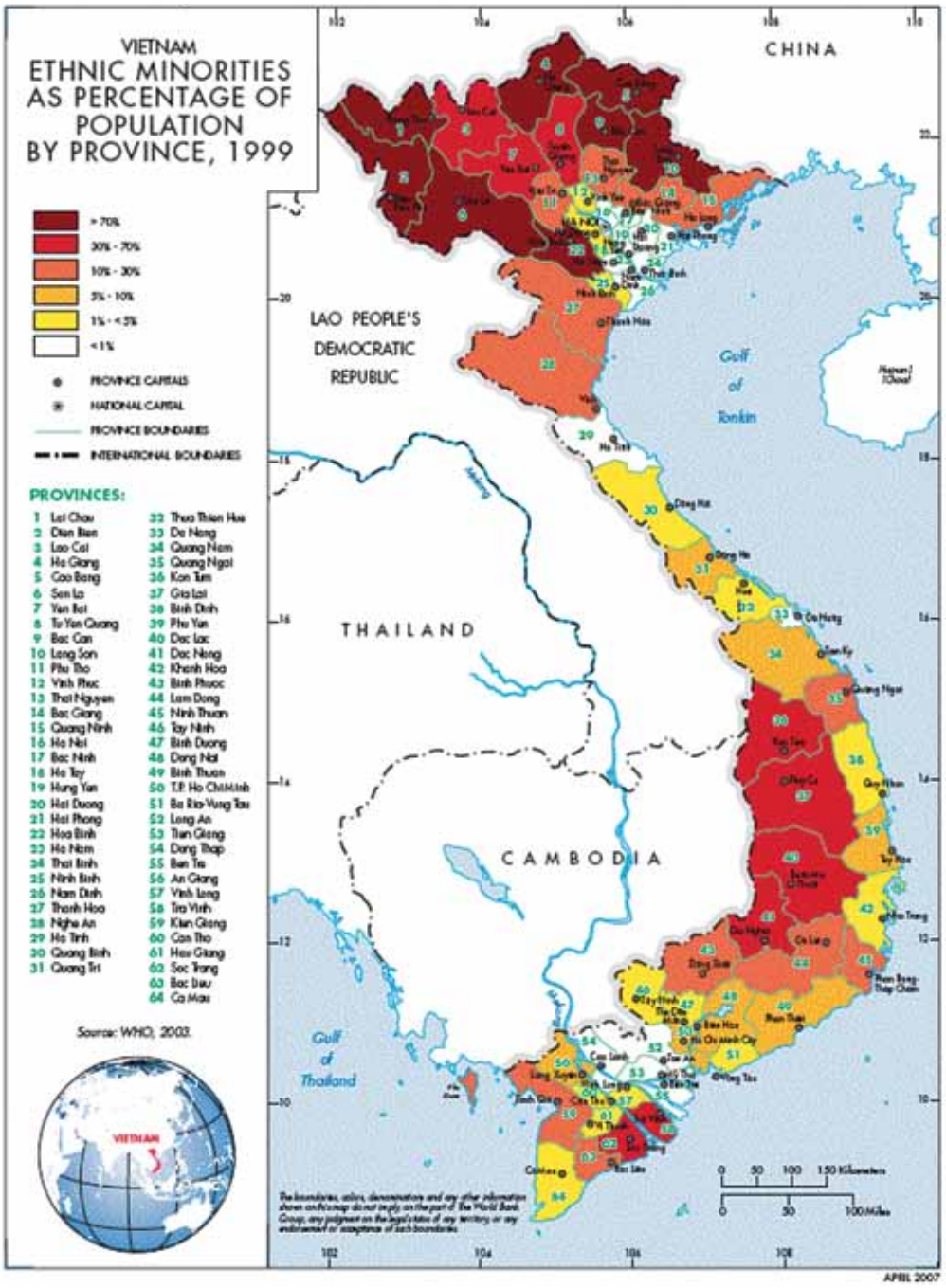
Compared to the Vietnamese (known as Kinh) majority, minorities continue to be more dependent on staple goods and traditional agriculture, and less diversified, and they report much lower rates of agricultural investment, with resulting lower productivity (World Bank 2009). Access to credit and financial services is very uneven in minority areas; Kinh report more loans and larger bank loans than minorities on average, while ethnic minorities report a higher need for credit (Hoang Cong Dung et al. 2006). Minorities also face many barriers in adaptive capacity as well, with the major factor in this area being much lower levels of education. Dropout rates remain significantly higher for minorities, resulting in higher rates of illiteracy and lack of language fluency in Vietnamese, which hinders minorities' ability to interact with others and take advantage of outside resources (World Bank 2009). Combined, all of these factors likely make ethnic minorities especially vulnerable to climate changes. Table 10 and Figure 7 indicates the regions in which minorities make up sizable percentages of the overall population, namely the Northern Mountains and Central Highlands.

TABLE 10. REGIONAL DISTRIBUTION OF MINORITY POPULATIONS

Region	*% rural HH who are minorities*
All of Vietnam	15
North East	44
North West	86
Red River Delta	>1
North Central Coast	11.3
South Central Coast	7
Central Highlands	39
South East	7.5
Mekong Delta	7.5

Source: 2006 Rural, Agricultural and Fisheries Census.

FIGURE 7. DISTRIBUTION OF ETHNIC MINORITIES IN VIETNAM



Source: World Bank 2009.

The Mekong Delta, which has a relatively low percentage of minorities, does have a particularly vulnerable group, the Khmer, who have experienced high rates of landlessness and dependency on wage labor as their main sources of income in recent years (Le Ngoc Thang et al. 2006). The number of Khmer households who are

landless is estimated to be more than 25 percent, with surveys revealing that more than 75 percent of poor households were landless. Khmer landlessness was not usually due to shrimp farm debt, which is a major reason for landlessness among Vietnamese (Kinh) in the same area. Rather, Khmer loss of land seems to relate primarily to failures in rice and crop cultivation. As a result of landlessness, over 80 percent of the incomes of poor Khmer households surveyed in a 2006 report came from wage labor (Le Ngoc Thang et al. 2006). Many people go to work for agricultural farms in neighboring provinces, and Khmer households from the same village often form a roving band of migrant agricultural labor. This migration pattern has contributed to strong vulnerability among Khmer, as these labor seekers have become dependent on distant and often unstable income. A number of problems are also associated with migrant workers, including less access to government services and more vulnerability to poverty and social evils (Le Ngoc Thang et al. 2006).

Main vulnerable areas. The regions where minorities dominate, the Northern Mountains and Central Highlands, are likely to be most sensitive. Areas with smaller, less prosperous, minorities are also likely more heavily affected (North-Central Coast, South-Central Coast, as well as the Northern Mountains and Central Highlands). And the Khmer minority group in the Mekong Delta is a vulnerable population in particular, due to very high rates of landlessness not seen in other minority populations.

Women and Children

It is clear that gender affects vulnerability to natural disasters, thus it is to be expected that similar vulnerability to climate change would also be encountered. For example, increases in domestic violence have been widely reported after climate disasters, such as hurricanes (Fordham 1998; Cupples 2007). Gender inequality also likely limits the possible range of responses for adaptation by women (Lambrou and Piana 2006). For example, changes in the physical environment as a result of climate change may increase women's workload as their access to natural resources may decline (Nelson et al. 2002). Women may be forced to break up families and either ask husbands to migrate or to migrate themselves in response. They may have to take up low-wage labor if agriculture becomes unsuitable to their local areas (Nelson et al. 2002).

In Vietnam, gender analysis gives us an understanding of how the identities of women and men determine different vulnerabilities and capacities to deal with climate change (UNDP 2009). A UNDP desk study on gender and climate change in Vietnam notes that women face challenges from climate change in three areas: the productive, reproductive, and community spheres. In terms of production, agriculture has been increasingly feminized; 62 percent of women versus 52 percent of men are engaged in agricultural production. Thus it is likely that more women face risks from climate impacts to the agricultural sector. Climate change also adds to water insecurity, which increases the work level of women as they are more likely to be the ones in a household responsible for water collection (Le Cong Thanh 2008). Women are also much less likely to have their name on land tenure titles, which can increase their insecurity in the case of divorce or widowhood and contestation over land rights.

For those in other economic sectors outside of agriculture, there is still vulnerability. More women than men work in household-scale small enterprises, as opposed to formal employment, and these household enterprises are often the worst hit and least able to recover as a result of disasters. Female-headed households (FHH) have their own special needs. In the 1990s, nearly 25 percent of all rural households were female headed, and 75 percent of all spouse-absent female-headed households in the whole country were living in rural areas (Desai 1995). While a large part of the reason for a high percentage of FHH in the past was due to excess male mortality as a result of the wars in Vietnam, younger FHH tend to be caused by migrant male labor or divorce/separation. Male out-migration can leave women and children left behind more vulnerable to climate events as they have less strong labor to help batten down homes and lift household goods to safety. Women migrants can be vulnerable too, as they may be alone with little protection without social connections, as well as usually earning less than men. Table 11 provides a snapshot of female vulnerabilities across regions in Vietnam.

So far no sex-disaggregated data is available on injury or death due to climate events in Vietnam, but

TABLE 11. STATISTICS ON FEMALE STATUS BY REGION

Region	*Maternal mortality by region (per 100,000 live births)*[1]	*Gender gap in male/ female literacy rates*[2]	*% female govt workers at commune level*[3]
North East	411	5.3	3.5
North West	(combined w/above)	15.2	2.2
Red River Delta	46	4.3	2.7
North Central Coast	162	5.9	2.6
South Central Coast	199	5.1	4.0
Central Highlands	178	6.9	5.0
South East	45	3.1	10.0
Mekong Delta	143	6.6	4.8

Sources: 1 = Demographic and Health Survey 2002 in ADB 2005; 2 = VHLSS 2004 in ADB 2005; 3 = 2006 Rural, Agricultural and Fisheries survey.

anecdotal evidence suggests poor women are more likely to become direct victims as they place family members' safety first. They are also often not warned by climate alarms, which go to heads of households or men. More women tend to die in floods than men because they "have not been given the same encouragement as men and boys to learn to swim. All sorts of social customs and behavior restrictions made it more difficult for them to do so" (Oxfam 2008). Women are also less likely to engage in community activities to increase adaptive capacity. It has been estimated that female participation in local politics is less than 20 percent of official positions at local People's Councils, and sometimes much lower (Le Cong Thanh 2008). Women's involvement in local Committees for Flood and Storm Control is often limited to asking them to be in charge of child-care or food distribution and sweeping and clean up, and they are not encouraged to take a more active role in overall decision-making (UNDP 2009).

Children can also be strongly vulnerable to climate events, especially events like increased flooding. Evidence from interviews of people affected by floods after typhoons and storms in the Mekong Delta noted that there were many people who "had died in relatively calm waters simply because they could not swim" (Oxfam 2008), and of this number, child drownings were the largest number. More than half of households interviewed in a study of health and climate in the Mekong Delta "expressed fear for children's safety during the flood months when water levels are high and currents may be strong" (Few and Pham 2010). Climate events can also indirectly harm children, as they can cause children to drop out of school (either due to physical closure of schools due to damage or economic expenses not being available after climate events for school fees), which will keep them from long-term advancement (Phong Tran 2008).

Main vulnerable areas. All regions/provinces have similar vulnerability in terms of proportion of the population that is female, but more attention needs to be paid to FHH, ethnic minority women, and migrant women in particular, who are more vulnerable. Children are especially vulnerable in coastal and riverine areas where they have to cross waterways to go to school and work, or where schools are vulnerable to submersion in floods (primarily Mekong Delta, Central Coast, and Red River Delta).

Migration

Vietnam has had strong patterns of migration since rules relaxing household registration went into effect in the 1990s. Since then, migration from rural to urban areas has accounted for the majority of the migration experienced (GSO and UNDP 2005). There are strong regional patterns of migration in Vietnam, with most areas sending migrants, and only two areas (the Central Highlands and Southeast) absorbing most in-migration. Large numbers of urban migrants can be found in the largest cities of Hanoi and Ho Chi Minh City, and in

the Southeast region, which is home to a large number of industrial zones where people have moved for work in agroprocessing, textiles, and other industries. In addition, the Central Highlands saw a large number of in-migrants in the 1990s and 2000s, despite being a rural destination, due to high world prices for coffee and other cash crops, and from government encouragement to settle these areas (Winkels 2008). This influx of migrants likely increased the vulnerability of local residents (mostly minorities) as they saw their land and natural resources availability decline dramatically, while the migrants themselves have been very vulnerable to climate- and trade-related shocks in the coffee sector in the past 15 years (Cheesman and Bennett 2005; World Bank 2009; Dang Thanh Ha and Shively 2008).

Migration can be both a cause and consequence of climate vulnerability. There is evidence that natural disasters have been a strong motive for migration. In a study conducted in the Central provinces in early 2000, respondents in Thua Thien-Hue stated that migration to the South had become even more popular in the wake of the severe floods in November 1999 (ADRC 2003). In the Mekong Delta, an assessment of migration as a consequence of climate change found floods to be a strong pushing factor for some households to leave for other areas (Dun 2009). HCMC may face later this century the prospect of large numbers of new migrants in the form of climate refugees leaving the Mekong Delta; estimations range as high as 5 million people who may be displaced (Carew-Reid 2008).

Additionally, those who have migrated to a new area for non-climate reasons (i.e. to get a job) may also be more vulnerable to climate events. For example, migrants in Vietnam are required to have some documentation under the national household registration system (*ho khau*) in order to access social services, but there are also numerous people who never register and remain undocumented migrants (Pincus and Sender 2008). Undocumented migrants and those without permanent status have no rights to public safety net services, and often are exploited for low wages in employment or let go if ill or injured, and they have little recourse due to their undocumented status (Dang Nguyen Anh 2005). Twenty-nine percent of the Ho Chi Minh City population is estimated to be registered temporary migrants, and migrants have tended to group in some particular districts (Go Vap, Tan Binh, Binh Thanh and Dis 12), where they often make up a majority of the ward population in some places (Le Van Thanh 2002), potentially making these districts sites of particular social vulnerability.

Another consequence of migration rates is that many sending areas are losing their youngest workers, and this can limit the sending community's capacity to respond to climate events. Without young people it is difficult to form youth labor groups to support the work on shoring up dikes, for example. Some villages in the Red River Delta have seen so many of their young people leave to work elsewhere that there is almost no one left under age 50, and without strong laborers, dike maintenance and protection of houses is very difficult during severe weather events (CRES unpublished data 2009).

Main vulnerable populations. Places with high levels of in-migrants are vulnerable. Ho Chi Minh City has largest absolute numbers, while other smaller cities, particularly in the Mekong Delta, have rising numbers as well (i.e. Can Tho city).

Urban Households

While many studies have pointed out the strong vulnerability of rural populations to climate change, an increase in urban-specific studies shows clearly that cities face major vulnerabilities themselves, often affecting very large numbers of people (deSherbinin et al. 2007). Although urban areas are often assumed to be less vulnerable to impacts due to higher rates of development, there are many pockets of poor, often migrant or unregistered populations in major urban centers of Vietnam who will be just as vulnerable, if not more so, than rural farming populations outside of urban areas. Furthermore, in terms of overall numbers of affected peoples, the population density of urban areas means that while the overall percentage of affected people may be lower in urban than rural areas, the total affected numbers will likely be higher in urban areas. For example, the projected population of Ho Chi Minh City is 10 million by 2020. With a current poverty rate of 6.6 percent of urban residents, that is a large number of absolute poor.

The built environment of cities can mean more exposure to climate hazards; for example, lots of concrete with poor drainage can lead to regular flooding. In Ho

Chi Minh City, a great deal of building has taken place in what used to be wetlands south of the city. This affects the ability of surrounding lands to drain and has been pointed to as a reason behind increased flooding in the city (Bolay et al. 1997). Urban residents also may have more constraints to individual adaptation than rural residents. For example, urban residents may find it hard to move to a new area through migration due to higher investments in housing stock than rural farmers with lower quality or temporary housing. These urban households may also have less social capital if they have migrated and have no relatives or friends in their new city, or have low participation in community and social activity because of lack of legal residence permits. "Unofficial" work activity is a large portion of the employment of urban residents in Vietnam; for example, it is estimated that about 45 percent of the residents in Ho Chi Minh City have some form of unofficial work, including small business and services, i.e. motorbike taxis, mobile food vendors, etc. The urban poor also often take what are known as 3D jobs—dirty, difficult, and dangerous—such as portering, sewage cleaning, pedicab driving, etc (Nguyen Minh Hoa 2008). These occupations can have low security of employment and low incomes, and be especially vulnerable to disruptions from events such as flooding.

Main vulnerable populations. Ho Chi Minh City has the largest number of urban households likely to be at risk, due to high exposure of the city to SLR and other climate events, as well as large numbers of migrant households.

Education

Levels of education can play a role in climate change sensitivity, because they can reflect the inability to read and receive climate warnings, as well as information in post-climate disaster situations about recovery policies. Education can also affect people's ability to make proactive adaptation decisions. Surveys in Thua Thien Hue, for example, have shown that those with a high school education were much more likely to think flood damage was a result of a combination of social vulnerability and natural factors, while those with less schooling were more likely to ascribe flood damage to "fate" or an "act of God" against which they had little control (Phong Tran et al. 2008). Higher levels of education can also increase the ability to recover after climate events through better access to information and sources of support. Overall rates of literacy and education are shown in Table 12, with high rates of lack of formal education even in richer regions like the Mekong Delta.

Main vulnerable populations. The most vulnerable populations include the illiterate and households in which no one speaks/reads Vietnamese fluently. These are more likely to be ethnic minority households concentrated in the Central Highlands and Northern Mountains.

TABLE 12. LITERACY AND EDUCATION RATES, 2001

Region	*% laboring population who is illiterate*	*% laboring population with no formal education level past primary*
All of Vietnam	3.8	16.7
North East	7.4	14.8
North West	23.5	22.5
Red River Delta	0.7	6.4
North Central Coast	2.3	10.4
South Central Coast	3.0	18.9
Central Highlands	5.6	17.4
South East	2.0	15.6
Mekong Delta	4.4	30.7

Source: GSO, 2005.

Illness, Health, and Sanitation

Having ill family members is one of the main risks facing poor households in Vietnam (Poverty Task Force 2002), and climate change can bring health risks in many forms. There are the direct health problems that can be caused by floods and storms, such as injuries from falling debris, as well as the sanitation aftermath of climate events. Diarrheal diseases are a major concern after flood events, with stagnant and nonpotable water spreading illness. Children and those already ill are particularly at risk. There is also an "elevated risk of skin diseases and conjunctivitis, especially among children who might play in the polluted water" (Few and Pham 2010).

According to the Ministry of Health, there are a number of diseases that are on the rise, some of which may be connected to changes in climate. These include increases in incidences of respiratory disease, rheumatism, hepatitis B, diphtheria, cholera, typhoid, plague, and malaria (Hoang Xuan Huy et al. 2007). Warmer climates will likely increase health risks to the elderly and those already suffering from some diseases. Temperature changes may also increase the breeding grounds for disease-carrying vectors.

Existing conditions regarding sanitation and access to clean water are not yet ideal, and it is likely that climate change will impact access to water, given the changes that are predicted. Table 13 indicates the areas of Vietnam that are already dependent on rainfall and surface water, and those with more reliable supplies of well, piped or purchased water. The Mekong Delta is particularly vulnerable to diseases spread through surface water sources, and the Red River Delta is vulnerable to changes in rainfall, given the large number of households who rely on rainfall for their water supplies.

Main vulnerable populations. The most vulnerable populations include people with existing illnesses that can be exacerbated, children, and people living in areas with poor sanitation.

Indicators of Adaptive Capacity

Adaptive capacity, as noted earlier, relates to the ability of institutions or people to modify or change characteristics or behavior so as to cope better with existing or anticipated external stresses from climate. There are a number of indicators of this capacity that have been pointed out in the literature; here we focus on social capital and collective action, institutional adaptations, and government safety nets. Unlike the indicators for exposure and sensitivity that we outlined in the above sections, which can be assessed with existing data sources by region, for these adaptive capacity indicators it is very hard to find quantitative or qualitative

TABLE 13. HOUSEHOLD ACCESS TO WATER 2005, IN % OF HOUSEHOLDS WHO GET MOST OF THEIR WATER FROM DIFFERENT SOURCES

Region	*Well (% of hh)*	*Surface/Spring (% of hh)*	*Rain (% of hh)*	*Piped water (% of hh)*	*Purchase (% of hh)*
All of Vietnam	62	8	15	8	>1
North East	70	>1	3	3	>1
North West	41	51	1	2	>1
Red River Delta	52	>1	42	6	>1
North Central Coast	80	1	8	5	>1
South Central Coast	90	>1	>1	5	>1
Central Highlands	85	2	>1	2	>1
South East	84	1	1	10	1.9
Mekong Delta	32	35	13	19	>1

Source: 2006 Rural, Agricultural and Fisheries Survey.

assessments by region. They are much more usefully assessed at levels such as districts or communes.

Social capital and collective action is one such indicator. In modern Vietnam, the individual family household is the prime kin unit, but extended kin relations remain one of the strongest markers of identity, and relatives are usually the first people to be called on in cases of need. Kinship networks are well-known as being particularly important for gaining access to information (Lan Anh Hoang et al. 2006). They are also important in mutual assistance, such as in sharing work in agricultural tasks. Reciprocal help is essential at peak seasons of rice cultivation, particularly during transplanting and harvesting. Overall, more than 85 percent of the households in one survey reported regular labor exchanges, with the average number of days varying from a minimum of five to more than twenty days per season (McElwee 2007a). People also can ask for help from their friends from other communes or districts, and relatives are the first line of defense for households that have been affected by storms. They seek shelter in relatives' houses, rely on relatives to help them clean up afterwards, and to provide loans if financial assistance is needed.

There is a history of use of this informal system to play a role in helping households cope/adapt with climate-related events, such as floods, which could be a good buffer and source of adaptive capacity for the future. This "social capital" for climate adaptation can be partly seen through the informal financial supporting activities of women's groups, for example (Miller 2006). Particularly in the Mekong Delta, women often form into small groups to provide rotating credit, in which members contribute a specific amount of money every month to lend one member. The amount will be circulated among members monthly. This kind of practice can be among women within a village or among brothers and sisters in a families or clans. The goal is to understand these informal institutions better, and help the formal system to support and encourage these informal practices (Adger 2003).

Institutional capacity thus has a role to play. Recent research shows clearly that institutions have a large role to play in understanding where vulnerability to climate change might be high, and how adaptation can happen (Agrawal 2008) Vietnam has a very hierarchical government structure, with government offices organized vertically from central to provincial to district to commune levels, the lowest level of state administration in Vietnam, with a total of more than 10,000 communes in the country. Although there may be a provincial department of a central ministry—for example, the Ministry of Agriculture and Rural Development (MARD) has provincial offices known as Departments of Agriculture and Rural Development (DARD)—these departments are answerable both to the People's Committee of the province (lateral reporting responsibility) as well as to the central ministry (vertical reporting responsibility). This system, while useful for conveying information in a clear hierarchy from top to bottom, also results in a lot of overlap between departments at each level, and unclear chains of command between vertical and horizontal levels. This means that new approaches and new actions, such as those needed to deal with new issues like climate change, will likely only slowly be incorporated into the existing institutional system.

There are also increasing numbers of new organizations that may play roles in local areas vis-à-vis climate adaptation. These include fishing and farming unions, agricultural cooperatives, and farmers' informal working groups. These groups can leverage support for their members in times of shocks and high risks. For example, many agriculture cooperatives have contracts with commercial suppliers of agricultural inputs, which the cooperative delivers to the individual farmer members on credit to be paid after harvest. There have been good examples of cooperatives acting after floods in Thua Thien Hue in 2000 to bridge a gap between the time the flooding occurred and the availability of formal support credits for the next crop by coops buying inputs on credit for delivery to farmers with payment due after the subsequent harvest (ADRC 2003).

One problem for climate change planning is the wide disparity between regions in terms of their inputs to the central budget and what they receive in return, which affects the ability of localities to deal with climate adaptation. The wealthiest regions (the Red River Delta, the South-Central Coast, and the South east, which includes Ho Chi Minh City) transfer much more to the central budget than they receive in return in terms of per capita budget support. Therefore, wealthier regions

are not necessarily better equipped to deal with climate impacts, as so much of their wealth is transferred to other regions, and the poorer regions are dependent on these central transfers, which limits their ability to put into place flexible local adaptation measures.

Social safety nets can also play a role in adaptive capacity. The removal of much of the former socialist safety nets during the Doi Moi process has left more households paying for public services out of pocket. Many formerly state services are now funded through additional fees and contributions paid by individual citizens and are being provided by state, para-statal, and private entities (such as agricultural inputs, now sold from private agribusinesses competing with state-owned fertilizer factories). By the end of the 1990s, for example, Vietnamese had to pay out of pocket for most social services; these expenditures accounted for about 70 percent of the country's education expenditures and 80 percent of health expenditures, whereas 20 years ago these would have all been provided in exchange for work in collective enterprises or agricultural farms (London 2004). For an individual household, the fees for social services have imposed an increasing burden on household incomes, and these burdens have fallen especially hard on the poor (Evans et al. 2007).

While in theory, the existing state safety net programs (primarily social security payments, disability payments, health insurance, education subsidies, and poverty alleviation programs) have the potential to mitigate the adverse impacts of climate shocks, in fact, there is low spending on social services relative to needs (Van De Walle 2004). Large numbers of eligible people simply do not receive safety net coverage. Furthermore, social benefits are often tied to one's location; undocumented migrants do not have access to social safety net services if they lack household registration cards. The provincial disparities in expenditures from the National Target Programs on hunger alleviation and poverty reduction (HEPR) area also of concern. While the greatest expenditures have been made largely in the poorest areas, there is significant unevenness in how much actually goes to each poor person (VDR 2005).

Main indicators of adaptive capacity. There are many possible indicators of adaptive capacity that could be used in Vietnam, such as the number of social ties between households; existence of active loan and support networks in villages; number of informal community-based organizations in localities; number of informal work groups or production cooperatives; districts and localities with more budget flexibility; training and support for key government personnel in capacity for adaptation; presence of formal climate adaptation plans or strategies at local levels; experience with past climate disaster events; and communes and districts with high credit and lending rates.

COMBINED INDICATORS USED FOR IDENTIFICATION OF VULNERABLE ZONES

In this final section of chapter 2, we combine the analysis of exposure, sensitivity, and adaptive capacity to see what regions are likely to be the most vulnerable to climate impacts. We follow the standard regional studies of Vietnam, which are based on divisions of the country into eight agroecological zones.

Table 14 marks a first attempt to assess vulnerability by region, based on exposure and sensitivity (adaptive capacity is not accessed here, given the difficulties in collecting data on the indicators for this indicated in the previous section). Each indicator is ranked by relative importance in comparison with other regions, with 0 being lowest impact/importance and 4 being of highest impact/importance.

Below we provide a summary of the regional vulnerabilities across Vietnam.

NATIONAL PLANNING FOR CLIMATE CHANGE: NAPA AND OTHER STRATEGIES

Vietnam's first national communication to the UN Framework Convention on Climate Change (UNFCCC) in 2003 did not say much about adaptation policy, listing only a few technical possibilities in adaptation to explore, like introducing new drought-resistant crops and building sea dikes higher, but did not give financing or timelines to these ideas (GoV 2003). Vietnam has not yet completed or submitted a national adaptation program of action (NAPA), unlike other countries in the region.

TABLE 14. COMPARISON OF VULNERABLE REGIONS BY INDICATORS OF EXPOSURE AND SENSITIVITY

Indicator	*NW*	*NE*	*RRD*	*NCC*	*SCC*	*CH*	*SE*	*MD*
Exposure	**1.16**	**1.5**	**2.16**	**3.16**	**3.16**	**1.66**	**1.83**	**3**
Storms	1	3	4	4	4	2	2	3
Flood	1	1	4	4	4	2	2	4
Salinity	0	0	1	2	2	0	1	4
SLR	0	0	2	2	2	0	3	4
Landslide/flash flood	3	3	1	3	3	2	1	1
Drought	2	2	1	4	4	4	2	2
Sensitivity	**3**	**2.13**	**1.5**	**2.13**	**1.75**	**2.75**	**1.875**	**2.25**
Poverty	4	3	2	4	2	4	1	2
Lack of economic diversification	4	4	2	4	3	4	2	2
Ethnic minorities	4	3	0	1	1	4	1	2
Women & Children	4	3	1	2	3	3	1	2
Migrants	0	0	2	2	1	4	4	1
Urban pops	0	0	2	1	1	0	4	3
Education	4	3	1	2	2	2	1	3
Health and sanitation	4	1	2	1	1	1	1	3

NW: Northwest Mountains; NE: Northeast Mountains; RRD: Red River Delta; NCC: North-Central Coast; SCC: South-Central Coast; CH: Central Highlands; SE: Southeast; MD: Mekong Delta.
Source: Data from CCSFC 2005 for exposure; self assessment for sensitivity based on indicators in report.

However, a National Target Program (NTP) to respond to climate change (Decision No. 158/QD-TTg) was developed in 2006–08 with the involvement of many national ministries and local areas, and was officially adopted in December 2008. The goals of the NTP are as follows:

- Identify the extent of climate change on Vietnam and its expected impacts
- Identify adaptation measures and policies
- Promote scientific and technological activities related to climate change
- Strengthen capacity building to respond to climate change
- Raise public awareness
- Promote international cooperation
- Mainstream climate change into socioeconomic development strategies and all levels of planning
- Develop specific action plans and pilot projects to respond to climate change (Nguyen Mong Cuong 2009)

Vietnam's NTP is the closest equivalent to a NAPA as many other countries have under UNFCCC obligations, although it is not as focused on adaptation as it might be. During the discussion leading up to the formalization of Vietnam's NTP, there has been concern that the country has significant deficiencies in local expertise in the field of vulnerability and adaptation assessment, and the NTP has called for additional resources in the area of training and capacity building in this area. This lack of expertise has been one reason why Vietnam has not yet filed a NAPA.

While the NTP document indicated possible general sites of vulnerability to climate, there were no clear criteria or indicators used for this assessment, nor were these factors of vulnerability researched or compared in any systematic way. The NTP mentions the importance of carrying out detailed vulnerability assessments to supplement the above general picture, but so far, such efforts have been haphazard and not consistent. For example, the NTP took a sectoral and regional approach, but did not specifically collect data on these

BOX 1. REGIONAL VULNERABILITIES TO CLIMATE CHANGE

Mekong Delta Region: HIGH EXPOSURE, MODERATE SENSITIVITY

- *Main physical vulnerabilities*: sea level rise, flooding, saline intrusions, rising rates of storms*:* inland flood zone including An Giang and Dong Thap provinces; saline intrusion areas: Kien Giang, Ca Mau, Bac Lieu. Lack of freshwater in the dry season; long flood duration areas (the Trans-Bassac depression zone) such as Can Tho city.
- *Main social vulnerabilities*: Several provinces with poor Khmer ethnic minority; rising rates of landless; large numbers of migrants (10 percent poverty rate).

Central Highlands: MODERATE EXPOSURE, HIGH SENSITIVITY

- *Main physical vulnerabilities*: flash floods, droughts, floods.
- *Main social vulnerabilities*: high number of ethnic minorities, high rates of poverty (29 percent incidence by region), many migrants, high numbers dependent on rainfed and subsistence agriculture.

Northern Mountains (Northeast and Northwest): LOW EXPOSURE, HIGH SENSITIVITY

- *Main physical vulnerabilities*: landslides, flash floods, droughts, storms from East China Sea
- *Main social vulnerabilities:* 49 percent poverty in the NW region; many provinces dominated by diverse ethnic minorities; high illiteracy rates and large families; low rates of female education; many remote areas with poor road access; high rates of subsistence and rainfed agriculture.

Central Coast (North and South): HIGH EXPOSURE, MODERATE SENSITIVITY

- *Main physical vulnerabilities*: increased storms from East China Sea, coastal surges, flooding, some drought-prone areas, esp. in south of coast.
- *Main social vulnerabilities*: 29 percent poverty in North, 13 percent in south coast; pockets of ethnic minorities; many fishing communities; dependence on rainfed agriculture in many areas.

Red River Delta: MODERATE EXPOSURE, LOW SENSITIVITY

- *Main physical vulnerabilities*: storms from East China Sea, floods and flash floods, inundation.
- *Main social vulnerabilities*: relatively low 9 percent poverty rate but large number of poor people overall; high rates of outmigration; female-headed households.

Southeast Region: LOW EXPOSURE, LOW SENSITIVITY

- *Main physical vulnerability*: coastal storms, drought in inland areas.
- *Main social vulnerabilities*: low rates of poverty overall (6 percent) but some pockets, particularly for ethnic minorities; many migrant workers.

vulnerabilities. Mentioned vulnerable sectors include agriculture, water resources, and public health with vulnerable regions being coastal areas (including deltas) and mountain regions (especially those with flash floods and landslides). Vulnerable communities were assumed to be farmers, fishers, ethnic minorities, senior citizens, women, children and poor people in urban areas (GOV 2008). The NTP also took note of the serious potential of climate change to hurt achievement of the Millennium Development Goals.

The NTP did not formalize an overall government structure for adaptation action, instead only setting up a general advisory committee made up of several government ministries. MONRE is taking the overall role for implementation of the NTP and acts to help other ministries develop their own specific plans. The NTP identifies 1,965 billion VND ($115 million) that will be needed to implement the strategy from 2009–15, of which 50 percent will be domestic funding, and 50 percent from international sources. Of the domestic money, more than half will come from the central budget and the rest from localities and the private sector.

In terms of specific details, the NTP primarily calls for pilot projects on coping with climate change,

TABLE 15. PROPOSED AREAS, SECTORS AND COMMUNITIES VULNERABLE TO CLIMATE CHANGE IN VIETNAM IN THE NATIONAL TARGET PROGRAMME

Climate Change Impact	*Vulnerable Areas*	*Vulnerable Sectors*	*Vulnerable Communities*
Temperature Increase	• Mountainous Areas: Northern East, Western East and North Central Part • Northern Delta	• Agriculture and food security • Aquaculture Natural ecology systems and biodiversity Water resources Energy (production and consumption) Community health care	• Poor farmers • Ethnic minorities • Senior citizens • Children and women
Sea level rise	• Coastal Areas, especially deltas and flooded areas (Mekong River Delta, Red River Delta, and coastal Central Part) • Islands	• Agriculture and food security Aquaculture Sea and coastal ecological systems Water resources (surface and ground water) Energy Tourism Residential Space Infrastructure, industrial zones	• Coastal communities, especially poor farmers and fishermen • Senior citizens • children and women
Floods, flash floods, and landslide	• Coastal Areas (including delta areas and flooded areas: Delta and coastal Northern Mtns, Mekong River Delta and coastal Central Part) Mountainous areas: Northern West, Northern East, North Central Part and Highlands	• Agriculture and food security • Aquaculture Transportation Water resources Infrastructure Residential Space Health care and life Trade and Tourism	• Coastal communities • Mountainous communities, especially ethnic minority groups • Senior citizens, children, and women
Storms and tropical low pressure	• Coastal Areas: especially coastal Central Part, Red River Delta and Mekong River Islands	• Agriculture and food security Aquaculture Transportation Energy Offshore and coastal activities Infrastructure Place of Residence Health care and life Trade and Tourism	• Coastal communities, especially fishermen • Senior citizens, children, and women
Droughts	• Central Part, especially South Central Part Delta and Northern Part Midland Mekong Delta Highlands	• Agriculture and food security Water resources Energy (hydro power) Waterways Health care and life	

Source: GOV 2008.

construction of legal frameworks and awareness raising, human resources development, international cooperation, and mainstreaming of climate into local plans and the national socioeconomic planning process. While the NTP calls for future assessment of climate change impacts on sectors and localities, it does not call specifically for assessment of vulnerable communities. The NTP calls for stakeholder consultations to identify measures to respond to climate change, to build capacity, and to have action plans in all ministries and sectors and localities to respond. Specific actions are thus lacking in the NTP, as these are left to ministries themselves to sort out in ministerial action plans (GOV 2008).

Specific adaptation activities mentioned in NTP that the government intends to focus on include new technologies in agriculture, new planning for river basins and water management, and quarantines for diseases and community hygiene projects. In coastal areas, the NTP calls for integrated coastal zone management plans, infrastructure adapted to sea level rises, storm early warning systems, research on the function of ecosystems like mangroves, and sea dike reinforcement. In mountainous areas, the NTP calls for a strategy to protect biodiversity, expand forestry, strengthen communication, integrate agroforestry, and expand irrigation. These activities are all left to the individual ministries that form the NTP coordinating committee to research and implement.

Each ministry and sector is now in the process of designing its action plans under the guidelines laid out in the NTP. Guidelines have been sent to provinces and cities for them to make similar action plans as well. The action plans for each sector or ministry are expected to be different from each other. In each ministry action

plan, the following issues are required to be analyzed: weather trends; who is affected and by what; and which measures are the most effective for adaptation. MARD is one of the leading ministries that already completed their action plan, while others have lagged behind somewhat. MONRE officials involved in issuing guidelines for these action plans stated that a province would definitely need to hire international consultants to help them carry this out. The government planned to set aside 150 billion VND for 64 provinces and cities in the country to design their plans in 2009 and 2010, but to date, in fact, only 60 billion VND has been spent for four provinces.

The NTP states that a goal should be to mainstream climate change into all levels of development planning, but that national guidelines on how to do this will have to be formulated first. This means many localities will wait until they get instructions on this and will not proactively seek to change their planning approaches until then. After action plans are designed by provinces and cities, it is expected that they will be reviewed by a team consisting of international consultants and experts among interested donor agencies. A final national adaptation policy will be made after the final version of action plans of ministries and sectors and localities are all approved (which could take 5 years or more).

Challenges. Clear challenges face this NTP approach. The overall focus of the NTP to date has been on adaptation options that the government can implement through policy or financial planning, to the exclusion of other approaches. There is a significant lack of horizontal integration as each ministry and each province and locality is coming up with their own separate action plans. Sectoral approaches also dominate, with specific ministries developing their own plans for agriculture, the water sector, energy sector, etc. This can lead to competition among agencies. This division of activities among ministries and sectors (agriculture, industry, etc), means that cross-sectoral problems (like urban planning) will not be approached in a holistic integrated manner and will simply replicate existing administrative divides and promote overlapping policies and "silo" behavior, such as a lack of sharing of information.

