



ECONOMICS OF ADAPTATION TO CLIMATE CHANGE

Social Synthesis Report

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Executive Summary

The social component of the **Economics of Adaptation to Climate Change (EACC)** study (hereafter ‘study’) aims to highlight how vulnerability to climate change is socially differentiated, what elements are needed to strengthen the adaptive capacity of poor people and regions, and how governments can support adaptation that addresses the needs of the poorest and most vulnerable, while maximizing co-benefits with development goals. In addition, the study draws attention to ‘soft’ or institutional and policy measures in adaptation, which are well placed to complement ‘hard’ infrastructure investments. The social component complements the global and sector-specific analyses of the EACC study by bringing the voices of the poor and vulnerable to the analysis to help ensure that climate-resilient adaptation investments best respond to their needs.

To achieve these objectives, this study employed a combination of innovative analytical methods including participatory scenario analysis to reveal local stakeholders’ assessments of robust adaptation pathways in the context of uncertainty. By bringing together local knowledge with expert information, the social component generated new evidence on how vulnerability is socially differentiated; identified the risks and benefits of adaptation options for a range of actors in an integrated and cross-sectoral manner; and highlighted the importance of social accountability and good governance for achieving pro-poor, climate resilient development. The study extends the use of participatory scenario analysis to include a focus on local development planning in national contexts, while the fieldwork results present how current coping strategies and policy emphases may guide development of future adaptation measures.

This body of research aims to inform our diagnosis of climate change; our understanding of vulnerability; the political economy of climate policy and action; the composition of local and national actors and coalitions; and the design, monitoring and review of process and policy instruments. In doing so, it is hoped that results may be used to inform the setting of targets and thresholds and the identification of

benchmarks for success in adaptation planning. In particular, this report aims to demonstrate that integrating a social perspective into national efforts to design adaptation strategies will contribute to developing climate action that targets poor and disadvantaged groups at national and sub-national levels.

Key Messages

Vulnerability to climate change is socially differentiated. Exposure to climate risk poses different risks to different groups of people. The ability to weather a cyclone or a drought is shaped by a host of social factors including degree of social inequality; access to resources; poverty status; lack of representation; and effectiveness of systems of social security, early warning and planning. For example, gender inequities may lead women to experience climate hazards differently than men; similarly, the poor are likely to suffer disproportionately compared to the rich; and children and the elderly or people with a limited skill set may suffer more than others. Social identity may also lead to restricted access to certain resources and subsequent lower adaptive capacity. Social as well as political-economic structures will influence the impact of climate shocks and trends. People that contend with multiple inequalities will be most vulnerable to climate change.

Across all countries, those consistently identified as most vulnerable to climate risk were those already socially vulnerable (elderly, women, children, sick, disabled); ethnic minorities; indigenous peoples; people dependent on natural resources for their livelihoods (e.g., pastoralists); and migrants. The poor were identified as particularly vulnerable, but in some cases “richer” groups will also be greatly impacted in the short term, though their ability to recover is greater.

Local adaptation preferences are socially differentiated and conditioned by a host of social factors: preferred adaptation options varied remarkably across study sites. Local preferences consistently supported the need for both autonomous and

planned adaptation; a mix of hard and soft measures; and awareness of the importance of pursuing both communal and individual adaptation measures was evident. In addition, the adaptation strategies perceived to be most effective were those that addressed underlying drivers of vulnerability, rather those that focused on climate change alone. ‘One size fits all’ adaptation planning does not work. Different communities among different regions will have different ideas about how to match their development objectives to the realities of climate change impacts.

Experience with climate events to date and past coping measures hold valuable lessons for the future; but future adaptation requires new knowledge and improved access to information – otherwise the risk of adopting maladaptive actions that perpetuate vulnerability in the long-term is high. Most actions taken by vulnerable groups today are only short-term coping mechanisms; attention to long-term adaptation is generally weak.

Most planned adaptation actions to date have focused on hard infrastructure development. For governments, decisions to invest in hard adaptation measures may be “high-regrets” options in social and economic terms because these investments are often irreversible. For this reason, decisions to invest in hard options merit careful review. “Thinking outside the box” on adaptation was not very common across most field sites and may be attributed to the tendency for individuals to be constrained by their current context and inability to plan for future uncertainty.

Enabling livelihood diversification is essential to manage climate risk; in some cases, profound transformation of livelihood activities will be required. Enabling social, political and economic structures will be necessary to support sector-specific investments aimed at strengthening the local adaptive capacity. In addition, improved access to information and decision-making processes for dealing with climate impacts will be essential.

TABLE 1

CHECKLIST FOR GOOD ADAPTATION PRACTICE

RECOMMENDATION

Combine investments in hard and soft adaptation options to meet the needs of the poorest and most vulnerable	✓
Consider and build on past strategies to cope with climate variability when planning future adaptation interventions	✓
Pursue adaptation interventions that realize co-benefits with sustainable development	✓
Anchor decision-making processes in inclusive and participatory processes. Promote transparency, accountability, the capacity to monitor and evaluate results, and the integration and coherence of policies across sectors and scales	✓
Target geographic regions where sensitivity to climate hazards is high. Consider multi-sectoral investments that build area resilience	✓
Invest in enabling policies that enhance sector-specific interventions such as improved land policy, improved natural resource management and the transfer and adoption of new technology	✓
Design social policy interventions (including social protection, education and training) that take better account of climate risk	✓

Local adaptation preferences largely coincided with adaptation plans and climate change strategies at the national level (e.g., NAPAs). Broad support exists at sub-national levels for national priority areas such as agriculture and water resources management; land management; roads; and early warning systems. In addition, additional investments in governance; social protection; training and education; and land tenure are strongly favored at sub-national levels.

Based on these findings, the recommendations of this synthesis report are summarized in Table 1, **Checklist for Good Adaptation Practice**. This Checklist may be used as a guide to inform the setting of targets and the identification of benchmarks for success in pro-poor adaptation planning. Notably, this table highlights issues that may not be immediately evident from a strictly quantitative cost-benefit analysis of adaptation options. For this reason, Table 1 should be viewed as an important complement to the recommendations of the overall EACC study.



One

Introduction and Overview to the Economics of Adaptation to Climate Change Study

The Economics of Adaptation to Climate Change (EACC) study estimates that it will cost \$75-100 billion each year for developing countries to adapt to a 2° warmer world from 2010 to 2050 (see Box 1 for comparison with previous estimates). The study, funded by the governments of the Netherlands, the UK, and Switzerland, had two specific objectives. The first was to develop a global estimate of adaptation costs to inform the international community's efforts to tailor support and provide new and additional resources to help vulnerable developing countries meet adaptation costs. The second objective was to support decision makers in developing countries to better evaluate and assess the risks posed by climate change and to better design strategies to adapt to climate change. This objective comprised the identification of adaptation options that incorporate strategies dealing with high uncertainty, potentially high future damages, and competing needs for investments in social and economic development up to 2050.

To achieve these objectives, a development baseline was developed for each sector using a common set of GDP and population forecasts for 2010-2050. From these dynamic baselines, sector-level performance indicators were determined to project development to 2050. Two climate scenarios were chosen to capture the range of possible model predictions. As precipitation is the major variant across models, two model scenarios that presented the extremes of wet and dry climate projections were used.

The EACC study comprises a global track to meet the first study objective and a case study track to meet the second objective (World Bank 2010a). The country track comprises seven countries: Bangladesh, Bolivia, Ethiopia, Ghana, Mozambique, Samoa and Vietnam. Under the global track, adaptation costs for all developing countries are estimated by major economic sectors using country-level data sets that have global coverage. Sectors covered are agriculture, forestry, fisheries, infrastructure, water resources, coastal zones, health, and eco-system services. Cost implications of changes in the frequency of extreme weather events are also considered, including the implications for social protection programs. Under the country track, impacts of climate change and adaptation costs are established by sector, but only for the major economic sectors in each case study country.

The country track differs from the global track in two notable ways. First, a macroeconomic modeling framework is used in the country track (in most case studies) allowing for analysis of macroeconomic and cross-sectoral effects of the impacts and adaptation to climate change. Second, the social component in the country track develops vulnerability assessments in socio-geographic hotspots in order to understand the socially differentiated nature of vulnerability. In addition, this component conducts participatory scenario development workshops in case countries to characterize various future adaptation pathways possible for different livelihood groups, given their identified



vulnerabilities and assets. These workshops serve as an important vehicle through which the perspectives of local populations may be used to help guide the planning and priority setting process carried out by technical and policy experts at a more macro level.

Previous estimates of the global cost of adaptation have ranged significantly. Box 1 presents an overview of these global cost estimates. Parry et al. (2009) have highlighted a number of common shortcomings in these estimates, such as the tendency to ignore the

costs of losses in ecosystem service provisioning and failure to take account of residual damages.

Existing estimates are limited due to several factors including their wide and uncertain range; paucity of sector-wide estimates; lack of consideration for climate-proofing current stocks; lack of an operational definition of adaptation; disconnect from climate projections; failure explicitly to treat uncertainty; lack of a projected development baseline; and failure to take account of any existing 'adaptation deficit'.

BOX 1**PREVIOUS ESTIMATES OF THE
GLOBAL COST OF ADAPTATION**

World Bank (2006): Annual adaptation costs \$9-41 billion per year for a 2-3°C increase in temperature.

Using same methodology but different parameter values

- **Stern (2006):** \$4-37 billion per year
- **UNDP (2007):** \$5-67 billion per year by 2015
- **UNDP (2007):** 47-109 billion / yr by 2015
includes social protection + disaster response

Where adaptation costs is a function of:
Baseline Investments x % Exposed to Climate Risk x
% Increase in Costs to Climate-proof Assets

- **Oxfam (2007):** NGO adaptation projects at least \$50 billion / yr
- **UNFCCC (2007):** First sector-based estimates \$28-69 billion / yr by 2030

Source: World Bank Presentation at Bonn Climate Talks (2009)



Two

Background to Social Component of EACC Study

Climate change will affect most people around the world; however, it is the poor and most vulnerable who have historically contributed least to causing the problem that stand to lose the most from its impacts. The inherently inequitable nature of this global challenge calls for special attention to be given to building the adaptive capacity of those least able to cope with increasing climate variability and climate change.

Yet despite facing a variety of climate threats, the most vulnerable populations will encounter surprisingly similar barriers to building resilience to climate change. Understanding vulnerability as sensitivity to risk and adaptive capacity, *in addition to* exposure to risk, has important implications for the way that climate change analysis, processes, and policy responses are shaped; and associated social and political implications are understood.

For the EACC study, the social component sought to highlight how local populations' vulnerability to climate change is socially differentiated, what types of resources local populations will need to strengthen their adaptive capacity, and how governments can support adaptation that addresses the needs of the poorest and most vulnerable and maximizes co-benefits with sustainable development. In addition, the social lens drew attention to 'soft' or institutional and policy measures in adaptation that would best complement the cost estimates of 'hard' infrastructure

investments generated under other components of the EACC study.

To achieve these objectives, this social component employed a combination of innovative, participatory methods including participatory scenario analysis, to identify how vulnerability is socially differentiated and to understand what a range of stakeholders consider robust adaptation pathways to be in the context of uncertainty. To date, such participatory scenario exercises have not been used at this scale in developing countries to reveal adaptation preferences focused on the needs of those most vulnerable groups in the short, medium and long-term, and to present how current coping strategies and policy emphases may guide development of future adaptation measures.