The main adaptation measures mentioned in the NTP are also primarily "hard" adaptation measures (sea dikes, reinforced infrastructure, more durable buildings) with some other measures, like resettlement, storm warning systems, and mangrove planting (MONRE 2008). Little attention has been paid to social vulnerability or "soft" adaptation measures like community mobilization plans, social safety nets, insurance schemes, livelihood diversification, increasing institutional capacity, or the role of local action and social capital in building resilience and adaptive capacity outside of government programs. This is largely because to Vietnam, as with other countries in the region, "adaptation is understood as primarily a technical means with which to reduce and minimize the impact of climate change rather than as a complex set of responses to existing climatic and non-climatic factors that contribute to people's vulnerability" (Resurreccion et al. 2008). The NTP also makes no attempt to differentiate between reactive adaptation and anticipatory adaptation (such as long-term integrated water planning and management), or between planned adaptation and facilitation of spontaneous adaptation. Overall, the NTP faces serious challenges in the integration, decision-making process, involvement of the private and sectors, and the cost-effectiveness and financing of adaptation plans.

3. RESEARCH METHODOLOGY

RESEARCH STRATEGY AND QUESTIONS

The research strategy for this project involved four main phases, each with specific approaches and methodologies.

Phase 1. Development of a vulnerability overview and typologies for Vietnam

Developing a vulnerability overview for Vietnam took place in December, January, and February of 2009/10 after contracts for work were signed, and primarily used existing qualitative and quantitative secondary data in the fields of poverty, vulnerability, and past climate hazards and adaptation. A literature review of the secondary sources on climate and vulnerability in Vietnam was undertaken by the international consultant to the project, the findings of which were presented in part 1 and 2 of this report, as well as a longer inception report. The goals of the review were to analyze where previous studies have taken place, what methodologies were used to assess vulnerability, and what these other studies found in terms of the scale and scope of vulnerability.

Phase 2. Policy review on adaptation

In conjunction with the literature review on vulnerability, the project also assessed the current policy environment related to adaptation. This phase involved an institutional analysis of key actors involved in climate adaptation, as well as interviews with these actors and other experts. We reviewed how useful local and national policy has been in creating an enabling environment for bottom-up adaptation practices, as well as how vulnerabilities to climate events have been reduced or increased due to policies in related areas in recent years. The policy review also attempted to link to the sector analyses being undertaken for the Vietnam EACC by providing a review of related policy environments in the fields of agriculture, water, fisheries, and forests, which were presented in the inception report of February 2010 in more depth.

Stakeholder interviews supplemented the policy document review and took place in January 2010. Departments interviewed included:

- Department of Science, Education, Natural Resources and Environment, Ministry of Planning and Investment (MPI)
- Institute of Meteorology, Hydrology and Environment, Ministry of Natural Resources and Environment (MONRE)
- National Institute for Science and Technology Policy and Strategy, Ministry of Science and Technology (MOST)
- Department of Dike Management and Storm and Flood Control, Ministry of Agriculture and Rural Development

All interviewees were asked about their existing institutional capacities, ongoing functions related to climate vulnerability and adaptation, future plans in these areas, and capacity needs going forward, as well as visions for overall adaptation pathways and economic costs of these choices.

Phase 3. Localized vulnerability assessments through local fieldwork

The focus of local field research was to validate the livelihood profiles generated from the literature review, to draw a more detailed picture of the types of people who are likely to be most vulnerable to future climate change, and how adaptation practices engaged in during past climate events might shed light on future adaptation choices and pathways, with a particular emphasis on how social vulnerability might be reduced and future adaptive capacity built up. The tools for the local research included standard tools for vulnerability and adaptation assessment methodologies: analysis of past events, analysis of root causes, risk mapping, and social assessments. These were approached through stakeholder consultations with key informants, semi-structured household interviews, and focus groups. The questions guiding the field research included:

- What are the effects of physical and social vulnerabilities at different scales, from local to national?
- How are the most vulnerable households in the studied local communities adapting? Are these adaptation strategies different from less-vulnerable households?
- Do adaptation strategies in different environments to different hazards vary?
- How do different types of institutions (public, civic, and private) either help or hinder adaptation actions taken by individual households?
- What different types of actions (behavioral, technical, financial, and otherwise) are undertaken by different types of households (poor, well-off, female-headed, etc)?

Phase 4. Participatory visioning workshops for scenario development

Workshops on participatory scenario development (PSD) were conducted in the main study regions (Northern Mountains, Central Coast, Central Highlands, and Mekong Delta) as well as in the capital Hanoi to identify and categorize adaptation pathways suitable for different livelihood groups. Participants in the workshops—including representatives of vulnerable livelihood groups, local and national experts, officials and policy makers, NGOs and academics—worked together to identify social costs and benefits of adaptation activities. The workshops were coordinated by CRES and the NGO Challenge to Change; the coordinators had been trained as workshop facilitators in a ToT workshop in early March. The workshops involved the use of climate data and forecasting, which was then downscaled and presented to the affected communities. The questions that guided the PSDs included:

- What are the perceived relative impacts of climate as predicted by EACC models? Which seem most likely, and which least likely, to impact the development trajectories envisioned by the community? What might be some future drivers of vulnerability that have not yet emerged?
- What are the local ideas about what the future is going to look like? What do people imagine their children's and grandchildren's lives will look like, especially for the next forty years? What are likely to be the major development trends that are going to affect them?
- What are the facilitating environments needed for adaptation successes in terms of policies or institutional support? What have been the relative costs and benefits of these actions?
- Can local adaptation practices from the past be scaled up in the future, or do new adaptation strategies need to be envisioned? How do different stakeholders hold different perspectives on the scale and scope of adaptation practices that will be needed?

Different scenarios resting on different visions and assumptions were played out and the costs and benefits of adaptation pathways identified. The workshop findings were a chance to assess the range of imagined futures that different communities envision, as well as a chance to cost out different approaches and make difficult choices about financial and social investments and outcomes.

SITE SELECTION AND SAMPLING

While each of Vietnam's eight agroecological regions will experience climate impacts to one degree or another, time and financial limitations meant that not every region could be assessed through local fieldwork by the social team. Thus the criteria for selection of study sites for the local field work were provinces that:

1. were located in the regions that scored high on indicators of exposure and sensitivity and low on indicators of adaptive capacity
2. were representative of their agroecological region
3. were places where little fieldwork had already been conducted on livelihoods or climate adaptation.

Due to financial and time limitations for the local fieldwork, the team combined some regions (the Northeast and Northwest into one and the South and North-Central Coasts into one region), decided not to focus on the region that is least vulnerable socially (the Southeast), and relied on previous recent fieldwork on vulnerability and adaptation done by CRES in fall 2009 for one region (Red River Delta in Thai Binh and Ha Tay provinces). This left the team with four regions to visit for local assessments during this project: the Northern Mountains, the Central Coast , the Central Highlands, and the Mekong Delta.

Background to Sites

Northern Mountains. Little work has been carried out in ethnic minority areas on climate impacts, particularly in the Northern Mountains. For understanding adaptation practices in the mountainous region, research was conducted in Ha Giang province. Ha Giang is one of the most heavily ethnic minority provinces in the

FIGURE 8. MAP OF VIETNAM'S REGIONS INDICATING SITES OF LOCAL RESEARCH

country, with over 90 percent of households being ethnic minorities. Major ethnic minorities are Hmong, Dao, Tay, Nùng, Lô Lô, Bố Y, Pu Péo, and Chinese. Ha Giang is one of the poorest provinces in Vietnam, with major financial transfers from central allocation, and has some of the highest rates of poor households of all highland provinces. The province's environmental geography is also very difficult, and comprises three main regions spread over ten districts: eastern limestone highlands (extremely steep slopes and water shortage in dry season); the highland region (land slides in rainy reason); and two lowland valley districts.

Livelihoods in two districts were assessed, one upland and one lowland (Quang Ba and Quang Binh). Most households in Ha Giang are dependent on non-irrigated agriculture, and corn and upland rice are the dominant crops. Different ethnic groups tend to have slightly different emphases on different livelihood streams (i.e. Hmong tend to grow more corn, Thai tend to grow more sticky rice), but steep slopes and rocky soils have limited the expansion of much irrigated agriculture. Households are diversified somewhat into additional sectors such as livestock or wage labor, but these usually make lower contributions to household incomes than in other regions. Despite being in a region that hosts much more forest and allows for more control over forest resources at the local level, few households earn much income off this sector. Households that are better off usually have additional income from trading or from salary work, such as for the military or government. Access to roads makes a big difference in how many people can take advantage of markets to increase their income accumulation. Incomes have risen in recent years and poverty has been reduced, but many households remain just at or over the basic poverty line, and are susceptible to weather-related shocks that push them back below it. Ha Giang, being a border province, is also susceptible to development pressures from China, including hydropower development on the other side of the border.

Central Highlands. Within the Central Highlands, Kon Tum was chosen as the field research site based on the relative lack of research on this province generally; a much less open economy than other areas, like Dak Lak to the south; and higher levels of poverty than other provinces in the region. Kon Tum has illiteracy rates of nearly 30 percent and only 3 percent of the population has graduated from high school (ADB 2001). Communication and transport are generally difficult in much of Kon Tum, especially in the rainy season, when many remote areas can be cut off from outside contact for up to 1–2 months. Although Kon Tum is not a coastal province, it has been increasingly affected by strong hurricanes that hit the coast and travel inland. In September 2009, when Typhoon Ketsana hit Vietnam, Kon Tum had the highest death toll of all provinces (21 people). Around 52,000 households (310,000 people) had to be evacuated before and during the typhoon.

Agriculture dominates the province's economy. Kon Tum has a large and vulnerable ethnic minority population (54 percent by total population) dependent on both cash crops and subsistence agriculture. Forty-six percent of the provinces' households were considered under the poverty line in 2005. The major crops grown in this area are primarily cassava for subsistence, with only a little rice, corn, and rubber for supplemental income. Households located in areas of the province with basalt soils have been able to transition into cash crop agriculture, particularly rubber but also coffee, tea, cashew, and litsea in the past 10 years. This transition has been slower than in other parts of the Central Highlands, which saw cash crop commodity booms in the 1990s. Forestry incomes are very low and few households have official title to forest land in the province, despite a large number of forest estates that remain state-owned. The households that have been able to escape poverty and move upwards are primarily those who have been able to diversify out of agriculture, or to invest in the cash crops—such as rubber—that provide higher incomes. Those that have not had the investment capital or capacity to move away from subsistence agriculture remain very close to the poverty line, and depend on rotational and upland rainfed agriculture, which is sensitive to weather.

Central Coast. The Central Coastal zone from Nghe An to Binh Thuan is a long and vulnerable zone, likely to be subjected to increased storms, surges, and flooding. Because much of the coastal region is often not much higher than 1 m above sea level, an area up to 20 or more km inland from the coast is vulnerable to storm surges that bring saltwater intrusion inland. For our research on coastal vulnerability, Quang Nam province

has been chosen, with field research taking place in two sites, Hoi An town and Cu Lao Cham islands off the coast. The rationale for Quang Nam was the need to include an urban area vulnerable to climate events in the survey and an interest in including an economic sector (tourism) that will likely be quite vulnerable to climate events. Hoi An city is a well known site on the tourist trail. In September 2009, Typhoon Ketsana caused severe damage and loss to local people in the Central Coast, including Hoi An town.

Hoi An, which is particularly dependent on tourism and vulnerable to flooding, is a city managed by the province and is now recognized as a third-tier mid-size urban city, with a population of 121,716 people. In 2009, 2.32 million tourists arrived, and the income from tourism was estimated at 1,900 billion VND. From 2000 to the present, tourism revenue has had an average growth rate of 28 percent per year. For households in Hoi An urban center, many are small entrepreneurs, with all members of a family participating in some way in the tourism industry. This makes many households very dependent on the seasonal nature of tourism, and during the rainy season in the fall, they can be vulnerable to declines in tourist numbers.

For the fishing communities in much of the Central Coast, much of the decline in capture fisheries in the past 10 years has been due to overfishing, not climate change, but the vulnerability remains nonetheless. Cu Lao Cham islands off the coast of Hoi An city are a prime example. The small fishing villages that exist on the archipelago have few other livelihood options, given their lack of agricultural land and distance from the mainland, which gives them very high dependency on fishing and makes them particularly vulnerable if weather-related risks are added to the general problem of overfishing. The off-shore corals of the Central Coast have been very susceptible to bleaching events caused by warmer temperatures, and can be vulnerable to invasion from thorn starfish, a coral predator.

Mekong Delta. The Mekong Delta faces climate threats from flooding and sea level rise in particular. There are also 4 million people living in poverty in the Delta. Many of these people lack basic health protection and school drop-out rates for their children are high. For this group, even a small decline in income or loss of employment opportunities linked to flooding would have adverse consequences for nutrition, health, and education. Thus the poor face a double exposure. They are far more likely to live in areas vulnerable to flooding, and they are less likely to live in more robust permanent homes. For the fieldwork in the Delta, Bac Lieu province and Can Tho city were the study sites.

Bac Lieu province faces the lower East Sea, and includes seven districts, three of which lie along the coast. The typical livelihoods in Bac Lieu province are shrimp farming and shrimp hatcheries, capture fisheries (both near shore and off shore), salt production, and vegetable production. Shrimp and catfish farmers were presumed to be more vulnerable to risks posed by climate change than rice farmers, who have longer histories of adapting to floods and have better adaptive mechanisms than those in the newer, high-capital fields of shrimp and fish farming.

Can Tho City is a relatively new city founded 200 years ago along the banks of the Hau River on low flat terrain, with an average elevation of about 0.8m to 1.0m above sea level. Can Tho City is built along an extensive river and canal network, with higher narrow strips of land—from 1.0m to 1.5m above sea level—where the principal urban development areas are located. Since 2009, Can Tho City has been directly under the central government as a tier-one city (of which there are five in Vietnam), and is considered the economic, cultural, education, and medical center of the Mekong Delta. The metropolitan area is 1,400 km^2, divided into nine administrative divisions, including five urban districts and four suburban or rural districts. Floods in the rainy season and high air temperature in the dry season are the main physical vulnerabilities of the studied districts. Livelihoods include wage labor, trading, informal work such as food vending, and salt harvesting and shrimp labor in more rural areas of the city. While people living in urban areas tend to have higher incomes and better connectivity to public services, making them less vulnerable to risks posed by climate change, there are a number of poor households in the city as well. Poor people usually live in low topography areas and they do not have enough money to raise their house floor. In addition, poor people live in high population density areas; two or three generations may be living together in a small house, and ventilation is not good.

METHODS: TOOLS EMPLOYED

Local research was carried out throughout March at selected sites representing the vulnerable regions identified by the social team. The research was carried out by teams of researchers from CRES (Northern Mountain, Central Highlands, and Central Coast) and DRAGON (Mekong Delta) in conjunction with input and participation of local authorities and local people. Fieldtrips of around one week per region allowed the teams to quickly assess the local situation and get input from communities and officials, given time and budget constraints that prevented longer fieldwork periods from being possible. The methodologies that were used are outlined below:

- *Community Risk Mapping.* Mapping exercises identified the most important local hazards, who and what may be at risk, and which mitigation measures are possible. Participants were asked to rank the incidence and severity of subjective risk perceptions, which allowed the researchers to identify and prioritize risks by distinct subpopulations and to construct an "index of risk" for different subjects (Smith et al. 1999). Other PRA tools—such as seasonal calendars of climate risks, wealth rankings, matrix rankings of livelihoods, natural resource access, and tenure maps—were also utilized in these meetings. These localized vulnerability assessments provided a unique index of how vulnerability is perceived in different cultural and economic settings.
- *Focus Groups.* To gather information regarding climate hazards, impacts, and adaptation practices and to address the role of community formation and group identity on adaptation choices, the teams conducted targeted focus groups. These focus groups, approximately 5–10 per community, were constituted from the most vulnerable groups in communities that were identified in the group risk maps above. The focus groups included poor people, women, youths, children, those who were landless, the elderly or infirm, migrants, and ethnic minorities as was appropriate to the local situation, and allowed the vulnerable members to identify their particular challenges related to climate and adaptation possibilities.
- *Key stakeholder interviews.* Stakeholder interviews were held with local civic institutions, private institutions involved in climate issues in the local area

FIGURE 9. EXAMPLE OF COMMUNITY RISK MAP CREATED IN QUANG NAM

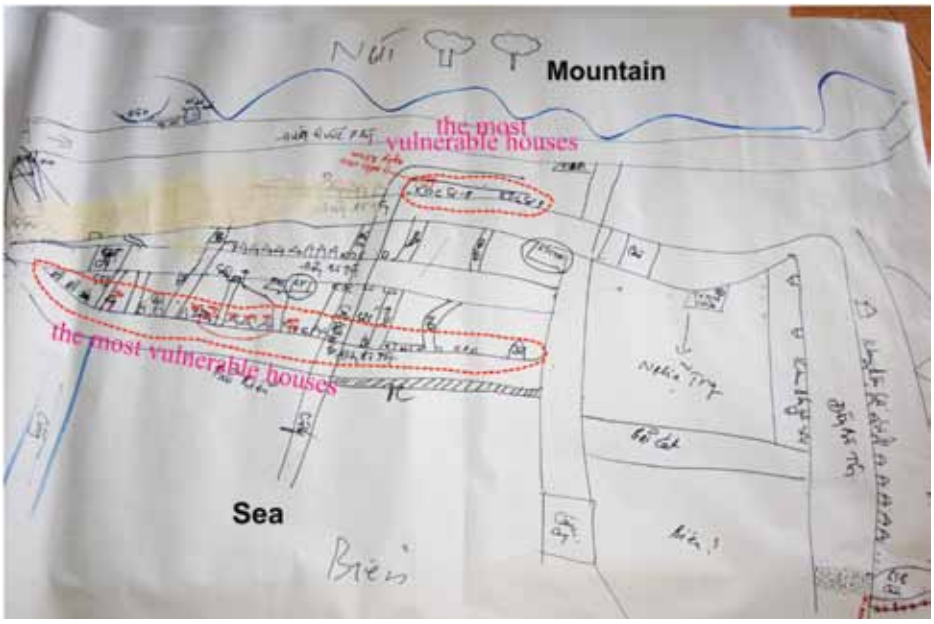


FIGURE 10. GROUP MEETING IN KON TUM FIELD SITE

(i.e. agricultural cooperatives or insurance providers); and with local government officials of the institutions identified as important in climate adaptation. At the provincial level, meetings with key informants from relevant departments—such as the Department of Planning and Investment (DPI), Department of Agricultural and Rural Development (DARD), and Department of Natural Resources and Environment—were conducted. At the district level, interviews with key informants at the district Office of Agricultural and Rural Development, Office of Natural Resources and Environment and Office of Finance and Planning, and the Committees for Flood and Storm Control were carried out. Meetings with cadres at the mass organizations—such as the Farmers' Association, the Women's Union, and the Red Cross—were also conducted. At the commune level, meetings with the heads of the same associations as at the district level were carried out.

- *Semi-structured interviews*. To compare individual household living conditions among the sites, a standardized semi-structured interview tool was used (see Appendix for the draft survey). The participating households (180 total) were selected to be representative for the different vulnerability groups. The survey asked a number of questions related to how the household had been able to adapt to climate events, such as household composition, labor allocation, ethnicity, migration, patterns of income and expenditures, agricultural characteristics (crop and seed choice, inputs, field rotation, yields, and use or sales), type and scale of land holdings and tenure regimes, and diversification of incomes in the household. Risks and shocks were assessed through questions about the scale and scope of climate impacts in the past, as well as questions on adaptation behaviors that the household had engaged in the past in response to climate events such as droughts and floods, and what the costs of these actions were. Other questions addressed inter-household adaptation and collective action, such as food sharing, informal and formal networks, and use of local institutions.

APPROACH TO DATA ANALYSIS

The data analysis approach has primarily consisted of creating typologies of vulnerability and adaptation for each community and extrapolating from these to the larger regional and national issues at hand. These typologies were developed and used to confirm the most vulnerable peoples to climate change by checking and adding to the vulnerability matrix designed by the social team during the inception report. They were also used for validation of livelihoods portfolios; that is, for populations that are presumed to be more vulnerable, such as a single female-headed household, how did their portfolio differ from other households, and how did different livelihood portfolios buffer against different kinds of risk? The results of the individual interviews were used to shed light on whether there were differences between ethnic, gender, and income groups with regard to how they were able to engage in adaptation practices; why they did or did not implement adaptation; and who had have been able to participate beyond the household in community adaptation strategies. Finally, the typologies were used to assess both costs and feasibilities of various adaptation options that have been used in the past to cope with climate events through an assessment of adaptation investments to date locally, such as in the fields of infrastructure, agriculture and income generation, and safety net provision.

In analysis we looked for patterns of adaptive responses as identified by previous work in the literature on adaptation, and worked to classify the adaptation practices we found into typologies of action (social, institutional,

physical, technological, investment, regulatory, market) and by actor (different levels of government from village to national, international actors such as donors and NGOs, local communities and community-based organizations, individuals, and the private sector). We also assessed actions across sectoral areas, such as in mobility/migration, risk pooling, storage, livelihood diversification, and market exchange (see Agrawal 2008). We particularly looked at those actions that were cost affective and that could be used across a variety of needs, such as those actions which:

- *Addressed the drivers of vulnerability*, such as adaptation options that reduced poverty and increased overall capacity of the household to improve their livelihoods
- *Built response capacity*, such as activities that focus on problem-solving through technological or other means, i.e. forecasting, weather monitoring
- *Managed climate risk*, such as activities that lead to better incorporation of climate information, i.e. climate-proofing physical infrastructures
- *Confronted climate change*, such as adaptation activities that were adapted for extreme response, i.e. relocation of whole communities away from vulnerable areas (McGray et al. 2007)

INTERACTIONS WITH OTHER EACC SECTOR STUDY TEAMS AND BANK STAFF

The social team has interacted in several ways with the other EACC sector studies, so that the sectoral teams and the social team could find areas of mutual interest to reinforce the others' findings. Our collaboration with the EACC study sector specialists was intended to help integrate the social and sectoral analyses, particularly for identification of adaptation choices valued by different communities.

First, we interacted with other elements of the EACC study through teleconferences. For example, members of the social team participated in a EACC-wide teleconference on January 13–14 to discuss the emerging findings in all the EACC countries. The late start to the Vietnam study allowed this country study to benefit from the comments on the other EACC country work, including peer-reviewed comments for the social reports from the other six study countries. The social team prepared a brief summary of the approach to the Vietnam social study, which was presented by the overall social study coordinators, Robin Mearns and Anne Kuriakose, for other EACC country teams to comment on. The Vietnam social team heard the feedback on the other social teams work so that problems could be avoided in our own country work.

Members of the social team participated in another teleconference for the Vietnam team only on January 26 and 27. At that conference, preliminary findings from the other sector studies were presented, including from the agriculture/water team, the forestry team, the fisheries team, and the coastal infrastructure team. The social team provided a six-page briefing overview of the approaches to be taken in the social study to the other members of the EACC Vietnam study on January 25 to allow the other sectors studies to see where the social study would be taken, and for those sectors to add their input to the social study. The close connections between vulnerability assessments being undertaken by the fisheries team and the social team were noted during the conference in particular.

Secondly, we held direct meetings between World Bank staff and EACC sector study personnel.

Robin Mearns was able to met with CRES in Hanoi on January 29 to go over the fieldwork and PSD workshop plans in particular. Anne Kuriakose worked closely with CRES, DRAGON, and Challenge to Change during the week-long Training of Trainers workshop that was held the first week of March. Pam McElwee, the international consultant, met with World Bank Vietnam officials during her visit in late March to help facilitate the final national workshop. Other sector consultants were extended an invitation to the national PSD in Hanoi through the EACC study coordinator, and Mr. Chien from the Forest Science Institute, who was a key leader of the forestry study, was able to attend.

Thirdly, we have shared documents closely among the other EACC sector studies. During the creation of the social inception report, we drew closely on the draft analyses that had been produced for the other sector reports, particularly on the climate forecasting and on the vulnerability analysis done for the various sectors. Draft reports from the social team were also shared

within the EACC team, and valuable comments were received from the World Bank Hanoi office in particular on the inception report.

LIMITATIONS OF THE STUDY

Like all studies, this EACC social study has had several limitations. Most of these limitations were predicted in advance, however, so we did our best to minimize their effect on the overall quality of the study.

The short time of the study. The EACC study in general and the Vietnam study in particular, were run on a tight schedule, which meant that not all activities could receive as much time as they warranted. The Vietnam study was the last social study to be chosen and set up, and the entire study was to take place in only four months. This meant that all activities had to be compressed somewhat, with little time between phases for lengthier analysis or reflections. Fieldwork in particular was done with around one week of work at each site; obviously a more lengthy fieldwork phase would have been able to collect more in-depth information.

Fieldsites cannot be fully representative. Due to financial limitations, only a limited number of fieldsites could be visited. While we deliberately tried to chose places for fieldwork that could be representative of the general issues facing the regions of Vietnam, the sites chosen ultimately cannot be totally representative of the diversity of livelihoods and adaptation possibilities in Vietnam. Some areas that are likely to be hard hit by climate change in the future but which were not sites of fieldwork include, for example, Ho Chi Minh city.

Coordination problems. There were also difficulties in coordination between the two main fieldwork teams—CRES in the center and north, and DRAGON in the south—due to geographic distances, as well as between the fieldwork and the PSD workshops. This prevented the DRAGON and CtC team members from attending the final national workshop. While having only one single institution be responsible for the whole study would have eliminated these coordination problems, we feel the diversity of approaches that we gained by having three disparate groups together work on the project made up for the challenges of this approach.

4. FIELDWORK RESULTS

OVERVIEW AND INTRODUCTION TO AREAS OF INVESTIGATION

Field research took place in several regions of the country in provinces that the social team felt were usefully representative of the climate issues facing that region. Each of the regions had particular existing vulnerabilities to climate changes that are likely to become increasingly important into the future. The fieldsites and vulnerability to climate in each area are indicated in table 16 below.

Existing Livelihood Systems in the Sites

Kon Tum. The local people's livelihoods in Kon Tum are not diverse and are mainly dependent on rainfed agriculture. The major crops grown in this area are primarily cassava for subsistence, with only a little rice, corn, and rubber for supplemental income. In areas with better access to Hwy 14, rubber plantations are found on almost 25 percent of the land area, with coffee and litsea being the second most important crops. Cassava and rice are also grown for subsistence in cash crop areas. The majority of the residents of the study sites were ethnic minorities; in Dak Tram, the Xe Dang accounted for 94 percent of the population and the remaining were Kinh, while in Dien Binh, the Xe Dang accounted for 63 percent and Ro Ngao for 37 percent.

Livelihoods in Kon Tum appear strongly influenced by geographical location, with poorer areas being more remote from roads and markets. On average each household member in Dien Binh earned three times as much from agriculture compared with a household member in Dak Tram. The reason is that in Dien Binh each house has at least one ha of rubber plantation and also coffee plantations. Meanwhile the main sources of income of households in Dak Tram are from rice, cassava and corn, all low-value crops. One significant problem for some subsistence farmers is the practice of selling unripe paddy to Kinh traders for half of the price for harvested rice so they can be fronted cash for inputs early in the season. Thus, the poorest households often end up earning half of the money that they should have, thereby increasing their vulnerability.

Almost all households in both communes did not keep any livestock. The reasons were two-fold. First, they did not know how to keep them, and second, they did not have capital sources to invest in animal pens and feed. The next large source of income for the average household member in Dak Tram was from government salaries and other sources of non-farm income.

Quang Nam. Bai Huong is one of four villages of Tan Hiep commune on the Cu Lao Cham islands, with a total area of 1,700m^2 and a population of 410 people. The main income source is coastal fishing. According to the village head, 90 percent of the households live off the coastal fishery, while 10 percent of the households own small shops. People mainly go fishing twice a day in a fishing area more than 3 km away from the coast.

An Thang ward is one of five divisions of Minh An commune of Hoi An city, with 1,350 people (282 households). The An Thang living quarter is located among the main roads of Hoi An city and fronting

TABLE 16. COMPARISON OF SITES FOR FIELD RESEARCH

Selected site	*Features/ rationale*	*Existing vulnerabilities to climate change*
Central Coastal Region, Quang Nam Province		
Hoi An city	Urban area, people live mainly on tourism services	• The rise of water level from river causes floods every year that reduces the income source from tourist services. • Storms cause damage to unstable houses. Diseases after floods and storms threaten local people's health, especially children, pregnant women, and old people
Cu Lao Cham island	Fishing community, people have no land for agriculture	• Storms and tornados affect fishing activities and damage boats and houses. • Tidal flooding also causes damage to houses and fishing nets. • Rainfall affects houses located around the mountains. • Drought causes lack of clean water for poor families
Central Highlands Region, Kon Tum Province		
Dak Tram Commune	Ethnic minority people, far from roads, reliant on subsistence agriculture	• Flash floods and drought affect farming activities and damage houses
Dien Binh commune	Ethnic minority people, nearer road (Hwy 14) and with more cash crop production, like coffee.	• Flash floods and drought affect farming activities and damage houses
Northern Mountains Region, Ha Giang Province		
Thai An Commune, Quan Ba District	Hmong people, remote from roads, living on steep slopes near the Chinese border	• Droughts cause limited access to drinking and agricultural water. • Flash floods strike highland areas and cause damage to homes. • Cold spells kill livestock and cause illnesses
Tan Trinh Commune, Quang Binh District	Kinh and ethnic minorities living nearer lowland areas and closer to roads	• Droughts cause limited access to drinking and agricultural water • Flash floods wash down to lowland areas and cause damage to homes and deposit sand on fields.
Mekong Delta Region, Bac Lieu Province & Can Tho City		
Long Dien Commune, Dong Hoi District	Shrimp farmers, rice producers, small scale traders.	• Extreme weather events, such as out-of-season rain, irregularly hot days, high differences in air temperature between day and night, whirlwinds, and sea level rise all affect local livelihoods
Long Dien Tay Commune, Dong Hoi District	Salt producers, shrimp farmers and fishers, including Khmer people	• Extreme weather events, such as out-of-season rain, irregularly hot days, high differences in air temperature between day and night, whirlwinds, and sea level rise all affect local livelihoods
Can Tho City, Ninh Kieu ward	Day laborers, traders, informal sector workers	• Increasingly hot days, extreme events like flooding and long-term events like sea level rise affect city-dwellers

TABLE 17. AVERAGE SOURCES OF LIVELIHOOD IN KON TUM, PER HOUSEHOLD

	Dak Tram		*Dien Binh*	
Sources of income	*2009*	*%*	*2009*	*%*
Crops	1,093,043	49.3	3,350,253	96.8
Livestock	34783	1.6	30303	0.9
Aquaculture	0	0.0	0	0.0
Other activities (trading, handicrafts, etc)	14609	0.6	13485	0.4
Wages/pensions/salary	1,074,957	48.5	66666	1.9
Remittances	0	0.0	0	0.0
TOTAL average HH income from all sources	2,217,392	100.0	3,460,707	100.0

Source: Household survey.

along the Thu Bon river bank. Providing services for tourists (shop keeping, restaurants, etc) is the main economic activity of households in Hoi An. Hoi An attracts tourists with its cultural heritage; therefore households with traditional wooden houses have more chance to improve their economic status as they can get money from selling tickets for tourists or open shops in their houses. In general the living facilities in Hoi An are good, with 100 percent of households there having access to electricity and clean water. This allows the households in this community, especially for the households that have a large house located along the main roads, to have higher incomes in comparison to nearby rural fishing communities.

FIGURE 11. TRADITIONAL WOODEN HOUSE IN HOI AN

The household survey shows that the average income of a household in An Thang in Hoi An is much higher than that in Bai Huong fishing village. There is also a large income disparity among households in both communities, with the rich households earning 10 times or more than the poorest ones (in An Thang, 250 million for the richest household and only 20 million for the poorest; in Bai Huong, 53 million for the richest household and only 15 million for the poorest) (Table 18).

A comparison of the livelihoods of different income classes in the two fieldsites in Quang Nam is presented below.

Ha Giang. The villagers of Thai An and Tan Trinh depend on various sources of income, primarily from crop production, livestock, aquaculture, and non-farm activities. As a better-off commune, Tan Trinh villagers, located nearer to lowlands, can generate twice as much income (more than 35 million VND) compared to that in Thai An, in the highlands (around 16 million VND). Tan Trinh villagers appear to be more diversified with more than one source of income to depend on, while in Thai An, livestock is the most important source with

TABLE 18. AVERAGE SOURCES OF LIVELIHOOD IN QUANG NAM, PER HOUSEHOLD

	An Thang		*Bai Huong*	
Sources of income	*2009*	*%*	*2009*	*%*
Fishing	0.0	0.0	95,975,000	83.56
Livestock	0.0	0.0	550,000	0.48
Aquaculture	0.0	0.0	150,000	0.13
Other activities (trading, handicrafts, etc)	2,019,047.6	2.78	5,100,000	4.44
Services	66,690,476.0	91.73	9,757,500	8.50
Wages/pensions/salary	676,190.48	0.93	0	0.0
Remittances	3,314,285.7	4.56	350,000	0.30
TOTAL average HH income from all sources	72,700,000.0	100.0	114,861,447	100.0

Source: Household survey.

TABLE 19. CLASS DIFFERENCES IN QUANG NAM LIVELIHOODS AND ASSETS

	Housing, Estate and savings		*Income activities*		*Estimated Percentage of Total HH*	
Types of HH	*An Thang (Hoi An City)*	*Bai Huong (Island Fishing Village)*	*An Thang (Hoi An City)*	*Bai Huong (Island Fishing Village)*	*An Thang (Hoi An City)*	*Bai Huong (Island Fishing Village)*
Rich	• Large house • Wide front side • Own multiple houses located in main streets such as Bach Dang, Tran Phu • Run their own business with more than 10 employees • Own expensive car	None	• Garment and export textile • Hotel • Big restaurant • Cafeteria	• None	2	0
Better – off	• Average size house • On the main roads • Run own business with less than 10 employees or give house for rent	• Have houses in mainland • Modern home facilities • Have relatives in mainland • House with flat roof • Have children at the university level	• Lantern shops • Souvenir shops • Restaurants	• Traders (fish, lobster for export) • Husband goes fishing and wife stays at home to run small shop	30	10 HHs (9.6%)
Middle income	• Small size house • On the small roads • Run small business • From 0.8 to 1 million VND income per capita	• Modern home facility • House with corrugated iron roof • Debt under 5 million VND	• Work as small shop keepers • Wage labor	• Fishing • Running small shops	50	60 HHs (57.6%)
Near poor	• Small and not solid house • On narrow roads away from main center • Income is under 600,000 VND per capita per month	• House with concrete walls, corrugated iron roof. • Debt (5–10 million VND) • Take out loans for buying food (200,000–500.000 VND/month)	• Manual wage labor • Street vendors	• Fishing	8	17 HHs (16.3%)
Poor	• None	• Non-concrete house (wall made by corrugated iron sheets) • Floor made by cement • Lack of labor • Loans for buying food 500–1 million VND/ month	None	• Small fishing • Collecting firewood and forest vegetables for selling	None	10 HHs (9.6%)

Source: Focus group discussion and key informants interviews.

more than 60 percent of household income. Although the table shows that non-farm activities generate 19 percent of income for Thai An household, it should be noted that most of this amount comes from government support for household loss and damage caused by a flash flood in 2008.

Bac Lieu. Livelihoods in the studied areas of the Mekong Delta are a combination of aquaculture, agriculture, salt production, and other sources of on and off-farm income. In one village (Bien Dien) of Long Dien Tay, income comes primarily from salt production (40 percent) on farms that have favorable natural conditions (good soil and good seawater quality are necessary), extensive shrimp cultivation (30 percent), intensive shrimp cultivation (15 percent), cash crops (5 percent), and other activities (10 percent). Remittances, wages, and pensions also provide good supplements to the farm-based incomes. The incomes of households in the Mekong Delta fieldsites were considerably higher than other rural regions, with an average income of 45 million VND.

Can Tho. The main sources of income in the researched ward are trading, services (such as food processing or motorbike repair), wage labor (bricklayers, waitresses,

TABLE 20. AVERAGE SOURCES OF LIVELIHOOD IN HA GIANG, PER HOUSEHOLD

	Thai An uplands		*Tan Trinh lowlands*	
Sources of income	*2009*	*%*	*2009*	*%*
Crops	2,650,000	16.5	12,780,000	36.0
Livestock	10,256,250	64.0	15,376,000	43.4
Aquaculture	25,000	0.2	633,333	1.8
Other activities (trading, handicrafts, etc)	3,090,625	19.3	6,677,333	18.8
Wages/pensions/salary	936,666	5.4	930,167	2.5
Services	533,333	3.0	180,000	0.5
Remittances	0	0.0	500,000	1.3
TOTAL average HH income from all sources	16,021,875	100.0	35,466,667	100.0

Source: Household survey.

TABLE 21. AVERAGE SOURCES OF LIVELIHOOD IN BAC LIEU, PER HOUSEHOLD

	Long Dien Commune		*Long Dien Tay Commune*	
Sources of income	*2009*	*%*	*2009*	*%*
Crops	7,066,667	10.1	1,500,000	0.9
Livestock	5,000,000	7.1	8,666,667	5.3
Aquaculture	12,420,000	17.7	53,000,000	32.6
Salt production	0	0.0	61,111,111	37.6
Other activities (trading, handicrafts, etc)	800,000	1.1	10,000,000	6.1
Wages/pensions/salary	11,900,000	17.0	21,000,000	12.9
Pensions	8,100,000	11.6	4,451,250	2.7
Remittances	24,833,333	35.4	3,000,000	1.8
TOTAL average HH income from all sources	25,005,000	100.0	69,615,250	100.0

Source: Household survey.

etc), and handicrafts (such as embroidery). Most households in Can Tho do not have agricultural land or livestock.

Household Asset Bases

Kon Tum. In both communes 100 percent of sampled households owned their houses (all one-storied), although the quality of construction of houses varied considerably. In both communes, no household owned a car, although the majority did have at least one motorbike.