Notably, the social component builds on one of the key messages of the EACC synthesis report; namely, that development is the best form of adaptation, though adaptation will require developing differently. Evidence generated in the field is useful to help illustrate where it is best to focus on no-regrets approaches and where new measures may be needed to improve local and area resilience.

In addition, the EACC social synthesis report addresses the issue of "planned" i.e., public, adaptation versus "autonomous" adaptation undertaken privately, and draws conclusions about factors that may contribute to an enabling environment conducive to

pro-poor adaptation. This discussion on planned versus autonomous adaptation is significant as private measures are not considered extensively in the EACC synthesis report.

This body of research aims to inform our diagnosis of climate change; our understanding of vulnerability; the political economy of climate policy and action; the composition of local and national actors and coalitions; and the design, monitoring and review of process and policy instruments. It is hoped that results from the social component may be useful in informing the determination of adaptation targets and thresholds, and the identification of benchmarks for success in the future. In particular, integrating a social perspective into national efforts to design adaptation strategies will contribute to developing climate action that responds to the needs and interests of poor and disadvantaged groups and regions at the sub-national level.

Scope and Outline of the Report

This report presents the methodology developed and results derived from research conducted for the social component of the EACC country study track in Bangladesh, Bolivia, Ethiopia, Ghana, Mozambique and Vietnam. The report intends to complement the aggregated perspective of the global study and provide information on lessons learned and insights gained from a bottom-up, local-level analysis of vulnerability and preferred adaptation strategies. This synthesis report presents key messages on what drives vulnerability and how these factors multiply climate risk for poor households. Recommendations are made regarding the forms of adaptation that local groups consider most effective and the factors that must be considered to achieve climate-resilient development. These recommendations will help guide



prioritization of actions, as well as the development of a robust, integrated approach for increasing resilience to climate risks at the national and sub-national levels – particularly for the poorest and most vulnerable groups in society.

While this report focuses on adaptation, it recognizes that actions to mitigate climate change must be pursued in parallel and supports the conclusion from the EACC synthesis report; namely, that while investment in mitigation is essential, it may be reasonable for developing countries to devote more effort to adaptation over the next few decades.

The report comprises four main sections. The first section presents the methodology used for data collection and analysis in all six country case studies (see Annex 9 for a list of country reports and all other outputs from the EACC Social component). The second section focuses on the concept of vulnerability as composed of exposure to risk, sensitivity to that risk and adaptive capacity. Examples from the case study

countries are used to illustrate key factors that shape sensitivity and adaptive capacity.

The third section presents what adaptation means at the local level; discusses the key characteristics of a socially sustainable approach to achieving climate resilience; and shows to what degree local adaptation preferences reflect priorities embodied in national level climate change strategy documents and development processes. The final section provides recommendations for integrating these findings into the national planning processes in order to support socially sustainable, climate-resilient development outcomes.

Annexes 1–6 provide a more detailed overview of projected climate change impacts in each country case; details of site selection for fieldwork; and the rationale underlying this selection; and a brief summary of empirical findings in each case. Annexes 7 and 8 describe the fieldwork methodology and approaches used for participatory scenario development respectively (see also Kuriakose et al. 2009).



Three



Study Methodology

Analytical Underpinnings

The study approach included identification of key socio-geographic regions vulnerable to climate change, and site selection for qualitative and quantitative fieldwork and consultations that would enable adequate coverage of diverse livelihood groups, climate risks, and production systems. Care was also taken to include urban sites in country studies, though research focused primarily on natural resource-dependent rural areas. The study aimed to generate evidence drawn from local populations using participatory forms of analysis. This approach complemented the top-down modeling and sector-specific analyses of the EACC study in the following ways:

- ***A focus on the local level.*** Because most adaptation is ultimately undertaken at the local level, a better understanding of locally-assessed costs and benefits is necessary to inform national efforts to improve local adaptive capacity. The methodology aimed to generate information on the types of preferred adaptation strategies at the local level;
- ***A focus on vulnerable and disadvantaged socio-economic groups.*** Poor, natural resource-dependent rural communities and households, as well as urban populations will bear a disproportionate burden of the adverse impacts of climate change.
- ***A focus on building on existing adaptive responses.*** The methodology aimed to identify effective local coping strategies in order to demonstrate where existing adaptation responses with a high benefit-cost ratio could be scaled up and demonstrate what social, economic and political factors contribute to adoption of maladaptive practices in order to identify how more sustainable practices could be fostered;
- ***A focus on soft as well as hard adaptation options.*** Even rough estimates of hard versus soft adaptation options are missing from efforts to understand the costs of adaptation to climate change. The methodology undertook an examination of these adaptation options in specific socio-geographic hotspots particularly vulnerable to climate change, focusing particularly on identifying complementary and potential tradeoffs among sector-based interventions;
- ***A focus on ground-truthing sector-based analyses at the macro-level.*** Rapid assessment techniques were used to elicit information on

The methodology aimed to assess adaptation preferences of the most vulnerable in the short, medium and long-term in order to inform the development of policies and processes that build local resilience for poor, socially excluded groups in particular;

vulnerability to climate hazards as well as to take stock of corresponding coping strategies used by poor and vulnerable groups to confront climate change and variability. This bottom-up approach is valuable in setting priorities for planned adaptation investments at the national and sub-national levels;

- ***A focus on triangulation between different data sources.*** The social component provided for validation of data about vulnerability, climate risks and adaptation strategies adopted by the poor through the triangulation of assumptions and conclusions reached through the focus group discussions, key informant interviews and survey sources. These methods combined with participatory scenario development workshops were an approach by which the research team – including local counterparts – could corroborate or reject model-derived data and help to improve the understanding of the costs and benefits of particular adaptation pathways and sequences of options.

Research Approach and Questions

The social component set out to answer the following research questions on vulnerability to climate change and potential pro-poor adaptation responses:

- What factors make particular individuals, households, or sub-national regions more vulnerable to the negative impacts of climate change?
 - What has been people's experience of climate events to date and what adaptation measures have they taken (both autonomous and planned)?
 - How do different groups, and local and national representatives judge various adaptation options and pathways?
 - How do identified adaptation priorities align with existing development strategies and policy emphases?
- To answer these questions, the following five-step methodology was adopted:
- *Primary and secondary literature review* supplemented by stakeholder interviews, to identify both existing knowledge about vulnerability in the country, and current and planned efforts to reduce that vulnerability;
 - *Selection of socio-geographic hotspots* where both elements of exposure and sensitivity were present based on primary and secondary literature review. Local experts were interviewed and consultation workshops were conducted in order to validate selection of climate vulnerability "hotspots" (See Annexes 1-6);
 - *Fieldwork* in vulnerability hotspots to validate results of the initial literature review and develop more detailed vulnerability assessments. The fieldwork comprised three elements: key informant interviews with representatives from local organizations and other leaders; focus group discussions with men and women from different socio-economic strata; and household surveys with a stratified sampling approach. This approach aimed to identify livelihood and adaptation strategies of households in different income tiers; identify sensitivity factors contributing to vulnerability such as gender, migrant status and age; and assess the presence of formal and informal institutions operating in these areas (See Annex 7);
 - *Participatory Scenario Development (PSD) workshops* at local, regional and national levels in order to identify local development visions, expected impacts of climate change on these visions, and preferred adaptation options and combinations of options over time. This analysis included identifying the types of adaptation measures that

would benefit different vulnerable groups in each country; the trade-offs between these adaptation strategies; and what types of policies and pre-conditions would maximize co-benefits with sustainable development (See Annex 8); and

- *Preparation of a final country case study report* incorporating results from all sectors, so that the results could be evaluated across EACC country cases.

Fieldwork

The primary purpose of the fieldwork was to validate the results of findings derived from the literature review. First, the question of differential vulnerability was explored: who were the most vulnerable, and how did climate change impact these groups, relative to everyone else? Second, current coping strategies and adaptation practices were identified. In particular, study teams sought to identify whether there was regional variation in the impacts and strategies.

Fieldwork was undertaken at study sites, using qualitative and quantitative tools (see Table 2). Sites were selected from among major socio-geographic zones identified, with a view to covering key hazard types, a mix of urban and rural sites, and to ensure alignment with Bank or other donor projects operating in the country. Participatory Rural Appraisal (PRA) exercises (village history/ timelines; focus group discussions of men, women and different age groups; wealth ranking; mapping of institutional and tenure issues; impact diagrams of climate events and community risk mapping, matrix ranking of adaptation options) were undertaken, as well as key informant interviews with local government, NGOs and traditional leaders.

Finally, household interviews were undertaken (10–20 per site from different income tiers, with questionnaire modules covering household composition, labor allocation, asset base, livelihood sources, ethnicity, migration, patterns of income and expenditure, agricultural practices, landholdings and land tenure regimes,

responses to climate and other shocks participation in formal organizations, local governance, adaptation practices, collective action and risk-sharing, and current access to public investments and services).

Participatory Scenario Development

The use of participatory scenario development (PSD) as a tool to elicit stakeholder preferences on adaptation is a distinguishing feature of the EACC study. PSD is traditionally used to “identify the effects of different responses to emerging challenges, to determine how different groups of stakeholders view the range of possible policy and management options available to them, and identify appropriate public policies and investment support necessary to facilitate effective future actions” (Bizikova et al. 2009).

For the purpose of the EACC study, PSD workshops were conducted in case countries at the local, regional and national levels with a range of stakeholders, including members of vulnerable groups and those representing them. PSD provided a framework and context in which stakeholders identified preferred adaptation options and sequences of interventions, based on their experience and information provided on local and national climate and economic projections. The PSD approach centered on the identification of largely planned adaptation measures that aligned with envisaged development trajectories and led stakeholders to consider potential trade-offs, and possible adverse social impacts of adaptation actions. In addition, PSD helped to determine how different groups of stakeholders prioritized the types of support and investment that would be needed to facilitate future adaptation (Bizikova et al. 2009).

PSD was a vehicle through which the concerns and adaptation preferences of traditionally poor and marginalized groups were represented and discussed. These results based on the effective participation of

TABLE 2

SCOPE OF FIELDWORK AND PARTICIPATORY SCENARIO DEVELOPMENT WORKSHOPS

	No. of "Hotspots" (sites)	Urban site included	No. of Agro-ecological zones covered	No. of Households interviewed	No. of Focus Group Discussions	No. of PSD Workshops		Total attending Participants	Zonal Characteristics (for study sites)
						Local/Regional	National		
Bangladesh	8	Yes	n.d	170	n.a.	5	2	234	HAZARD-BASED: Drought; salinity; cyclone; river flood; waterlogging; tidal flood; drainage congestion
Bolivia	14	No	4 of 16	70	45	28	1	n.a.	AGRO-ECOLOGICAL: Valleys Altiplano; Plains; Chaco
Ethiopia	7	No	3 of 8	294	6	3	1	165	AGRO-ECOLOGICAL: Mid-highland belt zone; Lowland pastoral; Mid-highland perennial and root crops
Ghana	4	Yes	4 of 6	80	8	3	2	137	AGRO-ECOLOGICAL: Coastal Savannah; Forest zone; Transition zone; Northern Savannah
Mozambique	15	No	6 of 6	137	45	2	1	104	ECONO-GEOGRAPHIC: Coastal urban areas; Non-urban coastal; Limpopo River Valley (upstream of Xai-Xai); Other flood prone River Valleys; Drought-prone inland areas; Inland area of high agricultural productivity
Vietnam	7	Yes	4 of 8	181	22	4	2	220	SOCIO-GEOGRAPHIC: Northern Mountains; Central Highlands; Central Coast; Mekong Delta

a diverse range of stakeholders serve as a valuable contribution to the growing evidence base on vulnerability to climate change and adaptation.