Quang Nam. The most important physical asset of households in Hoi An city are houses, which are valued depending on their location along roadways. The houses located along the main roads and next to the river have much higher value than others in small and narrow roads. The owners of these houses can run their own economic activities—such as a souvenir shop, a restaurant, a hotel, a garment shop, or a cafeteria—or they can rent their houses to others to get monthly rental income. The households living in the narrow and small lanes do not have this advantage. Thus the location of housing is a major contributor to income disparities

TABLE 22. SOURCES OF LIVELIHOOD IN CAN THO, PER HOUSEHOLD

	Ninh Kieu ward	
Sources of income	*2009*	*%*
Agriculture/livestock	0	0.0
Wage labor	12,400,000	23.8
Services/Processing	26,600,000	50.9
Trading	7,000,000	13.4
Pensions	1,800,000	3.4
Remittances	1,200,000	2.3
Other	1,175,000	2.3
TOTAL average HH income from all sources	52,175,000	100.0

Source: Household survey.

between households in the tourism community; while the rich households can have real estate and savings worth many millions of VND, the poor ones may only have only a few million VND.

Household savings are also an important financial asset. In both Hoi An and Cu Lao Cham, the sources of household savings mostly come from household income, but there is also another important source, remittances of household members, especially in Hoi An. As the former international sea port of Vietnam, with some old families originating from China and Japan, some

TABLE 23. TYPES OF ASSETS IN KON TUM

	Dien Binh		*Dăk Trăm*	
Status of the house	*#*	*%*	*#*	*%*
Permanent with flat concrete roof	1	5	2	9.5
Permanent (e.g. all walls are made of brick or strong wood)	15	75	13	62
Semi permanent (e.g. part of wall is brick, & other is wood)	2	10	2	9.5
Stilt house	1	5	1	4.8
Other	1	5	3	14.2
Total	20	100	21	100
Motorbike Ownership	*13*	*72.2*	*10*	*76.9*

Source: Household survey, 2010.

TABLE 24. THE VALUE OF HOUSING IN MINH AN COMMUNE

Housing and location	*Tran Phu street*	*Bach Dang street*	*Hai Ba Trung street*	*Small roads (no name)*
Renting price (million VND/month/m^2)	30	27	20	0.7
Selling price (thousand VND/m^2)	20	18	16	2

Source: Group discussion.

households in Hoi An have their children abroad or their relatives live in China, America, Canada, or other European countries, who sent a large amount of money back to Hoi An. Some households get substantial investments from their relatives to undertake big business investments, such as international tourist agencies or opening chains of restaurants, hotels, and resorts. These households are the richest in Hoi An.

The savings of households in Cu Lao Cham are mainly from fishing activities. Since the early 2000s, the households that invested in buying fishing nets and good boats could improve their fishing. The last few years, the price of seafood was high so that these households had good incomes and substantial savings. These households could buy houses in the mainland or invest in the education of their children. Remittance is also a source of income and savings in Cu Lao Cham since in many households, there are only husband and wife living together, as their children have gone to the mainland to find a job there. These remittances are not as high as the foreign remittances in Hoi An.

Ha Giang. Thai An commune is composed mostly of Hmong people and they have their house made of dirt to keep them warm in the winter and cool in the summer. Most of them rate their houses as semi-permanent (53 percent) or not permanent (20 percent). The majority of Tan Trinh villagers are Tay and most of them (50 percent) live in traditional houses on stilts, which they consider as not permanent. But more and more households now build concrete houses to avoid and lessen the damage caused by tornados and flash floods. More than 30 percent of the interviewed households in Tan Trinh report that they now live in concrete houses.

TABLE 25. TYPE OF HOUSING IN THAI AN AND TAN TRINH COMMUNE

	Thai An		*Tan Trinh*	
	#	%	#	%
Permanent (e.g. all wall are made of brick or strong wood)	4	26.7	5	31.2
Semi-permanent (e.g. part of wall is brick, & other is wood)	8	53.3	3	18.8
Not permanent (e.g. no brick, but only wood or bamboo)	3	20.0	8	50.0
Total	15	100.0	16	100.0

Source: Household survey, March 2010.

***Bac Lieu*:** Most of the houses of respondents are located near rivers or along roads. In terms of housing, house type 2 (cement walls, tile roof, and lasting for about 5–15 years) is the most common, while the rest are living in house type 1 (cement walls, brick roof, and lasting for above 15 years). In Long Dien Tay village, poorer quality house type 3 (brick walls, tile roof, and lasting above 3–5 years) was also encountered. In Long Dien village, about 60–65 percent of houses of respondents have sanitary latrines, and the rest have temporary toilets. Most households interviewed (80–90 percent) use deep well water, and 10–20 percent use tap water for household consumption. Still, about 20–60

TABLE 26. HOUSEHOLD ASSETS IN BAC LIEU

		Long Dien village		*Long Dien Tay village*	
		Frequency	*(%)*	*Frequency*	*(%)*
House type	Type 1	4	20	4	20
	Type 2	16	80	13	65
	Type 3			3	15
	Total	20	100	20	100
Toilet type	Temporary toilet	7	35	8	40
	Sanitary latrine	13	65	12	60
	Total	20	100	20	100
Source of drinking water	Deep well	18	90	16	80
	Tap water	2	10	4	20
	Total	20	100	20	100
Source of bathing water	Deep well	18	90	16	80
	Tap water	2	10	4	20
	Total	20	100	20	100
Water supply problem	Shortage in dry season	4	20	13	65
	Salinity contaminated water	16	80	7	35
	Total	20	100	20	100
Electricity status	Available	19	95	20	100
		Other Assets			
Auto		1		1	
Motorbike		17		17	
Bike		5		2	
Motorboat				1	
Boat				5	
Pump		7		18	

Source: Household survey.

percent of households interviewed are faced with shortages of freshwater in the dry season, and 35–80 percent use saline-contaminated water for household consumption.

Can Tho. Houses of households interviewed were rather small, with an average of about 48 m^2 /house or 8.8 m^2 /person (low compared to the nationwide average of 18.6 m^2 / person) because land values are rather high in this area (about 13 million VND/m^2). The average elevation of the floor of households interviewed is about 0.3 m above ground, making flooding a problem. Most of the households interviewed (65 percent) were also located along the river, where there is a problem with riverbank erosion. The other households (35 percent) are located in depression areas that are affected by river floods. In terms of the house type, 60 percent of households interviewed had a simple house (type 4, made from Nipa palm leaves), 30 percent had a type 3 house (brick walls, tile roof), and 10 percent had a type 2 house (cement walls, tile roof). There were no high-quality type 1 houses (cement walls, brick roof, lasting for more than 15 years) in the households interviewed. About 55 percent of households interviewed had a sanitary latrine, 40 percent had a temporary toilet, and 1 household still used an outdoor fish-pond for a toilet. All households interviewed in An Lac ward directly accessed tap water for both drinking and bathing delivered by the Can Tho Water Supply Company. In terms of electricity, 100 percent of households interviewed had access to electricity.

Resource Access and Land Tenure

Kon Tum. In Kon Tum, there is a distinct difference between the two communes with regard to both cultivated land and residential land. In general, land holdings per person in total in Dien Binh were twice as much if compared with those of Dak Tram, although irrigated lands only were more closely equal, if small, in both areas. Additionally, despite being located in the Central Highlands and surrounded by forest land, no households in either site had tenure rights to nearby forests, which remain managed by the state.

TABLE 27. LIVING CONDITIONS OF HOUSEHOLDS IN CAN THO

		An Lac Ward	
Type of equipments and facilities	*Details*	*Frequency*	*(%)*
House type	Type 1	0	0
	Type 2	2	10
	Type 3	6	30
	Type 4	12	60
	Total	20	100
Toilet type	Fish-pond toilet	1	5
	Temporary toilet	8	40
	Sanitary latrine	11	55
	Total	20	100
Source of drinking water	Deep well	0	0
	Tap water	20	100
	Total	20	100
Source of bathing water	Deep well	0	0
	Tap water	20	100
	Total	20	100
Electricity status	Available	20	100

Source: Household survey.

TABLE 28. LAND TYPE AND OWNERSHIP PER CAPITA BY COMMUNE IN KON TUM, 2009

Commune	*Residential land (m^2)*	*Cultivation land (m^2)*	*Cultivation land with irrigation (m^2)*	*Cultivation land without irrigation (m^2)*	*Forest land (m^2)*	*Aqua-culture (m^2)*	*Total (m^2)*
Dien Binh	279.2	4,612	525	4,216	0	0	9,633
Dak Tram	149.3	2,251	402	1,848	0	2	4,652

Source: Household Survey, 2010.

Quang Nam. In terms of natural resources, although the two researched communities are quite different, one being an urban area and the other a fishing village, they do have in common the fact that they do not own agricultural land, even gardens, for raising any cattle or pigs.

Because private land ownership (besides residential homes) in these Quang Nam communities is limited, these households are more dependent on access rather than ownership of resources. But when access to forest land and other resources are limited, this can make people become more vulnerable to extreme weather events because it can be hard to recover from climate losses due to the unavailability of livelihood alternatives. The Cu La Cham islands are a good example of this situation.

Among the 96 households in Bai Huong village, there are only 8 households newly engaged in tourism activities but who are still engaged in fishing or run small shops, while the remaining 88 households depend on fishing in the common fishing plots surrounding the islands near their village. Since the establishment of a marine protected area (MPA) in Bai Huong in the past few years, the fishers have no permission to fish at those areas where coral reefs exist. This means that, while it may result in long-term benefits in the protection of breeding grounds for fish, in the short term the demarcation of the MPA project has limited access to fishing resources.

Additionally, besides the fishing restrictions, forests surrounding the Bai Huong village are classified as watershed forests by the government, so people are not allowed to cut down any trees. The villagers can only collect firewood and vegetables such as non–timber forest products. In the past, about 4 households had rice fields in this area claimed by their ancestors. However, since 2005, they stopped cultivating since they were told the agricultural chemicals can contaminate the streams, which are the drinking water source for whole village. For a rural community like Bai Huong, living in the area with forests but not having them available for exploitation, and with no area for agricultural cultivation, has made people more dependent on fishing, their only source of livelihood.

Ha Giang. The most important resource to households in Ha Giang is land, for which all households reported land tenure certificates. As determined by topographical conditions, land area per household is different in the two communes. Thai An villagers (the mountainous

TABLE 29. LAND TYPE AND OWNERSHIP PER CAPITA BY COMMUNE IN QUANG NAM, 2009

		Residential land (m^2)			*House (m^2)*		
		Mean	*Maximum*	*Minimum*	*Mean*	*Maximum*	*Minimum*
Village	An Thang	121	400	24	126	400	24
	Bai Huong	93	200	0	93	200	0

Source: Household surveys, March 2010.

BOX 2. RESTRICTIONS ON RESOURCE ACCESS MEANS INCREASED VULNERABILITY IN THE SHORT TERM

For some poor families, since there is not much agricultural production in Bai Huong, vegetables and fruits are brought from the mainland so that the price is at least twice as high as it is in the center of Hoi An. Therefore collecting vegetables from the forest is a good source of income and contributes to the nutrition in their meals. Firewood collecting is also one source of income. The price depends on the weight (25,000 VND – 30,000 VND for a big bundle of 25 kg, 20,000VND for a small bundle of 20kg). However, firewood can only be sold within the island and people are not allowed to take it to the mainland for selling. This means that the income from firewood selling is small; locally speaking, "it just helps a little to cover the cost of salt or fish-sauce." Other restrictions on resource use on Cu Lao Cham island include caves, where swallows come and make nests near the village. It is said that the quality of the nest is very good. However, the birds' nests are under management of a state company and no local people are allowed to collect this special, high-value product. There are even guards equipped with guns to patrol and watch the cave in order not to allow any local people to collect illegally. Said one elderly woman in Bai Huong, "In the past, those bird's nests were collected and exploited by the Southern government, but local people still could come there to glean the ones left over. After 1975, this cave was managed by the national government, and at that time it started to become more difficult to collect nests, but we still could collect the nests. Since the late 1990s and from 2000 up to now, the cave was watched very carefully, and local people could not come to collect the nests any more. If any one comes, they can be shot."

commune) have a larger total land area, of which more than two-thirds is forest land. Cultivated land is only one-third, of which the land area without irrigation is almost double the area that is irrigated (Table 30). In Tan Trinh, the lowland commune, forest land also takes more than half of the land area (55.5 percent), although its ratio is smaller than that of Thai An.

Water is another important resource to households in the highland area. Tan Trinh people in the lowlands have more irrigated land than those higher up in Thai An. Tan Trinh also has more fishponds than Thai An, thus more households in the commune raise fish or aquaculture products. Due to different topographical conditions, access to water in Thai An commune is rather limited. As shown in Table 30, more than 73 percent of cultivation area in Thai An is not irrigated, while only 10 percent of Tan Trinh has to depend on rainfed water . The number of households that have 50 percent and more land area being irrigated in Tan Trinh (37 percent) is much larger than that of Thai An (13 percent)]. This makes Thai An more vulnerable to long-term changes in precipitation, although even the irrigated lands of the lowlands can also be vulnerable to events like extended drought.

TABLE 30. LAND OWNED BY HOUSEHOLDS IN HA GIANG

	Thai An		*Tan Trinh*	
	m^2	*% hh land*	*m^2*	*% hh land*
Residential land, including garden	347	0.9	1,575	13.1
Cultivation/farmland with irrigation system	3,133	8.5	1,663	13.8
Cultivation/farmland without irrigation system	6,820	18.6	1,243	10.3
Forest land	26,160	71.3	6,687	55.5
Aquaculture	40	0.1	883	7.3
Other lands	200	0.5	0	0.0
Total	**3.67 ha**	**100.0**	**1.21 ha**	**100.0**

Source: Household survey.

Bac Lieu. The average farm size of respondents in Long Dien village is about 10,000 m^2 (1 ha), of which, 6,830 m^2 is used for shrimp farming, 1,250 m^2 used for rice production, and the rest used for residential and fruit tree gardens. The average land value is about 300 million VND per ha. In Long Dien Tay village, the average farm size of respondents is about 19,000 m^2 (1.9 ha), of which 14,000 m^2 is used for shrimp farming, 1,700 m^2 is used for residential and fruit tree gardens, and the rest used for other purposes. The average land value is about 79 million VND per ha. While respondents in Long Dien Tay village have more land than those in Long Dien village, land in Long Dien is higher priced because of its easy access.

Can Tho. Being in an urban setting, households in Can Tho had only residential land and houses, and no

TABLE 31. LAND USE TYPES AND VALUE IN BAC LIE

Village	*Long Dien Mean*	*Long Dien Tay Mean*	*Total Mean*
Home area (m^2)	2,128	1,252	1,690
Home value (VND)	63,827,000	37,545,000	50,686,000
Fruit orchard area (m^2)	15	165	90
Fruit orchard value (VND)	450,000	4,950,000	2,700,000
Rice area (m^2)	1,250	–	625
Rice land value (VND)	37,500,000	–	18,750,000
Aquacultural area (m^2)	6,830	21,175	14,003
Aquacultural areas value (VND)	204,900,000	521,364,000	363,132,000
Other land area (m^2)	100	5,300	2,700
Other land area value (VND)	3,000,000	84,075,000	43,537,500
Total land (m^2)	10,323	27,892	19,107
Total land value (VND)	309,677,000	647,934,000	478,805,500
Average Land value (VND/ha)	300,004,464	255,655,648	277,830,056

Source: Household survey.

agricultural or other lands available to them. Ten percent of households interviewed were functionally landless.

INDICATORS OF VULNERABILITY

Kon Tum. Hunger and poverty rates were key indicators of vulnerability in Kon Tum. The poor in Dien Binh commune account for 62 percent, while it is 40 percent in Dak Tram. While the hunger rate is the same for the two communes, accounting for 10 percent, the situation has become worse due to the impacts of Typhoon Ketsana in 2009. The poverty rates are closely linked to the fact that both areas are primarily ethnic minority communities, with farmers who depend on natural resources management for their livelihoods. Other sources of vulnerability were the elderly, women, children, and those with low education (also linked to poverty). The extreme nature of poverty can be seen in a wealth ranking done by members of Dien Bien commune, where even households considered to be "average" in income often suffered food shortages two months out of the year.

TABLE 32. LAND OWNED BY HOUSEHOLDS IN CAN THO

	Ninh Kieu ward	
	m^2	*% hh land*
Residential land area	48	90
Landless		10
Average land value (VND)	816,666,667	
Total		**100.0**

Quang Nam. An Thang is in a coastal area and Bai Huong on an island, so the exposure level to storms of these areas is very high. The increasing intensity of storms, and changes in their direction and seasonality, have caused problems for these communities in coping and adapting, and mean that physical exposure is the primary indicator of vulnerability. In Hoi An city's An Thang area, physical location near the Thu Bon River in certain low-lying streets was the primary source of vulnerability (Figure 12). In Bai Huong on Cu Lao Cham island, besides storms, local people also suffered from high waves that made water overflow into their houses. When it rains heavily, the water flow from the

TABLE 33. WEALTH RANKING CRITERIA IN DIEN BINH COMMUNE

Type of HH	*What % of HH in this community?*	*Main assets*	*Main income sources*
Well-off	2.4	• Have 7–8 cattle • Have permanent house with flat concrete roof • Have a TV, motorbike, water pumping machine • Have a modern toilet in the house • Rubber trees have already produced latex • Have no refrigerator	• From rubber, rice, corn and cassava • Have sufficient food to eat
Average	21	• Working hard and do not borrow money from anyone • Have 3 cattle • Permanent house with tile roof • Have a TV, motorbike, water pumping machine. • Have children go to school • Have 3 laborers • Rubber trees have not produced latex yet	• Know how to apply farming technology • Do not have sufficient food to eat for 2 months/year
Poor	66.6	• Do not have sufficient labor • Suffer from a shortage of labor and cultivation land • Have many children who are in the age of schooling • Have sick or weak elderly household members • Do not have a motorbike • Rubber trees have not produced latex yet	• Do not have food to eat for 6 months/year • Lack capital sources • Engage in wage labor
Hungry	10	• Do not have enough food to eat for the whole year • Do not know how to calculate • Already sold their cultivation land to better households • Have weak and sick members or are newly separated households	• Engage in wage labor • Do not have food to eat for 12 months/year

Source: Focus groups discussion.

mountains toward the sea meets the water flow from the sea in surges. Therefore, situated in the middle of these two water flows, local people's houses are often flooded. Physical vulnerability often goes along with poverty, as the poor and near-poor usually own more unstable houses with less value. Once storms or floods occur, they are the most affected since they have trouble recovering from the loss and can often face bankruptcy.

The field discussions also revealed that the aged, children, and sick people are those who are vulnerable to extreme weather events. They need support from government or their children/parents, relatives, and neighbors. In extreme events, they totally depend on those support sources.

Ha Giang. Group discussions and household interviews revealed that different types of climate-change induced events have affected different groups of people. The common denominator was vulnerability, primarily related to health risks of climate impacts. For example, cold spells have strong impacts on the elderly and children as they get sick easily with lots of diseases of the respiratory system, and suffering from lack of warm clothes spreads colds and flu among all the poor villagers. Children quit school and have to sit around the fire at home to keep warm. Extended cold spells have bad impacts on livestock, causing great loss to better-off households that have big herds of buffaloes.

FIGURE 12. VULNERABILITY MAP DEVELOPED BY LOCAL PEOPLE IN AN THANG

Water stress is also related to health issues. In recently years, drought has affected the spring rice and corn crops, as well as resulting in a shortage of drinking water for people living in higher locations. The lack of water causes diseases among women and is very difficult for mothers who just gave birth. In the morning, villagers have to stand in line to get water (each household can only have 1 can of 2 liters) for household use. Thus, households that lack labor can't get water. Without water, their food is not washed, causing diseases to the intestinal system. The commune had a record number of cases of diarrhea two years ago due to lack of water. Without water, fire also easily burns down houses during the dry season; traditional houses with thatch roof and houses-on-stilts are easily exposed to fire.

Flash floods are detrimental to those who live near streams and have fields near streams. Quan Ba has nearly 20 percent of the total households living near and along streams and these suffer from flash floods yearly. Tornados often cause damage to those who have non-permanent houses or houses that are located along roads.

BOX 3. THE IMPACT OF WATER STRESS IN HA GIANG

Lo Thi May's household needs 40 liters of water every day for cooking, washing (not bathing) for six people, and feeding eleven chickens and one buffalo. Two of her children (one six-year old boy and one eight- year-old girl) are assigned to fetch water for the family. Each carries a plastic can of 10 liters and walks 3 kilometers to get water every day.

Bac Lieu. The vulnerable populations in the Mekong Delta were primarily those households with livelihoods most dependent on natural resources: shrimp farmers, fishers, or rice farmers. Livelihoods of people are particularly vulnerable to changes in surface water for shrimp farming, livestock diseases, and sudden weather changes (Table 34).

TABLE 34. RISKS, VULNERABILITY, AND ADAPTATION MEASURES IN BINH DIEN HAMLET OF BAC LIEU

Main climate risks	*Most vulnerable group*	*Adaptation measure*
Drought	Vegetable farmers	Plant drought-tolerant varieties
Irregular/or out-of-season rain	Salt farmers	N/A
Extreme high air temperature	Vegetable farmers	Improve irrigation system
Water pollution and diseases	Shrimp farmers	Dredging canals, remove pond sediment, improve culture techniques

TABLE 35. MAIN RISKS FOR WAGE-LABOR-DEPENDENT HOUSEHOLDS IN AN LAC WARD

Main risk	*Level of seriousness*	*Frequency*	*Compared to 5 years ago*	*Most vulnerable group*	*Adaptation measure?*	*Organization helping in adaptation*
Prices going up	1	1	More than past	Poor people	• Using cheap goods • Reducing expenses for coffee, cigarettes	No
Extreme temperature	2	2	More than past	Poor people	• Use air conditioning, fans	No
River flood	3	3	More than past	Poor people	• Construct high front on house • Removing garbage, sediment in drainage system	No

Can Tho. Poverty is the main measure of vulnerability among surveyed households in Can Tho. Extreme temperatures (hotter weather), and river floods (house flooded during extreme spring tide by river water mixed with waswater from drainage system) are the main risks for households in An Lac ward, who make their living primarily from wage labor.

Cross-Cutting Vulnerable Groups

While there were specific vulnerable populations in each of the fieldsites visited, there were some cross-cutting groups of vulnerable populations found in each fieldsite.

The Poor. Poverty is closely linked to climate vulnerability in Vietnam. In every fieldsite, the poor were singled out as households being both more vulnerable to climate events—such as living in poorer quality housing, or farming in more marginal lands—as well as having less capacity to respond and cope with these events; for example, having less access to financial services to rebuild livelihoods, or being less likely to have sufficient social connections to start a new businesses. The vulnerability of the poor to climate events can be seen in data from the Red River Delta collected by CRES in 2009. There, poor households experienced the greatest amount of relative damage to their livelihoods, losing 65 percent of their livestock incomes and 70 percent of crop incomes, compared to the rich, who lost 35 percent and 33 percent respectively.

Poverty also must be understood as a relative measure. For example, in Hoi An city, most households are very well-off compared to the poor households of Kon Tum, but even in Hoi An there are people who are not doing as well as others. Group discussion results in Hoi An showed that there are no officially "poor" households, according to the formal government standard. Instead, local people called the poorest households those households who "still have difficulties in bread-winning." About 18 percent of households in An Thang are in this category. The average income per capita of this type of household is under 600,000 VND (equivalent to $33) per month. These households either go selling foods or other products in streets or have to go to work for wage labor such as making lamps or handicrafts.

Just as in Hoi An's An Thang ward, where no household is officially poor, across the bay in Cu Lao Cham island, there are no households considered to be rich. In the Bai Huong fishing communities, the concept of "the rich" does not exist. In the local people's thinking, in this community, there only exist better-off, the middle income, the near-poor, and the poor. For the fishing communities, the "poor" are defined as those households lacking labor, households with sick people or aged households, or households with houses made of corrugated iron sheets and a cement floor.

Similarly, in Ha Giang, there are no rich households in the surveyed highland areas, and only around 5 percent of households in the lowlands are considered rich. But there is a big gap between the two areas in the ratio of

TABLE 36. VULNERABILITY TO FLOOD DAMAGE IN THE RED RIVER DELTA, 2009

	Time to recover (days)	*Crop damage (absolute value in VND)*	*Property damage (Absolute value in VND)*	*Livestock damage (Absolute value in VND)*	*Relative Livestock damage (% change)*	*Relative Cropping damage (% change)*
Poor (n=100)	367	1,666,495 ($92)	1,638,387 ($91)	868,186 ($48)	–65	–70.5
Middle (n=100)	298	1,449,141 ($81)	281,739 ($15)	1,429,326 ($79)	–31	–37
Rich (n=100)	458	3,572,817 ($198)	2,430,430 ($135)	5,352,248 ($297)	–35	–33
Significance		* (p=.034)	(p=.120)	**(p=.000)	(p=.312)	** (p=0.001)

Source: CRES unpublished data, 2009.

poor and non-poor households. Only one-third of the households in the highland area reached the "non-poor" category, and two-thirds fell into the "poor" category. But it is quite the opposite in the lowland area, where two-thirds of the households fell into the non-poor category. In Ha Giang, people stated that the main causes of poverty included:

- inheritance from previous generations (meaning like (poor) father, like (poor) son)
- poor and limited experience in production
- lack of capital investment or ineffective use of loans
- no food storage (e.g. no rice until next crop)
- sickness causing lack of labor
- limited land
- damage/loss caused by hazards

The last of these causes for poverty is directly linked to climate issues. To the villagers in Tan Trinh, apart from serious sickness, hazard damage is the most fatal cause for poverty in the commune. According to them, most poor households used to be non-poor and they are poor now because they couldn't recover from their losses caused by flash floods in 2008 and their crops in 2009 were unproductive due to serious drought. During the group discussions, households talked about how easily "non-poor" households can slip into the "poor" category in the case of climate events. Apart from such other causes as constant expenditure on children's education, lack of land (such as in newlywed couples and immigrants), drought and hazard damage were brought up again and again as a main cause of poverty.

Women. The discussions with women's groups showed they are often severely impacted by climate events. Agriculture in Vietnam is often highly feminized, with women playing a more active role in everyday agricultural production. This is also true for other sectors often seen as "men's work," but which are increasingly becoming feminized as well. For example, in storm seasons in coastal areas, local people have to stay at home more often. In some cases, they can only go fishing for 5–6 days per month. This has a negative influence on their cash income and puts more burden on women's shoulders in terms of taking care of the whole family, and particularly in finding food for meals. To cope, women may take on additional laboring activities (wage labor or home sales and trading), eat less food themselves, or eat less nutritious food so that the rest of the family does not go without.

Even in areas with male-dominated occupations, women are still at risk. In the fishing community of Bai Huong in Quang Nam, households at first did not think that women were more vulnerable than men. They said that in storms and floods, both men and women were affected equally, or even that the men were the most vulnerable to storms since they were fishermen and had to go fishing. However, in discussion it was determined that among 56 small fishing boats in the community, women participated in fishing activities on 40 boats, meaning they too were impacted. In fact, the fisherwomen have to do more work compared to non-fishing women and even in comparison to their husbands (Table 37).

Female-headed households are also particularly sensitive to extreme weather events. Many of those women are widows, so they have to do all work by themselves if they do not have nearby relatives. In storms, they definitely need support from outsiders, such as in battening down houses, bringing in livestock, and protecting food supplies. Even in their daily livelihoods outside of extreme events, these female-headed households often have difficult lives, having to juggle multiple income-making activities as the sole breadwinner for the house (Table 38).

TABLE 37. DAILY ACTIVITIES OF A TYPICAL FISHERWOMAN

Time	*Activities*
3:00 a.m	• To get up and prepare drinking water, gasoline, raincoat, food and tobacco • Go fishing with husband
8:00 a.m	• Return home, cook and have meals, clean the house • Stitch up or make new fishing net • Have a rest
14 – 15 p.m	Cook and prepare things to go fishing in the afternoon
16:00	Go fishing with husband
19:00	Return home, have a rest (watching TV)
21:00	Go to sleep

Source: Focus group discussion.

TABLE 38. DAILY ACTIVITIES OF A WOMEN-HEADED HOUSEHOLD IN BAI HUONG VILLAGE, QUANG NAM

Time	*Activities*
5am	• Get up and clean the house • Make fishing net for selling • Go collecting firewood for selling (25,000 VND – 30,000 VND for a big bundle of 25 kg, 20,000VND for a small bundle of 20kg)
11am–12noon	• Return home, making fishing net • Selling things in small shop • Raising pigs/chicken
15:00pm	• Cooking dinner • Selling things (coffee, food, etc.) in small shop
22:00pm	Go to sleep

Source: Group discussion, 2010.

EXPERIENCE WITH PAST CLIMATE VARIABILITY AND HAZARDS

Every year, Vietnam loses lives and income to climate hazards. Coastal areas are threatened yearly by typhoons and storms and losses of life have been in the hundreds to thousands, costing Vietnam billions of dollars in the past decade. The climate events that have most severely affected the researched fieldsites are explored below. In Ha Giang, the primary indicators of climate variability and hazards are increasing cold spells during winter, drought during spring and summer, and flash floods in the late summer. In Kon Tum, exposure hazards are effects from coastal storms blowing far inland where they used to not reach (especially Typhoon Ketsana in 2009), and droughts in spring. In Quang Nam the main hazards are coastal and river flooding and typhoons in the fall season. In the Mekong Delta, the main hazards are flooding, increasing salinization of freshwater, and droughts in the dry season.

Ha Giang. Many households across the research areas said that they believed the climate was already changing. During discussions with focus groups in Ha Giang, people said there is a significant change in local climate as the rainy season is shortened and dry season is longer. Households said it used to rain a lot before Tet, but now there is much less rain, and in fact there has been no rain for the eight months before March 2010. The rainy season used to start in March but it now shifts to the end of April. Water stress has always been a problem in the whole province, but it is getting very serious in recent years, said the chairman of the provincial Committee for Ethnic Minorities. He said in the past, when the soil was fertile and there were not so many people, villagers planted only one crop in the spring. Then they spent the rest of their time going to fetch water and collect fuel-wood. But it is serious now because such traditional coping systems are no longer effective. Swidden fields are no longer as productive, as there is no fallow period under pressure for food to feed a large population. Land is getting scarcer, as demands increase for flat land to build schools, buildings, and roads. Thus local people have to spend most of their time on their fields, and there is not much time to go fetch water. Water stress is widespread during the dry season, especially in the rocky mountain area. The 2009 report on rice area found that during the winter-spring crop (dry season) in most of the districts, the rice growing area has decreased by half, and only half of the planted area was irrigated.

The daily temperature is also increasing in Ha Giang. Many households said that *chuoi tieu* (small banana) and *rau sam* (small purple wild plants) can grow in the district area now and these varieties can grow in warm temperatures only. The difference in temperature between nights and days is also larger, and the local people said they now needed a thin blanket at nights even in the mid-summer.

Severe and extreme events also seem to be on the rise. The long winter cold spell in 2008, which killed 1,118 buffaloes in Quan Ba district and nearly 2,500 in Quang Binh, was also strongly remembered, as were major flooding events in 2008 and 2009, which completely destroyed the field crops of many communes. As shown in Table 39, nearly two-thirds of the households in both Thai An and Tan Trinh commune reported that they were hit by climate hazards.

Kon Tum. Interviews with key informants and heads of households reveal that in the past it always rained after the Vietnamese New Year, which normally falls at the end of January or in the second week of February, according to the Western calendar. By the time the field

TABLE 39. HOUSEHOLDS IN HA GIANG EXPERIENCING CC-INDUCED EVENTS DURING THE LAST 5 YEARS

Types of hazards	*Thai An (% hh)*	*Tan Trinh (% hh)*
Drought	73.3	75.0
Heavy rain	66.7	68.8
Cold spell	66.7	68.8
Landslide	33.3	12.5
Tornado	26.7	68.8
Flash flood	6.7	43.8
Hot weather	N/A	93.8

Source: Household survey, March 2010.

research was being carried out in March 2010, all villagers in the two communes complained that it had not rained since September 2009. All paddy fields were dry and crops needed water. Villagers in the two communes also experienced a similar severe drought in 2008 from February to May. Crops such as rice, corn, and cassava were either damaged or decreased their yields.

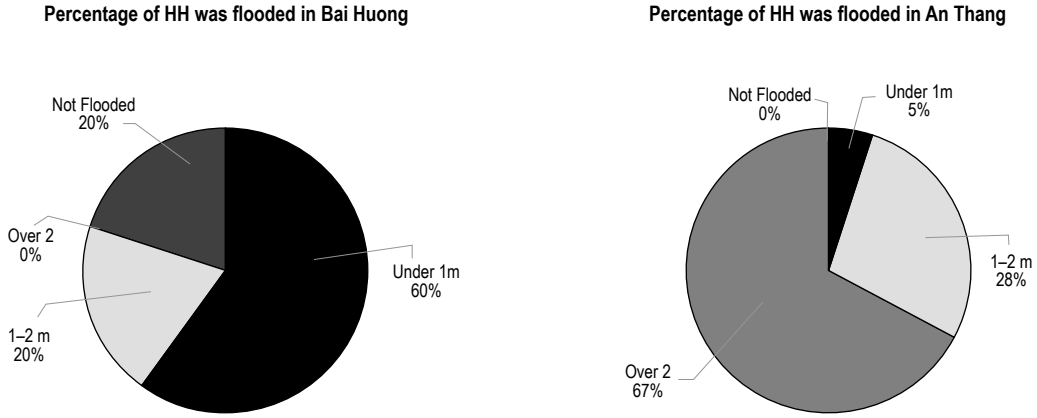
Extreme events, like Typhoon Ketsana that hit Kon Tum in fall 2009, have also had a major impact. According to the deputy head of the Kon Tum provincial Department of Natural Resources and Environment, it was the heaviest rain ever seen for the last 100 years. Since natural forests in the province have been degraded, all sand, soil, and even forest trees were swept away and blown into paddy fields, rivers, or lakes located downstream from the typhoon's winds. By the time the field research was being carried out, more than 50 percent of some village's paddy fields were still covered with sand, on average 1 meter high and sometimes 2 meters high. According to the Vice Chairwoman of Dak Tram commune, the commune lost 96.9 ha of rice, corn, and cassava land due to the Ketsana typhoon. Six months have passed and only 1.5 out of 96.9 ha have been repaired and tilled for the spring crops. The other 95.4 ha is still covered with sand and left idle. Heads of households were asked: "How long after an extreme climate event do you think your household is able to recover from that event?" All respondents in Dak Tram said that it would take them their whole life if they repaired their rice fields by hand. Meanwhile, according to an official of Dak To district, it would take between 2–3 years by machine to clear out the sand, but there is no money yet for such activities. The impacts to food production were already being felt. The total food production in the commune in 2009 was 691 tons, a decrease of 56 percent compared to 2008.

Quang Nam. Climate vulnerability in the central coast is primarily related to storms and floods. In case of the tourist service community, the season for foreign tourists is from September to March. However, this is also the time for floods and storms. In the past, floods and storms were few and predicted, so people could prepare for it. But recently those weather phenomena are difficult to forecast, in some cases coming suddenly, which causes a lot of damage and constrains tourist activity.

For example, on September 29, 2009, heavy rains and high seas flooded a part of Hoi An city up to a depth of 1 meter. In terms of occupations, local people in An Thang tourist communities agreed that the businessmen who own big restaurants or big shops are highly sensitive to these storms and floods. In the case of the sudden flood in 2009, they were the most affected groups with high losses. In addition, some richer owners do not live in this area but just hired the house, so when the flood came suddenly at night, they did not know about it and all their products were wet and ruined. The unusual nature of the 2009 flood was noted by many informants. Mr. Tung, the chairman of An Thang living quarter, recalled: "Normally, after storms, there will be no flood. The flood already came and we thought that we could do business as usual. But at night, the flood came suddenly, at around 1–2a.m. At that time, people were sleeping and did not know. Therefore, we lost a lot of things. Some households' property—such as motorbikes, fridge, fabrics, etc.—were flooded and ruined." Figure 13 shows that 67 percent of households interviewed in Hoi An had more than 2 meters of water in their houses in 2009.

The frequency of these flood events also seems to be of note to local people (Table 40). In the past 10 years alone, five major floods have occurred, while only one flood in the 1960s and one flood in the 1980s were remembered as being significant. Seventy percent of local people in the fishing community (Bai Huong) and 71 percent of local people in the tourism service community (An Thang) thought that the recent storms

FIGURE 13. PERCENTAGE OF HHS EXPERIENCING FLOODING IN QUANG NAM'S 2009 FLOODS



Source: Household survey.

TABLE 40. EXTREME EVENTS IN AN THANG RESIDENTIAL QUARTER'S HISTORY

Time (year/ month)	*Events*
1964	Water from Thu Bon River rose up to 3 meters, 99 percent of houses were flooded. It caused severe damage to household property such as furniture, clothes, and house roofs, and cattle were swept away.
April 1989	Very strong storm occurred and caused damage to houses. Water level reached 2.7m, causing flood for over 70 percent of households.
1999	Water from Thu Bon River rose up to 2.5 meters; 90 percent of houses were flooded. People had to stay on the attic or left the house to higher area.
2005	Strong storm caused big loss for houses.
July 2007	Strong storm came and blew away roofs of some houses. People had to closely tie their doors and furniture. The water reached 2.7m, flooding over 70 percent of households.
November 2007	Heavy rain made the water level of the Thu Bon River rise up to 2.5 meters; 80 percent of houses were flooded. Tourist activities were delayed.
September–October 2009	Strong storm occurred, blew away roofs of houses in An Thang living quarter, and then water of Thu Bon rose unexpectedly at midnight, so people could not do anything. Water reached a height of 2.7 meters, damaged vehicles, fridges, washing machines, etc. and blew away clothes and other handicraft products. The flood lasted one week, which made food in restaurants rotten and caused a big loss in terms of finance.

Source: Focus group discussion.

were more serious, and more than 85 percent thought that the average temperature has increased.

Bac Lieu. People participating in group discussions believed that the most noticeable weather change in the past 10 years was that the overall average temperature was hotter than in the past. The second most commonly noted problem was a rise in cyclone/storm activity. Others felt that the rainy season is shorter now than it was 5 to 15 years ago. However, when it does rain, it rains very heavily. A rise in sea level has also been noted in some areas.

Rice, vegetable, crops, livestock, chickens, ducks, and shrimp are all vulnerable to these extreme weather events, such as unseasonable rain, irregularly hot days, high differences in air temperature between day and night, whirlwinds, and sea level rise (Table 42).

TABLE 41. WEATHER CHANGE IN THE LAST 10 YEARS PERCEIVED BY LOCAL PEOPLE IN BAC LIEU

Biggest weather change over past 10 years	*Long Dien village*		*Long Dien Tay village*		*Total*	
	Frequency	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*
Cold	2	4.5			2	2.7
Drought	3	6.8	2	6.9	5	6.8
Flood	4	9.1			4	5.5
Heavy rain	4	9.1	3	10.3	7	9.6
Hotter	19	43.2	20	69.0	39	53.4
Whirlwinds/tornados	11	25.0	4	13.8	15	20.5
Total	44	100.0	29	100.0	73	100.0

TABLE 42. VULNERABILITIES AND EXTREME WEATHER IN BAC LIEU

Extreme Weather Event	*Vulnerability*
Irregular rain	Shrimp died, chickens and ducks caught diseases and died, farmers lost their investment; salt pans were diluted, farmers lost their investment
Irregular hot days	Rice died, chickens and ducks caught diseases and died, farmers lost their investment; local people's health also affected
High difference in air temperature between day and night	Rice and shrimp died, vegetables got diseases/pests
Whirlwind	Houses damaged/destroyed
Sea level rise	Rice fields and shrimp pond flooded, house and properties damaged
Storm	Strong winds can blow shrimps and salt away; damaged houses and crops

FIGURE 14. DAMAGES FROM CLIMATE EVENTS

Source: Household survey.

On left, households in Tan Trinh Ha Giang point out the height of flash floods to team member Nghiem Phuong Tuyen. On right, wood and timber swept into the Dak Psi river in Dien Binh commune in Kon Tum from Ketsana in September 2009 and was still there in March 2010.

Can Tho. Respondents in the research area perceived that in the last 10 years, there were two pronounced climate signal changes: hotter weather (85 percent) and the flood season is longer (65 percent) (Table 43). Twelve people interviewed (60 percent of respondents) said that their houses have been flooded sometime in the last 5 years; among them, three households had their house flooded every year in the rainy season with a water depth of 0.1–0.6 m. In An Lac ward, the main natural disasters are flood and whirlwind, so the damage caused by these disasters is not significant. A few households live along the river bank, their roofs were damaged when the whirlwind occurred. Only 40 percent of respondents in this area received an early warning from public media before the most recent natural disasters occurred. Most of these households are interested in this kind of advance weather information because it can effect their ability to protect their houses.

According to vendors and traders who participated in a focus group discussion, storms, river floods, extreme temperatures (hot weather), and heavy long rainfall are the main risks for traders. Can Tho city was slightly affected by Typhoon Durian in 2006. Typhoon Linda hit the Mekong in 1997, but Can Tho was barely affected. However, traders still ranked storms as a risk because they saw many storms hitting the central region, and they were afraid that storms will be moving down to the Mekong Delta in the future. River floods were also ranked as serious as they flooded houses during the extreme spring tide with river water mixed with wastewater from the drainage system, making houses dirty and damaged and preventing transportation for selling goods. Long rainy

TABLE 43. WEATHER CHANGE IN THE LAST 10 YEARS PERCEIVED BY LOCAL PEOPLE IN AN LAC WARD

CC signal	*# HH agreeing*	*% HH agreeing*
Hotter temperatures	17	85
Flood longer	13	65
More dry	5	25
More big typhoons	4	20
Rain shorter	3	15
Rain more heavier	2	10

TABLE 44. RISKS TO TRADERS IN CAN THO CITY FROM CLIMATE EVENTS

Main risk	*Seriousness level (1 = most serious)*	*Frequency (1 = most frequent)*	*Seriousness level compared to 5 years ago*	*Most vulnerable group*	*Adaptation measures?*	*Organization helping in adaptation*
Storm	1	4	2	Traders	• Reinforcing house • Putting sandbags on roofs	• Volunteer groups • Neighbors
River flood	2	3	1	Traders	• Raising house floor elevation • Making high stands for furniture	• Hired workers • Neighbors
Extreme temperature (hot weather)	4	1	4	Traders	• Using umbrella when going out • Using fan when staying home	
Heavy long rainfall	3	2	3	Traders	• Shielding roof by nylon sheet • Fixing roof leak	

Source: Focus group discussion.

seasons also affected their ability to move around to sell goods.

An overall summary of the main climate hazards currently affecting the fieldsites is listed in Table 45.

Costs of Losses from Climate Hazards

Information on damage to households from climate events was collected during household interviews. We asked each household how much they lost after any recent climate hazard in their area to get an estimate of how much climate hazards are costing households now, so that such expenses might be compared with the costs of adaptation measures for cost-benefit analyses.

Ha Giang. A flash flood in 2008 and a tornado in 2008 were the most significant climate events in Ha Giang in the past few years. The absolute value of damage in Tan Trinh, the better-off commune, was more than 15 million VND, almost double that in Thai An, the poorer commune. The weight of each sector is also different in each commune. In Thai An, most damage was to the livestock sector, while in Tan Trinh house damage was most significant.

Kon Tum. The household survey asked sampled households about their major income sources before Typhoon Ketsana and the change of income after the event. While the two researched communes had the same sources of income before the event, on average each household member in Dien Binh earned twice as much income as compared with their counterpart in Dak Tram. After the event, each household member in Dien Binh earned one and a half as much income from all sources. The reasons are two-fold. First, Dien Binh lost

TABLE 45. SUMMARY OF HAZARDS AND SEASONALITY ACROSS THE FIELD SITES

Geographic area	*Primary Hazard*	*Secondary Hazard*	*Seasonality*	*Major Events*
Ha Giang – Northern Mountains				
High limestone mountains	Water stress	Cold spells	Drought: Oct–April Cold spells: Nov–Feb	Every year, increasingly serious; strong cold snap in 2008
High earth mountains	Flash floods, landslides	Drought	Flash floods: May–July Tornados: April–July	Every year; most serious in 2008–09
Lowland areas	Flash floods, inundation	Tornados	May-–July	Every year; most serious in 2008–09
Quang Nam – Central Coast				
Hội An city	Floods	Storms	Sept–Nov.	Each year, more and more storms, flood levels higher and more serious
Cù Lao Chàm islands	Storms, high pressure areas	Tornados, drought, and strong rain	Storms: Aug–Nov Tornados: Dec–Mar Drought: June–Sept Strong rain: Oct–Nov	Each year, most serious in 2008 and 2009
Kon Tum—Central Highlands				
Drought – prone (Dak Tram)	Drought	Flash flood	February – May (Drought); June– September (Flood)	Drought occurs every 4 years (2004 and 2008); major flood occurred in 1996 and flash flood in 2009; severity is increasing
Flood-prone (Dien Binh)	Dak Psi River flood	Riverbank erosion	Monsoon (June–July)	Occurs every 10 years or more; the most serious one happened in 2009
Mekong Delta				
Bac Lieu	Drought	Irregular rainfall	April–May (Drought)	Irregular rainfall in 2008
Can Tho	High temperature	Floods	April may (high temp); Floods in Oct–Dec	High temperature in 2009; last major floods in 2000

Source: Key informant interviews and focus group discussions.

TABLE 46. HOUSEHOLD DAMAGE FROM CLIMATE HAZARDS IN HA GIANG

	Thai An (Flash flood in 2008)		*Tan Trinh (Tornado in 2008)*	
	VND	*%*	*VND*	*%*
House damage	2,350,000	33.6	6,687,500	43.9
Appliance	0	0.0	1,800,000	11.8
Vehicle/boat	0	0.0	937,500	6.2
Amenities/water supply, electricity, communication	200,000	2.9	93,750	0.6
Crop	1,199,833	17.1	2,115,625	13.9
Livestock and poultry	3,250,000	46.4	2,606,250	17.1
Fishing	0	0.0	750,000	4.9
Post-event sickness	0	0.0	237,500	1.6
TOTAL	6,999,833	100.0	15,228,125	100.0

Source: Household survey.

more coffee plantation land, which was more valuable than lost rice fields in Dak Tram. Second, many households in Dak Tram earned large income from harvesting timber from the felled tree for timber traders. It should be noted that during the typhoon the well-off households in the two communes were the most affected and the poor were least affected. The reason is that the well-off had more land than the poor. However, it would take the well-off a shorter period of time to make a full recovery since they had more assets and more alternatives than the poor. Table 47 shows that among all sources of household income, the agriculture

TABLE 47. INCOME LOSSES FROM TYPHOON KETSANA IN KON TUM

Dien Binh commune

Source of income	*Average Baseline income (2008) (VND)*	*After climate event – Ketsana*		
		% HH with Decrease	*% HH with Same*	*% HH with Increase*
Agriculture	22,227,000	100	0.0	0.0
Livestock	300,000	75	0.0	25.0
Wage labor	20,000	0	0.0	0.0
Government salary	280,000	0	67.0	33.0
Other	46,250	0	87.5	12.5

Dak Tram commune

Source of income	*Average Baseline income (in 2008) (VND)*	*After climate event – Ketsana*		
		Decrease (%)	*Same (%)*	*Increase (%)*
Agriculture	7,966,667	100	0.0	0.0
Livestock	14,286	67	0.0	33.0
Wage labor	594,286	60	15.0	25.0
Government salary	5,114,286	0	83.0	17.0
Other	43,333	0	85.6	15.4

Source: Household survey, 2009.

TABLE 48. LOSSES CAUSED BY 2009 FLOODS IN QUANG NAM

Region	Total loss/ damage (VND) (100%?)	Loss/ damage in details									
		Property loss/ damage	%	Fishing	%	Crops	%	Tourist services/ Business	%	Live-stock	%
An Thang	7,298,810	4,601,428	–63	0	0	14,285	>1%	2,683,095	–37 %	0	0
Bai Huong	5,273,500	4,226,500	–80	930,000	–18	0	0	72000	–1 %	45,000	>1%

Source: Household survey.

and livestock sectors were most negatively affected by the climate event in both communes.

Quang Nam. The losses in Quang Nam as a result of the 2009 flooding events had significant impacts on household income. Property damage was the overall largest impact, with the average household in the area losing from 63–80 percent of the value of their home and household goods in the floods. Not surprisingly, the greatest income losses were in the tourism business (loss of 37 percent of income) and in fishing (loss of 18 percent of income) compared to the previous non-flood year.

ADAPTATION OPTIONS AND PRACTICES

Because households have already started to experience climate impacts, they have also taken a variety of adaptation measures in the past. Learning how and why these adaptation measures were taken can help households and communities plan for better adaptation in the future. Adaptation options are often grouped in categories such as behavioral, structural, technological, financial, and others. These options can also be grouped into those adaptation options that happened spontaneously or autonomously—without policy or intervention from authorities—and those that were planned; that is, supported by policy or other government assistance and guidance. In the following section, we explore the different types of adaptation already going on, and those options being explored for the future.

Autonomous Adaptation Practices and Household Decision-making

Kon Tum. Household adaptation actions in Kon Tum have taken several forms. In the short term, after floods, households have tried to restore their livelihood portfolios by "boosting" up livelihood activities already in the portfolio; for example, expanding pig keeping if paddy fields are flooded, or expanding dry swidden fields if paddy production is poor. They have also made some small investments in improvements to some fields, such as digging water canals and purchasing water pumps, especially if the family decides to move toward more cash crops to supplement their livelihood portfolio. Shifts away from vulnerable crops, like rice, to hardier crops, like cassava, were also practiced, although diversification has been adopted by only a very small number of households, the majority of which were Kinh households or otherwise well-off households in Dien Binh who had moved some of their investment into coffee plantations.

For the medium term, while households in Dak Tram concentrated on rice field restoration, their counterparts in Dien Binh not only focused on rice field repairs but also on cash crops, such as cassava and coffee. It should be noted that only well-off households could afford planting coffee at the moment, since the average and the poor could not afford to purchase water pumping machines that cost up to 10 million VND. By the time the field research was being carried out, 40 percent of households in Dien Binh were engaged in coffee plantations. The commune had 20 Kinh households and all of those households planted coffee. In Dien Binh, no household had options for long-term adaptation, which is unfortunate as future predictions indicate strong vulnerability for the coffee sector by 2050. Ten percent of households said that they would plant litsea, simply because litsea could bring good income and did not need large investment. However, each household said they would need at least 2 million VND to buy seedlings to do this activity.

TABLE 49. ADAPTIVE OPTIONS AND COSTS FOR DIFFERENT CLIMATE HAZARDS IN KON TUM

Climate event	*Short-term adaptation (less than 1 year)*	*Medium-term adaptation (1–5 years)*
	Dien Bien	
Floods	1. Activities: Pig keeping Improving paddy fields Tilling non-flooded fields Growing beans Cost: 0.36–5 million VND	1. Activities: Clearing land to grow cassava Planting coffee Repairing flooded fields Purchase of water pumping machines and planting coffee Cost: 2–10 million VND
Droughts	1. Activities: Pig keeping Improving paddy fields Cost: 2.5 million VND	1. Activities: Growing cassava Cost: 2 million VND
	Dak Tram	
Floods	1. Activities: Wage labor Pig keeping Improving paddy fields Taking advantage of the remaining area Tilling non- flooded fields Cost: 0.7–3 million VND	1. Activities: Restoring flooded rice fields Transporting sand to another place to restore rice production Cost: 1.2 million VND
Droughts	1. Activities: Doing nothing Cost: 0 VND	1. Activities: Doing nothing Cost: 0 VND

Source: Focus group discussions.

Differences between the better integrated community of Dien Bien, which was closer to roads and had more diverse livelihood portfolios before climate events like Ketsana, and the remoter commune of Dak Tram were noted. For example, to combat droughts, the Dien Bien households said they would invest labor in improving irrigation to their paddy fields or else change to planting cassava, which is more drought resistant, while in Dak Tram households said they had no options to combat drought. This seems to indicate that Dak Tram has less resiliency than Dien Bien, as they were unable to think of possible adaptation options they could implement in the future.

Unlike households in the Red River Delta or Mekong Delta, where there is considerable mobility in terms of short-term working opportunities, especially among younger members of households, the research results show that only two households surveyed had members working in Kon Tum town. The rest did not want to move permanently away from climate-affected areas, or try to make their livelihoods outside of the native village, simply because they said they did not have any skills, except for working on their fields. Their concerns about their lack of capacity and inability to compete in any field except the agriculture they had grown up with means that the Kon Tum households had a very limited array of adaptation options to pursue in terms of livelihood shifts. For example, as discussed earlier in the livelihoods section, almost all villagers in both Dak Tram and Dien Binh did not keep any pigs or chickens. This is due to the fact that they did not have much knowledge of pig or chicken keeping. Important as well is that they did not have capital sources to invest in animal feed. During group discussions, villagers expressed their desire to be trained in animal keeping and provided micro-credit so they could engage in livestock as an income-generating activity when agriculture suffered from climate events.

Quang Nam. Adaptation activities in Quang Nam cannot really be characterized as "adaptation" as much as coping strategies for disaster risk reduction. The primary things that households do is simply try to

reduce the risk of household asset damage during the climate events that most affect this area (namely floods and typhoons), with other activities like long-term shifts to new livelihood strategies not yet being considered. It is clear that local people in both sites do not have long-term plans for coping with extreme weather events.

In Hoi An city, preparing for the fall floods is the main option carried out. Most houses now have a second floor that can be used to store food and household goods during floods. Normally the flood season is from September to November and starting in July every year, households will start taking assets from the first floor to the second floor to avoid the damage of flood. One resident commented that "in July, it is like a festival or Tet since people are busy wrapping unnecessary things, preparing ropes, etc. to wait for storms and floods." For the richer households, they even make advance contacts to some other households or workers so that whenever the floods happen, the workers will come to help and they will be paid for moving goods to safety. In Bai Huong village on Cu Lao Cham island, people also prepared bags, ropes, etc., before the storm season. However, since this is an island community, these households also get state priority and support in the form of an army troop that garrisons in this area. These soldiers will help old people or female-headed households, sick households, and those people who are not able to protect themselves. That is why local people often answered that when a storm comes, each household will take care of their own families, and soldiers will help other "weak" households. Soldiers even help local fishermen move their boats to safe places. While this military help keeps the weakest households safe, there is concern that people have become dependent on the state support, reducing their own adaptive capacity.

Knowledge also plays a role in disaster risk reduction. For fishermen, they need to know about the forecasts for weather by their own local knowledge, such as the colors of the cloud, the humidity, and the temperature. These customs relating to fishing are important to avoid storms and strong winds. Another aspect of fishing households' adaptation strategies are to keep their fishing operations small. Villagers still use mostly small boats and older traditional techniques (simple netting) to do fishing. With the small boats, the fishers cannot go very far, and normally it takes 3 to 4 hours per day to go out to the sea and back home. But households explained that they deliberately do not want to go very far because it will be dangerous if they meet storms or strong wind. The problem is that the imposition of a marine protected reserve around Cu Lao Cham island has pushed fishermen farther out to sea than they would normally like to go.

TABLE 50. ADAPTIVE STRATEGIES TO CLIMATE CHANGE IN QUANG NAM

	Strategy	
Climate Hazards	*Minh An (Hoi An city)*	*Tan Hiep (Cu Lao Cham island)*
Flood	• Build household with supplemented floors • Higher first floor • River • Build concrete river bank Costs: several tens of million VND	• Increase the height of first floor Costs: several tens of million VND
Storms and strong winds	• Build concrete houses • Prepare wooden roofs Costs: several tens of million VND	• Build boat-keeping areas • Build concrete sea dikes to prevent soil erosion • Prepare sandy bags to put on roofs of houses Cost: millions of VND
Typhoons	N/A	• Weather prediction based on local knowledge and traditional experiences Costs: None

Sources: Group discussion and local PSD workshop.

The technological options that households have pursued have so far all been aimed at risk reduction, namely building higher and stronger houses or boat marinas. A quarter of the city residents surveyed said they would consider moving to other areas of the city out of the way of floods in the future. The residents of Bai Huong fishing village, however, had literally no ideas about what they would do for long-term adaptation (Table 54).

Ha Giang. Residents in the minority communities of Ha Giang have traditionally relied on much indigenous knowledge to help them through climate events, but with the severity of climate events increasing and as a result of increasing vulnerabilities outside of their control, such activities have become less effective. For example, in the past, to deal with the heat, local people collected imperata grass to make roofs to reduce heat during summer time. But it is hard to collect that kind of grass now that lands that previously had grass are planted with forest monocultures of acacia under national reforestation programs. The head of Thai An commune said this monocultured forest is not effective in preventing flash floods, either, which was one of the reasons it was originally planted. To deal with landslides, the local people used to dig a hole in front of their fields to capture sand washing down with the water from streams. But villagers in Quang Binh commune said this option does not work now as there is too much sand and the flash floods are too strong; the hole is filled with sand after just one rain.

Still, some indigenous knowledge is still able to be practiced. To deal with cold spells, the Hmong often pursue the following options:

- Make earth walls for buffalo cages
- Keep buffalo out of windy areas, or keep buffalo and horses inside the house in cold days and keep fire in the house
- Feed buffalo with rice straw, or prepare rice/corn porridge for animals with *thao qua* (local herb) and salt to keep their bellies warm

Housing styles can also be adaptive. The Hmong try to build houses in areas out of wind flows, to build small houses with low roofs and earth walls, and build bamboo attics to dry corn and rice, which can also be used for sleeping when needed. Keeping the houses simple (with little furniture) helps to mitigate damage from winds and floods.

The four districts in the rocky mountain area are also changing their crops grown to lessen the damage caused by water stress. According to the head of Water Management Department of DARD, nearly 30 percent of corn area has been converted to grass plantation in 2009 due to lack of water. The villagers plant "elephant grass" (imported from Guatemala) as fodder for buffaloes. Villagers said this grass has high resistance to cold spells, can grow on sloping land, and they even said this grass could help prevent soil erosion as well. This option encourages buffalo grazing, and since this adoption, new

TABLE 51. HH PLANS IN QUANG NAM IF FUTURE BRINGS MORE FREQUENT STORMS AND FLOODS

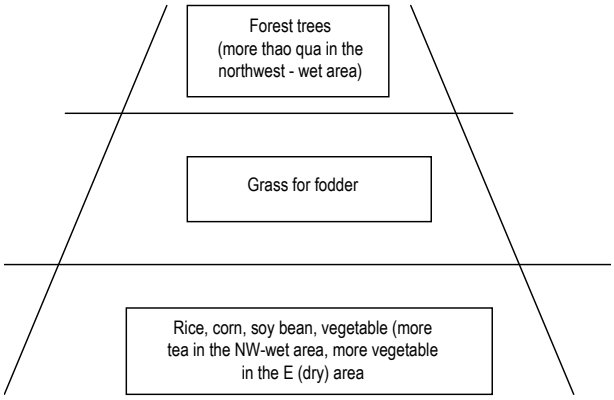
Activities	*An Thang*	*Percentage*	*Bai Huong*	*Percentage*
No idea	12	57	19	95
Move to other living area	5	23	0	0
Build more stable house	2	10	0	0
Consult local government	1	5	0	0
Reduce industrial activities	1	5	0	0
See how the situation will be and then will think of plan	0	0	1	5
Total	21	100	20	100

Source: Household survey.

buffalo/cow markets have emerged and the villagers can sell a buffalo/cow for 4–5 million VND. Introduction of *cay cai* (an oil-produced crop) is another adaptation option. This crop is imported from Australia and is known for having resistance capacity to drought. Rubber plantations are another option to support the development of forestry crops. Around 700 hectares of rubber was planted in Bac Quang district in 2008. A mountain slope planted with more adaptive crops is shown in the Figure 15.

Changing varieties and calendars is another option. Rice and corn are still a major crop but short-term (3–4 month) varieties are replacing local (6-month) varieties. China-made rice varieties are widely used as they have high resistance to drought. Corn varieties (NK 4300 and CP999) are imported from Thailand as they fit in with the shorter rainy season. The villagers widely apply

FIGURE 15. CROP DISTRIBUTION ADAPTED TO CLIMATE CHANGE ON MOUNTAIN SLOPES (QUAN BA DISTRICT)



Source: Household survey.

TABLE 52. ADAPTATION OPTIONS TAKEN BY HOUSEHOLDS IN HA GIANG

Type of hazards	*Thai An*	*Tan Trinh*
Cold spell	• store grass before winter • cover cage with plastic cover • store fuelwood • keep fire in the house Costs: This does not cost much in terms of money, except for 50,000–100,000 VND to buy plastic cover. The cost is in terms of labor days. It takes nearly 3 weeks—if we push for the timing the villagers spend on collecting grass and fuelwood	• keep livestock in cage (instead of grazing) and feed with grass • keep fire inside cage • use plastic cover for cage • prepare porridge with salt and *thao qua* to feed buffalo • use short-term varieties • replace rice with vegetables (if rice can't stand) Costs: 200,000–300,000 (mainly on vegetable seeds to replace rice, plastic cover and thao qua)
Drought	• buy (extensive) plastic pipes to get water for household use • do not plant any crop Costs: 100,000–200,000 VND (on plastic pipes)	• replace rice with vegetable • replace rice with *cai dau* (oil-produced crop) • replace corn with peanuts Costs: 100,000–200,000 VND for seeds
Flash flood	• build house away from streams • dig contours in front of the house to catch water (before it gets to the house) • evacuate to other houses Costs: 5,000,000 VND (on building a house), 1 week on digging contours	• move house to another place • move to relatives before flash • use short-term varieties to harvest before flood season Costs: no cost in terms of money
Landslide		• evacuate to relatives or neighbors Costs: no cost in terms of money
Tornado	• use bamboo to tie the roof • resettle in other village Costs: no cost in terms of money	• tie down roof • dig tunnel near the house to hide in • use wooden poles to support the house • build low-roof cage • build cement house Costs: 5,000,000–7,000,000 VND on building a house, 300,000–400,000 VND on fixing roof

Source: Household survey and focus group discussions.

short-term varieties so they can harvest earlier to avoid tornados. If the crop is not successful, they still have time to replace with other crops. For example, in Thai An commune, 3-month rice varieties are used so that the villagers can replace it with soybean or peanut in case the rice dies of drought.

Income diversification is the final option that Ha Giang residents have adopted. To cover loss and damage caused by hazards, minority people often work for construction projects near their commune (e.g. construction of roads, lakes, small-scale hydro power plants, etc.). Some young men in Tan Trinh have also moved to the south (Ho Chi Minh city) and Quang Ninh province to work for textile companies since 2006.

Bac Lieu. Farmers in the Mekong Delta did not have many short- and medium-term measures to adapt to climate change, instead focusing on small coping actions. In terms of short-term changes, households coped with hotter days by buying fans, and with colder days by wearing more clothes. They also undertook disaster risk reduction measures like preparing houses before storms by tying down windows and roofs. In Long Dien village, the biggest short-term needs after climate events were to be provided with cash, fuel, a clean water supply, and rebuilding their house.

In terms of medium-term measures, most households (more than 75 percent) said they have done nothing. Most respondents have not changed their production system in the last five years, and only a few residents have grown more trees or dug water pools to improve their farming systems in response to climate change. The average amount of money spent by these households was around 2.2 million VND. Regarding saving money to cope with disaster and climate change, 45 percent and 55 percent of households interviewed in Long Dien village and Long Dien Tay village said they had saved money to cope with disasters and climate change, respectively.

For long-term adaptation, residents had no ideas on how to adapt to climate change in the long term and said they would need more knowledge on this issue. Some 70 percent of respondents strongly agreed with a statement in the survey that "serious natural disasters are fated, beyond man's control," which may limit their understanding of what they will be able to do to adapt. Some households did suggest that one way to adapt would be to move away from climate-affected activities like farming and aquaculture if their children had adequate employment in the future to support them. Therefore many households have paid attention to their children's education at the present time.

Can Tho. Short-term adaptation measures to extreme weather has been limited in Can Tho to coping measures, like buying fans for hotter days or preparing houses in advance of floods. Only 25 percent of people interviewed had any responses to questions about measures and costs for adaptation to climate change (Table 54). For long-term adaptation to extreme

TABLE 53. ADAPTATION MEASURES BY BAC LIEU VILLAGES

Extreme weather	*Short-term coping*	*Long Dien*		*Long Dien Tay*		*Total*	
		Frequency	*%*	*Frequency*	*%*	*Frequency*	*%*
No response		34	77.3	23	79.3	57	78.1
Flood	Building dike system Costs: 500,000 VND/hh	1	2.3	0	0.0	1	1.4
Hotter	Growing more trees Costs: 1,000,000 VND/ hh	9	20.5	5	17.2	14	19.2
Drought	Digging water pool Costs: 20,000,000 VND/ hh	0	0.0	1	3.4	1	1.4
Total		44	100.0	29	100.0	73	100.0

Source: Household survey.

TABLE 54. ADAPTATION MEASURES IN CAN THO

Extreme weather	*Short-term adaptation measures*	*HHs adopting measure*		*Average cost/ HH (VND)*	*Medium- term adaptation*	*HHs adopting measure*		*Average cost/ HH (VND)*
		#	*%*			*#*	*%*	
Hotter	Buying fans	6	30	541,667 total all actions	Installing air conditioner	1	5	4,666,667
Flood	Preparing house	6	30		None	–	–	–
Colder	Buying sweater	1	5		None	–	–	–
Whirlwind	Preparing house	2	10%		None	–	–	–

Source: Household survey.

weather, only one person had an idea, which was to raise the house floor higher than the flood water level, at a cost of about 10 million VND.

Community Adaptive Actions

Collective action can play a significant role in helping households cope and adapt with climate hazards, which can be a useful buffer for the future. People can ask for help from their friends and relatives, who are often the first line of defense for households that have been affected by storms. They can seek shelter in relatives' houses, rely on relatives to help them clean up afterwards, and to provide loans if financial assistance is needed. Most of the households in our research sites took collective actions one way or another but they did it with different degrees in each study site. Types of activities taken in each community primarily differ depending on the types of climate events and the level of seriousness of the events. We can classify these collective action adaptation activities into three main categories (Burton 1993):

- reducing the sensitivity of the system to climate change, such as by preventing losses or spreading losses socially
- altering the exposure of the system to climate change, such as shoring up infrastructure, building collective shelters, or planting community trees
- increasing the resilience of the system to cope with changes, such as making new institutions or raising capital.

Before the climate events, collective action primarily took the form of preparedness activities that tried to reduce their exposure to the event. Residents often exchanged information about the events that they heard from early-warning systems, and shared information on things to do such as reinforcing houses. Information sharing about weather forecasts and disaster preparation measures was the most common collective action, likely because this action comes with little cost, although this varied by region, for example, sharing information happened in less than half the households surveyed in the Mekong Delta. Preparatory activities that entailed raising or spending of funds and additional labor—such as preparing rescue roads, building sandbag dikes, or dredging drainage and canal systems—tended to be less common, and these were usually coordinated by mass organizations like the Veterans' Union, Farmers' Union, and Women's Union. Additional actions were often taken in smaller neighborhood or kin-based groups, such as helping one another get a crop in early before a storm. For example, to respond to flash floods, the villagers in Tan Trinh commune of Ha Giang helped each other to collect and move neighbors' furniture and livestock before the flood came. After the flood they joined together to clean up their villages. In this case, the collective action had clear mutual benefits for all who participated.

After climate events, collective action emphasized rescue and relief activities aimed at reducing sensitivity to the event; the most common options were behavioral and structural. Households in the communities collaborated to conduct such activities as cleaning up the environment, mobilizing and distributing goods and assistance to affected people, and reinforcing and repairing damaged dwellings and public infrastructure. Eighty

percent of respondents in Long Dien village and 45 percent in Long Dien Tay village in the Mekong Delta participated in these types of joint activities within the community to collect money to support impacted households, and to rebuild houses after disasters occurred. In Cu Lao Cham, Bai Huong village had many people who borrowed money interest-free from their friends—typically 3–5 million VND—to help rebuild after climate events. However, collective action was not seen yet in the research sites in the form of a long-term adaptation strategy primarily aimed at increasing the resilience of the system to cope with changes.

Overall, most collective actions taken by households at the community level are more time-consuming than financially costly. This may indicate that most collective actions being undertaken are the "easy" actions that entail little sacrifice of time or money. Should more serious actions be needed in the future, these may bring more difficulties in terms of mobilizing participation and reducing conflicts to ensure the collective action provides benefits for all.

State-level organization of adaptation activities is one reason for a limit to collective action. In the case of Vietnam, the structure of response to climate events by local officials is primarily through a Storm and Flood Prevention Team (SFPT) formed in all of the hamlets researched. The formal structure of disaster and flood responses means that there are clear plans from district to commune to village about who is responsible for various actions (i.e. village head will do this, the village women's union representative will do that, etc). While this is useful in some respects, it does create situations where local people do not volunteer or organize themselves spontaneously, because they think that the local government officials have responsibility for those activities.

Urban areas in particular have also seen an erosion of collective help in favor of financial relationships. In the urban community in Hoi An, the relationships among households were reinforced by a long time living together, and although the traditional elements in the social relationships still exist, market relations have step by step influenced the life of people here. An elderly man in An Thang said that 20 years ago, during the floods he and his neighbors helped each other to move household goods from the first floor to second floor. After that they shared meals together to thank one another. But nowadays, there is no more relationships of that kind – anything now can be bought and sold. Before and after floods, if he needs someone, he can call a wage laborer and pay for them. It is easier and there is no need to cook meals for the neighbors afterwards, he said.

But even in urban areas, there are still signs of collective action for the greater good. For example, keeping the street clean is considered as the most important way to attract tourists. A 45 year-old man, who is the owner of a tourist boat on the Hoai River, noted in an interview that: "My life relies on this river. When I was a child, my family did fishing in this river. Recently, as there are increasing number of tourists in Hoi An, I changed to this job (providing boat service for tourism). My neighbors and I understand well that if the river is polluted our clients will decrease, so we follow the rules of the city in keeping the river clean. When the commune organizes the collective activities in collecting plastic bags and other waste on the river, we are active to participate." Making the same point, a women who is owner of a cafeteria next to the river in Hoi An reported: "My house as well as other houses along this Bach Dang street know well that we need to keep the street clean, we plant and take care of the trees along this road. Although the commune pays a worker who cleans the road as usual, we clean the street everyday. We organize the day to clean together. By that way, we have no complaints from tourists about waste and dirty streets."

Self-Assessment of Community Adaptive Capacity

Ratings of effectiveness of capital assets in the community were conducted during focus group discussion at district and commune level to see how the local communities assessed their own adaptive capacities. We asked groups to rank the types of capital in the community from 1 to 5 (with 5 being the highest), including natural capital (local natural resources such as water, forest), human capital (education, ability to work), financial capital (access to bank loans, cash/income sources), social assets (helping each other, receiving support from outside), and infrastructure/physical assets

(road quality, access to market). These were then plotted on a pentagram diagram. The larger the "spider web," the higher the self-assessment of adaptive capacity.

Ha Giang. Quan Ba district had higher adaptive capacity than Quang Binh despite the fact that Quang Binh is a better-off district and is located in the lowlands.

Kon Tum. Dak Tram commune and Dien Binh commune both gave themselves very low assessments of capacity, particularly in the areas of financial capital, natural resource capital, and human capital. Only social capital and infrastructure were rated moderately well in Kon Tum.

Quang Nam: The island village of Bai Huong gave themselves fairly low capacity assessments, while the urban community of An Thang rated higher, surprisingly even in social capital, which might be expected to be lower in urban settings.

Bac Lieu. Both communes assessed gave themselves fairly high marks for natural capital, noting the favorable production conditions in much of the Mekong

FIGURE 16. CAPACITY ASSESSMENT IN HA GIANG

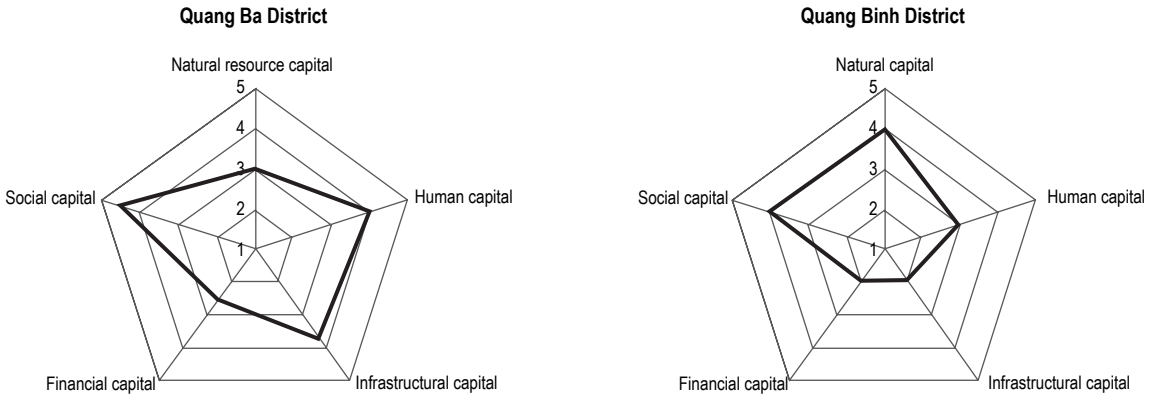


FIGURE 17. CAPACITY ASSESSMENT IN KON TUM

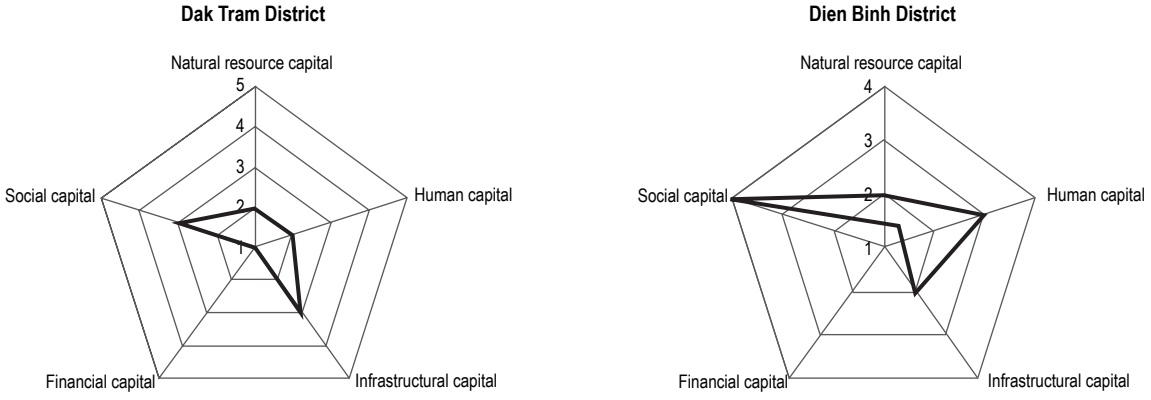


FIGURE 18. CAPACITY ASSESSMENT IN QUANG NAM

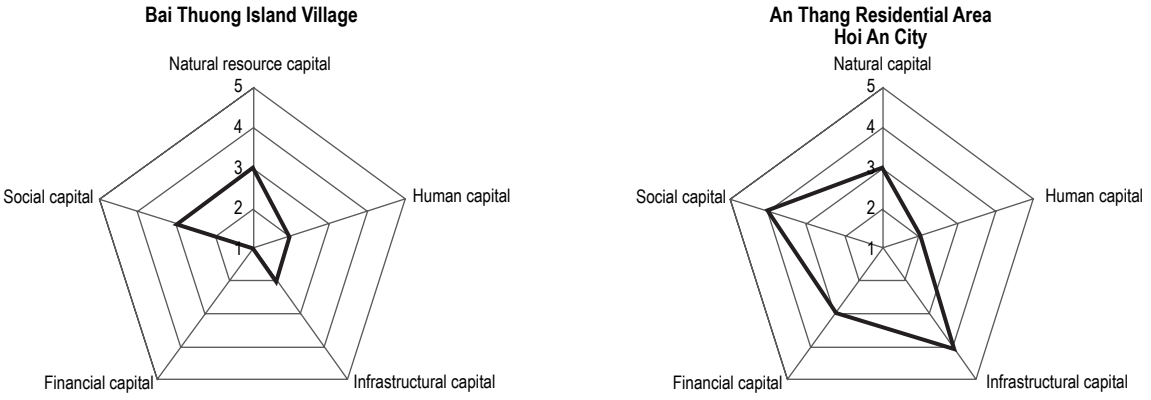
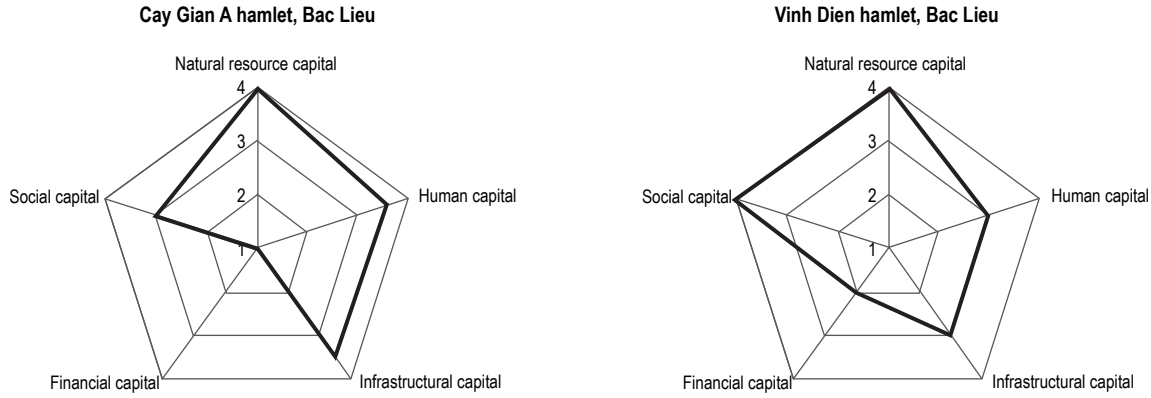


FIGURE 19. CAPACITY ASSESSMENT IN BAC LIEU



Delta. Challenges, however, were found in financial capital resources in particular.