Components of PSD include:

- Process-oriented and collaborative approaches that involve stakeholders participating in exploring the future in creative and policy-relevant ways;
- Climate and development baseline projection information which is used for developing “visualizations”;
- Structured debates around development priorities and relevant adaptation responses and well as trade-offs and synergies among adaptation options or policy reforms; and
- A focus on strengthening the inter-sectoral linkages between adaptation and development priorities that are not specific to climate change (Kuriakose et al. 2009; Bizikova et al. 2009).

The objective of these PSD workshops was to foster a structured discussion and identification of adaptation pathways that:

1. Identified the most important impacts of future climate change and climate variability on local populations as understood by them, taking into account baseline and projection scenarios presented by modelers;
2. Assessed the probable impacts of these identified climate changes on particularly vulnerable people and livelihoods and what the expected associated adaptation responses are 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 trade-offs 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 et al. 2009).

Participants were able to identify the types of adaptation support they considered to be most effective – including soft adaptation options such as land use planning, policy reform and greater access to information – for managing future climate risks.

While recognizing the limitations of the PSD process (as discussed in the following section), the study team endorses the continued development and use of participatory scenario development as an analytical tool to elicit stakeholder preferences on adaptation to climate change.

Table 2 provides details on the scale of the fieldwork and PSD workshops conducted in each country.

Study Contributions and Limitations

The social component of the EACC study complements the global and sector-specific analyses of the EACC study by amplifying the voices of those most vulnerable to climate change impacts. It helps to inform national-level planning on climate adaptation with a view to prioritizing measures that best address the needs of those most vulnerable to the effects of climate change. It is also specifically designed to help strengthen national capacity to undertake policy research on pro-poor adaptation and thereby help inform ongoing national policy and planning processes (see Box 2 for illustrative examples).

More specific contributions of the social component to the overall EACC study are that it:

- helped identify the wide range of soft adaptation options that are available to complement hard adaptation investments;

- focused on the ability of local populations to mobilize assets and resources (including forms of social, physical, financial, natural, and cultural capital) to adapt to climate change and build resilience;
- highlighted issues of scale and the need for complementary measures to be undertaken at national and sub-national levels;
- examined the role of a wide range of formal and informal institutions in contributing to adaptation, thus taking the EACC analysis beyond planned adaptation to consider autonomous forms of adaptation undertaken by households, civil society organizations, and the private sector;
- called attention to political economy issues and their influence over alternative policy choices; and
- applied Participatory Scenario Development techniques to highlight the importance of structured, bottom-up assessment approaches, applied in a disaggregated manner within developing

BOX 2

STRENGTHENING NATIONAL CAPACITY IN PRO-POOR ADAPTATION RESEARCH AND PLANNING

A key objective of the social component of the EACC study was to strengthen national capacity in pro-poor climate change adaptation research and planning. This was done in three main ways:

To implement the EACC social study methodology, national researchers were trained in participatory approaches or paired with experienced international researchers; in some cases, social science institutes were paired with natural science institutes. In **Bolivia**, prior to initiating the fieldwork, a capacity building workshop was held at the national level during which forty individuals from nine local NGOs were trained in using participatory approaches for conducting vulnerability assessments related to climate change at the community level. In **Vietnam**, the Center for Natural Resources for Environmental Studies (CRES) at Vietnam National University Hanoi was paired with the Dragon Institute of Can Tho University, a center of excellence on climate change for the Mekong Delta. This collaboration aimed to promote and facilitate the use of participatory approaches for adaptation research in an institute traditionally focused on the physical impacts of climate change.

A Training of Facilitator's approach guided planning, design and conduct of the the Participatory Scenario Development (PSD) workshops. Prior to conducting PSD workshops in the African case countries, local research teams gathered at a regional training event to learn about designing and conducting participatory scenario development workshops for adaptation planning. In addition, a Training Manual (see ESSA & IISD 2009) based on EACC experience with PSD workshops was prepared to serve as a guide for future efforts to design and conduct participatory scenario development workshops focused on adaptation to climate change.

Engagement with national planning and program processes helped to ensure that study findings will inform current and future adaptation planning. For example, in **Vietnam**, the EACC-social team engaged in policy dialogue with the NGO Climate Change Working Group as well as the State Committee for Ethnic Minority Affairs (CEMA); the latter group is preparing a Socio-economic Development Plan for 2011-2015 which will be informed by EACC study results. In addition, EACC study inputs on climate adaptation have contributed to the design of a multi-donor Natural Resource and Environmental Governance Program in **Ghana**.

Findings from the EACC social component will also inform the World Bank's Pilot Program on Climate Resilience (PPCR) in **Bolivia** and **Bangladesh**. In addition, application of the PSD methodology for ongoing climate change work is currently under consideration for the PPCR in Tajikistan.

countries to bring multi-stakeholder perspectives to bear on adaptation planning.

In spite of these contributions, it is important to acknowledge certain limitations of the social component.

The social component was largely a qualitative investigation, with limited efforts to collect quantitative household data. The qualitative approach was helpful in understanding process and social dynamics, as well as perceptions and value preferences of various stakeholder groups. However, detailed distributional analysis of climate impacts (e.g., on poverty rates; expected migration) was beyond the scope of this study.

The social component did not attempt to provide quantitative data on either the costs or the benefits of adaptation measures identified by local stakeholders. As a result, there were limitations in the extent to which the findings from the social component were integrated with the economic analyses conducted under the overall EACC study.

While efforts were made to select field sites most representative of key climate risks in each case country, the number of sites and households surveyed were limited. Urban sites are particularly under-represented in the EACC-Social study.

The PSD process has limitations of its own. In particular, cognitive biases amongst workshop participants inevitably influenced discussions on development, climate change and adaptation preferences, as can be expected from this type of process. For example, a workshop structured around questions of climate change tended to elicit responses focused first and foremost on climate change, whether or not these represent the key concerns of stakeholders. Nonetheless, several of the exercises in the workshop (such as impact diagrams, and timeline of past adaptation measures and responses to extreme events) generated information on adaptation that was not accounted for in the largely quantitative analysis of the wider EACC study. More specifically, this includes information regarding indirect effects of climate change such as increases in conflict at the community

level due to natural resource scarcity and emphasis on the need for gender equity, non-farm diversification and improved governance in urban areas.

While grounded in scientific evidence, the PSD process must still be recognized as a participatory method for joint analysis and reporting of stakeholder preferences and assessments. Discussions on future adaptation needs, no matter how structured, are inevitably conditioned by limits of the past experience of both participants and facilitators and access to information; as well as prevailing policy discourse of what seems possible and important in the current context. Difficulties in people's ability to imagine and plan for a different future abound, and one must recognize the possibility of inherent path dependence in identifying routes forward. The workshop design allowed for careful cross-checking of preferences, and interrogation of preferences with regard to pro-poor response, synergies among options and the like, however it is challenging for participants to imagine a world in 20 or 30 years' time, and to know what types of livelihood measures might best meet future needs. This was particularly apparent when participants were asked to sequence their adaptation preferences over the short, medium and long-term; participants tended to focus on short or medium-term needs, with the long-term visions were generally characterized by options that today seemed infeasible.

While all workshops followed similar guidelines, workshop protocol varied. This is because local teams: (i) incorporated their own ideas for improving focus on adaptation and adaptation pathways; (ii) integrated different interactive and engaging tools to spur discussion amongst participants; and (iii) accommodated comments and feedback received during initial in-country workshops. Necessarily, all workshops were highly customized in each country to reflect national and local realities and were tailored to best suit the range of participants involved (villagers, or district-level representatives for example). In addition, the size and capacity of the facilitating team varied between workshops and between countries which also influenced workshop design and conduct.



Four



Conceptual Framework

The EACC-Social study focused on understanding livelihood systems; vulnerability to climate change as socially differentiated; and the policy and institutional factors that enable climate resilience.

Assets 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 and economy (Scoones 1998; Leach et al. 1999; Pretty and Ward 2001). Livelihood simply defined refers to the way in which people make a living and sustain themselves and their families, 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 encompass development. These aspects include physical capital (infrastructure), financial capital (monetary assets); natural capital (including land, forest resources, and water), human capital (skills, education, health); and social capital (relationships, affiliations, community networks, and other ties upon which people draw to sustain their livelihoods) (Leach et al. 1999). In other words, rather than simply looking at production and income/expenditure data, livelihood studies have attempted to

incorporate analytical understanding of a variety of market and non-market resources that affect household well-being. From these studies emerges the need to understand the way in which institutions, social systems, and economic assets combine to form and reform locally-specific livelihood systems. The current study is informed by such an understanding.

Vulnerability to Climate Change: A Socially Differentiated Phenomenon

Vulnerability has often been understood in the climate change literature as exposure to climate change. This limited definition has led development practitioners and policy experts to devise one-dimensional interventions focused on protecting infrastructure, rather than protecting the vulnerable populations living in these areas. Today, there is growing recognition that vulnerability is composed of *exposure* to risk, *sensitivity* to that risk, and *adaptive capacity* (IPCC 2007).

Exposure deals with the character, magnitude and rate of climate change and variation to which a system is exposed. Populations will be vulnerable when exposed to extreme weather events; increased water insecurity; sea-level rise; reduced agricultural productivity;



increased health risk; large-scale singularities and aggregate impacts that worsen over time (e.g., temperature rises).

The *sensitivity* of a system is high if an external stimulus such as drought or cyclones is predicted to strongly impact that system. More specifically, the sensitivity of local populations is acute if they are highly dependent on the environment for livelihoods, food and energy (as in the case of pastoralists or fishing communities); if they are highly exposed to hazards due to their geographic context; if they are deficient in assets and resources; and if prevailing governance structures are weak. The most vulnerable populations will confront multiple threats even in the absence of climate change. At the same time, climate change threatens to enhance existing inequalities and exacerbate already stressed systems.

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 defined as the capacity to absorb stress (either through resistance or adaptation); to manage and maintain basic functions during such stress; and to bounce back after such stress. Improving levels of adaptive capacity can be particularly complicated inasmuch as it entails action across sectors and at local, national and international scales, among a range of actors and institutions. Having said this, development interventions at regional levels can go a long way to improving resilience and adaptive capacity. Poverty, inequality, dependence on natural resources, governance and institutional effectiveness, and access to technology and infrastructure are all factors that affect adaptive capacity and influence the types of adaptive responses that households and communities can pursue successfully. Climate resilience is strengthened where adaptive capacity is improved, inequalities are addressed, and exposure to climate risk is minimized.

Thus consideration of the broad range of factors that shape sensitivity and adaptive capacity, in addition to that of physical exposure itself, is crucial for building

resilience into socio-ecological systems and achieving sustainable development.

Vulnerability to climate change is socially differentiated.

Climate change has the potential to affect families, communities and countries around the world; however, different groups of people in different places will be affected to different degrees. To date, the human dimension of vulnerability has been rather neglected in vulnerability and adaptation studies (Adger and Kelly 1999). Crucially, the suffering and damages that people experience from storms, droughts and other climate events are shaped by social, political and economic factors on the ground. Indeed, vulnerability can be considered to be a socially constructed phenomenon shaped by a set of institutional and economic dynamics (Adger et al. 2004) where resource availability and the entitlements of individuals to draw on these resources help shape the level of security or vulnerability of a particular group and their ability to buffer against shocks (Leach et al. 1997).

An extensive literature on social vulnerability, emerging particularly from the hazards literature in geography and anthropology, has related how access to resources is distributed within and among communities (Adger et al. 2004). Research in this area primarily focuses on ‘vulnerability mapping’ to identify who (which individuals, groups of people, communities and regions) is more vulnerable 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 – and have also considered more “generic factors” of vulnerability, such as wealth status and levels of inequality; access to resources (e.g., financial, natural); health and labor; and social exclusion.

A major challenge in vulnerability studies is that capturing factors that researchers believe will impact vulnerability and adaptive capacity are often hard to measure with discrete quantitative indicators; an

example would be a factor such as “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 (Box 3), but which are often difficult to capture in single quantitative indicators.

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 Wandel 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 on adaptive capacity (Brooks et al. 2005) which considered national indicators measured against past vulnerability to climate-related disasters, the capacity of countries to adapt to climatic events was most strongly associated with good development 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 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).

The social component of the EACC study provides a more complete picture of the types of factors that contribute to vulnerability and adaptive capacity and

BOX 3

EXAMPLES OF PROCESSES THAT AFFECT VULNERABILITY

LOCAL-LEVEL PROCESSES

- Increasing labor migration
- Declining labor availability
- Loss of customary rights and change to “modern” tenure systems
- Reduction of mobility in terms of grazing livestock
- Increasing need for cash
- Increasing price of inputs
- Privatization of land and resources
- Monetization of resources and services; increasing health and education costs
- Loss of access to communal resources
- Increasing skills requirements for non-agricultural employment

PROCESSES AT HIGHER SCALES

- Population growth
- Increasing/decreasing provision of services by the state
- Increasing penetration of global markets/ Re-orientation of production away from local circulation and reciprocity
- Relative declining value of rural products, both agricultural and nonagricultural
- Changing legislation and tenure systems
- Declining biodiversity and forests/ expansion of agriculture
- Declining indigenous knowledge
- Increasing HIV/AIDS prevalence
- Urbanization
- De-agrarianization

Source: Adger et al. 2004

underscores the importance of accounting for them when designing future adaptation policies and interventions. In this sense, the EACC social synthesis report provides an important piece of complementary analysis to the largely quantitative analysis on which the rest of the EACC study is centered.

Socio-Spatial Approaches to Adaptation and Building Resilience

Socio-spatial approaches to assessing vulnerability to climate change and identifying possible response measures look below the national level, to sub-national or even local levels of socio-economies. The EACC social component builds upon this perspective in its methodology of identifying socio-geographic

zones (largely agro-ecological zones, with a social and hazard overlay) in order to select “hotspots” for field research. Country results bear out the importance of considering production systems with a spatial and social lens, whether looking at pastoralists in low-land Ethiopia, or ethnic minorities in the mountains of Vietnam. This is because production systems are organized along social lines, and hence possibilities for adaptation intervention must be considered in light of specific producer groups and regions, relations among groups, and governance mechanisms for grievance redress. Additionally, important political economy issues arise in examining state policy towards specific sub-regions, whether looking at the resource-rich Forest zone of Ghana or past resettlement of farmers from north to south in Ethiopia.

A social analytical approach to adaptation tries to link the specific livelihood profiles found in geographically

delimited areas to the resilience of households and communities to climatic change. While individually, people may or may not be able to adapt depending on their entitlements and access to resources (Adger et al. 2005), they are also constrained by the actions of others, and by gender-, age- and social status-specific norms on appropriate behavior and livelihood strategies. Examples of culturally-shaped adaptation responses include use of 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 2008).

Policy and Institutional Framework for Climate Resilience

Because adaptation to climate change likely requires changes in investments, production, and decision-making over the long-term, assessments of planning and policymaking at all levels are routinely part of any climate vulnerability study, and thus policy was also assessed by the 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 2008; Dovers and Hezri 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, but also reform of the more general institutional setting in which adaptation will take place, are required. In addition, civil society actors and the private sector are key components of understanding institutional settings, e.g., in order to assess how effective local and national policy has been in creating an enabling environment for bottom-up adaptation, including autonomous adaptation. Such policy assessments usually address existing institutional capacities, ongoing functions related to climate vulnerability and adaptation, future plans in these areas, capacity needs going forward, visions for overall adaptation pathways and economic costs of these choices (Lim et al. 2005; Klein et al. 2005).



Five



Evidence from the Field: Understanding Vulnerability to Climate Change

Exposure to Climate Change in Case Study Countries

All of the EACC case countries for the social component are subject to one or more of the following risks from climate change: drought, flood, storms, sea level rise and threats to agricultural productivity (see Table 3 for more details). Annexes 1-6 provide greater detail on the projected climate impacts for each case country.

Factors Driving Sensitivity to Climate Change

As discussed, the world's poor are disproportionately vulnerable due to unequal access to resources; poverty; lack of representation in decision making processes; and poor access to social security, information and planning structures. Populations that contend with more than one of these factors will be more sensitive to the additional stress posed by climate change (World Bank 2008; Ribot 2010; Mearns and Norton 2010).

Where inequalities intersect, vulnerability will be worse. For example, in **Vietnam**, in the communes of Dien Binh and Dak Tram in the Central Highlands within Kon Tum province, the poor account for 62 and 40

percent of the residents, respectively. Moreover, many of these poorest belong to ethnic minority groups, largely depend on natural resources for their livelihoods, live in rural areas away from market centers, and have low levels of education. These intersecting inequalities exacerbated the vulnerability of commune residents when Typhoon Ketsana struck in 2009, and poverty and hunger rates rose.

Remarkably, while levels of exposure and sensitivity of a local population may differ by region, the most vulnerable groups typically face the same types of challenges in building resilience to climate risks. In addition, just as vulnerability to climate change is

TABLE 3
EXPOSURE TO CLIMATE THREATS IN CASE COUNTRIES

	Drought	Flood	Storm	Sea-level Rise	Agriculture
Bangladesh		✓	✓	✓	✓
Bolivia	✓	✓			✓
Ethiopia	✓	✓			✓
Ghana	✓			✓	✓
Mozambique	✓	✓	✓	✓	✓
Vietnam	✓	✓	✓	✓	✓

BOX 4

PSD WORKSHOP DISCUSSION ON
GEOGRAPHIC LOCATION AS A
SENSITIVITY FACTOR

In the southern coastal city of Xai-Xai, **Mozambique**, participants identified key issues and criteria that would be useful for characterizing vulnerable populations and places in the southern region of the country. Areas identified as vulnerable typically mirrored areas where climate-sensitive activities were taking place and occurrence of climate hazards was high. Participants also were asked to identify which livelihood activities were most sensitive to climate events. Livelihoods identified were again activities that were pursued in areas highly exposed to climate hazards. For example, agriculture-based livelihoods were identified to take place in areas prone to drought, where people nevertheless farm. In the case of fishing, inland fishing sites where resources are under threat from over-fishing were identified. Coastal fishing also was perceived by workshop participants as a hazardous activity, especially as artisanal fishers increasingly venture further from shore in search of better stocks.

socially differentiated, so are preferred adaptation measures. Consequently similar adaptation preferences may be expected to emerge from groups facing similar types of vulnerability. The following evidence draws on fieldwork and participatory scenario development workshops conducted in Bangladesh, Bolivia, Ethiopia, Ghana, Mozambique and Vietnam.

Geographic Location

Geographic location can shape both exposure and sensitivity of countries, communities and households to climate change. Populations living on small island states, along coastlines and riverbeds, in flood plains and on pasturelands will be exposed to climate-related hazards including floods, cyclones, sea level rise and droughts. In addition, local economic and social conditions can force people to live in risky areas

and on marginal lands and where natural resources are already scarce and access to markets is difficult. Communities and households located in rural areas may be more vulnerable if road networks are underdeveloped and access to markets, schools and public services is limited. At the same time, urban populations may face different risks that heighten their sensitivity to climate hazards. The urban poor tend to reside in informal settlements, on steep slopes, along river banks and transport corridors, and on flood plains. Consequently, their lives, assets, health and future prosperity may be further compromised with the onset of floods, landslides, heat waves and droughts.

In **Bangladesh**, the riverine sand and silt landmasses known as *char* in Bengali are home to approximately five percent of the Bangladeshi population (Chowdhury et al. 1993). *Char* are highly exposed to flash floods as well as river erosion and land loss, which places the lives of *char* dwellers at high risk. Many can scarcely produce basic staples or buy enough food to eat. In the river flood prone hotspot study site, land must be cultivated over a two to three year span otherwise crops will not grow. Yet villagers expressed unwillingness to invest resources for long-term activities because river erosion can undo such investments. As agricultural land becomes increasingly eroded by rivers, livelihood options decrease and residents are forced to find new housing on higher land or on other *char* on a regular basis. Frequent floods also block tubewells and latrines, forcing people to use river or flood water for drinking, cooking, washing, bathing as well as defecation. Consequently, malnutrition and health problems are more common among *char* dwellers than elsewhere in the country.

In **Vietnam**, “although many fisher families are not extremely poor by Vietnamese standards, they are highly vulnerable due, firstly to their dependency on declining marine resources; and, secondly, to their *relative isolation* and exposure compared to inland or urban communities” (DANIDA 2005). This isolation of fishing communities has rendered them quite sensitive; for example, access to schools is limited as is

access to health and other social safety net services. In addition, fisher families must often absorb additional costs due to their geographic location such as transportation fees for sending their children to school by boat or boarding fees (NCAP 2006; Asian Disaster Reduction Center 2003; Trap 2006; Phong Tran et al. 2008; Phong Tran and Shaw 2007; East Meets West Foundation 2009).

Climate-Sensitive Resource Dependency

People dependent on natural resources for livelihoods are most vulnerable to climate risk. Many families and communities are directly dependent on ecosystems for their livelihoods either for primary or supplementary sources of food, feed, medicine and shelter. Households that depend on a narrow set of climate-sensitive activities such as agriculture or fishing will be at greater risk from climate change. At the same time, people dependent on ecosystem services for employment and income (e.g., dependence on coral reefs for employment in the tourism sector) will also be vulnerable. Across all country cases, people dependent on natural resources for their livelihoods and those with little scope for livelihood diversification were most vulnerable to climate variability and change.

The Cu Lao Cham islands off of **Vietnam's** Central Coast do not offer alternative livelihood opportunities in agriculture, and employment prospects in trade and commerce sector are scarce. Fisher families are increasingly exposed to risk from increasingly frequent and intense storm events. In Kon Tum province in the Central Highlands, non-farm livelihood opportunities are equally scarce. Most agriculture is rain-fed and subsistence-based and thus highly vulnerable to erratic weather patterns. In the wake of Typhoon Ketsana in September 2009, many residents' fields were covered with sand blown in by the storm, and food production decreased consequently by about 50 percent compared to the previous year. During fieldwork, Ha Giang province in the Northern Mountains region was experiencing an extended

drought that had lasted for 8 months and had limited the irrigation of rice crops to 20 percent of the usual total; local farmers expected overall drops of at least half in terms of production.