INSTITUTIONAL ACTIONS AND INTERACTIONS

Role of Formal and Informal Institutions

Across the country, institutions for climate change are largely similar in local areas, due to the strong centralization of government in Vietnam. National institutions, like the Central Committee for Flood and Storm Control (CFSC), which includes representatives of all major line ministries, are usually represented down to even the village level in the form of Storm and Flood Control Teams (SFCT). The central CFSC's job is to gather data and monitor floods and storms and issue warnings and forecasts to local areas. Then local offices of the CFSC at each province are supposed to coordinate local measures to be taken, such as dike protection and post-flood recovery efforts. Other district offices that are engaged in storm and flood prevention activities include the Irrigation Sub-Department,

Department for Agriculture and Rural Development (DARD), Department for Planning and Investment (DPI), and Department for Natural Resources and Environment (DONRE).

Funding is often limited for these activities; for example, the budget provided to Quang Nam CSFC for the whole province was 530 million VND every year. Richer communities can find more money for these activities; for example, the annual budget for storm and flood control of Hoi An city is usually from 500 million VND to 1 billion VND, taken from 1 percent of the annual total budget of the city. This system means that poorer areas get less money for their storm activities, since the money is usually only a fixed 1–2 percent of local budgets. At lower levels (i.e. village), storm activities are often funded by small contributions/taxes from households, usually 100,000VND a year or less.

Despite these constraints, as a disaster management institution the local-level CFSC committees usually manage to do a lot. For example, in Hoi An, there is a transportation cooperative with ten or more 45-seat cars. The city can use those cars to move people from low areas to higher and safer places in case of floods and storms, as well as the use of 60 boats for rescuing and moving people. In the past four years, on three occasions the CSFC of Hoi An has had to implement the evacuation of thousands of local people.

Complaints are often heard in local areas about the top-down manner of working of the CSFCs. In Bai Huong village and An Thang living quarter, the CSFC has not been highly appreciated due to their relative lack of actions of helping and supporting households outside of flood emergencies. This is primarily because all members in CSFC at this level do not have any allowance or budget for their labor or efforts for communal/public activities. Sometimes, the members said they do not like to join the CSFC since they felt they could not help most people very much.

Other national mass organizations, such as the Fatherland Front and Red Cross, often get involved in disaster response as well, such as by raising and distributing relief funds. The overall coordinating committee for these organizations is the Fatherland Front, and specific mass organizations include the Farmers' Union, Women's Union, Youth Union, Veterans' Association, Senior Citizens' Association, and local branches of the Red Cross. There were few independent NGOs encountered in the fieldsites working with residents on climate or livelihood activities, with the exception of Action Aid in Ha Giang and the Japanese Red Cross in Quang Nam. Local Vietnam Red Cross groups are a very effective nonprofit organization in the field of storm and flood control. For example, the Quang Nam Red Cross was supported by the Japanese Red Cross in 1995 to develop a vulnerability map. They also were involved in developing a group of young people in flood and storm control by training volunteers in rescuing techniques, restoring food and water, etc. The Red Cross also developed training material describing the structure of houses that can cope with floods and storms.

There is no institution or committee that is in charge of "climate change" per se at any fieldsite. Therefore there is no budget allocated specifically for climate change adaptation activities. According to the head of the Dak To District DONRE, climate change would be given the first priority if the budget allowed them to do so, even though none of the staff members of related offices/departments or of CFSC were trained in the field of climate change. Sometimes, however, provinces receive "occasional" funding for climate-change-related activities. For example, since 2005 Ha Giang received 100 billion VND from ADB to fix irrigation projects and DONRE was provided with 100 million VND by MONRE to work out appropriate hygienic projects for local people after landslides. But these funding sources are infrequent and often tuned to outside demands.

Despite the clear top-to-bottom chain of command in CSFC activities, information on climate is often late in getting to localities, even for extreme events. For example, the hydrometeorology center of Ha Giang is responsible for collecting information from the Northeast weather stations. The information is sent to a number of organizations in the province, but not on a regular basis. The center also does not have the ability to analyze long-term trends; this has to be done in Hanoi at a specialty institute. The head of one district DARD said his division only received information about the several cold spells and drought after it had already taken place in 2008 and 2009, and it was too

late to make effective intervention activities. Even communication between upper and lower levels in the same ministry can be difficult. For example, in Ha Giang, the meteor-hydrology information is collected by a center that is under MONRE management, but the provincial Ha Giang DONRE has no ties with this center. If there is a need for any data, DONRE has to send an official request to the center via MONRE in Hanoi. Other provincial departments have no skills to deal with unfamiliar challenges, and have to hire outside experts and consultants to prepare work plans for their sectors. For example, in Ha Giang, DPI is hiring the Institute of Development Strategy of MPI to work on its socioeconomic plan toward 2020, including notification for climate change impacts in the province, while Ha Giang DARD is hiring the Institute of Planning under MARD to work on land use and crop planning. The hiring of outside consultants to complete local land use and climate plans means that little capacity is being built up outside of Hanoi for these activities.

Overall, the mechanisms for research, information sharing, cooperation, and budgeting both horizontally and vertically in government institutions related to climate is weak and ad-hoc, and determined by the size and seriousness of hazards. Thus, local government units often play a passive role in climate change issues, and provinces usually do not have sufficient budget for climate change activities. This is a major challenge to climate change adaptation work by the formal institutional system in the future.

Planned Adaptation Investments and Policy Path Dependence

Given the weaknesses in the formal institutions involved in government climate and disaster risk reduction, it is not surprising that there have been few planned adaptation investments in the fieldsites. In most cases recounted below, the investments have been in other sectors (i.e. in agriculture), which just happens to be related to climate change issue. In other cases, a lack of attention to climate change in these other sectoral investments is leading to increased vulnerability for some areas.

Kon Tum. Planned adaptation-related actions undertaken in Kon Tum have all been implemented through non-climate change related programs, primarily through existing programs to resettle ethnic minority households out of remote areas and programs for agricultural extension. For example, funding has been provided for the relocation of those who live along rivers and streams to safer places. Extension workers also provided villagers with vegetable seeds and seedlings to grow after Typhoon Ketsana, and also provided training on cassava, rice, corn, rubber, and coffee planting techniques to villagers, such as intercropping cassava with leguminous plants to enrich the soil. They have encouraged villagers to plant litsea, a drought-tolerant tree species. The district also temporarily provided a water pumping machine for irrigation after Ketsana, but since local rice fields were not geographically concentrated, it was very difficult to pump the water and the costs to run it were high.

Kon Tum has also been participating in the central government target Program 167 to support housing to the poor. Each poor household is given financial support of 8.4 million VND; at the same time, the household could take a loan of 8.5 million VND from the Social Policy Bank with no interest. The decision has helped the poor build permanent houses with flat concrete roofs, and in that way the poor may also be able to better adapt to climate change.

One place where many complaints were heard by residents is in the financial services programs of the province. According to key informants the ethnic minority people did not have good access to banks. However, the bank did give loans to the Kinh, simply because the Kinh people were seen to know how to do business. The Kinh had access to such banks as the Social Policy, the Agribank, and the Tieu Dien Rubber Bank. In addition, the program—entitled Poverty Alleviation in Central Vietnam—also gave loans up to 20 million VND with interest of 0.75 percent per year to households. However, it requires collateral. In other words, in order to be eligible for the loan one needs to hand in their red book, which entitles him or her to use the land, to transfer the use rights as collateral for obtaining bank loans. Given this and the fact that the procedure is too complex and time consuming, in particular in terms of the time required to obtain a signature from the village cadres, many minority households did not take advantage of these programs, which might have increased their financial resiliency to climate hazards.

Quang Nam. Planned adaptation actions in Quang Nam have primarily related to restrictions on some activities that might exacerbate disaster vulnerability. For example, the local government in Cu Lao Cham has forbidden the exploiting of sand for concrete to build houses to prevent excess coastal erosion, but there are regular violations of the rule. Forest protection activities are also restricted by regulations and a ranger who works as the police at the village checks on what people take from the forest, as only dry firewood and some vegetables are allowed to be exploited there. Recently, about eight households were supported by the project of the nearby marine protected area to open a new type of guesthouse named "home-stay" for tourists, but it is unclear what kind of support they will receive for this.

In addition, since An Thang community is located in the ancient city of Hoi An, local people have to follow rules and regulations of the government in conserving the ancient city. This means that people cannot build new stable and concrete houses, as this would diminish the attractiveness of the traditional wooden houses, and they cannot build up the existing houses since rules restrict the height of their houses to 6 meters or less. This regulation has made local people face challenges in struggling with floods in particular.

One official safety net in most areas of Quang Nam is the practice of using government funds to compensate households that have damage from storm events. In an interview with the vice chairman of Hoi An city, he revealed that sometimes the city has to use their own budget and social welfare funds to supplement central-state support for damage from storms and floods. Specifically, in 2006, each collapsed house would get 5 million VND support from the province, while the city gave 15 million VND more to help them to build a new house. For those houses losing a roof, the city government provided 5 million VND more added to 2 million VND from the province's budget. In 2009, according to the central government decision 167/2008/QD-TTG to support housing to the poor, each poor family will get 8.4 million VND support for building a house and the families with houses that were damaged will get 2 million VND. Hoi An city government made full use of this decision to provide a budget of 30 million VND on average to local households for building new houses.

Ha Giang. The primary adaptation activities that are taking place in Ha Giang are related to infrastructure development. To respond and adapt to water stress in the area, Ha Giang province is building small lakes in the mountains to catch and reserve rainfed water for irrigation during the dry season. The province received more than 200 billion VND since 2007 from the central government to build three reservoirs. The head of the DARD planning office said they would have to increase the height of these lake banks from 1.5 to 1.7 meters now that they learned about future warnings and forecasts about precipitation under climate change scenarios. Roads are also being improved and consolidated for evacuation purposes during flash floods and storms, as well as for better access to markets. The province is receiving ADB funding for these activities.

The province is also participating in several National Target Programs that have impacts on climate adaptation. For example, for the Poverty Alleviation (134) program, the province received 182 billion VND to build permanent houses, provide cultivable land, and drinking water to the poor households, with priorities being given to minorities. There is also a small-scale irrigation projects fund to repair old canals and build new ones; this program provides a subsidy for irrigation fees of 650,000 VND/hectare. The province is also implementing a national resettlement /displacement program, known as the 193 program, which gives support to those who lose their home due to a calamity, and those who live near the border. The people residing in mountainous areas, especially those who live in areas prone to landslides, are also being resettled under the 193 program. Houses are built in new areas and given to households, with the resettlement site often near the previous one. These people, however, often are faced with a difficult challenge in finding new cultivation land due to the limited land resources near the new houses. They often go back to their old fields to farm, and thus are facing a great risk of losing all their crop at any time, even if their house structure itself may be less vulnerable in the new site. Ha Giang receives an annual budget of 1,284 billion VND for this program. Ha Giang also follows national forest planting plans (5 Million Hectares program) to encouraging forest plantations by providing rice to responsible households for protecting trees.

FIGURE 20. SMALL-SCALE IRRIGATION UPGRADE PROJECT IN HA GIANG

Finally, small hydro power plants are being built; in 2010, the province will reach a total capacity of 600 MW. There are significant downsides to some of these plans, however. The Malipho authority on the Chinese side of the border is testing an operation calendar for the gate on their side, which closes the Lo River from 4:30 pm to 10:00 am everyday. This decision, plus the shortage of rainfall, has caused serious problem to Ha Gang's irrigation capacity.

Path dependency. There is not yet much path dependency in overall climate adaptation activities, as few formal adaptation pathways have been identified in local areas. But much of the path dependency problem is in related sectors, many of which are not yet recognized by the formal government sector as being affected by climate change. This includes plans for socioeconomic development that focus on minerals exploitation or hydro development, which may increase vulnerabilities to some communities if careful planning to take climate change into account is not integrated with these sectors. For example, there is strong evidence that although Hoi An is located at the lower side of Thu Bon River next to the sea and has always been vulnerable to flooding, in recent years the activities in the upper river in mining, the construction of dams, and forest degradation has likely increased the impacts at the lower Thu Bon River. Similarly, in Ha Giang there were many worries and complaints from local people about large-scale mining developments in the mountains, which might make downstream communities more vulnerable in the case of increased precipitation and landslide vulnerability in the future.

FUTURE PATHWAYS FOR ADAPTATION AND DEVELOPMENT

In Quang Nam coastal areas, the main options identified for future pathways of adaptation and development were to raise awareness of local fishermen about the need for storm prevention, to provide information about weather events in time, to use natural resources rationally, and to plan the residential area rationally in Hoi An town (i.e. resettlement away from flooded areas). In addition, Bai Huong village wanted to make full use of the beautiful sightseeing available on the island to attract tourists and promote ecotourism. However, they acknowledged this type of service will need knowledge and skills to use their natural resources effectively. Being only fishermen, local people in Bai Huong felt they lacked the knowledge and skills and needed support from government agencies.

In terms of future adaptations and long-term development planning, 57 percent of interviewed people from An Thang and 95 percent of interviewed people from Bai Huong had no idea what they will/should do if extreme events happened more frequently. Twenty-three percent of the interviewed people from An Thang and 5 percent of the interviewed people in Bai Huong said they would consult with local government, and 5 percent of the interviewees mentioned the idea of reducing industrial activities since it affected the environment negatively. Fifty percent of interviewed people in Bai Huong fishing village wanted their children to find another job in their living area, compared to 33.3 percent of those interviewed in An Thang ward in the city. Forty-five percent of those interviewed in Bai Huong village, compared to 23.8 percent of those interviewed in An Thang ward, considered the possibility of moving to another place to live to cope with climate change in the future.

In Kon Tum, the households in our study sites have thus far tended to rely on measures implemented at the household level and aimed mainly toward on-farm

actions to protect against climate hazards. No adaptation measures have been taken at the community or at the district or provincial level. What has been done so far at the provincial, district, and commune level is primarily aimed at disaster preparedness. In contrast to this focus, residents indicated their interests for the future were to have allocated forest rights, so that they might have safety nets to support sustainable development and ensure food security. Community-based forest protection models and environmental education campaigns in order to change people's habits of using forest products were recommended actions. Rational water use was also a proposed strategy, given projections for increasingly frequent drought by 2030.

Interviewees were asked: "What does your household need to deal with climate change induced problems in the future?" Most of the villagers suggested that the following needs should be taken into consideration in order to help them adapt better:

- Provide financial support and excavators to households to repair flooded fields to restore production
- Provide rice and corn seeds from government subsidies
- Provide financial support to buy coffee and rubber seedlings and pumping machines
- Provide financial support and training courses on animal husbandry
- Provide boats
- Provide financial support to improve the waterways

In Ha Giang, residents considered many possible options for long-term development and adaptation. After being asked what they would do if the yield of corn decreased 15–20 percent (as is predicted by the agricultural projections by 2050), residents of the highland areas dependent on corn gave a number of plans:

- Replace corn with soybeans or grass for fodder and livestock
- Develop services such as processing activities
- Still grow corn but replace the existing seeds with different varieties
- Produce corn wine for value added
- Set up support institutions such as "exchange" cooperatives at the commune to get a fair price for their produce.

Other adaptation suggestions included better development planning, particularly for small-scale irrigation, and changing cropping systems to more resilient varieties. Residents indicated that their key development needs for the future included:

- Secure supplies of drinking water, and irrigation and water supply for remote people
- Roads to villages to sell goods
- Research on effective farming on sloping land
- Investigation of the real needs from local people, e.g. identify places where need to remove rocks to extend cultivation land, where need to make terraces to avoid soil erosion, etc.
- Provide a sufficient amount to support local people to really fix or build a permanent house (right now the support is only 5–6 million VND, only enough to build a very small house (24m^2) to the standard of the ethnic minority people, who need space to keep livestock
- Form an organization specialized in climate change adaptation to coordinate activities.

In Bac Lieu, respondents in focus group discussions suggested a number of possible actions:

When presented with scenarios that in the next 40 years, due to climate change, productivity of shrimp and rice might be reduced 40 percent or more, interviewees in Bac Lieu had a variety of reactions:

- 35 percent of households said they did not know what production system they would apply in the future
- 30 percent of respondents answered that they would continue to combine cultivating rice and doing shrimp farming
- 20 percent would apply a polyculture of brackish species (mud crab, mud keeper, and shrimp),
- 10 percent would only do shrimp farming regardless
- 5 percent would only plant fruit trees.

In the scenarios of rainfall increasing rapidly in the next 40 years, leading to more flooded areas:

- 50 percent of respondents answered that they would raise dykes and floor level of their house to continue staying in this area

TABLE 55. FUTURE ADAPTATION POSSIBILITIES FOR BAC LIEU RESIDENTS

Adaptation measures	*Rank of effectiveness level (from high=1 to low)*	*Who should do the adaptation measures*	*Rank of cost for adaptation*
AGRICULTURE/FARMING			
More investment for agricultural production, such as irrigation for crops	1	Local authority and other donors	More expensive
Improve seedlings, varieties, post-harvest techniques	2	Extension center	Expensive
Diversify agricultural production (planting peanuts, forests, livestock production)	3	Local authority guides, people do it by themselves	Less expensive
Change cropping pattern (from 3 crops/year to 2 crops/year, change seasonal calendar)	4	Farmers do it by themselves	Inexpensive
Change farming practices, i.e. fallowing	5	Farmers do it by themselves	Inexpensive
Change cropping calendar to harvest earlier or use new varieties that can tolerate better extreme weather conditions	6	Local authority guide, people do it by them selves	Inexpensive
More investment for new varieties	1	Sees quarantine center	Less expensive
Stocking more livestock in grazing areas	2	Farmers do it by themselves	More expensive
WATER RESOURCES MANAGEMENT			
Access to new water sources (shallow groundwater, deep groundwater, rainwater harvesting)	1	Local authority and local people	Most expensive
Improve watering techniques to save water	2	Local authority and local people	Medium
Canal restoration	3	Farmers do it by themselves	Medium
OTHER INCOME SOURCES			
Migrate to cities to find job; do off-farm activities, sell labor	1	Young people (male, female)	
Increase savings to prepare for risk	2	Household	
Sell property	3		
Buy insurance	4		
Diversify income sources (i.e. handicrafts)	5		
HOUSING			
Build new permanent house of more durable material	1	People do it by themselves	More expensive
Make ceiling/attic for storing goods	2	People do it by themselves	Expensive
Build more floors	3	People do it by themselves	Expensive
Move to new place (higher land)	4	People do it by themselves	Expensive
COMMUNITY ACTIVITIES			
Contribute cash or in kind to local climate change adaptation fund	1	Farmers	Average
Community food/seed bank	2	Farmers	Most
New regulations of the community in using land and water resources	3	Farmers recommend, local government approves	No
Participate in group works/establish new organizations	4	Local government and farmers	Less
Contribute labor to reinforce dykes, infrastructure, etc…	5	Local government and farmers	No
NATURAL DISASTER PREPAREDNESS			
Rescue equipment (i.e. boat)	1	Local authority and other donors	More expensive

Continued on next page

TABLE 55. FUTURE ADAPTATION POSSIBILITIES FOR BAC LIEU RESIDENTS *(continued)*

Adaptation measures	*Rank of effectiveness level (from high=1 to low)*	*Who should do the adaptation measures*	*Rank of cost for adaptation*
Improve information access	2	Weather station, broadcasting station	Medium
Participate in short training course on first aid	3	Clinic	Less expensive
Organize short training on swimming	4	People do it by themselves	Less expensive

Source: Focus group discussions.

- 10 percent said they needed help from the government
- the rest said they did not know what to do in this situation.

When presented with scenarios of serious drought in the next 40 years:

- 40 percent of respondents answered that they have never thought about it
- 35 percent would store more freshwater for household consumption and production
- 10 percent would plant more trees
- 10 percent had no response
- 5 percent would move to another place.

If sea level were to raise very highly in the next 40 years:

- 55 percent of respondents answered that it might be good for shrimp farming
- 25 percent would raise house floor level
- 5 percent would stop rice cultivation and only do shrimp farming
- 5 percent would follow what the neighbors do,
- 5 percent would select suitable plant and animal for plant and raising
- 5 percent of respondents said that they would move to another place if they cannot do farming here.

In Can Tho, when presented with a scenario of rainfall increasing and floods becoming more serious in the next 40 years, most people had no response or did not know what to do, 15 percent said that they would move to another place, and 10 percent thought that they would stay in the ward but strengthen their house. In the scenario of increased drought in the next 40 years, most households said they had no idea or would continue their current way of life, with one person saying they might move away. In the scenario of sea level rise and saline water intruding up to Can Tho city in the next 40 years, 18 people interviewed said that they never think about it or that they do not know what to do in this situation. One person said that his family would use groundwater and rainwater and one person said "Let the government take care of it." Overall, results indicate that local people in Can Tho do not know how to adapt to climate change in the long term, and are in need of more knowledge and awareness on this issue.

KEY CONCLUSIONS FROM FIELDWORK

Overall, in the patterns of vulnerability and responses to existing climate events by surveyed households and communities, there is not yet a strong understanding of the long-term nature of climate change. Most activities have been geared toward short-term coping in the face of climate events like floods or storms, not making plans for long-term adaptation.

Vulnerabilities

In all fieldsites, the poor were identified as especially vulnerable. In Hoi An and Can Tho towns, the poor had unstable employment (mostly wage labor) that could be lost if excessive flooding and storms occurred. In Kon Tum and Ha Giang, poor households were usually subsistence farmers, and were less likely to have

stored food or have savings to rely on during periods of famine. In Bac Lieu, the poor were former farmers who had taken out large debts or who had lost their land, and who were dependent on wage labor opportunities, which might decline during climate events.

Those dependent on natural resource occupations were also identified as vulnerable. In the Cu Lao Cham islands, fisher families are directly vulnerable to storms, especially if they are out away from shore in boats and have no warning of impending danger. They are also vulnerable as they lack alternatives to fishing: there are no agricultural opportunities on their island and no other jobs. In Kon Tum, most agriculture was subsistence-oriented and highly vulnerable to weather. In the wake of Typhoon Ketsana in September 2009, many of the residents' fields were covered with sand that had been blown in by the storm, and food production had decreased by about 50 percent compared with last year. In Ha Giang, an extended drought for 8 months had resulted in only about 20 percent of rice being irrigated, and there were expected drops of at least half in terms of production. Overall, losses due to climate events were strongest in climate dependent sources of household income, such as agriculture, livestock, and aquaculture. Even urban businesses can be climate dependent; in Hoi An, businesses related to tourism were highly negatively affected by climate events.

Other vulnerable groups identified in local areas included:

- *Ethnic minorities* were also considered vulnerable, particularly in Kon Tum and Ha Giang. Many minorities lived in more remote areas and thus were harder to reach with immediate weather storm warnings, but also longer term information planning is also hampered.
- *Senior citizens* (who lacked mobility to avoid sudden or disastrous weather events in Kon Tum, and who were considered to be vulnerable to cold spells and sickness in Ha Giang)
- *Women* (especially women who have recently given birth and are prone to illness as a result, and who often cannot fetch clean water for their families while they are confined at home with new babies, such as in Ha Giang, or women working multiple jobs to feed their families, like in Quang Nam)
- *Children* (who are vulnerable to cold spells in Ha Giang and kept home from school if it is too cold)
- Those with *low levels of education*.
- Those who *lack sanitation and fresh water* were also identified in Ha Giang as vulnerable, as the recent drought has meant rationing of household water.

External Influences. Vulnerabilities to weather can be compounded by vulnerabilities to external forces. For example, as Vietnam has transitioned into the WTO and global markets for goods like coffee, coffee price drops in the early 2000s strongly affected other provinces in the Central Highlands and led to high rates of indebtedness among some minorities who could not weather the price drops. Although Kon Tum was less affected because of lower rates of coffee planting, the large-scale moves in the past 10 years toward rubber production may be vulnerable to the same forces if rubber prices decline or Chinese investment (which has driven much of the change) dries up in the future. Vulnerabilities were also noted in some sites that were driven by forces out of the local areas' control, such as a decline in water volume in Ha Giang and the Mekong Delta, likely caused by hydropower dams on rivers in China.

Adaptation Options

So far, we have primarily seen households' adaptation options aimed at managing climate risk: listening to weather forecasts, building stronger houses, moving goods to upstairs rooms, evacuating out of unsafe areas, etc. These are mostly short-term coping strategies. Some medium-term to long-term adaptation practices were beginning to emerge in the heavily subsistence-agriculture-oriented zones of Kon Tum and Ha Giang, where farmers were experimenting with new crops, changing crop calendars, or using new varieties with shorter seasons or climate resistance. The most proactive adaptation appeared to be in Ha Giang in particular, with strong social capital and indigenous traditions. For example, the erratic cold spells experienced in recent years have led households to experiment with feeding different crops to animals (such as a local herb that is supposed to keep the animals' stomach warm). The Ha Giang farmers were also proactive at storing seeds and experimenting with new crops like vegetables or fodder grass, which they hoped might be more hardy to weather changes.

The local authorities in the study sites have been primarily focused on building response capacity: for example, having yearly evacuation plans, training people in disaster drills, providing weather data to local authorities, etc. There has also been some small-scale infrastructure development for climate risk. For example, in Hoi An the urban authorities have constructed a cement pavement along the bank of river to prevent erosion; in Cu Lao Cham, the Army has provided safe evacuation shelters for some residents; in Ha Giang, small hydropower projects to reserve water during the dry season have been constructed on small streams. But local efforts have been hampered by:

- Lack of a long-term planning perspective ; one- and five-year plans are the most used time horizons
- Lack of strong administrative authority dealing with climate change; no climate office, lack of direct funding
- Lack of information; most climate work being done in research institutes in Hanoi, little capacity development or sharing of information elsewhere
- Lack of integration of climate change into other sectoral plans; hydropower development without considering that the forecasts for water flow might be changed in 50 years.

Coping Strategies versus Adaptation. An individual or communities' "coping capacity" has been defined as "the manner in which people and organizations use existing resources to achieve various beneficial ends during and immediately after unusual, abnormal, and adverse conditions of a disaster event or process" (World Bank 2010). Most actions seen in the fieldsites were short-term coping actions, not long-term adaptation. For example, most storage activities were not aimed at storing of assets and money over a longer term, although there was some strong collective contributions to pooling of money for community damage. But most of this financing is aimed at short-term storage of assets through an event of several days, not sharing of assets and money over a longer term. The poor and the hungry households in most communities could not even afford storage activities that are even aimed at short-term storage through a flood of several days, as these are households that have difficulties in making ends meet.

While short-term coping can in fact build long-term resilience, the majority of households interviewed simply don't have any idea what they should be doing in the future to help them adapt better to climate change. Coping mechanisms combined with more information and an institutional framework that facilitates longer term planning should lead to better long-term adaptation, but this is not yet in place in most areas of Vietnam. There are limited adaptation responses at either the household or the government level that either address the drivers of overall vulnerability or ones that directly confront climate change processes. These are clearly areas that need more attention.

There is some mobility in terms of short-term working opportunities, especially among younger members of households. From the household surveys and also from the group discussion, members of communities report that there are not many young laborers in their communities. In Hoi An, it is because the number of old people are high and the young people in their commune want to find a better job; their motive to leave is the change of lifestyle. They leave the shops for their parents to manage. In Cu Lao Cham, the young also leave their village to find jobs in the mainland. But in Kon Tum, very few households wanted to move permanently away from disaster areas or try to make their livelihoods outside of the area where they were born in and have grown up in.

Diversification has been adopted by only a very small number of households, and primarily the richer ones. Households in all areas were already using markets for agriculture and livestock produce, and it is not clear how this can be expanded beyond what is already being done to increase resilience to climate hazards.

Pro-Poor Adaptation. Another point to consider is the adaptive capacity of the local people, especially the poor. The issue of how to improve the resiliency of local people and what kinds of mechanisms or institutions can facilitate that capacity is still a question. In many cases, simple advance provision of information can raise awareness of self-protection from extreme weather events. Information about those weather events should be provided to local people early and accurately, so people can have enough time to prepare for their house and help other houses in case of need, many

respondents said. Uncertainty is one of the most cited causes preventing households from performing adaptation activities, such that information dissemination can help prevent uncertainty and increase resiliency.

To improve adaptive capacity of the local people, especially the poor, it was suggested in most fieldsites that there needed to be more livelihood alternatives for local people. In case of Bai Huong fishermen, their monolivelihood has weakened the adaptive capacity of local people, and also made them become more sensitive to climate events. This recommendation is closely related to the need to give local people more rights of access to manage the natural resources available in their region. The restrictions on land, forests, and water in Cu Lao Cham island created great resource constraints on households, and the lack of forest management rights in Kon Tum kept households from being able to fall back on forest goods during times of need.

"Hard" adaptation vs. "soft" adaptation. In most definitions, "hard' adaptation measures usually imply the use of specific technologies and actions involving capital goods, such as dikes, seawalls, and reinforced buildings, whereas "soft" adaptation measures focus on information, capacity building, policy and strategy development, and institutional arrangements (World Bank 2010). There have been very few hard adaptation measures taken by individuals to protect their houses, lands, and assets, such as building more permanent houses or building and improving drainage systems. The majority of actions by households have been soft, behavioral ones: preparing for storms by moving goods and tightening houses and boats; changing crops grown or seasons planted; using traditional knowledge to keep livestock alive; and diversifying incomes through migration or shifting to new sources of income. Most of these options are low-cost, flexible, adaptable and require no input from authorities, which are major reasons why they have been pursued by households who usually lack many financial resources.

On the other hand, most planned adaptation options by authorities have been more focused on hard options, such as building new roads, new houses away from vulnerable areas, more water pumps, or more reservoirs. In some cases, both hard and soft options, like information provision and early warning systems, have been in place, but there is very little focus on capacity building or policy changes.

Institutional Needs for Adaptation. In terms of proactive responses by institutions to adaptation needs, within governmental agencies, closer cooperation among different sectors is needed. Additionally, though storm and flood control is highly prioritized by the central government and local authorities, climate change is a different type of problem and as such requires new thinking about the administrative structures and functions needed to cope with it. For example, the CSFC at local levels only operates intensively just before the storm and flood season (late spring and summer) and CSFC members do not get salaries, so the work is another burden on the shoulders of officers or local people. Participating people often rotate year to year and so there is no long-term thinking in terms of personnel skills either. Therefore, it is necessary to have financial mechanisms and other types of incentives in terms of finance and social relationships to encourage people to take a more active and long-term role in institutions to combat climate change. Overall, separate budgets for climate change adaptation and confrontation at various scales, as well as human resources for this kind of work, and the cooperation and information sharing among responsible agencies/ sectors, are likely to be the key factors in improving institutional adaptive capacity.

5. PARTICIPATORY SCENARIO DEVELOPMENT (PSD) WORKSHOP RESULTS

PSD WORKSHOPS: DESIGN OVERVIEW

Workshops on participatory scenario development (PSD) were conducted to identify and categorize adaptation pathways suitable for different livelihood groups. PSD is a methodological tool for assessing future development and adaptation trajectories, which allows the participation of multiple actors and stakeholders to explore the effects of different actions for future climate impacts. Components of PSD include:

- Climate and economic projection information used for "visualizations."
- Processual and collaborative approaches that involve stakeholders participating in exploring the future in a creative and policy-relevant ways.
- Structured debates about development priorities and relevant adaptation responses, as well as tradeoffs and synergies among adaptation options or policy reforms.
- A focus on strengthening the intersectoral linkages between adaptation and development priorities that are not specific to climate change (Kuriakose et al. 2009; Bizikova 2010).

PSD workshops have been used throughout the country case studies that make up the social component of the EACC study. The objective of these PSD workshops was to come out with a set of discussions and pathways that:

1. Identified the most important impacts of future climate change and climate variability on in-country populations as ranked by themselves, taking into account baseline scenarios presented by scientific studies.
2. Assessed the probable impacts of these identified climate changes on particularly vulnerable people and livelihoods and what the expected associated adaptation responses were likely to be.
3. Noted the preferred pathways for adaptation and policy response that are pro-poor and cost-effective.
4. Identified key areas of integration and tradeoffs across sectors and/or regions in the country, in which adaptation to climate change goes hand-in-hand with other development priorities (Kuriakose et al. 2009; Bizikova 2010).

The PSD workshops were a chance to assess the range of imagined futures that different communities envision, as well as a chance to cost out different approaches and make difficult choices about financial and social investments and outcomes. These results can help policy makers make better, more inclusive choices about the range of adaptation responses to be considered in the future.

All the Vietnam workshops were modeled on the design presented by IISD in the TOT workshop, held in early March (Figure 21). Following this training and the chance to do a "trial run" in the first national workshop, the regional workshops were held . The PSD workshops concluded with a 2nd National Workshop on March 31 (Table 56). A total of 220 people were

FIGURE 21. ORGANIZATION OF THE PSD WORKSHOPS

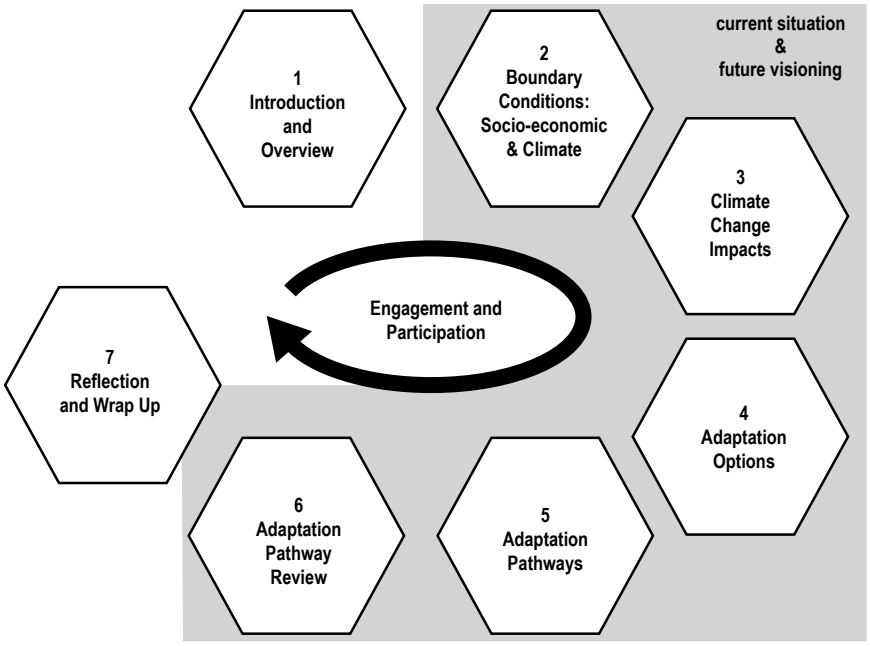


TABLE 56. LIST OF PSD WORKSHOPS HELD IN VIETNAM, 2010

Type	*Location*	*Date*	*Organizer*	*No. of participants*
1st National	Hanoi	March 4	IISD/CRES	22
Northern Mountains Regional	Ha Giang city	March 24	CtC	29
Central Highlands regional	Kon Tum city	March 16	CRES	28
Central Coast Regional	Hoi An city	March 17	CRES	26
Mekong Delta regional	Can Tho City	April 1	CtC, Dragon	46
2nd National	Hanoi	March 31	CRES	69

able to participate in one of the PSD workshops in Vietnam.

All the workshops generally held to the model of having a morning session, which featured plenary presentations, while the afternoon was spent doing group visioning work. (An example of a workshop agenda from the Second National Workshop is presented in Appendix 5). The afternoon visioning groups were formed based on the interests and experience of the participants and were created to correspond to geographical or social issues identified during the fieldwork that had taken place in the area; each workshop had from two to five groups, as indicated below.

- First National Workshop: Mekong Delta; Central Coast Region; Central Highlands; Northern Mountains groups (4 groups)

- Central Coast Workshop (Hoi An): Mountain areas; Lowland areas; Coastal areas; Islands (4 groups)
- Northern Mountains (Ha Giang): Rocky highlands; mountainous areas; lowland areas (3 groups)
- Central Highlands (Kon Tum): highland areas, lowland areas (2 groups)
- Mekong Delta (Can Tho): rural areas, suburban areas, urban areas (3 groups)
- Second National Workshop: Urban areas; Central Highlands region; Northern Mountains Region; Coastal and Red River Delta Region; Mekong Delta Region (5 groups)

Once in groups, the facilitators introduced the concept of the group work, which was primarily aimed at identifying the impacts of and vulnerability to climate change in the region represented by the group, and to brainstorm adaptation options for these impacts. Once adaptation options had been enumerated, the facilitators had the group review the identified adaptation options and list the five most preferred adaptation options, with an eye to what might be missing from the most-urgent options. For each of the five adaptation options, the group then answered the following questions:

1. To what extent could the adaptation option be considered pro-poor?
2. What preconditions are needed for the adaptations?
3. What synergies could exist between the five adaptation actions?
4. What tradeoffs could there be between the five adaptation actions?
5. Who are the beneficiaries?

Once these questions were answered for the adaptation options identified, the groups then constructed adaptation pathways that would integrate adaptation options with preferred development trajectories. These included asking the group about what would be the preferred way forward for the region based on other development challenges. Other questions included what would be the no-regrets options that might work under different climate projections, and what would be the necessary actions that needed to be in place at the national level to enable actions in the regions? Finally, given the responses to the above questions, each group constructed a narrative for their region, following the model outlined below:

> Given projected climate change impacts of……., and projected socioeconomic changes of …… by ……., we proposed an adaptation strategy entitled …… that seeks to meet the following goals of ……. through structured focus on …… and adaptation activities of ……

Range of Stakeholders

Participants in all the PSD workshops were diverse, including representatives of government ministries, government research institutions, academic institutions, provincial and district government offices, NGOs, and local residents from several regions (Table 57), although government officials tended to be the majority of participants at the regional workshops. Gender parity was very good in the participants list, as was a balance between older and younger participants.

TABLE 57. TYPES OF PARTICIPANTS IN PSD WORKSHOPS

Workshop	*Govt offices*	*NGOs/Civil Society/ Mass orgs*	*Academics/ experts*	*Others (including local people)*
1st National	7	5	9	2
Northern Mountains Regional	18	10	0	2
Central Highlands regional	18	5	2	1
Central Coast Regional	21	2	3	0
Mekong Delta regional	27	9	4	9
2nd National Workshop	14	8	31	15

OVERVIEW OF RESULTS FROM LOCAL AND NATIONAL WORKSHOPS

Identified Impacts and Vulnerabilities to Climate Change

Overall, the results of the PSD workshops closely mirrored the vulnerabilities and impacts that had been highlighted in the inception report for the social study. In terms of climate impacts identified by the PSD participants, these impacts range widely by region, and also within regions, as noted below.

In the identification of vulnerable populations, most of the groups that were highlighted by the research team in the inception report were also identified by the PSD participants as those who were most vulnerable. Nonetheless, a few additional vulnerable groups (highlighted in bold below) were identified in the PSD but had not been looked at closely in the inception report, so some new information was able to be obtained from the PSD process in addition to the interviews and literature reviews that comprised the inception report.

Development Tradeoffs and Choices

Before discussing how adaptation options could be considered for the climate impacts and vulnerable peoples identified, most workshops also spent time identifying development trajectories and tradeoffs. That is, what external pressures unrelated to climate change would likely be encountered in the next 40–50 years that could either help or hinder action to combat

BOX 4. IDENTIFIED CLIMATE IMPACTS FROM PSD WORKSHOP GROUPS

First National Workshop:

- Changes in rainfall: (M, CH)
- Sea level rise (M, C)
- Increasing Temperature: (M, CH)
- Drought: (C, CH, NM)
- Typhoon: (C)
- Flooding: (CH, NM)

MD = Mekong Delta; NM = Northern Mountains; CH = Central Highlands; CA = Coastal areas

Second National Workshop:

- Temperature change: (CH, U, NM, MD)
- Precipitation change: Drought (CH, NM, MD), flood (U, MD, CA), flash flood (CH, NM)
- Typhoons: CA, MD, U
- Sea level rise: MD

U=Urban areas; MD = Mekong Delta; NM = Northern Mountains; CH = Central Highlands; CA = Coastal areas

Central Coast Workshop:

- Increasing temperature: (L, C)
- Decreased rainfall, drought: (M, L)
- Increased rainfall, flood: (M,C)
- Typhoon: (C, I)
- Sea Level Rise: (C, I)

M=Mountains, L= Lowlands, C=Coastal, I=Islands

Central Highlands Workshop:

- Flash flood: (H, L)
- Landslide: (H)
- Drought: (H, L)
- Forest Fires: (H)
- Increased Temps: (H, L)

H= Highlands, L=Lowlands

Northern Mountains Workshop:

- Cold spells (RH, M)
- Drought (RH, L)
- Forest Fires (RH)
- Flash floods (RH, L, M)
- Landslides (RH, M)
- Storms (L)

RH: Rocky highlands, L=Lowlands, M= Mountains

Mekong Delta Workshop:

- Floods: (U, R, S)
- Sea Level Rise: (U, R, S)
- Drought: (U, R, S)
- Saline intrusion: (U, R, S)
- Extreme events out of season: (U, R, S)
- Storms/winds: (U, R, S)

U=Urban, R=Rural, S=Suburban

BOX 5. IDENTIFIED VULNERABLE GROUPS IN THE PSD WORKSHOPS

First National Workshop: poor urban people, women, elderly, children, invalids, migrants, farmers (especially poor and landless), **tourist services industry**, fisherpeople, ethnic minorities, people dependent on agriculture, those in geographically vulnerable areas, minorities with forest dependence.

Second National Workshop: The poor, elderly, children, women, ethnic minorities, low education, those with **home employment & under-employment, households in the tourism services industry**, **commuters,** migrants, slum dwellers, farmers, fishermen, those without water/sanitation.

Central Coast Workshop: Those living on riversides, farmers, children, women, people in mountains, **investors in hydropower**, fishermen, the elderly, invalids, **tourist service providers**.

Central Highlands Workshop: Poor people, those who have low levels of education, ethnic minorities, elderly, children, women, those who live in remote areas, those who live along streams and rivers and at the foot of the mountains.

Mekong Delta: Poor households, migrant households without land or house; **those in illegal temporary houses; those on river banks**; farmers; households lacking labor; those with unstable jobs and low income; women; children; the elderly; the disabled; female-headed households.

Northern Mountains: Ethnic minority groups, especially Hmong, Dao, Tay, Nung; poor households; farmers; women, esp. pregnant women; children/ students; the elderly, the disabled; those living at high altitude; **those along rivers or aside hills or mountains with a high slope; those living in areas around mineral exploitation**; children; households with a lack of labor.

climate effects? Challenges that were commonly encountered in the workshops included:

- Continued urbanization trends into the future, putting more pressure on municipal governments to provide services like housing, energy and water, particularly in large rapidly growing cities like Hanoi and Ho Chi Minh City. Better planning is needed to deal with urbanization more effectively, especially by creating centers for jobs in what are presently small towns to relieve some of the labor migration to big cities. There may also be challenges in building and maintaining infrastructure in rural areas as they become less populated.
- More people will likely be employed in factories and industries such as mining; as a result, people may lose their agricultural lands and be displaced into migrant jobs. Particular attention would need to be devoted to preventing land loss of smaller landholders because of urbanization, industrial expansion, and accumulation of land by few owners leading to large farms. Loss of land for agriculture without proper planning could lead to regional shortages of food or food insecurity.
- Concurrent with urbanization, the high rates of migration of rural people into cities to find education and work is likely to continue. Development of services would be needed to address increasing rates of migration—lack of basic services, poverty, unemployment, underemployment, and limited access to resources including food, water, and shelter in areas with high migration. Therefore, population growth may be underestimated in master plans and planning. Strained capacity will exist for infrastructure as well as social services (education and health care) at continued high migration rates.
- Changes in the types of agriculture than can be practiced, both as a result of negative pressures from climate change and loss of agricultural lands to industrial expansion, but also potentially positive trends like new technologies for climate resistant crops.
- There are likely to be pressures for more exploitation of natural resources if conservation is not specifically emphasized in development planning. Due to soil erosion in riverside and coastal areas, people are already facing the loss of agricultural and aquaculture land. More focused efforts on forest conservation and reforestation to address current challenges of deforestation leading to negative impacts on local livelihoods and biodiversity, as well as exacerbating the effects of drought, erosion, and bush fires, will be needed.
- There will likely be potential shifts in aquaculture such as changes to practices that are feasible in

brackish water, especially in areas where freshwater is polluted or less available. Due to salinity intrusion, there will likely be potential shifts in areas suitable for aquaculture, and increased threats of water scarcity. Due to demands for industrialization and urbanization, exploitation of groundwater will likely exceed groundwater capacity without better planning, while the quality of surface water in many rivers is being degraded by pollution and saline intrusion. In addition, the level of river water tends to be lower and lower in dry season because of climate change impacts like drought and saline intrusion. Megascale hydropower in the upstream of the Mekong River in other countries like China will also have an impact.

- Expanding opportunities for education in the future are likely to lead to improvements in human capital resources. However, targeted education will be needed to better reflect the changing job market, including sectoral changes. Plans to expand Vietnam's economy into new service and industrial sectors are dependent on increasing access to financial capital for investment and human capital in the form of skilled workers for these jobs.
- The number of tourists can be vulnerable to reductions due to unexpected weather events as well as the disappearance of a number of scenic locations due to sea level rise. This will also lead to the reduction in income resources for heavily-dependent tourist areas (i.e. Hoi An, Hue, Sapa, etc).
- A growing and worrisome gap is likely to continue between the incomes of the rich and the poor unless new policies to address it are developed.
- Increased incidence of diseases such as sexually transmitted diseases and malaria and other waterborne diseases, coupled with limited health care services—especially in remote, rural areas—could occur if more attention is not paid to public health services.

FIGURE 22. PARTICIPANT IN THE SECOND NATIONAL WORKSHOP RESENTING GROUP IDEAS IN THE PLENARY.

Overall, participants reported that further investigations are necessary to better understand current vulnerabilities to challenges, including urbanization, industrialization, and climate variability; most of these challenges are already occurring. Participants also emphasized that there needs to be a stronger focus on resource conservation (including water and forests) and on addressing pollution. Finally, participants emphasized that observed changes from current climate variability have negative impacts on increasing vulnerability of livelihoods that rely heavily on the environment; for example, agriculture, which is highly sensitive to fluctuations in temperature and rainfall, especially subsistence and rainfed agriculture.

Adaptation Options: Key Sectoral Themes

In each of the PSD workshops, groups were asked to come up with a list of prioritized adaptation options that would be suitable to the type of impacts and livelihoods found in the region on which the group was concentrating. After this brainstorming, the groups then narrowed their ideas down to five key adaptation options. The participants considered each of the five adaptations offered in terms of their pro-poor level and rated this on a scale from 1 to 3. They also assessed the preconditions that would be needed for the adaptation option to happen, and any synergies with other options that were available. They also were to identify any tradeoffs associated with the adaptation option.

This process can be seen in one table created by the Mekong Delta group of the Second National Workshop (Table 58). The group came up with five key adaptation options to adapt to the increasing floods, sea level rise, and salinity that is likely to be common in the Mekong area. They agreed that option 3—on improved policy and planning—could be developed to address poor

people's problems, in which case it would be considered as a pro-poor adaptation option. Option 5 was also considered as pro-poor (improving awareness), while other options were considered as only moderately pro-poor since they benefited not only poor people but all other groups. Among the five most important adaptation options, the third (develop policy and planning) and the fifth (awareness raising) were considered beneficial to all other options, with high synergy, since they helped draw attention and consent from the whole society, although none of the five options were considered mutually exclusive as they all could be implemented alongside one another. The group's assessment was that none of these options had significant tradeoffs, although the preconditions that would be needed tended to focus on financial, technical, and personnel measures.

Comparing across all the six PSD workshops, the types of adaptation options suggested ranged widely. Below, the key options from all the groups in all the PSD workshops are combined and organized by sector to give a sense of this wide variety. No one sectoral approach dominated any one group; most PSD workshops came up with a mix of options that spanned different sectors as their preferred approaches.

Integration was a key cross-cutting theme in several workshops, as the synergies between many options were discussed. For example, planting trees might provide both new livelihoods for poor uplands people, as well as leading to better soil retention and prevention of landslides for lowland peoples. Other types of integration were also explored. For example, some groups were concerned that integration should happen between mitigation options and adaptation options. For example, some workshop participants, particularly those based in urban areas that have higher levels of creation of greenhouse gases, pointed out at the workshops that urban areas could be a leader not just in creative adaptation to climate change but in the merging of adaptation with mitigation options as well. Adaptation practices like building green-certified housing for the poor would serve to both increase the adaptive capacity of the poor (they would have housing that was more durable and could withstand the impacts of climate change) as well as contributing to mitigation (these houses would have lower carbon emissions if they were built to greener standards than the typical urban apartments/houses).

Some adaptation proposals were found only for specific regions. For example, in the central coast, a strong focus emerged for emergency and disaster risk reduction planning (in terms of information dissemination, evacuation drills, etc.) for this area, given the particular impacts of strong and sudden typhoons. Mangrove afforestation was also highly ranked as a way to help dull the force of storms as they hit the coast and thereby diminish some of their potential damaging winds and waters.

TABLE 58. PRIORITIZED ADAPTATIONS OPTIONS AND THEIR CHARACTERISTICS FOR THE MEKONG DELTA GROUP AT THE SECOND NATIONAL WORKSHOP

#	*Adaptation options*	*Pro-poor level*	*Pre-condition*	*Synergy*	*Tradeoff*	*Geographical focus and vulnerable groups*
1	Plant coastal mangrove forests	2	Funding, advocacy, management	2,3,5	None	Coastal areas, the poor
2	Apply new technology (i.e. improved rice varieties)	2	Funding, personnel (trained ones)	1,3,5	None	Rural areas, farmers
3	Develop policy and planning (esp. land-use planning)	1 (if they were directed toward the poor)	Awareness and participation of government officials and local authority	1,2,4,5	None	Whole areas, everybody
4	Invest in infrastructure	2	Funding	3,2	None	Whole areas, everybody
5	Improve awareness and adaptation capacity	1	Materials, funding, personnel	1, 2, 3, 4	None	Vulnerable groups, everybody

Note: Level 1 is considered as pro-poor, level 2 is moderate, and level 3 is not pro-poor.

BOX 6. PRIORITIZED ADAPTATION ACTIONS ACROSS PSD WORKSHOPS

Polices focused on integrated regional development: Decentralized urbanization; establishment of sustainable communities; developing policies that support tailored activities for the regions and aimed at rural development.

Changes in the agricultural sector: Improving food security; livelihood diversification; research on new varieties and biotechnology; improved market systems; change of crop seasons and variety of crops and animal types to be more adaptive; food preservation techniques for times of shortages.

Sustainable infrastructure development: Investment in infrastructure, roads, and irrigation to higher standards; technical construction indicators to enhance resilience of the built form to flooding and storms; better transportation facilities, including use of cleaner energy (biofuels, electric cars and buses, etc); stronger irrigation systems and canal walls in agriculture; reinforcing and constructing sea-dyke systems; application of renewable energy (i.e. biogas, solar energy, improved cookers, etc.); dredging river bed and sea coast to reduce flooding.

Water sector: Rational management and use of water resources; combination of forest rehabilitation and afforestation with hard measures like water pipelines; improvement in wastewater treatment and water provision in urban areas; construction of water tanks and reservoirs for preservation of water in rainy season; construction of small-scale irrigation schemes; construction of dams to regulate flooding; research and more rational exploitation of groundwater; reinforcement of monitoring and supervision of water use by industry.

Early warning systems and communication: Creation of early warning systems to improve forecast and warnings about flash floods and extreme events for communities; education about climate change and natural disaster management; health education in the context of early warning and emergency preparedness (i.e. basic first aid training); establishment of Climate Change Coordination and Information Centers at local level to collect and share data; public evacuation shelters for local people to stay during storm or flood.

Social security systems: Improved social welfare and security support systems; building of subsidized houses for low-income people; vocational training on tourism and other service industry fields; provision of credit and job creation training to those harmed by climate events.

Forest sector: Tree planting in cities; coastal mangrove planting; green space and parks in cities; rational exploitation, afforestation and forest protection; focus on planting indigenous trees.

Policy and planning, integrated land use planning: applying strategic environmental assessment (SEA) more effectively; planning residential areas out of vulnerable sites; resettlement for households in the risk areas with material supports; policies on favorable conditions for local ecocultural tourism; strict monitoring and supervision of implementation of the existing law and regulations, especially treatment of solid industrial waste; implementation of national target program on water, sanitation, and environment with a focus on remote and isolated areas; formulation of local strategic plans on climate change adaptation; integration of CC into other local projects; strengthening public administration and improving coordination between sectors.

Private investment: attract private business investment in new sectors, like tourism.

Capacity building: Capacity building for local communities; improving and strengthening communication about activities on climate change; better awareness of the impacts of climate might lead to spontaneous adaptation options; improve or preserve indigenous culture/knowledge; building capacity for local authorities and line agencies on participatory planning on climate change adaptation; capacity building on community-based disaster risk management (CBRDM); training on swimming for children.

Adaptation Pathways: Key Preference Criteria, Sequencing, Leveraging, and Tradeoffs among Options

The criteria that PSD participants used to create their preferred adaptation pathways varied considerably. The diversity of participants in the PSDs gave rise to a surprising diversity of adaptation options identified. One important finding was that no two groups had adaptation plans that were fairly similar; there was a great diversity of options among groups. Secondly, perhaps reflecting the backgrounds of participants—including government and local officials, academics, NGOs and others—no one pattern of adaptation options dominated either sectorally or in type of adaptation option (hard vs. soft).

Examples of the proposed pathways that the PSD groups came up with are indicated on the following page.

BOX 7. ADAPTATION PATHWAYS PROPOSED BY PSD WORKSHOP PARTICIPANTS

Central Coast Workshop Group Pathways:

***Mountains*:** Given projected climate change impacts of decreasing rainfall, and projected socioeconomic changes caused by drought, by 2015 we proposed an adaptation strategy entitled "Future Green" that seeks to meet the goals of minimizing the negative impact of natural disasters through a structured focus on increasing the plantation forest area and adaptation activities of resettlement, building reservoirs, shifting crop structure, and raising awareness.

Lowlands: Given projected climate change impacts of the increase of temperature, and projected socioeconomic changes caused by drought, by 2020 we proposed an adaptation strategy entitled "Clean water for a healthy world" that seeks to meet the goals of protecting water resources through a structured focus on rational water resource management and use and adaptation activities of forest plantation and awareness raising.

Coastal Areas: Given projected climate change impacts of typhoons and floods, and projected socioeconomic changes like damaged houses and boats and increasing diseases, by 2020 we propose an adaptation strategy entitled "Actively confronting flood and typhoon" that seeks to meet the goals of minimizing damages and loss through a structured focus on developing early warning systems, and adaptation activities of raising awareness of local people and capacity building for local government, socioeconomic planning, and dredging river beds and coasts as well as using environmental friendly and clean power.

Islands: Given projected climate change impacts of sea level rise and increasing typhoons and floods, and projected socioeconomic changes of land loss and decreases in biodiversity, damages of infrastructure, and threat to people's lives, by 2030 we propose an adaptation strategy entitled "Island is like our virtuous mother" that seeks to meet the following goals of protection of the ecosystem and improvement of local people's quality of life, through a structured focus on developing management regulations for biosphere reserves and residential area planning and adaptation activities like developing dike systems, developing environmental protection projects, and awareness raising.

Northern Mountains Workshop Group Pathways:

Rocky highlands: Under the impacts of climate change—such as flash floods, droughts, extreme events including cold spells, and increasing temperature—and under future socioeconomic scenarios characterized by threatened food security, rapid urbanization, increasing mineral exploitation, increasing environment pollution and lack of water, by 2030 we propose a strategy named "Development of Highland Rocky Mountains" through focused interventions of enhanced awareness of the protection of the rocky resources; enhancement of local ethnic diversity and cultures; call for investment from private tourist companies; development of various tourism initiatives such as community-based tourism or adventure and ecotourism; reduction of industry development and agriculture; and building capacity for the local ethnic groups in community tourism.

Lowlands: Under the impacts of climate change such as flash floods, heavy rainfall, landslides and droughts, and under the future socioeconomic scenarios of increasing population, development of industry, services and trade sectors; more modern infrastructure, and improved incomes, by 2030 we propose strategies of development of qualified human resources for the region with the special attention to women and ethnic minorities in the qualified labor force and sustainable forest exploitation. The adaptation activities for the first strategy include capacity building for pre-primary, secondary school, and high schools of vocational training, especially in remote and ethnic minority areas, together with upgrading the school infrastructure, environmental education in schools; high schools of vocational training are strongly linked with the business sector in the locality; creating and maintaining favorable working environment to attract the qualified labor force to work in locality.

***Mountainous areas*:** Under the impacts of climate change, including flash floods, landslides, cold spells, increased rainfall in the rainy season, reduced rainfall in the dry season, and the vision of the socioeconomic development of more developed infrastructure, increased population, the productive land becomes more exhausted, reduced agriculture land, new diseases for human and animals increased environment pollution, and reduced level of water supply in sources, by 2030 we propose a strategy of "Development of ecocultural tourism" in combination with sustainable forestry development, through the focus on protection, maintenance, and development of traditional culture values and development of traditional products, for example, "Shan Tuyet" traditional tea plants, with the aims of socioeconomic development with sustainable environment protection. Adaptation measures are proposed such as forest plantation and protection, community-based forest management system; disaster risks management and climate change adaptation awareness raising among local communities, market outlets identification for forests-based products, ecotourism models, historical relics preservation, and promotion of clean energy sources that are environmentally friendly.

Central Highlands Workshop Group Pathways:

***Highlands*:** Given projected climate change impacts of increasing temperature and changes in rainfall, and projected socioeconomic changes of rapid population growth, by 2030 we propose an adaptation strategy entitled "Water for life" that seeks to meet the goals of food security through structured focus on sustainable agriculture and adaptation activities of sustainable forest plantation and protection, planning and

Continued on next page

BOX 7. ADAPTATION PATHWAYS PROPOSED BY PSD WORKSHOP PARTICIPANTS *(continued)*

rational use of water resources, rational planning of residential areas, planning and stabilizing agricultural land, changing cropping systems, and improving local people's livelihoods.

Lowlands: Given projected climate change impacts of increased temperatures and changes in rainfall, and projected socioeconomic changes of rapid population growth and urbanization, by 2030 we propose an adaptation strategy entitled "Forest for All" that seeks to meet the goals of sustainable livelihoods and environmental protection through structured focus on forest development, food security and sustainable income from forest and adaptation activities of allocation of forest land to households for development and protection, community-based forest protection models, and environmental education campaigns in order to change people's habit of using forest products.

Second National Workshop Group Pathways:

***Urban*:** Given projected climate change impacts of significant temperature variations and increased seasonal precipitation, and projected socioeconomic changes due to in-migration and urbanization, by 2030 we propose an adaptation strategy entitled "Green Life" that seeks to meet the following goals of sustainable development through structured focus on greening cities and focusing adaptation activities on building social houses for low-income people, and improving wastewater treatment and water provision technologies.

***Mekong*:** Given projected climate change impacts of sea level rise, and projected socioeconomic changes of increasing food security by 2030 we propose an adaptation strategy entitled "Gold Rice Development" that seeks to meet the following goals of ensuring food security and export of rice through structured focus on developing new rice breeds with drought and saline tolerance, and constructing water irrigation systems to enable farmers to produce this rice for export as well as local consumption.

***Coastal*:** Given projected climate change impacts of typhoons in particular, and projected socioeconomic changes caused by infrastructure damage and decreases in agricultural production, by 2030 we propose an adaptation strategy entitled "Protection of coastal and Red River Delta areas" that seeks to meet the following goal of social stability through structured focus on prevention and mitigation of the impacts of storms through activities of mangrove afforestation and sea-dyke reinforcement and construction.

***Northern Mountains*:** From now until 2030, the Northern Mountains will face these major climate change features: temperature and rainfall increases and decreases, leading to variable weather, with impacts in the socioeconomic context of shifts in economic sectors and professions over time (away from agriculture and toward services) and population increases as well. Consequently, the Northern Mountains region should develop under a strategy known as "Forest and Community." In order to move toward sustainable development, this region will focus on rational exploitation, afforestation and forest protection through activities including co-management, improving and promoting the indigenous ethnic minority culture/knowledge, and strengthening of sustainable livelihoods for local inhabitants.

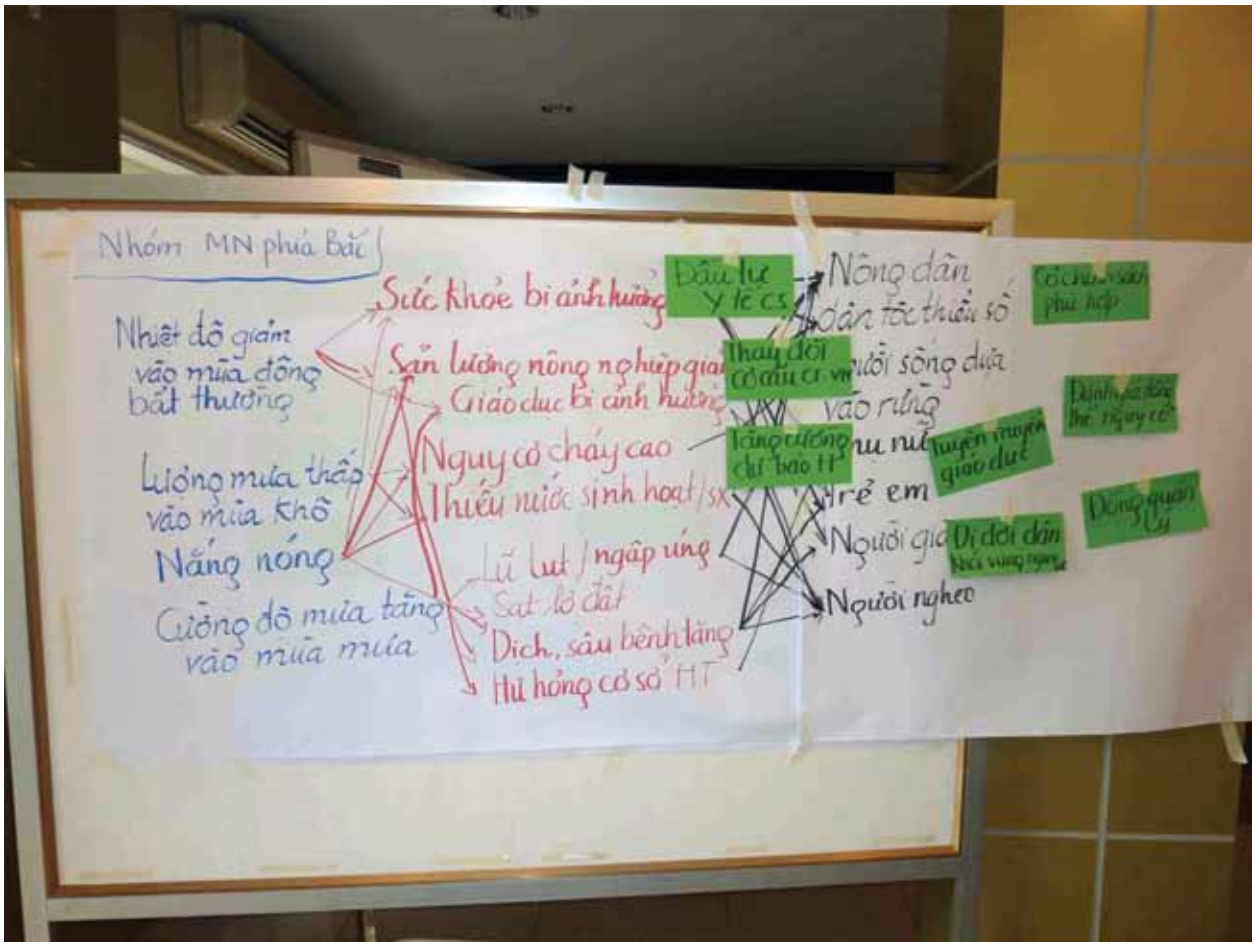
***Central Highlands*:** Given projected climate change impacts of increasing temperature, and projected socioeconomic changes of population growth combined with migration, we propose an adaptation strategy entitled "Water for life" that seeks to meet the following goals of sustainable livelihoods through structured focus on forest rehabilitation and afforestation and adaptation activities of improving people's awareness on climate change, changing cropping systems, and rational water resources use and management.

Despite the success in identifying a number of adaptation options, the PSD was less successful in getting participants to consider timing or tradeoffs in these choices. It was difficult for participants to conceptualize these ideas and apply them in their group work. Many groups said their selected adaptation options had no tradeoffs, only to acknowledge in the final plenary that there may have been some which they had not had time to consider. The tradeoffs that were mentioned tended to be loss of land to infrastructure projects, or changes in traditional cultures that accompany development activities. It was also difficult for the participants to focus on the timing and sequencing of options. While most groups recognized the synergies and linkages between options, such that choosing one option might create certain path dependencies that would obviate the choice of other options down the road, teams had trouble organizing their pathways into clearly sequenced events, and instead chose to focus primarily on end-goals of where the teams wanted their development paths to end in the future.

Relative Prevalence of "Hard" versus "Soft" Adaptation Options

Most groups came up with a mix of options that emphasized both hard and soft options, and which were fairly closely integrated with one another (Table 59).

FIGURE 23. EXAMPLE OF PATHWAYS IDENTIFIED IN GROUP WORK IN SECOND NATIONAL WORKSHOP



Sometimes some of the groups leaned more toward hard options, and several groups promoted only soft options, but no group promoted hard options only. For example, in several groups, afforestation of mangroves was actually ranked above the hard infrastructural option of sea-dyke repair, given the lower costs of mangrove planting and the potential for it to be more pro-poor. This provides some indication to the cost-benefit analysis that is part of the EACC analysis that even "cheaper" soft options are very much on the table for many of the people engaged with climate change in Vietnam, and that these softer options should be included in discussions of adaptation in the future, whether these discussions are held by donors like the World Bank or by others.

Policy Preconditions and Institutional Base

Teams came up with a number of things that are likely to be preconditions for adaptation actions in the future. The most common preconditions were basics like money, knowledge, research, technology, and capacity. However, other prerequisites were also mentioned by at least one PSD, including participation, beliefs and trust, monitoring, transparency, and accountability. Key take-away points are:

- Investment in climate change will be needed from both central budget and donors
- Active learning on climate change needs to take place

TABLE 59. OVERVIEW OF TYPES OF PRIORITIZED ADAPTATION OPTIONS ACROSS ALL REGIONS FROM PSD WORKSHOPS

Soft Adaptation Options	*Hard Adaptation Options*
Tree planting (U, MD, CA, NM)	Build houses for low-income people (U)
Forest use and protection (NM, CH)	Improve wastewater treatment technologies (U, MD)
Policy and planning (esp. land-use planning)(MD)	Build modern transport system (U)
Improve awareness and adaptation capacity (MD)	Use clean and renewable energy (i.e. solar and biogas) (U, MD)
Information, especially on disaster risk management (CA) and early warning systems (CH, MD)	Apply new technology (i.e. improved rice varieties) (MD, CA)
Livelihood diversification (CA, NM, CH)	Invest in infrastructure (MD, NM)
Intensify human resources development (NM)	Reinforce and construct sea-dyke system (CA)
Improve indigenous culture/knowledge (NM)	Construct water tanks and reservoirs (NM)
Apply strategic environmental assessment (SEA) more effectively in govt planning (CH)	
Improving people's awareness on climate change (CH)	
Change in cropping systems timing (CH, NM)	
Ecotourism and adventure tourism promotion (NM)	
Rational management and use of water resources (CH) and groundwater (NM)	
Integration of climate into other sector's policy and planning (CH)	

U = Urban areas; MD = Mekong Delta; NM = Northern Mountains; CH = Central Highlands; CA = Coastal areas.

- Research on climate impacts and adaptation options should be the focus of many research projects
- Technology training needs to be shared with more people (i.e. early warning systems, plant breeding)
- Capacity needs to be upgraded by improving opportunities for participation.

CONGRUENCE WITH NATIONAL PLANS INCLUDING NAPAS

To what degree do the adaptation pathways identified in the PSD workshops match the adaptation policy outlined for Vietnam in official documents? As noted earlier, Vietnam has not yet completed a NAPA, but has instead a National Target Program on Climate Change (NTP). In terms of specific details on adaptation, the NTP primarily calls for pilot projects on coping with climate change, construction of legal frameworks and awareness raising, human resources development, international cooperation, and mainstreaming of climate into local plans and the national socioeconomic planning process. The NTP calls for stakeholder consultations to identify measures to respond to climate change, to build capacity, and to have action plans in all ministries and sectors and localities to respond. Specific actions are thus lacking in the NTP, as these are left to ministries themselves to sort out in ministerial action plans (GOV 2008).

Specific adaptation activities mentioned in NTP that the government intends to focus on include new technologies in agriculture, new planning for river basins and water management, and quarantines for diseases and community hygiene projects. In coastal areas, the NTP calls for integrated coastal zone management plans, infrastructure adapted to sea level rise, storm early warning systems, research on the function of ecosystems like mangroves, and sea-dyke reinforcement. In mountainous areas, the NTP calls for a strategy to protect biodiversity, expand forestry, strengthen communication, integrate agroforestry, and expand irrigation. These activities are all left to the individual ministries that form the NTP coordinating committee to implement, and appear to be more like a "shopping list" of options rather than a coordinated national plan.

Clearly, the NTP has focused more on harder options than soft ones, and in this it varies quite a lot from the PSD workshops, which had a much more explicit focus on soft options, and which covered a very broad variety of sectors. The NTP also has not had an explicit focus on integration of adaptation options across sectors, given the fact that individual ministries are developing their own plans, many of which are not likely to be integrated across sectors. Finally, the NTP does not have an explicitly pro-poor focus in its adaptation approach, while PSD teams did a good job of identifying and prioritizing those options that had higher benefits for the poor.

CONCLUSIONS FROM WORKSHOP TRACK

The PSD approach was a new one for many people who attended our workshops. Several people expressed surprise that they had been asked to take such an active role all day, as many workshops in Vietnam are primarily passive ones in which invitees simply come to listen. Overall, most participants noted that the PSD plenary sessions and afternoon discussions had clarified for them the types of detailed impacts that are projected for Vietnam, and allowed them to think about vulnerabilities in open-ended ways. Most left with strengthened knowledge about the strong regional diversity of impacts likely to hit Vietnam. The final consensus of all workshops was that the PSD approach had been a success, even though it was a new technique for many of the participants. Many participants expressed strong support for the active learning principles embodied in the PSD approach.

Climate change poses a primary challenge to continuing Vietnam's 7 percent GDP growth rate, as has been accomplished in the past, through to 2020 and beyond. Some participants discussed how policy choices that Vietnam has made in the past have primarily been made to favor current growth over future risk; examples were given of poorly planned minerals exploration in upland areas that created a situation where upland peoples had less access to forest land that had been developed for minerals, which increased their vulnerability to climate in the future. In other words, Vietnam's chosen development trajectory has potentially increased the risk of future climate change impacts for some sectors (agriculture, fishing, and tourism being the ones most at risk in discussions in PSD workshops). Changing these trajectories in light of the impacts that are predicted will be a major challenge.

Discussion in the PSD workshops focused on the fact that managing climate change requires a process that focuses not just on narrow adaptation policy alone (i.e. the creation of an NTP for climate change) but also needs to include clear consideration of climate change risk in relation to economic growth and development strategies that fall outside of the purview of the environmental ministries. PSD participants highlighted in their adaptation options and pathways that in order to mainstream climate change into existing policy, these tradeoffs need to be made more explicit, such as weighing near-term growth prospects against future risk exposure. The need to include different stakeholders, who might put different priorities on these benefits and risks in different ways, was highlighted, and the need to have inclusive bottom-up processes was also emphasized.

6. SYNTHESIS AND DISCUSSION

VULNERABILITY CONCERNS

As discussed in chapter 2, vulnerability comprises exposure to climate changes; sensitivity of people and places to those changes; and the adaptive capacity or resilience of the people or system to respond to those changes. In terms of exposure, Vietnam will have to face many different types of climate changes in the next 50 years, with different regions facing different problems. For Ha Giang, the primary indicators of exposure were increasing cold spells during winter, drought during spring and summer, and flash floods in the late summer. In Kon Tum, exposure hazards were effects from coastal storms blowing further inland than they had in the past (especially Typhoon Ketsana in 2009), and droughts in spring. In Quang Nam, the main hazards were coastal and river flooding and typhoons in the fall season. In the Mekong Delta, the main exposures were hotter days, increased floods and droughts, new storms tracking southward, and sea level rise.

Most Immediately Vulnerable Groups

In all fieldsites the poor were identified as especially vulnerable. In Hoi An town, the poor had unstable employment (mostly wage labor) which could be lost if excessive flooding and storms occurred. In Kon Tum, poor households were less likely to have stored food or savings to rely on during periods of famine. In the Mekong Delta, the poor were more likely to be landless or migrants.

Those dependent on natural resource occupations were also identified as vulnerable. In Cu Lao Cham islands, fisher families are directly vulnerable to storms, especially if they are out away from shore in boats and have no warning of impending danger. They are also vulnerable as they lack alternatives to fishing: there are no agricultural opportunities on their island and no other jobs. In Kon Tum, most agriculture was subsistence-oriented and highly vulnerable to weather. In the wake of Typhoon Ketsana in September 2009, many of the residents' fields were covered with sand that had been blown in by the storm, and food production had decreased by about 50 percent compared to the previous year. In Ha Giang, an extended drought for 8 months had resulted in only about 20 percent of rice being irrigated, and there were expected drops of at least half in terms of production.

Ethnic minorities were also considered most vulnerable, particularly in Kon Tum and Ha Giang. Many minorities live in more remote areas and thus are harder to reach with immediate weather storm warnings. Longer term information planning is also hampered by their lack of fluency in spoken Vietnamese or inability to read.

Other vulnerable groups identified in local areas include:

- Senior citizens, who lack mobility to avoid sudden or disastrous weather events in Kon Tum, and who were considered to be vulnerable to cold spells and sickness in Ha Giang
- Women, especially women who have recently given birth and are prone to illness as a result

- Children, who are vulnerable to cold spells in Ha Giang and kept home from school if it is too cold, or who are susceptible to drowning during floods in the Mekong Delta if they don't learn to swim
- Those with low levels of education
- Those who lack sanitation and freshwater were also identified in Ha Giang, as the recent drought has meant rationing of household water.