High dependence on rainfall patterns also characterizes farmers' livelihoods in **Ethiopia**, with the consequences of this becoming increasingly evident. Many crops and livestock have already perished due to water scarcity and high temperatures. Temperature extremes are also affecting agricultural labor practices: observation suggests that farmers and their plowing oxen retire to shade earlier than usual. One elderly farmer and mosque leader in Choresa *kebele* (village) described the following experience with temperature rise:

"Before, like 10 years ago, the farmer plowing his field and his plough oxen as well as those livestock feeding on the pasture, used to start seeking shade at around noon. These days they do it around ten in the morning."

In **Bolivia**, household interviews revealed that livelihood strategies based on rain-fed potato cultivation were most vulnerable to drought. Compared to other crops, the potato requires more humidity and yields are highly sensitive to water scarcity. Moreover, the loss of a potato crop is costly, not only because the price of the potato is relatively high but also because the inputs – in particular potato seed – is superior to other crops. Loss of a crop can perpetuate a cycle of poverty and suffering. A small-scale potato farmer from the Valleys region of Bolivia detailed his hardship associated with drought as follows:

"Up to now I have still not recovered my potato crop; three years have passed and I still do not have the same amount of seed that I had [before the drought]. Little by little I am recovering, working together with others that do have seeds."

Income diversification away from agriculture appears to be essential. Households most resilient to climate shocks are those that have managed to diversify their

livelihood activities towards the informal trade sector or in some cases, tourism. But in all countries, livelihood diversification proved difficult due to existing inequalities and lack of opportunities. During focus group discussions with widows in the rural land capital Chokwé of the southern Gaza province in **Mozambique**, they described that recipients of micro-finance invested their money to buy food rather than invest in business.

This underlines the substantial “soft” inputs needed to help support livelihoods diversification, including not only training and education in a new skill set, but also seed capital. Furthermore, integrating rural areas into markets will be an important activity to spur diversification away from natural resource-based activities.

Poverty

Poverty and lack of resources heightens sensitivity to climate change. Climate change will impact everyone, however, the poor will be hit first and hit hardest. Poverty status is a crucial determinant of access to entitlements and resources and directly shapes sensitivity to risks. The ability of poor populations to draw on a range of assets to cope with climate-related stressors is limited; the resources at their disposal are often less resilient; and their ability to recover from both slow and rapid-onset events is consequently weak. Low

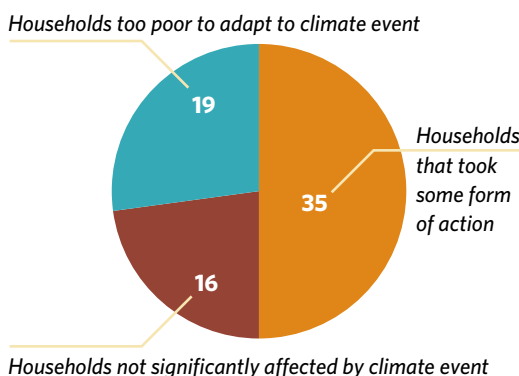
physical, financial and human capital asset levels lead to extreme vulnerability of households. Common factors here include high dependency ratios in the household, reliance on a single livelihood source, and low education levels. Cluster analysis of 294 households in **Ethiopia** revealed that poor farmers – in particular young agro-pastoralists – were most vulnerable when compared to households with larger landholdings.

In **Bolivia**, the poorest country in Latin America in GDP terms, the poverty levels of 70 households in the fourteen most vulnerable municipalities were classified according to asset indicators such as land tenure, livestock holdings, family prestige, education, employment, and type of housing. These households were then asked to consider past coping strategies in the event of a flood, drought, hailstorm and/or frost (see Figure 1).

Fifty percent of the families surveyed claimed that in such circumstances they maintained their same life patterns but tended to reduce consumption and draw down their reserves. Among these families were (i) those not significantly affected by the climate event and (ii) those that were unable to react to the event. The former were generally the most well off families possessing plenty of good irrigated land and a level of agricultural production which would help them to survive. They were also invariably families who had access, apart from farming, to other activities not totally dependent on climate change, such as outside jobs, trade, and processing value-added items for sale.

FIGURE 1

Past Household Coping Strategies in Bolivia



The latter category were generally the poorest in the community, comprising elderly people, single women and subsistence farmers with scarce resources who often either were unable to work due to lack of opportunities or due to physical inability. In addition, these families were generally unable to migrate to seek new economic opportunities due to lack of resources. These families were more likely to endure hardship and rely on neighbors and other family members for assistance. The following statement illustrates how extreme events affect the family of a 68-year-old subsistence farmer from the Plains region:



We live off rice, maize and cassava production (3 hectares), and the vegetables grown by my wife. We could do nothing when the drought came and simply waited for the next year in order to start again. Luckily we survived on vegetables, which we were able to irrigate with the little water available to us. -San Isidro Community, Yapacaní Municipality

The other 50% of respondents claimed that they had taken some form of action in the face of adverse climatic events. The responses were varied: some adopted new economic activities as part of their livelihood strategies, some migrated to other areas, while others devoted themselves to improving their traditional farming methods.

Similarly, in **Mozambique** about twenty-five percent of surveyed households did not identify any *ex ante* coping strategy for managing drought and forty-five percent of households did nothing in preparation for floods or cyclones. In addition, during or after these climate events, the majority of respondents reported to have not taken action *ex post* – about 55 percent,

70 percent and 75 percent of respondents did nothing to manage the effects of droughts, floods and cyclones, respectively. When asked what they would do if the climate hazards in their regions became more severe the majority of responses (70 out of 120) indicated that they would do nothing differently. A lack of resources to cope with these events seems to be a main factor contributing to this sense of resignation and disempowerment. See Figure 2 below for more details.

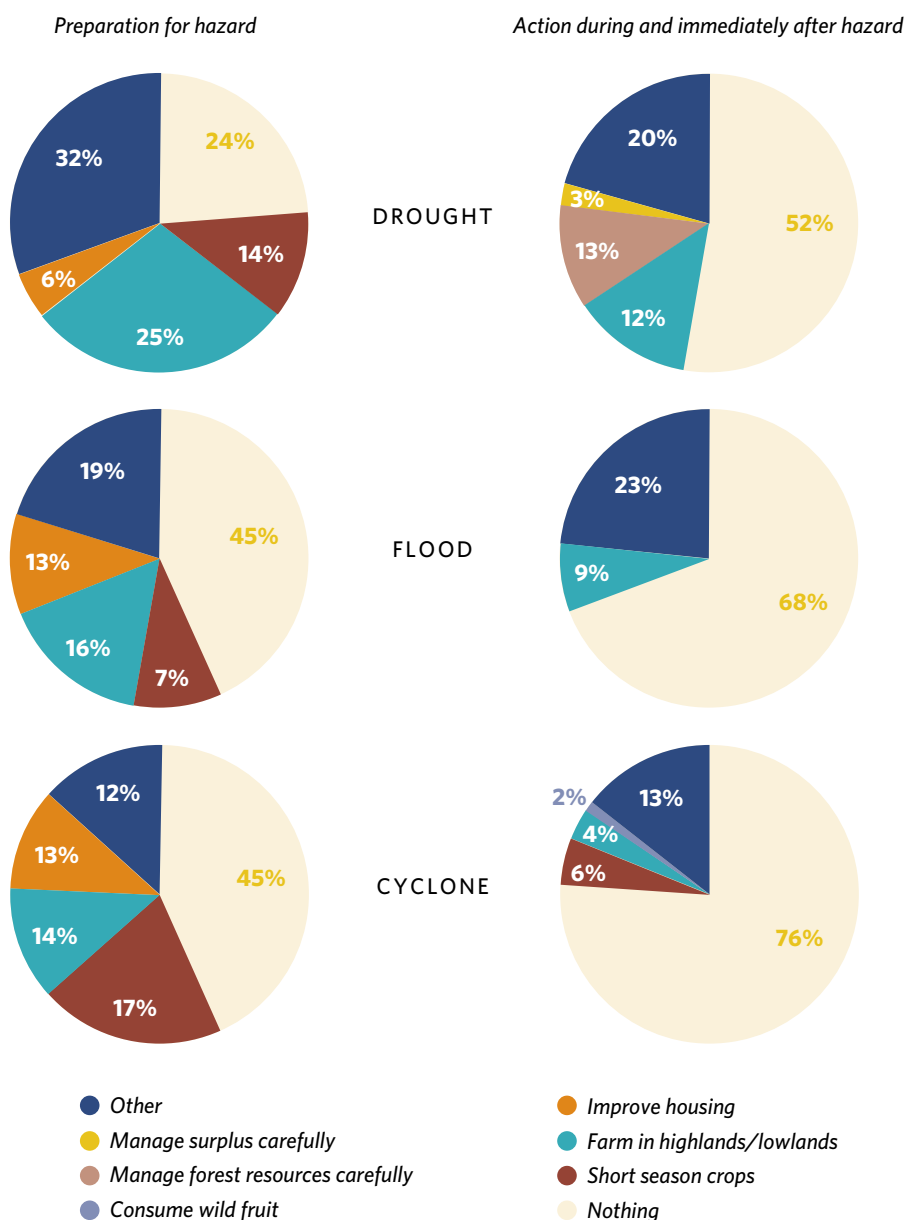
In **Bangladesh**, some 88 percent of households surveyed disposed of assets to cope with severe drought conditions during monsoon season, by selling their livestock or land or by leasing out their land. Many households sold other assets such as poultry and housing during drought and a few households leased their livestock. Disposal of household and personal assets was only done as a measure of last resort – when domestic food stocks were exhausted and the need to raise cash through the sale of assets became necessary. Poverty status and lack of assets forced vulnerable households to pursue short-term measures at odds with long-term sustainability such as

withdrawing children from school. In the end, a climate event pushed these households even deeper into poverty. This example shows how poverty and lack of resources can lead to maladaptation and perpetuate a cycle of vulnerability.

Notably, in **Vietnam**, results from research carried out by CRES in the Red River Delta revealed that wealthier households were also highly sensitive to climate risk and often took longer to recover from floods than middle-income families. This somewhat

FIGURE 2

Coping Mechanisms Before, During, and Immediately After Climate Hazards in Mozambique



surprising finding may be explained by the fact that because wealthier households were more likely to invest in riskier economic schemes, they consequently faced higher losses in absolute terms from climate-related damage. Similarly, in **Ethiopia** it was also observed that certain groups that may have appeared “richer” were in fact quite vulnerable. Specifically, pastoralists with large herds of cattle often seemed relatively well off; however, in some cases, low levels of education and limited options for livelihood diversification rendered them extremely vulnerable to climate risks.

Gender

Where gender-based inequalities in social, economic and political institutions intersect, the vulnerability of particular groups to climate change is heightened. Women are often the victims of gender-based inequality in rights, resources and voice as well as in household responsibilities. They often have limited access to and control over natural resources, information, and money. Moreover, due to cultural norms, they may be less mobile than men and may lack vital survival skills to weather storm events. Consequently, women are likely to suffer greater damages from climate risks and have a lower capacity to adapt. At the same time, empowered women have a proven track of record of improving adaptation and mitigation outcomes and of being powerful agents of change.

In **Ghana**, focus group discussions highlighted the inequitable inheritance rules and land tenure relations often found in Ghana’s traditional patriarchal system. This system limits women’s access to productive resources and, in some instances, to social justice. This is significant as land generally is the basis for the most productive livelihood activities. In the Guinea Savannah, for example, taboo on female ownership of land has prevented women from being recognized as farmers in their own right. Rather, they are considered assistants in the fields. In the Transition zone, the traditional and kinship structure in the community requires that at the family level, family heads (usually men) control

BOX 5

GENDER IMPACTS OF DROUGHT IN ETHIOPIA

During a focus group discussion in Birko-Debele (midland zone), a male farmer expressed that women suffer the most as a result of food shortage in the household:

“When I realize that there is not enough food in the house, I go out to the nearby town or to my friends. The woman cannot go out because the children will be waiting on her to get some food. In such cases, it is common that she cooks the little she has in the house, gives it to her children, puts some aside for the husband and goes hungry herself. As a result the women get sick easily.”

In this instance, women again enjoy less mobility than their husbands. Moreover, their propensity to fall ill rises as reducing their own food consumption is a common coping strategy.

the allocation and use of all family resources, including land. Male siblings are bestowed priority access to land over their sisters. In some cases, because women are perceived to lack the skills and abilities to cultivate larger land portions, they are bestowed marginal land with low production capacity.

In addition to gender-based cultural norms and inheritance structures, household responsibilities often also render women more vulnerable to the impacts of climate change. Indeed, responsibility for household tasks such as water, food and fuel provision generally fall to the females in the home. In the saline and drought-prone areas of **Bangladesh**, where fresh water is in short supply, women are forced to walk long distances to collect water, risking their health and safety in the process. Their vulnerability is further compounded as the amount of time available to these women for other productive tasks is significantly reduced. Box 5 provides an illustration of some of the gendered outcomes of drought in Ethiopia.

BOX 6

LAND ABANDONMENT IN THE COMMUNITY OF OVEJERÍA IN BOLIVIA

What effect has climate change had here? The community of Ovejería in the valleys region of Bolivia, has been practically abandoned, everyone has left, only a few elderly residents stayed behind. The reason is that in recent years, wheat and barley yields fell so drastically that families could no longer produce enough for their sustenance. The climate is very dry in this community.

Where did they go? The majority of young people went to the city, others to work as laborers in the region of Río Chico where agriculture is irrigated.

How do those who were left behind live? In the community of Ovejería there are now only a few goats, tended to by the elderly. Many years ago, when there was more pastureland, this community reared sheep; about 20 years ago sheep breeding was replaced by goat breeding.

During focus group discussions in the fishing community of Bai Huong in Quang Nam province on the central coast of **Vietnam**, participants initially dismissed the possibility of women being disproportionately affected by climate risks than men, noting that men were most vulnerable to storms because they were the fishermen. Yet as discussions progressed, it was revealed that of the community's 56 small fishing boats, women participated in fishing activities on 40 boats and were consequently also directly affected. Moreover, domestic responsibilities including cooking and cleaning added to their workload.

Migrant Status

Migrants may become more vulnerable as climate variability and change reduces opportunities to engage in sustainable productive activities. At the same time, migration may be a valuable adaptation strategy for other groups. While economic and social forces are usually the primary drivers of migration,

changes in climate are becoming increasingly recognized as an additional 'push' factor for migration. Poor vulnerable populations, whose livelihoods are based on climate-sensitive activities, are increasingly resorting to temporary migration to cope with shifting weather patterns. Often migration is viewed as an option of last resort. In many cases, undocumented migrants and those without permanent status do not have rights to public safety net services, and often are exploited for low wages in employment or let go if ill or injured, with little recourse due to their undocumented status. At the same time, migration can have positive impacts, particularly the ability to send income remittances to family members left behind. Rural-rural migrants are often at an unfair disadvantage when participating in local land tenure systems, particularly where there is not an active land market. Insecure tenure affects agricultural production decisions directly, as in the case from northern Ghana below, leading to increased livelihood vulnerability.

A male migrant farmer from the northern region of **Ghana** captured the problem of being landless in the following statement:

"Though I wish to, I could not plant crops which have long gestation periods particularly of high commercial value like cocoa and cashew. This is because land is generally not sold here. Since I do not have permanent use of the land leased to me, I am limited to cultivating only crops with short gestation periods and low commercial value compared to cocoa and cashew. I believe I would have been better off if I am granted permanent use of the land."

Similarly, during a focus group discussion in the municipality of San Pedro in the valleys region of **Bolivia**, a subsistence farmer observed the following:

"We cultivate banana, rice, corn and yucca, mostly. During the flood last year, the first thing we did was seek refuge. We had to leave behind our animals and seek another type of work in the

neighboring city, Riberalta. The entire family went. I found work in construction for about three to four months. This never used to happen before."

Families whose livelihood strategies already entailed seasonal labor migration either from rural to rural areas or rural to urban areas may become increasingly reliant on migration as an adaptation measure. Support for migration requires political, social and economic capital, which both migrants and receiving areas often lack (see Box 6).

In **Ethiopia**, families that received remittances perceived migration as a valuable coping strategy. In fact, survey evidence there suggests that migration there appeared to be of the "pull" factor, undertaken by those households cultivating more land who have excess resources to be able to undertake migration. Yet at the same time, focus group discussions revealed the inherent risks associated with migration for particularly vulnerable groups of people. Box 7 describes these experiences in more detail.

By contrast, in Hoi An town and the nearby Cu Lao Cham islands in the central coastal region of **Vietnam**, migration is generally a preferred coping strategy for most households. Remittances make up an important source of household income for these local populations. The wealthiest households in Hoi An are those with relatives or children abroad. For these families, ancestral ties to China, Japan and Europe have presented important opportunities for children to migrate abroad, find work in tourism agencies, or open restaurant and hotel chains. Residents of Cu Lao Cham islands count remittances as an important source of income and savings.

Ethnic Minority Status and Indigeneity

Minority ethnic groups and indigenous peoples may be disproportionately sensitive to climate change impacts. While ethnic minorities and indigenous peoples are more likely to be farmers, live in rural areas, and be poor, these minorities also confront

BOX 7

EXPERIENCES WITH TEMPORARY MIGRATION IN ETHIOPIA

At least a quarter of the participants in each of the mid- and highland focus group discussions indicated that at least one of the household member migrated to other towns during the last year. Many expressed that quite a number of youngsters in the area travel about 400-500 km for salt mining work but also to the nearby towns of Kombolcha, Dessie and Addis. Some women travel to countries like Dubai and Saudi Arabia. Many migrants send remittances back home. In a focus group discussion in the village of Keteteya, the downside of the situation is expressed as follows:

"Due to food shortage in the households, some girls are forced to drop out of school and travel to the nearby towns to look for work. Some of the girls ended up in prostitution and came back home with HIV/AIDS."

a range of specific sensitivities that other rural or poor groups may not. They often depend on their surrounding ecosystems not only for subsistence but also for cultural survival. Moreover, ethnic minorities are often excluded from the discussion and debate surrounding actions to mitigate, adapt to and prevent the impacts of climate change. Similarly, despite their close connection to natural cycles and wealth of ecological knowledge, indigenous peoples are not always recognized as full partners in the decision-making process for building resilience at the sub-national, national and global levels.

In **Vietnam**, there are 54 official ethnic groups. The Tay are the largest minority group with nearly 1.5 million members, while the smallest group, the O Du, has only 300 members. Compared to the Vietnamese Kinh majority, these minorities are disproportionately reliant on staple goods and on a limited number of traditional agricultural practices. They invest less in agricultural development and consequently produce less overall (World Bank 2009b).

These minorities do not typically enjoy equal access to credit and financial services despite the fact that they may be in greater need of credit than their Kinh counterparts. In addition, ethnic minorities are more likely to be illiterate, drop out of school, and lack the Vietnamese language skills necessary to capitalize on outside resources (World Bank 2009b). Confronting these multiple threats reduces the adaptive capacity of ethnic minorities in Vietnam.

Similarly, **Bolivia** has the largest indigenous population in Latin America, with 36 ethnic groups residing primarily in poor, rural zones. Since pre-colonial times, most of the indigenous population has worked in agriculture and livestock farming although some livelihoods are based on fishing and hunting. Now rapid population growth and increasing climate variability are jeopardizing their livelihoods. In addition, many youth have difficulties surviving on their ancestral territories, mainly due to the weakened carrying capacity of these lands. Focus group discussions with indigenous farmers revealed that indigenous communities believe successful adaptation would imply profound transformations to current livelihood systems but that these may pose significant challenges to cultural identity. These changes may mean shifting from rain-fed to irrigated cropping and open-range to semi-enclosed livestock production. These transformations highlight the need for accompanying adjustments in market practices, uses of technology and organizational development.

Education

Across all case study countries, participants in PSD workshops and fieldwork identified capacity-building, training and improved information exchange as vital to improve their adaptive capacity. Skills and knowledge enable people to pursue different livelihood strategies and achieve their livelihood objectives. Education will also affect a person's ability to anticipate climate events, make proactive adaptation decisions and reduce losses related to disasters. Women, ethnic minorities and the poor in particular often have

limited opportunities for obtaining and education, decreasing their chances of leading productive lives in the face of increasing climate variability and change.

Surveys in the central coastal **Vietnamese** province of Thua Thien Hue, for example, showed that those with a high school education were much more likely to think flood damage was a combination of sensitivity factors and natural factors while those with less schooling were more likely to ascribe flood damage to "fate" or an "act of God" over 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.

With regard to climate change adaptation strategies, vulnerable households in Kon Tum in the Central Highlands did not view migration as a viable strategy simply because they lacked the skills to engage in new livelihood activities in a new location. This knowledge and capacity deficit prevented them from diversifying away from agriculture. Not surprisingly, villagers shared a desire to undergo training in animal husbandry along with provision of microcredit services, in order to engage in livestock breeding and buffer against damages caused by climate-related events. In contrast, households in the Red River Delta and Mekong Delta did pursue migration as they possessed the skills to capitalize on short-term working opportunities outside these regions.

Focus group discussions with subsistence farmers and community leaders in **Mozambique** revealed a great deal of confusion about the causes of natural disasters, and whether these would increase or decrease in the future. Many farmers suggested that hazards occur because of failure to follow local customs or carry out traditional ceremonies, or because of witchcraft.

Conflict Over Resources

Conflict related to increasing resource scarcity due to climate change will disproportionately affect

vulnerable groups. The interaction between natural, social and political systems will determine the adaptive capacity of particular groups of people. Conflicts can be either horizontal (e.g., between roughly-equal parties in the same locale) or vertical in nature, the latter for example found when external investors or the state purchase or appropriate land locally without consultation. Capacity to respond to and manage climate risks will be weaker in poorly governed areas and steps must be taken to ensure local participation in consultations, reduce power and resource inequities and foster accountable and transparent public institutions. Indeed, adaptation to climate change will need to recognize the linkages between adaptation, development and conflict (Smith and Vivekananda 2009).

Focus group discussions in the **Ethiopian** pastoralist village of Haro Kersa, indicated that conflicts with neighboring villages had increased. These conflicts were especially related to water shortages (see Box 8) and a lack of high-quality grazing lands.

Similarly, in saline-prone Satkhira district in **Bangladesh**, there is conflict between rich shrimp farmers and poor crop cultivators, with the latter reported to be deliberately causing breaches in embankments to further salinize agricultural lands so that the crop cultivators are forced to sell or lease their damaged land.

In **Bolivia**, competition for water is high, and in the cities of Cochabamba, Sucre or Tarija, social conflicts are frequent between the urban utility and user communities. The incidence of conflict is likely to increase as this resource becomes scarcer.