The good news is that some of these vulnerable groups are already receiving attention and support from national target programs like the 134 Poverty Program and Program 167 to build houses for the poor. Ethnic minorities are also targeted under several regional programs funded by the central government. The bad news is that much of this support is inadequate or inflexible or unrelated to climate risks. For example, in many places the housing support programs do not provide enough money to build adequately sized houses, and the houses were not necessarily built with storm-resistant materials, given the small amounts of funding available. In another example, safety net services like free access to health care or educational subsidies for children are usually tied to having an official household residency permit. Undocumented migrants, especially in large urban areas, do not have official residency permits and as such, cannot access social programs. More flexibility in the household residency system would allow people to access benefits no matter where they moved in the county; this is one example of how existing programs could be better "climate-proofed."

Emerging Drivers of Vulnerability

In addition to increased climatic impacts, Vietnam has in recent years been undergoing national trends that may foretell increased vulnerability to global temperature changes. These include:

- **Extensive losses of mangroves**, particularly in the Mekong Delta, due to pressure from shrimp farming for global export. Many coastal provinces reported dramatic drops in hectares of land under mangroves in the 1980s and 90s and a great increase in land under shrimp farming. Shrimp ponds are usually dug in mangrove areas to take advantage of daily tides, which has increased vulnerability to storm exposure throughout coastal areas (Adger et al. 2005). This has reduced resilience of many coastal communities, both in terms of having less protection from storms, but also economic losses from the conversion of mangroves—which were previously open-access or community-managed—where aquatic goods could be collected freely (Le Thi Van Hue 2001; Adger et al. 2005). Mangrove replanting has been encouraged in coastal areas from reforestation programs and the mangrove area is on the increase again, but remains well below the amount of mangroves that were cut down in the last 20 years in the name of coastal development (Nguyen Hong Tri et al. 2003). Much of this shrimp expansion was deliberately encouraged by government policy, including through land tenure certificates for privatizing once common mangrove areas, preferential taxation, and targeted credit and investment such as large unsecured loans to encourage conversion to shrimp (EJF 2004). Conflicts between agriculturalists and shrimp farmers have increased, particularly in the Mekong Delta, as shrimp ponds have moved into new areas.
- **Access to common pool resources is declining**, exposing people to greater vulnerabilities. Household livelihoods are becoming less diverse in some regions due to a loss of supplementary income from commons that have been privatized, such as income from crabs, clams, worms in coastal flats and medicines, and foods and timber in forested areas, particularly for women. This has had particular impacts on vulnerable populations, like women and the poor, who lose their access to freely collected goods (Le Thi Van Hue 2006; McElwee 2009). As Le (2006) argues, "rapid changes in local land use systems, ownership, management practices of mangrove resources and institutional arrangements in response to Doi Moi have weakened the livelihoods of poor households and sidestepped women in particular, while opening up economic opportunities for others, especially well-off households and men. Doi Moi, in effect, has built on and reinforced social heterogeneity and power and resource differences with communities."
- **Social safety nets** that were provided during the cooperative era have eroded, leaving households who are not under the poverty line with more individual responsibilities for schools and health fees,

and less likely to contribute to public collective activities like dike maintenance (Adger 1999a, b).

- **Localized deforestation and land degradation**. There has been an expansion of overall forest cover, rising from 28 percent of the land area in 1990 to more than 38 percent in 2005, but a decline in "old growth" and natural forest and a rise only in plantation forestry, which may not serve the same climate and soil regulating functions (Meyfroidt and Lambin 2008). Many of the forest products that households once may have used as supplements to cultivated food—wild leaves and vegetables, forest honey, wild animals—are becoming increasingly rare as forest areas have receded or become overexploited. Deforestation has led to increasing danger of landslides in the rainy season in many parts of the country, and lack of tree cover was one reason why Typhoon Ketsana had such a extensive impact on the inland province of Kon Tum. The majority of respondents in a World Bank survey of ethnic minority areas reported that the quality of the environment was worse now than it was 10 years ago. Among the main problems cited: drought (reported by 60.7 percent of respondents), shortage of timber for building houses (52.2 percent), livestock diseases (50.3 percent), human diseases (48.4 percent), mosquitoes (42.9 percent), decline in soil fertility (40.4 percent), scarcity of drinking water (40.1 percent), and scarcity of land (38.7 percent) (World Bank 2009). All of these problems exacerbate future vulnerability to climate change.
- **General decline in the diversity of crops harvested** in many agricultural areas, due to single-crop patterns encouraged for export agriculture and a loss of traditional flood-resistant rice varieties to hybrid and HYV seeds. Government programs and projects have focused in recent years on providing input materials for cultivation, particularly the expansion of high-yield seed varieties and use of inputs like fertilizers and pesticides, through agricultural extension and credit programs, as well as through investments in irrigation infrastructure. For example, ethnic minorities are often given discounts on input materials up to 50 percent or even more, and reduced prices on seeds and fertilizer. One reason for this support is to encourage the diversification of agriculture away from certain lower value crops (rice) to higher value ones (industrial crops) and away from monocultures to diverse cropping systems. The thinking is that diversification can raise productivity, increase value, and provide a hedge against price drops or production drops in any one crop sector. Ironically, as the rest of Vietnam has been encouraged to diversify into new crops, ethnic minorities in particular are moving away from their traditional diversity. Many crops traditionally important to minorities—millet, sorghum, flax, hemp—are not high value and are gradually being replaced by things that can be planted in monocrops and can be sold, such as corn, cassava, and sugarcane.

Links Between Extreme Events and Long-Term Climate Change

Households and communities in Vietnam now face a variety of extreme events—droughts, storms, floods, and other examples. The overall changes predicted under future climate scenarios will unfold over many years; for example, sea level rise will likely be slow, on the order of a few centimeters or so a year. What is the relationship between extreme events and long-term climate change? This question has not been explored in much detail for Vietnam. In general, we can say that if households are resilient to extreme events, the assumption is that they can adapt to slow climate change if the worst-case scenarios are dealt with. Alternatively, however, just because communities are not resilient in the face of extreme hazards does not mean that they could not face long-term climate change that occurred slowly. For example, an example of a community that might have been resilient if a familiar threat had occurred was Dak Tram commune in Kon Tum. Faced with an unprecedented event that had never happened in living memory (a typhoon that blew in tons of sand), people did not know what to do. The community failed to be resilient; they are still waiting for something or someone to remove sand from their fields, 6 months after the storm. A slower event, however, such as long-term declines in precipitation, could perhaps be more easily dealt with in Dak Tram, as communities in Ha Giang were doing in switching away from rice and toward growing grass for fodder as water levels have been low the past 2 years.

One problem with the long-term changes that will likely accompany global temperature rise are the fact

that slow changes are harder to see than sudden storm events. Further, climate changes that are out of the experience of local people means they will lack a knowledge base to deal with them. For example, coral bleaching and loss of fish in the Cu Lao Cham islands is likely to take place over a longer period, even as households there want to scale up their opportunities for ecotourism and home stays. They may develop such options just as they are losing the natural resources on which the tourism would be based. If households there had better long-term forecasts for marine reef resources, they might choose to develop a different pathway for the future.

ADAPTIVE CAPACITIES

It is hard to measure adaptive capacity in Vietnam. Much of what we see now in terms of actions are really only short-term coping mechanisms, while attention to long-term adaptation is not very strong. For example, in Hoi An town, households have simply grown used to yearly floods, and at least 1 or 2 months before the flood season they start moving their household assets (like refrigerator, washing machine, etc,) upstairs. Even if their homes are flooded several meters high, they usually just stay on their second stories and wait for the floods to subside. They felt they could take no other course of action to adapt to the floods. In Cu Lao Cham, households try to tie down their roofs and some even leave the island for the mainland during the storm season to avoid damage, but livelihood changes were not yet seen.

Some proactive adaptation was noted in Ha Giang more than in other areas, a place with strong social capital and indigenous traditions. For example, the erratic cold spells that have been experienced in recent years have led households to experiment with feeding different crops to animals (such as a local herb that is supposed to keep the animals' stomach warm) or keeping them inside pens near warm fires. The Ha Giang farmers are also proactive at storing seeds and experimenting with new crops like vegetables or peanuts that they hope might be more hardy to weather changes.

There are many strategies that households adopt to cope with risk, but these are primarily self-insurance strategies in Vietnam, as the public safety net is often so thin in its coverage or provides so little in terms of support. Such self-insurance includes options like selling assets or borrowing from relatives and friends. But the poorest households have very few options for self-insurance. Many households indicated that they need better access to credit and subsidies for borrowing after natural resource calamites (such as the households in Ha Giang, who noted that the major cause for poverty was a recent flood and storm in 2008, which some households still had not recovered from). Therefore one indication of adaptive capacity at a provincial or district level might involve analysis of the availability of credit and other financial support to households (obtainable from analysis of the frequent Rural and Agricultural Censuses).

For local governments, the main adaptation actions so far have been infrastructure development. For example, in Hoi An the urban authorities have constructed a cement pavement along the bank of the river to prevent erosion. In Cu Lao Cham, the Army has provided safe evacuation shelters for some residents. In Ha Giang, small hydropower projects to reserve water during the dry season have been constructed on small streams. "Thinking outside the box" on adaptation in creative ways was not yet seen in any fieldsites.

There were also indicators of a lack of adaptive capacity. For example, in Cu Lao Cham, because an army outpost has also been established on their island, the fisher families have become somewhat dependent on the army to provide support to them, such as storm warnings, helping evaluate residents, providing emergency supplies, etc. This has "crowded out" local collective action because the residents expect the army support instead. In other fieldsites, such as the Mekong Delta, respondents mentioned that they had no idea what to do about climate change, and they would "wait for the government" to tackle it.

Adaptation Options and Future Pathways

The most striking finding about adaptation options in the fieldsites was how different the strategies were. In Quang Nam coastal areas, the main options identified were to raise awareness of local fishermen about the need for storm prevention, to provide correct and exact information of weather in time, to use natural resources

rationally, and to plan the residential area rationally in Hoi An town (i.e. resettlement away from flooded areas). In other words, disaster risk reduction was the primary focus. Yet in Kon Tum, residents indicated a need to have allocated forest rights, so that they might have safety nets to support sustainable development and ensure food security. Community-based forest protection models and environmental education campaigns in order to change people's habit of using forest products were recommended actions. Rational water use was also a proposed strategy, given projections for increasingly frequent drought by 2030. Thus in Kon Tum, the adaptation focus was on access and control of natural resources. In Ha Giang, adaptation suggestions include better development planning, particularly for small-scale irrigation, and changing cropping systems to more resilient varieties. This focus could be classified as small-scale sustainable development. And in the Mekong Delta, residents suggested changing varieties and cropping, setting up seed banks, migrating to cities for work, or looking into new household industries like handicrafts; in other words, this strategy was more about livelihood diversification.

These findings make clear that one-size-fits-all adaptation will not work for Vietnam. Different communities among the different regions will have different ideas about how best to match their development objectives to the realities of climate change impacts on these pathways. Because these diverse views have not yet been heard in the development the policies like the NTP, there is a danger that decisions will be made at the top that create path-dependency. That is, if the central government views the resettlement of households away from coastal areas as a key adaptation option, but fails to address the ramifications of uprooting households from their livelihoods without helping them find new ones, there could be massive social unrest and long-term problems. "High regrets" adaptation options, that is, options that have high irreversibility, need very careful assessment. Examples might include sea dykes along the Mekong coast—where sea dykes have never been built—that could interfere with water flow coming down the Mekong River; such high-regrets actions should be carefully considered only as last resorts, before other forms of low-regret and no-regret actions are taken.

Key points to ensure localized, appropriate adaptation that have come out of the fieldwork and PSD workshops are that:

- **Both autonomous and planned adaptations will be needed**. Autonomous adaptation seems to be happening in the agricultural and residential sectors primarily, as households plant new seeds or build new houses. Planned adaptation has primarily focused on infrastructure development, such as irrigation or building reservoirs. Future planning will need to find a away to integrate both spontaneous and planned adaptations.
- **Hard and soft adaptation will be needed**. Most participants in PSD workshops prioritized soft adaptation over hard adaptation options. Yet in policy documents like the NTP and in the draft action plans for climate change of several ministries like MARD, the focus is primarily on hard adaptation options (new irrigation systems, dams, sea walls, and dykes, etc). There is a disconnect in the understanding that soft adaptation can play an important role as well. Furthermore, some soft adaptation options are actually discouraged in existing law, such as labor migration. Following years of strict regulation of labor migration and household registration, many officials still view labor migration as a problem, not as a potential solution. A focus on soft adaptation strategies would help officials see that migration could be a policy option, not a failure of policy. As evidenced from the central coast (particularly Hoi An) and the Mekong Delta, where remittances are a significant part of the household asset base, migrants in the household form an important part of livelihood portfolio diversification. While migration can increase vulnerability in the short term (especially when young male labor is the migrant pool and households might lose the very people who could help keep houses safe in storms, etc.), over the long term the use of migrant anchors can be an important part of household strengthening and resilience over time.
- **Both community and individual adaptation will be needed**. So far we see individual households doing adaptation, and some local authorities and government institutions doing adaptation, but the "in-between" area of local villages and neighborhoods has not shown much action. That these

communities lack resources is a given, but in Vietnam many communities also lack "space"—authorities have played a large role in the past, and it is difficult to get out of the mindset that the government should always be in the lead. Communities don't know what they are allowed to do; there have been examples of communities that tried to do things proactively and were then told by higher authorities that they had no right to spend money in a certain way without permission. Communities also have problems with long-term thinking, since much focus on local action is to meet short-term yearly targets.

- **Adaptation can be cost-effective**. Households are eager and willing to take small actions that can be quite cost-effective. Examples include trying new seeds or raising goats instead of cattle. These sorts of actions can be less than $100 per household per year in many cases. For these types of actions, households might be likely to bear the costs of these adaptation actions themselves, if they were provided with opportunities like credit or insurance schemes. Furthermore, when we compare the scope of annual adaptation costs versus costs of impacts, it is likely to seem even more cost-effective. In other words, adaptation options do not need to be only large ticket items for donors to fund; smaller actions are likely to be as effective.

LOCAL AND NATIONAL DISCOURSE ON CLIMATE AND HAZARDS: INPUTS TO DECISION SUPPORT SYSTEMS

Although there is much concern in the government and development realms in Vietnam over climate change, the decision support system to implement new approaches is not yet in place. The major problem in dealing with climate adaptation at the provincial level and below in particular is often a lack of human resources and poor information. The issues are often understood as natural disasters, not something that requires long-term planning or adaptation. At the national level, there is also unclear authority spread among a number of ministries and committees. While the Ministry of Natural Resources and Environment (MoNRE) is the key ministry on climate change in terms of their explicit role, as they are the coordinating institution for the National Target Program, they have relatively weak authority, especially at provincial levels and below, in terms of authority and in technical capability (O'Rourke 2002).

In the absence of new formal mechanisms for adaptation guidance, the Central Committee for Flood and Storm Control (CCFSC) remains the primary national government entity actively involved in climate actions down to the local level. The CCFSC, which includes representatives of all major line ministries, is supposed to gather data and monitor flood and storms and issue warnings and forecasts, and offices of the CCFSC at each province are tasked with coordinating local measures such as dyke protection and post-flood recovery efforts (Chaudry and Ruysschaaert 2007). However, institutionally the CCFSC is aimed more at short-term forecasting and coping, and not long-term adaptation, and the small amounts of money given for these activities (usually not more than 1–5 percent of the localities' yearly budget) means that very little gets done.

The Ministry of Agriculture and Rural Development also plays a role in climate-related issues. They have been the most proactive ministry in seeking to come up with adaptation action plans, even before instructed to by the NTP. MARD adopted a steering committee for their Action Plan of Adaptation and Mitigation to Climate Change in 2007 (Dang Thu Phuong 2008). Provincial DARD offices are responsible for advising the People's Committee on agricultural, forestry, and fisheries development, and are particularly responsible for disaster control and damage; pest and epidemic disease recovery; protection of the dyke system, irrigation, aquaculture, water supply, drainage system; work that controls storms and floods; and management of irrigation systems. As such, they are the ministry most likely to be doing climate adaptation-type actions at provincial levels and below.

The Ministry of Planning and Investment (MPI) also has a strong role to play in government decision support for climate change. Ministries and provincial authorities have to send their planned activities and matching budget each year to the MPI to prepare for a comprehensive national budget. MPI has a science department to provide input to the ministry and climate change adaptation is one of the areas of their work. However, staff at MPI believe that their understanding of climate

change and climate change adaptation is quite limited. For example, in order to improve industrialization and exports, the upgrading of several harbors to international standards has been planned and budgeted for in MPI; however, representatives from MPI confirmed that these planning targets do not yet take into account any climate change impacts, which might make such development goals more expensive or harder to reach. It is clear that climate change has not yet been mainstreamed into most socioeconomic planning for the country.

MULTISECTORAL ANALYSIS AND PROGRAMMING

Natural resources management policy has a great effect on vulnerability and adaptation because it influences such issues as land rights, agricultural production, water allocation, and other related topics. Natural resources policy has changed significantly in the Doi Moi era, generally moving from centralized control of land and means of production to a more devolved privatized system of land rights held by individuals and households. Doi Moi has unleashed market forces on agricultural systems that were collectively held for many years. For example, farmers who in the past were able to rely on government price supports for their crops are now directly affected by changes in the world rice market, and world markets for other commodities. This can lead those who are already vulnerable to be even more at risk. Farmers are also less likely to be able to rely on government support in the forms of free extension, preferential credit, reduced-cost pesticides and fertilizers, and government marketing of crops. The more individualized, household-oriented production brought about by Doi Moi may be increasing per capita productivity, but it is clear that it may also bring many unforeseen consequences to the most vulnerable farmers. The lack of attention to vulnerability and climate change in the agricultural sector stands out as a cautionary tale, and as a place where multisectoral linkages are sorely needed.

The biggest trends in agriculture among socially vulnerable peoples (particularly the poor and ethnic minorities) include a marked reduction in the use of traditional agricultural practices, particularly in non-irrigated agricultural areas, such as a reduction in fallow cropping cycles and a move toward more tillage of land through mechanical means (Le Hai Duong et al. 2007; IEMA and McElwee 2005). One driver of this agricultural change has been high world prices for several cash crop commodities, first coffee, then cashew and tea, and now increasingly rubber. Coffee planting in unsuitable lands has been a major source of environmental degradation in the Central Highlands region, "as many fields were established on poor soils with very steep slopes and high rates of soil erosion, and in areas prone to drought. Inexperienced farmers cut down shade trees to maximize production, and chemical fertilizers were also overused" (World Bank 2009). This switch in the use of highland fields has increased vulnerability in many areas, most seriously, through loss of fertility as fields are used for longer periods and fallowed for shorter periods (or not fallowed at all). The problem of cash cropping has also affected water supplies, as electric groundwater pumps have become widespread. About 40 per cent of current coffee acreage is irrigated by groundwater (requiring about 66 million cubic meters during the dry season in the spring), and has resulted in dramatic reductions in the water table in the Central Highlands and drying up of surface water in dry years (D'Haeze et al. 2003). Spring droughts have occurred frequently in the last few years and have highlighted the precarious water situation.

Even as the government policy has been to encourage diversification, there has been a reduction in species diversity, both in upland rainfed agriculture as well as in lowland irrigated rice, where new hybrid and high-yielding varieties have increased in use while local varieties, such as local cultivars of maize in the uplands and the indigenous "floating rice" formerly found in the frequently flooded Mekong Delta, have declined (McElwee 2007b). The shift away from local varieties to improved ones has contributed to rising incomes and increased agricultural production in the short term, but these changes may also be introducing new forms of vulnerability in the long term. That is, the trends away from diversification and toward single crops and single varieties may render agricultural households less resilient to climate events.

Such increased vulnerabilities can be seen clearly in the Mekong Delta as it has shifted to HYVs over the past 30 years. The indigenous "floating" varieties previously common were uniquely adapted to flooding, as they

elongate their internodes directly in accordance with water levels, and can be grown in water up to 12 feet deep. Most HYVs, however, are not adapted to sudden inundation and flooding. However, while the floating rice is highly adaptive to the hydrological balance of the area, it is unfortunately not highly productive. Since 1983, more than 300,000 ha of floating rice land in the Mekong Delta has been converted to double cropped land through improvements in irrigation, decreasing the deepwater rice-growing areas from their pre-war peak of 1.26 million ha (nearly half the Delta's total land area) (Vo Tong Xuan et al. 1995). While only 17 percent of the rice grown in Vietnam in 1980 was improved, hybrid, or "modern" rice, by 2000 the total was more than 90 percent. Triple cropping has raised the annual production of rice to well over 10 tons per hectare in some areas, although this has come with large capital costs and the doubling of labor input for many farmers (Hossain et al. 1995). In fact, HYVs have pushed many farmers into less diverse overall economic strategies, as well as decreasing diversity of rice varieties, as HYV requires many more upfront capital and labor commitments than floating rice (Hoang Tuyet Minh 2000).

Yet these HYVs are not suited to the flooding season of many areas of the Mekong Delta, and they are particularly vulnerable to "exceptional event" flooding when dykes are overrun and bunds breached. An early monsoon or an extended monsoon can wipe out an HYV crop completely. Should modern farmers be locked into agricultural schemes that do not allow for this last-minute flexibility (such as HYV that waterlog easily or inflexible irrigation schedules), they will likely suffer badly from climate events in ways that they might have been able to survive just a generation ago (Kakonen 2008). In the Mekong Delta, "associated with the change from extensive, adaptive farming systems to more intensive cropping is a shift from a naturally regulated water regime to a much more human regulated water regime….The locus of power is becoming more remote from direct water users. For example, cropping calendars and irrigation schedules are now prescribed by commune authorities, whereas previously farmers had some flexibility in determining when to crop" (Miller 2006).

As another example of a sector that needs to be linked to climate change, natural phenomenon like typhoons and rainstorms are compounded by man-made problems in the inadequate system of infrastructure. Understanding what is not working now, before building new systems, as is called for in the NTP, is necessary. Problems include sea dykes that are too low in the RRD; river tributaries that are often backed up due to poor irrigation, drainage, and pumping infrastructure, exacerbating the flooding caused by natural events; the age of much flood and irrigation infrastructure, some of which dates back to the French colonial era in the early 1900s; improving land use planning, as currently much land designed for agricultural production has been converted into industrial land, or urban land, without flood prevention measures. Related problems include the loss of forests across the country, which then no longer retain water, leading to greater volumes accumulating in flood-prone areas. The infrastructure system is further complicated by multiple overlapping management responsibilities. Polder irrigation and drainage systems are managed by provincial irrigation and drainage management companies, district irrigation enterprises, and commune agricultural cooperatives. Inter-provincial dyke systems are managed directly by the national Ministry of Agriculture and Rural Development, are built and planned by the Ministry of Construction, and are funded by the Ministry of Planning and Investment. Thus tackling the infrastructure situation requires not just funding of the infrastructure itself, but addressing the policy, economic, and social drivers that have contributed to poor and overtaxed infrastructure in the past.

SCALE: LEVERAGING NATIONAL AND SUBNATIONAL POLICIES AND INVESTMENTS FOR PRO-POOR ADAPTATION

While the National Target Program adopted by the government in 2008 was a first step, much more needs to be done to leverage investment into the future. The NTP lacked a scheme for prioritization of efforts, and directed attention to potentially vulnerable sectors and locales, yet not to vulnerable people/communities. The NTP also did not lay out specific actions. This is left to different ministries and provinces to flesh out. If there is not an explicit push for horizontal integration, the danger is that silo behavior will be pursued, information will not be shared, and there is little basis for all the different plans to add up to a coherent national picture.

As the lead coordinating institution, MoNRE is better at undertaking forecasts and scenarios on exposure than on orchestrating a coherent approach to mitigation, and especially adaptation. As noted above, several areas of government policy and/or economic development strategy have strong implications for climate change exposure and adaptive capacity, yet are rarely explicitly linked to these. Leveraging support for climate adaptation requires rethinking certain approaches that may be increasing local/sectoral exposure to climate change impacts; these would include policies that (a) re-zone agricultural land as industrial or urban land, yet do not make provision for investments in drainage; (b) have encouraged massive planting of cash crops, such as coffee or rubber on steep slopes and other marginal land; (c) have altered the varietal mix for crops away from traditional varieties toward higher yielding "improved" varieties; and (d) have expanded shrimp aquaculture at the expense of mangrove forests. They also include the absence of policies/regulations regarding groundwater management, leading to overpumping of water in both urban and rural areas; and policies that have shifted institutional responsibilities and resulted in the decline in collective maintenance of dykes, irrigation works, and other infrastructure.

For at least some of the above, implicit choices have been made to favor current growth over future risk. In mainstreaming the policy dialogue on climate change, these choices would be made more explicit. Hence, there is a need to emphasize that increased exposure to climate change impacts is not simply due to (externally caused) environmental circumstances, of which Vietnam is an unfortunate victim. It also has much to do with changing patterns of settlement, migration, economic development, and urbanization, and these trends will continue into the future. One could even go so far as to say that in some instances, Vietnam's development path has put more assets, livelihoods, and economic activities "in the path" of encroaching climate change. Managing climate change will thus need a process that goes well beyond basic structural investments (i.e. sea dykes, irrigation canals) and adaptive technical measures (i.e. more salt-tolerant rice varieties), but also includes explicit consideration of climate change risk in relation to sectoral growth and development strategies. There are many tradeoffs involved, the greatest of which is likely weighing near-term growth prospects against future risk exposure. The participatory scenario workshops indicated clearly that different stakeholders will put different weights on these benefits and risks.

The danger is that this is a more complicated pathway than simply requesting more money for climate change "pet" projects. The costs of these projects is very large. For example, the Ministry of Agriculture and Rural Development (MARD) has estimated that for the next two years alone (2009–10) 2,500 billion VND are needed for system upgrades to infrastructure in the RRD basin alone, with local governments needing 2,651 billion VND for smaller canals and construction of pumping stations (VNA 2008). Estimates for irrigation and water management in the Mekong Delta are 21,100 billion VND in the 2010–20 period (Nguyen Huu Ninh 2007). Yet no estimates are available regarding how much could be saved by focusing not on hard measures, but on soft measures like better enforcement of land use planning and eliminating deforestation around watersheds.

The other problem is that these sorts of large-scale, hard adaptation measures are also the least likely to be pro-poor. It is often the poorest households who are displaced by hydropower development, or electrical lines, or roads, and the poor are the least likely to be able to ask for compensation for their losses. Evidence from industrial development in many areas of Vietnam, including in the fieldsites notes, is that such policies—such as overexploitation of minerals in upland areas with no royalties paid to local communities, or industrial parks built near rural villages, which then have to bear the damage from polluted water —often do not end up helping the poor. Thus careful consideration needs to be paid to the proper balance of pro-poor adaptation measures with the existing development pathways that Vietnam is now pursuing.

7. CONCLUSIONS AND RECOMMENDATIONS

SUMMARY OF FINDINGS

Impacts:

- Climate impacts vary significantly from region to region. Impacts include drought and flash floods in the Northern Mountains and Central Highlands; storms, floods, and tornados in the Central Coastal areas and Red River Delta; and drought, floods, and sea level rise in the Mekong Delta.
- The Mekong Delta Region has high exposure and moderate sensitivity; Central Highlands, moderate exposure and high sensitivity; Northern Mountains, low exposure and high sensitivity; Central Coast, high exposure and moderate sensitivity; Red River Delta, moderate exposure and low sensitivity; Southeast Region, low exposure and low sensitivity.

Vulnerability:

- Vulnerability studies in Vietnam are lacking; there are no clear indicators of vulnerability to climate change used consistently by the government. Studies so far have been donor-driven and thus do not cover the entire country consistently or in a comparative fashion. Regional vulnerability to climate change is very diverse, with different areas experiencing different types of climate impact exposure and having different abilities to cope.
- Vulnerability is difficult to identify with simple indicators like poverty; even rich households can be significantly affected. Across the four regions, however, the most vulnerable groups were consistently those who were poor; those who were ethnic minorities; those who had climate dependent income; those with little capacity to react to climate events; and those who were already socially or medically vulnerable (the elderly, children, women, the infirm or disabled).

Adaptation Options:

- Adaptation options taken to manage climate risk have been very limited in all fieldsites. Households surveyed have so far tended to rely on measures implemented at the household level and aimed mainly toward on-farm actions to manage climate risk, such as listening to weather forecasts, building stronger houses, evacuating out of unsafe areas, etc.
- Longer term adaptation changes include some changes in housing styles (concrete, two-story houses); diversification of farm incomes; changing crops and varieties grown; and adjusting crop calendars for seasons grown. There have been very few "hard adaptation" measures taken by individual households, such as to protect their farmland from floods by building small impoundments or drainage systems.
- Some collective adaptive capacity was seen at fieldsites, but it was limited. Community collective action measures include an informal coping system; for example, community members can ask for help from their friends and relatives, seek shelter in rela-

tives' houses, rely on relatives to help them clean up afterwards, and provide loans.
- Longer term adaptation options are lacking, both at the household level but also in policy and responses by government authorities. The local authorities have been primarily focused on building response capacity: i.e. having yearly evacuation plans, training people in disaster drills, providing weather data to local authorities.
- There are limited adaptation responses at either the household or the government level that either address the drivers of overall vulnerability or directly confront climate change processes. These are clearly areas that need more attention into the future.

Policy:

- Current policy approaches to adaptation are limited primarily to the National Target Program, which faces serious challenges. These include lack of local research on vulnerabilities; lack of direction for prioritization of efforts or specific actions; a focus only on government actions, not local ones; significant lack of horizontal integration as well as intersectoral integration that replicates existing administrative divides; a focus on primarily hard adaptation measures; and little to say on the role of local action and social capital in building resilience.

RESPONDING TO DIRECT AND INDIRECT IMPACTS OF CLIMATE CHANGE

Clearly much needs to be done in the realm of social vulnerability in particular, and on identifying adaptive capacity in the hundreds of thousands of local communities that will be affected by climate change. Clear indicators of vulnerability and adaptive capacity to climate change and climate variability have yet to become publicly recognized, and in general, policies on adaptation are not yet linked to sectoral policies already in place.

- Disaster preparedness is already in place in Vietnam, but there is a need to transition it to long-term adaptation, rather than just short-term coping.
- Information will clearly be needed to help individuals, communities, and institutions undertake preparedness and adaptation action. However, lack of sharing of information has long plagued Vietnam, with research institutes often hoarding data they produce and not providing it to others as a means to capture power in a system of overlapping administration. New laws to encourage transparency and openness in public access to information about government planning have been implemented only sporadically, and much information remains nearly impossible for an average citizen to find. Better information provision and increased access of citizens to planning and policy institutions is likely to reap benefits outside the climate change issue as well. For example, groups provided with sufficient information can then begin putting adaptation strategies into place, and pursuing "no regrets" options.
- At local levels, warning systems, weather forecast equipment, and modern communication systems are needed, especially the specialized knowledge of climate forecasting over longer terms, skills in using software programs for modeling climate, and documents and materials for training and awareness raising. They also need a synthetic assessment for provinces; for example, in specific scenarios given by MONRE, how the livelihoods of local people are affected, how crops are structured, how aquaculture and cattle raising is predicted to change, and how to solve those problems.
- Incorporation of climate forecasts is needed immediately in economic and social planning. For example, future settlement developments and land planning should concentrate on areas safe from flooding or sea level rise; yet the expansion of urban areas like Ho Chi Minh City still takes place in areas known to be vulnerable. Not taking action now to limit development of areas known to be especially vulnerable to climate impacts may mean that the government assumes enormous costs of resettlement down the road.

SOCIAL RISK MANAGEMENT: ASSET DEVELOPMENT AND SOCIAL PROTECTION

- **Concern for overall livelihood resilience needed**. Many groups indicated that robust livelihoods that are diverse and supported by government and market policies provide the best buffer for vulnerable

households. This requires a rethinking of some of the current agricultural policies that place more emphasis on short-term economic gains than long-term risk (i.e., hybrid seeds that grow fast but can be more climate vulnerable).

- **Safety net programs not yet tied to climate change**. Migrants lack access to many safety net services if they lack residency permits. If climate change induces more migration out of rural areas and into cities, this will create strains on social services if safety net programs are not revisited and made more flexible. Other examples include the fact that specialized credit is not usually given to victims of climate disasters unless the households have already been certified as poor. This can limit access to needed funding to cope with climate change.
- **Decentralize adaptation to climate change**. The centralized nature of much administration and service provision in local areas means that individuals, households, and communities have less flexibility to adapt to the changing circumstances of climate change The primary mode of governance is by command and control from the center, rather than a decentralized or performance-based approach that would encourage initiative and competition among communities. The absence of formal methods to address early climate adaptation in policy and planning means that later and often unnecessary costs may be imposed on both individuals and the government by failure to act in a preemptive fashion.
- **No regrets options can be implemented now**. Climate proofing of policies and investments can often be "no-regret" actions: that is, they are cost-effective and provide benefits above and beyond their usefulness in adaptation to climate change. An example would be expanded use of urban trees to cool buildings, reducing both the urban heat island effect and also reducing energy costs of urban households. These sorts of no-regrets action would be worth pursing even in the absence of CC forecasts. Some of the preferred adaptation pathways in the PSD workshops, for example, are things that would be a livelihood improvement even in the absence of climate change, such as the need for affordable housing that meets green standards.
- **Strategies for adaptation plans**. Strategies for adaptation plans should clarify what adaptation actions are best undertaken by what levels: national, provincial, district, and community. Practices that are only feasible at a higher government level include building codes and land use planning maps of vulnerable areas. These can be built into information and communication systems so that communities and individuals can take them into account while making personal choices about places to live.
- **Mix of Hard and Soft Adaptation**. Adaptation options need to be understood as a suite of possibilities to be undertaken by a host of people and groups. Distinguishing between hard vs. soft adaptation options will be necessary, as governments like those of Vietnam often will tend to focus attention on the hard adaptation options: those that are more expensive and more likely to attract donor funding. These hard options are also less flexible in the long term should forecasts prove variable as to climate impacts. That is why soft adaptation options, which are often less expensive and more flexible, should be on the table as well. As of yet, however, there is no strong advocacy lobby to put these soft options on the table.

POLICY DESIGN AND IMPLEMENTATION

- **Government will play a large role**. Nearly all groups in PSD workshops indicated that appropriate policies and investment need to come from the central government for many preferred adaptation pathways. This is a function both of Vietnam's history of strong government intervention, especially in pro-poor development, and recognition of the large scale of the options that will need to be considered. Mangrove planting, for example, can be carried out by NGOs and private citizens, but in order to scale up and make a real difference, cooperation and coordination with government offices would be needed to ensure coastal areas across different provinces were all working to improve coastal defenses. Similarly, work on improving sea dykes or sea walls would fall primarily to the central government, as they are the only institution that can coordinate effectively among many provincial stakeholders.
- **Ministerial guidance missing**. Institutionally, Vietnam is not equipped with a strong lead ministry

to guide climate adaptation. The CCFSCS, while boasting much experience in inter-ministerial coordination and local action, is set up to respond to disasters when/if they happen, not to coordinate ministry actions to reduce vulnerabilities over the long term. While the government structure to respond to climate disasters is clear and well-coordinated, it lacks flexibility to take on the new challenges posed by climate change. All plans for the CCFSC and lower level committees are made for a short-term of one year; therefore they are more suited to short-term disaster coping than long-term management. Risk assessments are ad-hoc, done on the basis of previous years experience and on short-term weather predictions, and there is currently no system and no capacity for long-term climate risk management.

- **Overlapping mandates**. The problem of an absence of a lead ministry is compounded by a general lack of horizontal integration, leading to overlap and competition among agencies, such as between MARD and MONRE. The current NTP divides adaptation activities and does not combine them in a holistic integrated manner and will simply replicate existing administrative divides.
- **Climate change adaptation needs to be mainstreamed into all local development planning**. Yearly, five-, ten-, and twenty-year socioeconomic plans are already done on a systematic basis by all local government units. Shaping this planning to incorporate climate impacts, vulnerability assessments, and adaptation options needs to start happening now, not in five or ten years. The urgency of thinking about climate in all planning should be conveyed downward from the prime minister and all ministries should take part, not just those that have been traditionally associated with environmental issues (MARD, MONRE, MOST).
- **Linkages between adaptation policy and existing sectoral policies** need to be made explicit, and require close cooperation among competing ministries. More studies need to be undertaken to explore the impact of sector policies, like the promotion of single crop farming, rather than diversification, on the vulnerability of different types of communities to climate change. New policies should be measured up against such climate vulnerabilities to ensure they do not exacerbate existing problems.
- **Investment needed from many sources**. Many of the preferred adaptation pathways—such as sea dykes or technology transfer for new rice varieties—need large investments in the short term. There will clearly be a strong need for donor support in some of these areas, in particular the areas of crop technology and development for which Vietnam is often dependent on research done in other countries. Donor support for integrated coastal planning and other large-scale approaches has been tested in the past and there are good models of cooperation to move forward. If the private sector—such as the insurance sector—is to take an active role in climate change adaptation options, they may need to be explicitly pushed to take such a role, as there is little spontaneous involvement from the private sector to date.

8. BIBLIOGRAPHY

FURTHER RESOURCES

A number of recent climate reports on Vietnam have been produced in recent years. The graph below compares these reports in terms of their methodologies and their indicators of vulnerability. As can be seen, many of these reports have been primarily qualitative reviews relying on others' data, and only a few have attempted a more quantitative look at vulnerability or a nationwide approach.