In **Vietnam**, as shrimp has become more valuable on the international market, it has replaced rice as the major export from the Mekong Delta. In addition, government policy has strongly encouraged the conversion of agricultural land to shrimp ponds; land tenure certificates for privatizing once common mangrove areas are now widespread; and preferential taxation, as well as targeted credit and investment to encourage conversion to shrimp are supported by

the government (EJF 2004). Consequently, conflicts between agriculturalists and shrimp farmers have increased, particularly in the Mekong Delta, as these shrimp ponds have moved into new areas. Moreover, exposure to climate events has increased as mangroves are cut down to make room for shrimp ponds and coastal areas are left more vulnerable (Adger et al. 2005).

Aspects of Adaptive Capacity

Adaptive capacity, as noted earlier, refers 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 adaptive capacity highlighted in the literature: here we focus on institutional capacity; natural resource management; collective action and social capital; and public and private safety nets.

BOX 8

RESOURCE SCARCITY INDUCES CONFLICT AMONG WOMEN IN ETHIOPIA

In Ethiopia, the effect of water and food shortage in the household as a result of changes in the rainfall patterns appears to be gendered. In a focus group discussion in Choresa (midland valley zone), women emotionally expressed the effect of water shortage as follows:

"Everyday we fight over the ever weakening spring water in the area especially during the dry season. This coupled with the long queue, it takes us more than three hours to get about 20 liters of water from a nearby spring for domestic chores which is about double the time it used to take us 10 years ago. This causes reduced sanitation in the household especially for the children."



Governance and Institutional Capacity

Governance deficiencies can severely limit the ability of individuals and households to build adaptive capacity. For individuals and households, access to decision-making, information, justice and rights is essential to accumulate resources necessary to build adaptive capacity. Public action can help overcome barriers in access to such resources and capacities. Failure to do so is likely to reinforce structural inequities related to resource access and land tenure, enhance existing inequalities between groups of people and seriously impede the capacity of disadvantaged groups to adapt to climate hazards.

Effective adaptation requires institutions to support enabling policies and systems at the national level (e.g., climate monitoring and forecasting, disaster risk management plans, food security programs, etc.); to ensure effective central-local coordination so that policies and systems at the national level may target

the poorest and most vulnerable; and enhance organizational capacity in order to carry out adaptation. When national institutions are decentralized, they may facilitate coordination between national and sub-national levels, lead adaptation initiatives on the ground, and support related community-level climate action. However, not all institutions are equally efficient – where governance deficiencies exist, inequalities between groups of people may be exacerbated or local populations may resort to informal channels for action (World Bank 2010b).

In **Bolivia**, a significant determinant of local adaptation strategies and preferences was the presence or lack of institutions. During discussions with community members, it was observed that the number and type of ‘institutional’ interventions in a particular community affected the priority assigned to the measures by the communities. For example, the San Pedro Community in the Plains region, which had hitherto received little institutional support, awarded

priority to measures which required only limited institutional help. On the other hand, communities such as Saipina in the Valleys, which currently benefits from significant investments made by the local authorities and private institutions, prioritized investments requiring substantial external support. Thus there is a ‘social learning’ process as communities learn to make claims on external assistance.

In the national PSD workshop in **Mozambique**, improved governance and related processes of decentralization and capacity-building of local institutions emerged as a key theme for supporting envisaged adaptation pathways. These factors were considered as a way not only for climate change adaptation to be integrated into national and sectoral level planning processes but also as necessary prerequisites to fostering a more attractive investment environment for domestic and foreign investors. In the PSD workshop in the southern coastal city of Xai-Xai, the break-out group focusing on forestry-based livelihoods noted that improved institutional control of wildfires, better enforcement of forest laws and the establishment of steering committees for fire management would help build resilience to future climate change related risks. Many participants suggested that the forestry sector did not necessarily need new laws to promote more sustainable forest management, but rather more effective and fairer enforcement of existing laws.

During the Doi Moi era in **Vietnam**, land and natural resource policy underwent fundamental changes that continue to shape local responses to climate variability and change. One outcome of the progressive privatization of land rights, extended in the early 1990s to forest and agricultural land, has been a decline in access to commons, with severe consequences for those whose livelihoods depended disproportionately on them.

- *Conflicts among land users* have become increasingly common since the legal system was restructured to only recognize one official claimant per plot of land. In the past, land-use relations could

exist between the state (grantor of land-use certificates) and a local community (World Bank 2009b).

- *Privatization of common lands* has in many cases caused household livelihoods to depend increasingly on a shrinking suite of activities. This problem is particularly acute in mangrove areas (Adger 1999b; Le Thi Van Hue and Scott 2008) where women and the poor in particular can no longer obtain additional income from goods such as clams and forest products that were once freely available for collection (Le Thi Van Hue 2006; McElwee 2009). As Le Thi Van Hue (2006) asserts, “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.”

At the same time, changes in government structures and related land use policies may bode well for some vulnerable populations. In **Ghana**, the commoditization of land in the forest zone seems to be reducing the vulnerability of migrants and different ethnic groups in particular. Where in the past, these groups suffered discrimination, today those that have sufficient financial resources may rent or purchase land and even become better off than their indigene counterparts who do not own land. In addition, a new ‘share-land-cropping’ system enables migrants to cultivate land over a period of years after which they are eventually given a third of the farm as compensation. While this practice is prevalent in the western region of Ghana, this new system has not become as common in other zones. Consequently, not all migrants and ethnic groups enjoy these benefits and most remain quite vulnerable to climate vagaries depending on the receiving zone in which they have settled.

Enabling political, social and economic structures are necessary in order to support the increasing need for livelihood diversification. In **Ethiopia**, in order to reduce vulnerability to future climate variability and change, the *kebele* (village) of Gola is shifting dominant livelihood activities from a pastoralist to mixed farming-livestock system. However, this process is long, requires considerable resources and dependency on farming has continued during the transformation. Low yields persist and farming technology necessary to support these changes remains inadequate. In addition, since the beginning of this process, the *kebele* of Gola has lost a considerable number of livestock. These factors combined demonstrate that even when awareness of the need to diversify is present, the perils associated with the process may exacerbate vulnerability in the short term if appropriate support services and economic and social structures are not in place.

Natural Resource Management

Where ecosystems already suffer environmental degradation and poor management practices are common, climate change will pose an additional stress. Across all country case studies, local populations noted that ongoing practices of poor natural resource management significantly exacerbate the vulnerability of local populations to climate change. Improving enforcement of existing laws and government policies, as well as building the capacity of community associations to manage local resources effectively will be crucial for fostering socio-ecological resilience.

In **Ethiopia**, for the midland villages and for Keteteya in the eastern lowlands, soil erosion was reported to be an important factor contributing to vulnerability during focus group discussions, whereas for Haro Kersa in the pastoral zone, animal diseases were noted as having detrimental long-term effects. Even though these hazards are not directly related to climate, increased climate variability and change is likely to aggravate the situation. Similarly, flood

problems in Gola, a village located in the pastoral zone, are less related to climate variability than to the effects of soil degradation and the protection measures taken by the nearby sugar estate. In addition, overgrazing, deforestation and lack of organic fertilizer use were equally important causes for reduced yields and reduced water storage in the soil while human, animal and crop diseases were considered to be important and threatening of the livelihoods in the rural areas.

In **Vietnam**, overfishing has rendered communities in much of the central coast extremely vulnerable as a significant decline in fish stocks over the past ten years has placed in peril the livelihoods of hundreds of fishing families. The occurrence of increasingly frequent and more intense floods and cyclones bode poorly for these families already living close to the brink of subsistence. This prospect is equally threatening in **Ghana** where livelihoods of coastal fisher families are increasingly precarious as fish stocks dwindle, sea levels rise, and lack of skills narrows the possibilities of integration into the modern urban economy.

A further example, reported by all the communities in the Altiplano and Valleys regions in **Bolivia**, reflected how climate variability contributes to a cycle of poor pastureland management and overall reduced pasture availability. According to the *campesinos*, pastures require more water today as the climate heats up and germination does not occur by the end of winter. The outcome was that animals were unable to find the same amount of grass to eat and had taken to chewing the roots of grasses, which had negative effects on pasture recovery times. Due to lack of available food, the number of animals kept per family has begun to decline, causing food shortages in families and a manure deficit for fertilizing crops.

In the Valleys and Plains regions of Bolivia, goats were reported to have begun to replace sheep, which require more and better quality forage. A farmer from the La Sillada community in the Valleys region described this problem in detail:

"When I was young we had lots of animals at home - around 200 sheep and goats. Now have only 40. The problem is that animals have been dying from external parasites and disease. Previously we also had these problems but the animals were stronger and more resistant in those days, as well as bigger and fatter."

Policies and institutions should enforce sustainable resource management and wise land-use planning. This can include the enforcement of existing laws and government policies, as well as by improving the capacity of community associations to manage local resources effectively. Planning is also needed to make sure that activities gradually move from those areas of high risk to areas of lower risk.

Social Capital and Collective Action

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.

Most households across all study sites undertook collective actions but did so to varying extents adopting different types of activities and in each study site. The types of activities undertaken in each community differ depending on the types of climate events and the level of seriousness of the events. People often ask for help from their friends and relatives, who are often the first line of defense for households that have been affected by storms or other climate events. They seek shelter in relatives' houses, and rely on relatives to help them recover after the event and to provide loans if financial assistance is needed.

In **Vietnam**, prior to storm events, residents often exchanged information about the impending hazards that they heard from early-warning systems, and shared information on coping mechanisms such as reinforcing houses. Information sharing about weather forecasts and disaster preparation measures was the most common form of collective action, most likely because this action comes with little cost, although this varied by region, with less than half the households surveyed

BOX 9

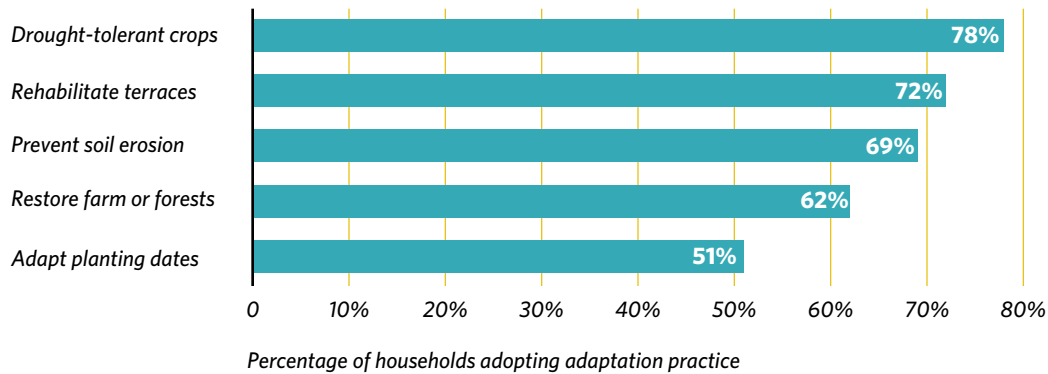
EROSION OF COLLECTIVE ACTION IN URBAN AREAS OF VIETNAM

Urban areas in Vietnam were observed to have experienced a decline in collective action in tandem with increasing market activity. The urban tourism community in Hoi An consists of neighborhoods with long tradition of living together and supporting each other in times of stress. However, the nature of social relations has recently undergone changes as related by an elderly man in An Thang. He noted that 20 years ago during the floods, he and his neighbors helped each other to move personal belongings from the first floor to second floor. After that they sat down to share meals and express gratitude to one another. Today, this type of attention no longer exists and help is something to be bought and sold. When floods strike today, he hires laborers - this is easier and less time consuming for him. Meals with neighbors before and after floods are foregone.

in the Mekong Delta sharing such information. Those disaster preparation activities that required raising or spending of funds and/or additional labor were less common (e.g., repairing rescue roads, building sand-bag dykes or dredging drainage and canal systems) and were usually coordinated by mass organizations such as the Veterans' Union, Farmers' Union, and Women's Union. Additional actions were often taken up by smaller neighborhood or kin-based groups, such as helping one another to harvest a crop early before a storm. To respond to flashfloods, the villagers in Tan Trinh commune of Ha Giang helped each other by collecting and moving neighbors' furniture and livestock before the flood. After the flood, they joined together to clean debris from their villages. Here, collective action had clear shared benefits for all who participated. In other contexts, such as the increasingly prosperous city of Hoi An, collective action in flood response is becoming less prevalent (see Box 9).