COMPARISON OF RECENT REPORTS ON CLIMATE CHANGE IN VIETNAM ON METHODOLOGY AND INDICATORS OF VULNERABILITY

Study Title	*Authors/Date*	*Indicators of vulnerability used*	*Identification of most vulnerable geographic zones or communities*	*What data collected/ used?*
Climate Change Adaptation Survey, Quang Nam Province	East Meets West, 2009	Geographical location of communities (coasts, deltas, or mountains)	Not specified	125 HH surveys in Quang Nam
Climate Change and Human Development in Viet Nam	Chaudry and Ruysschaert, 2007	Rural poor	Not specified	Literature review, MONRE reports
Climate Change Impacts in Huong River Basin and Adaptation in its Coastal District Phu Vang, Thua Thien Hue province	NCAP 2006	Geographical location	Not specified	Modeling of future impacts in GIS maps of district based on physical data
Climate Resilient Cities A Primer on Reducing Vulnerabilities to Disasters	Prasad et al. 2008	• Moderate to high level of one or more natural hazards • Medium or high observed vulnerability in past disasters • Moderate to high sectoral vulnerability of climate change • Medium or high slum density or large proportion of informal population; no comprehensive disaster response system • Economic and/or political significance in regional or national context	Only Hanoi mentioned for Vietnam	National datasets

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COMPARISON OF RECENT REPORTS ON CLIMATE CHANGE IN VIETNAM ON METHODOLOGY AND INDICATORS OF VULNERABILITY *(continued)*

Study Title	*Authors/Date*	*Indicators of vulnerability used*	*Identification of most vulnerable geographic zones or communities*	*What data collected/ used?*
Drought-Management Considerations for Climate-Change Adaptation: Focus on the Mekong Region	Kyoto University and Oxfam 2007	Self-identified vulnerability of communities (i.e. direct question, are you more vulnerable than in past)	Women/children	Qualitative interviews in Ninh Thuan
EACH-FOR Environmental Change and Forced Migration Scenarios: Viet Nam Case Study Report	Dun 2009	Not specified, mostly those vulnerable to geographic displacement	Mekong Delta	45 expert interviews in HCM, Phnom Penh, and An Giang
Flood risk management in Central Viet Nam: challenges and potentials	Phong Tran et al. 2008	The poor	Not specified	400 HH surveys in Thua Thien Hue province
HCM City Adaptation to Climate Change Study	ADB and ICEM 2009	• Geographic location • Poverty	Not specified	GIS mapping, provincial statistics
Mega-Stress for Mega-Cities: A Climate Vulnerability Ranking of Major Coastal Cities in Asia	WWF 2009	• susceptibility of the city impacted by 1 m sealevel rise and 2 m storm surge; historical frequency of extreme weather events • population • gross domestic product • the relative importance of city to the national economy • overall willingness of the city to implement adaptation strategies • per capita GDP	Ho Chi Minh City is medium vulnerability city in Asia (behind Dhaka, ahead of Bangkok and Singapore)	National datasets
Rapid Assessment of the Extent and Impact of Sea Level Rise in Viet Nam	Carew-Reid, 2009	Geographic location (Less than 1m)	Mekong Delta and Ho Chi Minh city primarily	Digital Surface Model satellite imagery spatial overlay and analysis of the SLR inundation zones with national GIS layers on socioeconomic and environmental variables
Social Vulnerability to Climate Change and Extremes in Coastal Vietnam; Institutional adaptation to environmental risk under the transition in Vietnam	Adger 1999; Adger 2000	• Poverty • Dependency on natural resources • Income inequality • Institutional competition	Not specified-coastal areas in general	Nam Dinh province 60 HH survey, qualitative interviews
The Role Of Local Institutions In Reducing Vulnerability To Natural Disasters, And Long-Term Sustainable Livelihood Development In High Risk Areas: Vietnam case study	ADRC 2008	The poor, but not specified	Not specified	Qualitative fieldwork in Quang Tri and Thua Thien Hue
Towards an integrated approach of disaster and environment management: A case study of Thua Thien Hue province, central Viet Nam	Phong Tran and Shaw 2007	• Unsustainable practices (slash burn, sand dredging) • Downstream from dams • HH with poor waste management	Geographic areas where unsustainable land use is taking place	HH surveys in Thua Thien Hue
Vietnam Coastal Vulnerability Assessment	Nguyen Huu Huan 2000	• geographical locations	Not specified	GPS data on exposure and geographical position

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COMPARISON OF RECENT REPORTS ON CLIMATE CHANGE IN VIETNAM ON METHODOLOGY AND INDICATORS OF VULNERABILITY *(continued)*

Study Title	*Authors/Date*	*Indicators of vulnerability used*	*Identification of most vulnerable geographic zones or communities*	*What data collected/ used?*
Vietnam: Climate Change, Adaptation and Poor People	Oxfam 2008	Poverty	Not specified	Studies in Quang Tri and Ben Tre; qualitative interviews
Vulnerability and Adaptation to climate change on Catfish farming: Stakeholder Analysis in the Can Tho Province, Vietnam	Nguyen Lanh 2009	• Sectoral vulnerability (fishing hh)	Mekong Delta	Stakeholder workshop in Can Tho
Vulnerability of fishing communities in Vietnam: an exploration of the scope to adapt to environmental change	Trap 2006	• HH under natl pov line • Female HH • Those who live on boats	Lagoon dwellers in Thua Thien Hue Province (TTH)	PRA with HH in Phu Vang, TTH

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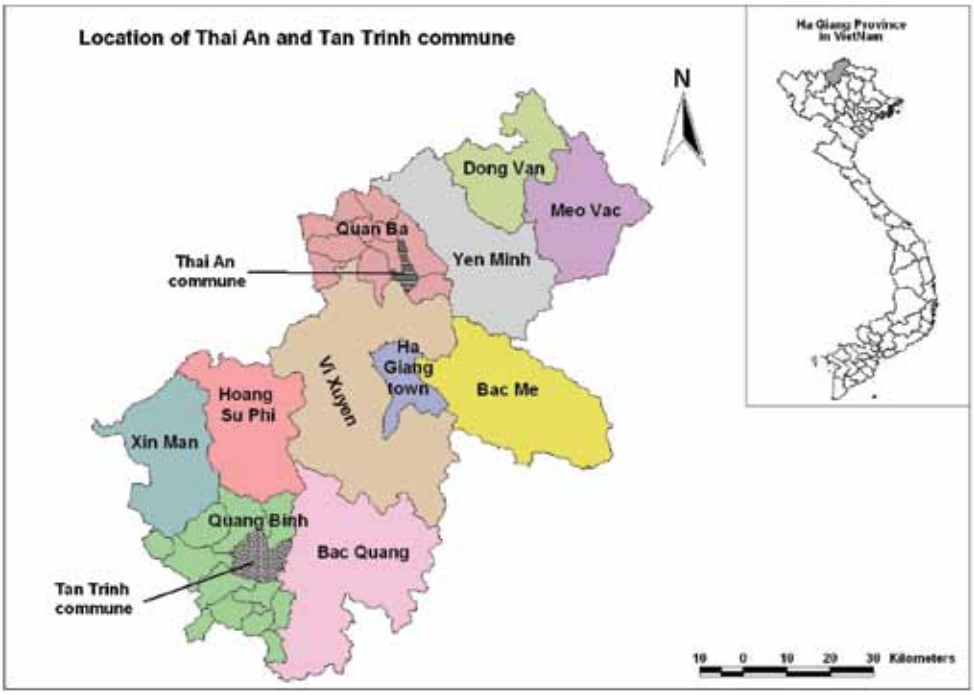
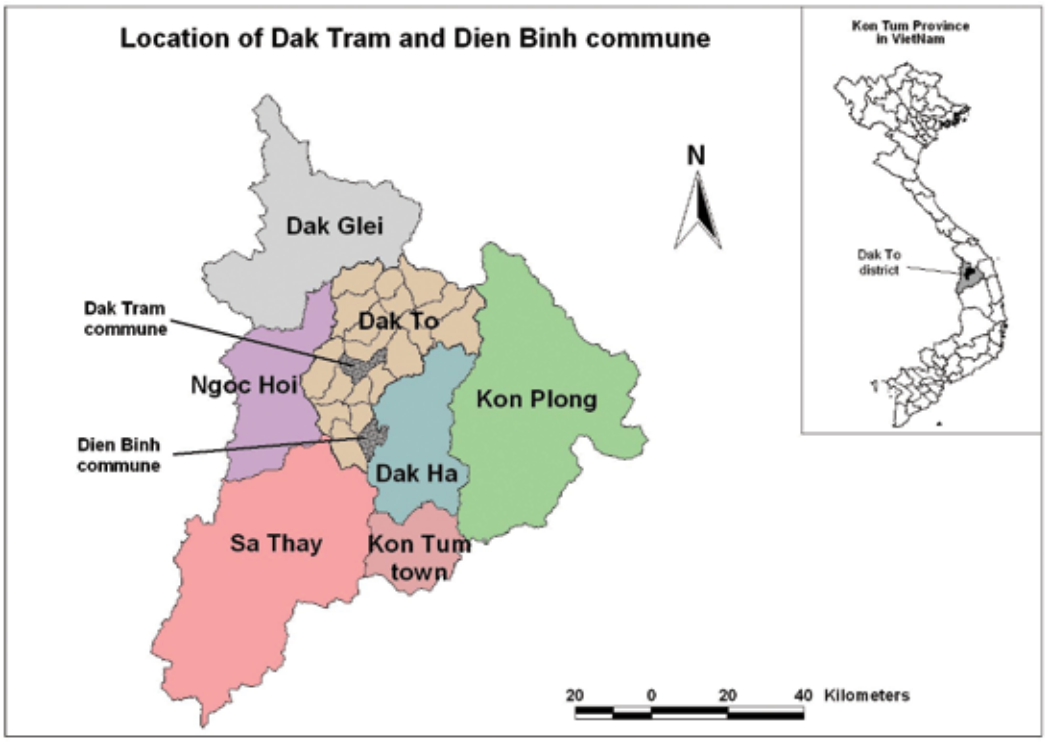
APPENDICES

APPENDIX 1. MAPS OF FIELD SITES

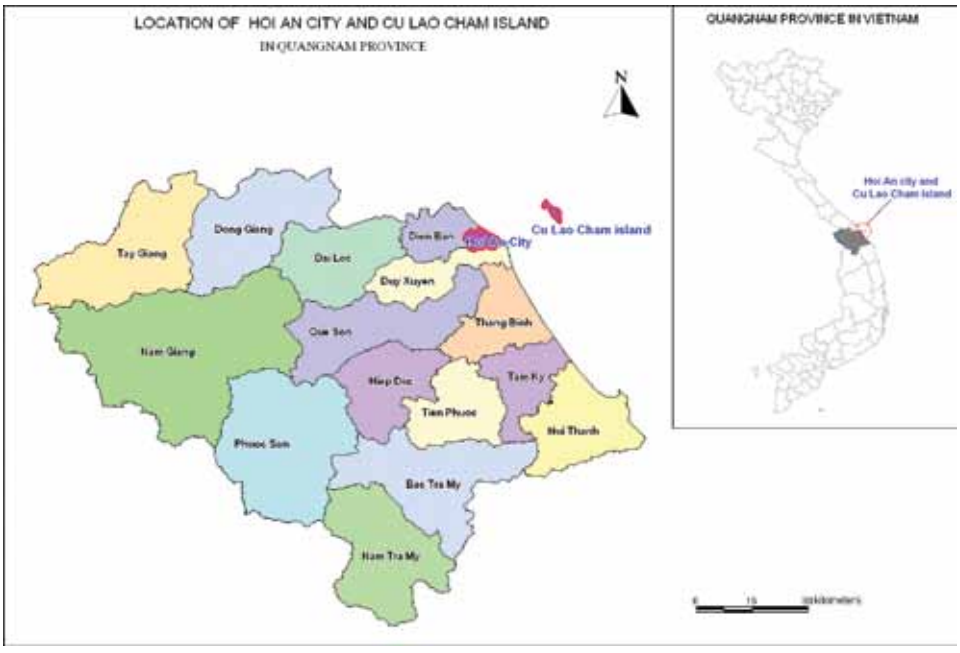
MAP OF HA GIANG PROVINCE, SHOWING SITES OF FIELD RESEARCH



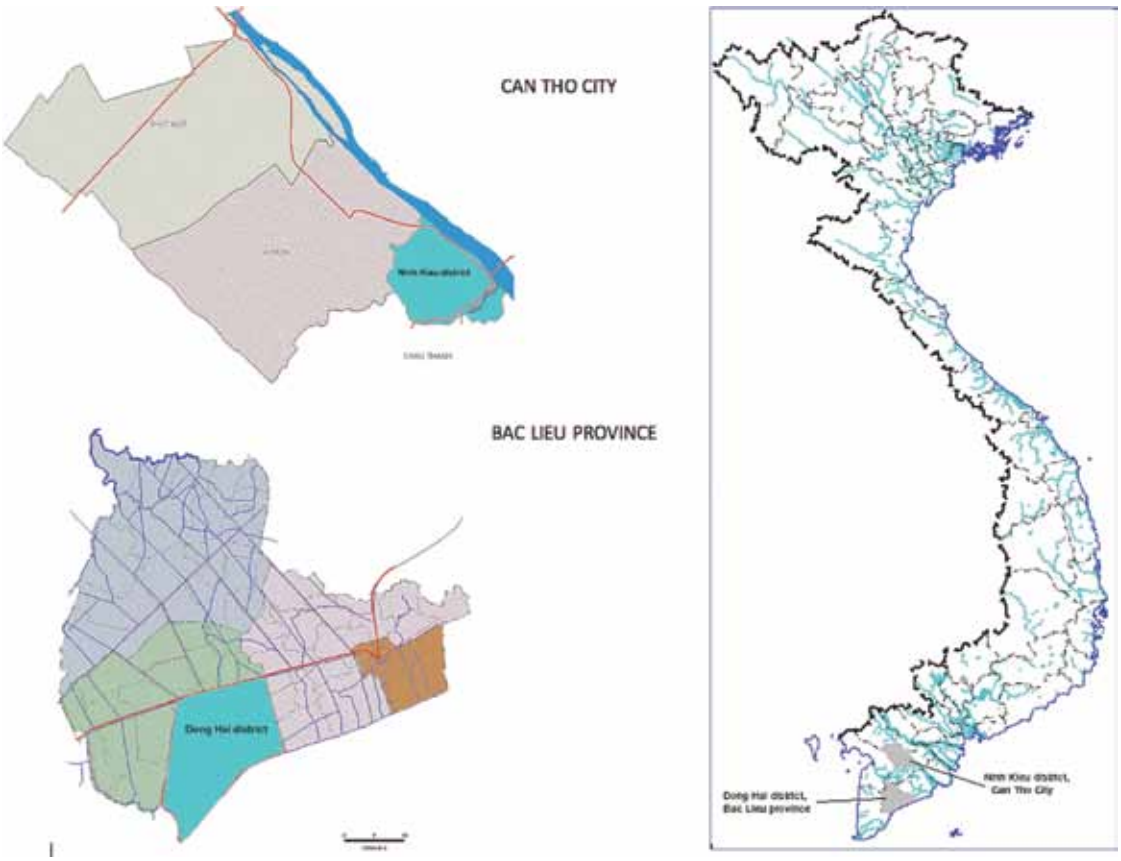
MAP OF KON TUM PROVINCE, SHOWING SITES OF FIELD RESEARCH



MAP OF QUANG NAM PROVINCE, SHOWING SITES OF FIELD RESEARCH



MAP OF MEKONG DELTA PROVINCE, SHOWING SITES OF FIELD RESEARCH.



APPENDIX 2. NO. OF HOUSEHOLDS INTERVIEWED WITH SURVEY

	Number people interviewed		*Type of Household Structure*			*Age*	*Gender of Respondents*	
Commune	*# of HHS*	*Total number of hh members*	*Male-headed hhs*	*Female-headed hhs*	*Other arrangements*	*Average Age of Respondent*	*Male Respondents*	*Female Respondents*
Kon-Tum Dien Binh	20	99	18	2	0	49.75	14	6
Kon-Tum Dak Tram	21	115	19	2	0	42.86	10	11
Ha Giang, Quang Ba	15	87	12	3	0	38.00	10	15
Ha Giang, Quang Binh	16	74	15	1	0	43.00	12	16
Quang Nam, Hoi An	21	100	8	13	0	59.29	8	21
Quang Nam, Cu Lao Cham	0	95	8	12	0	41.85	8	0
Bac Lieu – Long Dien village	20	103	20	0	0	44.7	13	7
Bac Lieu – Long Dien Tay village	20	111	20	0	0	50.00	17	3
Can Tho, Ninh Kieu District	20	128	9	11	0	52.00	3	17

APPENDIX 3. NO. OF FOCUS GROUP DISCUSSIONS HELD

		Number people interviewed	
Commune	*# of Focus group meetings*	*# total participants*	*% women*
Kon-Tum Dien Binh	2	49	33%
Kon-Tum Dak Tram	2	32	31%
Ha Giang, Quang Ba	Ha Giang province: 2 Quan Ba: 2	Ha Giang province: 10 Quan Ba: 38	Ha Giang province: 10% Quan Ba: 22%
Ha Giang, Quang Binh	2	29	35%
Quang Nam, Hoi An	3	24	40%
Quang Nam, Cu Lao Cham	4	26	38.5%
Bac Lieu – Long Dien village	1	18	0%
Bac Lieu – Long Dien Tay village	2	31	16%
Can Tho, Ninh Kieu District	2	24	75%

APPENDIX 4. HOUSEHOLD QUESTIONNAIRE

BẢNG HỎI HỘ GIA ĐÌNH
Kinh tế của thích nghi với Biến đổi khí hậu:
Nhóm Xã hội Việt Nam

Mã hộ:
Người phỏng vấn:_____
Ngày phỏng vấn:_____

PHẦN I: CHỈ SỐ KHẢ NĂNG THÍCH NGHI

1.1 Tên người được phỏng vấn:

1.2 Địa chỉ:
Làng:
Xã:
Huyện:

1.3 Giới: **1. Nam** **2. Nữ**

1.4 Tuổi: (Nói rõ)…….năm

1.5 Ông bà học hết lớp mấy? Lớp…… hệ (nói rõ 10/10 hay 10/12).....

1.6 Ông/bà có phải là chủ hộ gia đình?
1. Có
2. Không, có mối quan hệ với chủ nhà……
   1. Vợ/chồng 2. Con gái/trai/cháu
   3. Bố/mẹ 4. Khác (nói rõ)……

1.7 Gia đình Ông/bà sống ở đây bao lâu? (không kể ông bà tổ tiên) ……. Năm

1.8 Số thành viên gia đình

STT	Mô tả	Số người	Số người mù chữ	Số người học hết cấp I	Số người học hết cấp III
1	Số thành viên của hộ gia đình				
2	Số người trong độ tuổi lao động				
3	Số trẻ em dưới 15 tuổi				
4	Số thành viên trên 60 tuổi				
5.	Số người đi làm xa (di cư)				

Chỉ số cơ sở hạ tầng

1.9 Ai đứng tên chủ sở hữu nhà hiện nay ông bà đang ở…….?

1.10 Kiểu nhà của Ông/bà là gì?

1.10.1 *Mức độ kiên cố*

Kiểu nhà ở	**Tích vào các ô sau**
1. Kiên cố (ví dụ: tất cả tường đều làm bằng gạch hoặc gỗ cứng), nhà đổ mái bằng, v.v…	o
2. Bán kiên cố (ví dụ: một phần của tường làm bằng gạch và những phần khác làm gỗ/tre)	o
3. Nhà sàn	o
3. Nhà cấp 4	o
4. Khác, nói rõ	o

1.10.2 *Số tầng: ……* *Nền nhà cao:……...m*

1.11 *Gia đình Ông/bà có điện không? o* Có o Không

Chỉ số kinh tế

1.12 Thông tin về đất và tài sản của hộ

	Loại đất/tài sản	**Sở hữu** **1= sở hữu,** **2= Thuế** **3= khác**	**Diện tích đất (m2)** **hoặc** **Số đơn vị tài sản**
	Đất		
1	Đất ở, bao gồm vườn nhà		
2	Đất trồng/trang trại		
	- Trong đó + Có hệ thống tưới tiêu		
	+ Không có hệ thống tưới tiêu		
3	Đất rừng		
4	Nuôi trồng thuỷ sản		
5	Khác (nêu rõ:.....		
	Tài sản		
6	Xe có động cơ/ô tô		
7	Xe máy		
8	Thuyền		
9	Khác (nêu rõ:.....		

1.13 Nguồn thu nhập của hộ gia đình trong năm 2008, 2009 như thế nào?

STT	NGUỒN	Thu nhập năm 2008 (VND)	Thu nhập năm 2009 (VND)	Lý do thay đổi (giải thích)
1	Trồng trọt			
2	Chăn nuôi			
	Gà			
	Vịt			
	Trâu bò			
	Lợn			
	Cá nước ngọt			
3	Nuôi trồng thuỷ sản (ngao, tôm)			
5	Kinh doanh của gia đình (phi nông nghiệp)			
6	Làm thuê			
7	Lương hưu/các loại lương khác			
8	Tiền thành viên gia đình hoặc họ hàng làm xa gửi về			
9	Khác (Nêu rõ).....			

1.14 Năm 2010 hộ gia đình ông/bà dự định trồng cây/ con gì và không trồng/nuôi cây con gì? Tại sao?

.....

.....

.....

.....

1.15 Gia đình có thiếu gạo ăn trong 1 năm không?

1. Không
2. Có, thiếu .....tháng/ngày

Nếu có, lý do tại sao lại thiếu: .....

.....

.....

1.16 a. Đối với hộ phụ thuộc chủ yếu vào nông nghiệp, ước lượng số các loại cây trồng khác nhau năm ngoái (ví dụ: lúa, lạc, đậu, vừng, ngô, rau, cà phê…):

Tổng số các loại cây trồng:

Liệt kê các loại cây trồng:

.....

.....

1.16b. Hộ gia đình ông/bà có thay đổi các loại cây trồng trong vòng 5 năm trở lại gần đây không? Nếu có thì loại cây nào?

……..……....

Nếu có, tại sao lại thay đổi? (Đánh dấu nếu phù hợp)

1. Giá tốt hơn 2. Dịch vụ khuyến nông khuyến khích các loại cây trồng mới 3. Thích ứng tốt hơn đối với biến đổi khí hậu 4. Năng suất cao hơn 5 Có vấn đề với cây trồng cũ nên thay đổi 6. Khác (nói rõ) ……..……

1.16c. Hộ gia đình ông/bà có trồng thêm cây công nghiệp (tiêu, cà phê, cao su, mía… - cây trồng mà không ăn được) trong 5 năm qua?

1. Có 2. Không 3. Không chắc

1.16d. Hàng năm gia đình ông/bà có giữ lại hạt giống?

1. Có 2. Không 3. Không chắc

Nếu có, loại: lúa ngô rau khác (nêu rõ: ……

1.16e. Hộ gia đình ông/bà có nhận được sự trợ giúp từ dịch vụ khuyến nông, khuyến lâm trong vòng 2 năm qua không?

1. Có 2. Không 3. Không chắc

Nếu có, trợ giúp gi?

1. Tập huấn kỹ thuật 2. Cung cấp hạt giống 3. Cung cấp phân bón hoặc thuốc trừ sâu 4. Cung cấp con giống 5. Cung cấp dịch vụ thú y 6. Khác ……

1.16f. % đất của hộ gia đình được tưới tiêu thường xuyên? _____ %

1.16g. Ai là người có trách nhiệm duy trì hệ thống tưới tiêu dẫn nước vào ruộng ông/bà?

Gia đình ông/bà Thôn Chính quyền xã Hợp tác xã Khác.

1.16h. Cây trồng của hộ gia đình ông/bà có bị dịch bệnh phá hoại trong 2 năm qua không?

1. Có 2. Không 3. Không chắc

Nếu có, loại dịch bệnh nào? _____

Tổn hại do dịch bệnh gây ra là bao nhiêu? _____ VND

Ông/bà làm thế nào để giải quyết vấn đề? _____

_____

Chỉ số kỹ thuật

1.17a. Sức khoẻ: Có ai trong gia đình bị ốm đau thường xuyên không?

1. Có 2. Không 3. Không chắc

1.17b. Có ai trong gia đình bị ốm tháng trước và do đó phải nghỉ làm hoặc nghỉ học không?

1. Có 2. Không 3. Không chắc

1.17c. Ông/bà có nước sạch để uống không?

1. Có, luôn luôn 2. Thỉnh thoảng 3. Hiếm khi 4. Không 5. Không chắc

1.17d. Ông bà lấy nước sinh hoạt từ đâu?

1. Nước máy 2. Nước giếng khoan
3. Từ sông/hồ 4. Community well
5. Mua 6. Khác (nêu rõ)

1.17e. Gia đình có nhà vệ sinh không?

1. Có 2. Không 3. Không chắc

1.17f. Hộ gia đình ông/bà có nhận được sự hỗ trợ nào về dịch vụ xã hội trong 2 năm qua không?

1. Có 2. Không 3. Không chắc

Nếu có, loại dịch vụ?

1. Thẻ bảo hiểm 2. Trợ cấp (dầu, muối, v.v.v) 3. Giảm học phí
4.Hỗ trợ nhà ở 5. Hỗ trợ đất đai 6. Đào tạo nghề 7.Khác (nêu rõ_____)

1.18 Nhà Ông/bà cách UBND xã/trung tâm xã bao xa? ……. Km
Trong trường hợp xảy ra thiên tai nghiêm trọng, gia đình ông/bà đã/sẽ sơ tán đến nơi an toàn hơn không?

1. Không.
2. Có

Nếu có, Ông/bà có thể đi đến nơi tránh thiên tai nào?

1. Toà nhà chính phủ (Nhà UBND, trường học, trạm xá, trung tâm cứu hộ an toàn...)
2. Chùa, nhà thờ, đền,..
3. Nhà hàng xóm 4. Khác

1.19 Gia đình Ông/bà nhận được thông tin/tin về thiên tai bằng phương tiện gì? (có thể tích vào nhiều hơn một ô)

1. T.V 2. Đài 3. Internet
4. Báo 5. Thông tin từ hàng xóm
6. Thông tin từ cán bộ địa phương
7. Khác (nói rõ)……..

<u>Chỉ số vốn xã hội</u>

1.20 Trong năm qua hộ ông/bà có vay tiền từ bạn bè hoặc hàng xóm không?

1. Có 2. Không 3. Không chắc
Nếu có, bao nhiêu? _____ vay của ai: _____

1.21 Trong năm qua ông/bà có cho bạn bè hoặc hàng xóm vay tiền không?

1. Có 2. Không 3. Không chắc
Nếu có, bao nhiêu? _____ cho ai vay: _____

Trong năm qua ông/bà có vay tiền từ ngân hàng không?

1. Có 2. Không 3. Không chắc
Nếu có, bao nhiêu? _____ Ngân hàng: _____

1.22a. Ông/bà có khoản để dành để sử dụng cho tái phục hồi sau thiên tai không?

1. Có 2. Không 3. Không chắc

1.22b. Gia đình Ông/bà đã bao giờ phải nhờ đến sự giúp đỡ từ bên ngoài khi gặp phải những vấn đề về thiên tai/ lũ lụt / ...xảy ra không?. Và ai là người mà Ông/bà tìm đến để được trợ giúp?
1. Không, tôi không thể tìm được ai để giúp tôi
2. Có, (nói rõ nguồn và chi tiết được giúp như thế nào)……
   1. họ hàng giúp khi ……
   2. bạn bè giúp khi …….
   3. cơ quan nhà nước (nói rõ) giúp khi ……..
   4. Khác (nói rõ)……

1.23 Số lần họp thôn/ 1 năm tại đây?
1. Tuần một lần 2. Tháng một lần
3. 3 tháng một lần 4. Một hoặc hai lần trong một năm
5. Không bao giờ
6. Tôi không biết

1.24 Hàng xóm của Ông/bà có hay trao đổi kinh nghiệm/ý tưởng với nhau về thiên tai và biến đổi khí hậu không?
1. Không 3. Thỉnh thoảng
2. Hiếm khi 4. Thường xuyên

1.25 Ông/bà có là thành viên của tổ chức cộng đồng nào không? Có/không
1. Không 2. Nông dân
3. Phụ nữ 4. Thanh niên
5. Cựu chiến binh 4. Khác (nóii rõ) .....

1.26 Nếu có, Ông/bà có là thành viên tích cực không?
1. Không, 2. có

1.26a Ông/bà có là thành viên của tổ chức như Nhóm sử dụng nước, Hội nông dân hay nhóm tín dụng/ hụi phụ nữ ...v.v.v?
1. Có 2. Không 3. Không chắc

Nếu có, tổ chức nào ? _____ bao lâu lại họp một lần? _____

PHẦN II: SỰ KIỆN BÃO/LỤT NGHIÊM TRỌNG VÀ TÁC ĐỘNG CỦA NÓ

2.0 Ông/bà có thấy khí hậu thay đổi ở đây không, so với 10 năm trước?
1. Có 2. Không 3. Không chắc

Nếu có, thay đổi như thế nào? (Có thể đánh dầu nhiều)

bão thường xuyên	ít bão hơn
nhiều bão to hơn	ít bão to
mưa to hơn	mưa nhỏ hơn
mưa lâu hơn	mưa ngắn hơn
nhiều lũ lụt hơn	ít lũ lụt hơn
khô hơn	ẩm ướt hơn
mùa khô kéo dài hơn	mùa mưa dài hơn
tăng t0 TB	giảm t0 TB

2.1 Trong 5 năm trở lại gần đây hộ bao nhiêu lần gia đình ông/bà phải trải qua hiện tượng khí hậu cực đoan như bão hoặc lũ hoặc hạn hán?
_____ lần

2.2 Nếu có thì là hiện tượng gì?
1. Lũ 2. Hạn hán 3. Bão 4 Mưa lớn 5. Lốc 6. Sụt lở đất 7.Lũ quyét 8. Thời tiết lạnh
9. Khác (nói rõ)_____

2.3 Nhà ông/bà có bị ngập trong vòng 5 năm qua không?
1. Có
2. Không

2.4 Nếu có, trong khi bị ngập mực nước lên cao như thế nào?
1. Đến sân cao…… m
2. Vào tận trong nhà sâu …… m

2.4a Ông/bà có nhận được những cảnh báo trước khi hiện tượng khí hậu nói trên xảy ra không?
1. Không
2. Có,
Thông qua phương tiện truyền thông nào?
1. Họ hàng/ bạn bè
2. Hàng xóm
3. Chính phủ
4. Chính quyền địa phương
5. Tổ chức phi chính phủ
6. Phương tiện thông tin đại chúng (Đài/ ti vi/ báo)
7. Khác (nêu rõ)……
   a) Ông/bà có hiểu được thông điệp đó không? 1. Có 2. Không
   b) Kể từ thời điểm ông/bà nhận được lời cảnh báo thì bao lâu sau thien tai xảy ra (Hãy cho con số thời gian cụ thể) .....giờ/ ngày
   c) Sau khi nhận được lời cảnh báo, ông/ bà mất bao thời gian để làm các hoạt động bảo vệ tài sản và gia đình mình an toàn không bị ảnh hưởng? …… giờ

2.5 Trong 5 năm qua những hiện tượng khí hậu vừa nêu trên có gây thiệt hại cho gia đình ông/bà không?
1. Thiệt hại/mất nghiêm trọng
2. Thiệt hại/mất không đáng kể
3. Không thiệt hại/mất *(chuyển sang câu hỏi 2.7)*

2.6 Những mất mát/thiệt hại của gia đình Ông/bà do sự kiện đó gây ra là gì?

TT	Loại	Thiệt hại quy thành tiền (VND)
1	**Thiệt hại/mất đối với tài sản của hộ (chỉ tính thiệt hại/mất do sự kiện gây ra)**	
	Nhà	
	Gia dụng	
	Xe có động cơ/thuyền	
	Tiện nghi gia đình (nguồn nước, điện, thông tin)	
	Khác, nói rõ	
2	**Thiệt hại/mất đối với sản xuất của hộ (cây trồng/nông nghiệp/vật nuôi/nuoi trong thuy san/ca/hoạt động kinh doanh)**	
	Cây trồng/ nông nghiệp	
	Chăn nuôi và gia cầm	
	Trang trại nuôi trồng thuỷ sản	
	Nuôi cá	
	Kinh doanh hộ gia đình	
	Khác, nói rõ	
3	**Thu nhập bị mất**	
	Mất thu nhập/lương	
	Mất kinh doanh	
	Khác, nói rõ	
4	**Mất người/an toàn**	
	Chết hoặc thất lạc (noir o so nguoi)	
	Bị thương (chi phi dieu tri/thuoc va thu nhap bi mat)	
	Bệnh tật/ốm đau (chi phí điều trị/thuốc và thu nhập bị mất)	
	Khác, nói rõ…….	
5	**Khác, (nói rõ…… ví dụ mâu thuẫn trong việc giải quyết vấn đề trong cộng đồng, di cư)**	

2.7 Bao nhiêu ngày/tuần/tháng/năm sau khi cơn bão xảy ra Ông/bà cho rằng gia đình mình có thể phục hồi được? (Nêu rõ đơn vị thời gian) ngày/tuần/tháng/năm…… ……
……..

2.8 So với các hộ khác trong thôn, ông/bà có cho rằng gia đình mình dễ bị tổn thương hơn đối với khí hậu, đỡ bị hơn hoặc cũng giống như các hộ khác?
Dễ bị tổn thương hơn đối với các hiện tượng khí hậu
Ít bị tổn thương hơn đối với các hiện tượng khí hậu
Giống như các hộ khác trong thôn

PHẦN III: HÀNH VI THÍCH ỨNG VỚI SỰ KIỆN BIẾN ĐỔI KHÍ HẬU CỤ THỂ

3.1 Đối với các hiện tượng khí hậu (nêu trên) mà gia đình ông/bà vừa phải trải qua trong 5 năm trở lại gần đây, ông/bà đã ứng phó như thế nào đối với các hiện tượng này? Cho một vài ví dụ và ước lượng chi phí.

Hiện tượng khí hậu	Thích nghi ngắn hạn (ít hơn 1 năm)	Thích nghi trung hạn (1- 5 năm)	Thích nghi dài hạn (hơn 5 năm)
Ngập	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND
Hạn hán	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND
Bão	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND
Mưa lớn	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND
Lốc	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	11. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND
Sạt lở đất	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND
Lũ quyét	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND
Thời tiết lạnh	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND

Hiện tượng khí hậu	Thích nghi ngắn hạn (ít hơn 1 năm)	Thích nghi trung hạn (1- 5 năm)	Thích nghi dài hạn (hơn 5 năm)
Khác (nêu rõ)_	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND	1. Hoạt động: _____ _____ _____ 2. Chi phí _____ VND

3.2 Trước, trong và sau khi hiện tượng khí hậu nêu trên xảy ra, thôn/ xóm của ông bà có cùng nhau làm các hoạt động chung nào không? Nếu có, hãy liệt kê. Bản than gia đình ông bà có tham gia vào những hoạt động nào trong những hoạt động đó không, tại sao. Ai trong hộ nhà ông bà tham gia? ……
……
……

3.3 Hộ gia đình ông/bà đã nhận được những hỗ trợ/ giúp đỡ gì, từ ai/ tổ chức nào để đối phó với climate events vừa qua (trước, trong hay sau khi climate events đó xảy ra) ……
……
……

3.4 Hộ gia đình của ông/bà cần hỗ trợ những gì để khắc phục những hậu quả do cơn bão gây nên trong đợt vừa qua và trong tương lai? ……
……
……..

3.5 Ông/bà có cho rằng những sự kiện bão, lũ lụt lớn là thiên định và con người ít khả năng kiểm soát được?
1. Rất đồng ý 2. Đồng ý 3. Không đồng ý 4. Phản đối

3.6 Theo Ông/bà, trong tương lai, những cơn thiên tai xảy ra tại địa phương sẽ như thế nào?
1. trầm trọng hơn những sự kiện đã trải qua
2. gần giống như những sự kiện đã trải qua
3. không chắc
Nếu trầm trọng hơn, Tại sao? ……..……
……

PHẦN IV: Kế hoạch tương lai/thích nghi

4.1 Trong 20 năm tới ông/bà muốn con mình làm gì?
1. Giống như bố mẹ 3. Tìm việc làm mới ở địa phương (nêu rõ _____) 2. Chuyển đến vùng mới
4. Khác _____

4.2 Nếu trong vòng 40 năm nữa sản lượng [đưa ra những ví dụ khác về thay đổi trong nông nghiệp cho mỗi vùng, không chỉ nói về Kon Tum) cà fê ở Kon Tum nói riêng và Tây nguyên nói chung sẽ giảm 40% do biến đổi khí hậu thì bà con trong thôn sẽ chuyển đổi sang trồng cây gì và nuôi con gì? Vì sao?

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

4.3 Nếu trong vòng 40 năm nữa lượng mưa ở vùng này sẽ tăng và ngập lụt sẽ xảy ra thường xuyên hơn thì gia đình mình sẽ làm gì?
Đưa ra những lựa chọn cụ thể: _____
_____

4.4 Nếu trong vòng 40 năm nữa hạn hán ở vùng này sẽ nghiêm trọng hơn thì gia đình mình sẽ làm gì?
Đưa ra những lựa chọn cụ thể: : _____
_____

4.5 Nếu trong vòng 40 năm nữa mực nước biển sẽ tăng hoặc nhiễm mặn sẽ trở nên trầm trọng hơn thì gia đình mình sẽ làm gì?
Đưa ra những lựa chọn cụ thể: : _____
_____

APPENDIX 5. SAMPLE PSD WORKSHOP AGENDA

Workshop Program for Second National Workshop, March 31, 2010

8:00–8:30	Registration
8:30–8:40	Welcome and Introductions – Welcome remarks by Director of CRES – Welcome remarks by Vice President of Vietnam National University – Welcome remarks by representative of World Bank
8:40–8:50	Brief Introduction to the EACC Study by social team
8:50–9:10	Overview of Climate Change Scenarios for Vietnam (Ministry of Natural Resources and Environment)
9:10–9:20	Overview of the Current and Potential Future Socioeconomic Trends (Ministry of Planning and Investment)
9:20–9:40	Climate Change Adaptation Policy Review in Vietnam (Pam McElwee)
9:40–10:00	Climate Change Adaptation in Vietnam: Preliminary research findings (CRES)
10:00–10:30	Plenary Discussion
10:30–11:00	Coffee/Tea break
11:00–11:45	Group discussion: Impacts of climate change and vulnerability
11:45–13:30	Lunch
13:30–14:15	Group discussion: Prioritizing adaptation options
14:15–14:30	Coffee/Teak break
14:30–16:30	Group discussion: Adaptation pathway review
16:30–17:15	Plenary discussion and reflecting on the day

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