In household surveys in **Ethiopia**, community members identified measures they had used in the past

FIGURE 3

Past Household Adaptation Practices in Ethiopia

to confront hazards. The most common adaptation measures were selection of drought-tolerant crops, rehabilitation of terraces, soil erosion prevention programs, restoration of homestead or mountain forests, and adapting planting dates. Figure 3 presents the preferred strategies.

Notably, three of the five strategies were part of programmatic efforts, supported by external projects. Through such supported collective action the community identified, implemented and in most cases maintained the activities. In the pastoralist villages of Birko Debele and Haro Kersa, the majority of households opted for communal pooling strategies. This is most likely because they are dependent on communal grazing lands and communal watering points and consequently only have limited set of individual strategies at their disposal.

In addition, this widespread preference for communal strategies suggests that local institutions play a pivotal role in improving the livelihoods of *kebele* residents. At the same time, it was observed that marginalized households were less likely to adopt communal strategies and generally received less support from informal community institutions. This suggests that communal interventions do not always target these

vulnerable groups and that bottom-up community strategies warrant thorough review to ensure that the most vulnerable are included.

Social Safety Nets

It is becoming increasingly recognized that social protection programs are likely to become a key vehicle for supporting adaptation in developing countries (Stern 2007; World Bank 2009a). The need for improved social protection policies and programs in order to help poor and excluded members of society to effectively confront multiple risks and shocks from climate change emerged as a common topic of discussion in workshops and focus groups discussions in all countries. Approaches such as cash transfers, asset transfers, weather-based crop insurance, employment guarantee schemes and social pensions will be more effective in protecting the livelihoods of poor and excluded populations in the long-term if they account for climate risks.

Social protection can be derived from both public and private sources, though the latter are much less reliable for poorer households who hold low social capital. This is because the perception of households' wealth status by others affects the degree to which

they can access private social protection measures organized at village level through their socially-constructed ‘entitlements’ to these measures.

In **Ethiopia**, analysis shows that private benefits accrue largely to wealthier households facing crises given that they are more likely to offer future reciprocal assistance. At the household level, low levels of entitlements to resources means that households are more vulnerable to climate and other shocks. Cluster analysis of household survey responses found that informal village social assistance institutions tended to benefit large, landowning farmers; 52 percent of large farmers accessed the social assistance institutions, compared to an average access rate for all income groups of 34 percent. These findings point to the likelihood of inequity in collective social protection mechanisms through community institutions such as *idir* and *kire* (informal insurance organizations), *jiggie* and *debbo* (labor sharing organizations), and *iqub* (informal rotating savings associations).

This finding underlines the importance of ensuring that public social protection transfers are also available to vulnerable households, with transparent targeting processes, as now being undertaken by the Productive Safety Nets Program (PSNP) in Ethiopia. Such programs help smooth household consumption, and through natural resource management-targeted public works, help build area resilience, but may also thereby help households take on more of the necessary risk needed to diversify successfully through long-term adaptation measures in which more vulnerable households are unable to invest (e.g., education).

Changes in the governance system of **Vietnam** brought about significant changes in the provision of social services to the poor. Box 10 describes how as a result, many Vietnamese may now be more vulnerable to climate and non-climate related hazards than before.

BOX 10

EFFECTS OF REMOVAL OF FORMER SOCIALIST SAFETY NETS IN VIETNAM

During the Doi Moi process most of the former socialist safety nets in Vietnam were eliminated. Consequently, most state services are today provided by state, parastatal and private entities at a cost much higher than in the past. These expenses have hit poor households particularly hard (Evans et al., 2007).

Today, 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; however, in reality spending on social services is relatively low compared to the needs (Van De Walle 2004).

Nguyen Ngoc Quynh (2003) notes that “There is a contingency fund run by the central government to minimize the consequences of natural calamities and other emergencies by dispensing disaster relief to regions and households. Field studies indicate, however, that emphasis is placed primarily on surviving the emergency, and that credit is a common instrument for disaster recovery ... Because institutional capacity and finances are limited, the aid tends to be short of what would be necessary to get households back on their pre-crisis development paths. Poor households in particular are prone to further impoverishment as a result”. 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.



Six

Adaptation to Climate Change

The social component of the EACC study corroborates a key finding of the EACC Study Synthesis report: development is the best form of adaptation, though adaptation will require developing differently. As there exists a great deal of uncertainty regarding when and where the effects of climate change will occur, a solid understanding of climate risks as well as the ways in which the poor are most vulnerable will be essential to inform identification of future climate action that maximizes co-benefits with sustainable development. Measures that facilitate “good development” may comprise a combination of effective past coping strategies; *no-regrets* options that result in net social benefits even in the absence of climate change; and new interventions that may be required to address the numerous risks (such as irreversibility of impacts) associated with climate change. This section examines the different types of action that will be best suited to meet the needs of those most vulnerable to climate change.

As discussed below, findings drawn from the six country cases demonstrate that vulnerable groups preferred and prioritized a mix of old and new, hard and soft adaptation and *no-regrets* options. In addition, local populations distinguish between the need for both planned and autonomous adaptation measures. Social norms, cultural beliefs and past experience with institutions and social service providers influence local visions of future adaptation pathways

and inform conclusions regarding the types of factors that may enable autonomous adaptation.

Learning from the Past

Past coping strategies may hold valuable lessons for future climate change adaptation. Experience plays an important role in coping with problems and traditional knowledge can be useful for developing strategies to adapt to changing environmental conditions. In addition, basing adaptation strategies on past practices may help address the specific needs of ethnic minorities and indigenous communities for managing climate change impacts.

In **Bolivia**, indigenous knowledge can play an important role in building adaptive capacity to enhance the resilience of local populations and inform national policies (see Box 11). Indigenous peoples use a wide and valuable diversity of measures to manage climate variability. At the same time, in all of the studied communities, indigenous farmers considered that their traditional methods for predicting weather and managing climate variability were becoming increasingly ineffective. For many, these predictive capacities are no longer as reliable as they were for past generations.

For **Vietnam**, residents in Ha Giang province in the northern mountains have historically relied on “indigenous knowledge” to cope with adverse climate

BOX 11

INDIGENOUS PRACTICES CAN INFORM FUTURE ADAPTATION IN BOLIVIA

The pre-Inca culture of Tiwanaku had sophisticated irrigation systems, which could hold valuable lessons for the design of future water management practices. More specifically, the indigenous of the highlands traditionally cultivated their crops at different altitudes, which allowed them to produce different varieties of potatoes simultaneously, and buffered against climate shocks including droughts, frosts and hail. In the lowlands, the Moxos indigenous peoples established a canal system to regulate water and reduce the risks for flooding. These traditional adaptation strategies are still valid today and could still greatly benefit areas where they are no longer practiced.

At the same time, it is becoming increasingly evident that the value of this traditional knowledge could be enhanced when combined with new technology and science. For example, as weather patterns become increasingly unpredictable, indigenous farmers could significantly benefit from the interpretation of meteorological data and related early warning systems.

events. However, as in Bolivia, coping traditional methods are becoming increasingly unreliable. For example, during oppressive summer heat, members of the Thai An commune had built their roofs with *imperata* grass because of its cooling abilities. However, in order to prevent flash floods, a national reforestation program decreed that forest monocultures of acacia would be planted on the grassland. In addition to rendering this traditional coping strategy ineffective, this reforestation program has proven ineffective in preventing flash floods.

In waterlogged and flash flood prone hotspots of **Bangladesh**, people are skilled in making traditional handicrafts such as fishing traps (*charons*) from bamboo and mats from *murta* trees. These have now become an important secondary source of income

when primary activities like agriculture are disrupted due to hazards. In the river flood prone hotspots, elders can predict floods and erosion simply by analyzing the flow of river water.

Local Adaptation Preferences

Local adaptation preferences are conditioned by a host of social factors. Vulnerability to climate change is not uniform but differs according to the socio-cultural axes of the society concerned. Where socio-economic processes are inequitable, the poorest and most vulnerable are likely to experience marginalization. Indeed, social differentiation and access to resources as enabled by both formal and informal institutions will influence the different adaptation measures people undertake in their communities. The nature of the inheritance system, governance systems and land tenure relations are important in this regard (see Box 12 for an example from Ghana).

Table 4 presents a very wide variety of community livelihood strategies in the Plains region of **Bolivia**. This diversity of options can be explained by the following factors: first, each strategy tends to reflect the specific concerns of an individual community, especially regarding the extent to which the community is exposed and sensitive to climate change. Adaptation measures identified by communities and the order of priority assigned to each also mirror the kind of measures or investments that have been pursued (or not) in the community in the past. In effect, this shows how preferred adaptation strategies depend on the recent history of a particular community. For example, communities that have benefitted from investments in water management schemes that have resulted in safer drinking water do not consider water management for improved drinking water to be necessary for their future livelihood strategy as they do not view the current system as inadequate.

TABLE 2

PRIORITIZED ADAPTATION STRATEGIES, BY COMMUNITY, IN THE PLAINS REGION OF BOLIVIA

	San Isidro (Yapacani Municipality)	Puerto San Borja (San Ignacio Municipality)	Agosto 15 (Yapacani Municipality)	Valparaiso (San Pedro Municipality)
1	Water supply system for cattle	Construction of water hole (aguada)	Emergency water recovery and Educational Center	Community flat boat to transport produce to market.
2	Construction of social housing	Family plots to be fenced off	Construction of defenses on the River Yapacaní	To plant fast-growing vegetables.
3	Improved dual-purpose cattle	Grain storage system	Repair of 5 km of main road in the Agosto 15 community	Domestic irrigation using waterwheels in orchards
4	Construction of the Con-dorito Bridge	Irrigation pumps to be installed	Installing windbreaks in rice paddies	30 irrigation pumps for irrigating family orchards in the Valparaiso community (with river water)
5	Pilot centre for apiculture improvement	Construction of artificial terracing	Restarting rice production in the Agosto 15 community	10 irrigation pumps for lifting river water to irrigate family vegetable plots
6	Controlling high incidence of weeds in pastures and orchards	Construction of furrow terracing (camellones)	To diversify agricultural production by planting citrus and cocoa	
7	Joint production of citrus and coffee			
8	Diagnostic study on flowering times of local plants			

Source: Community workshops in Bolivia

The presence or lack of institutions is a second determinant for identifying, prioritizing and sequencing adaptation strategies in Bolivia. Where local authorities and privatized institutions have a history of supporting development, community members will count on their continued support and prioritize measures that require external support. Where institutions do not have a strong presence, prioritized adaptation options will require little external support.

As discussed earlier, migration can be a favorable autonomous adaptation option resulting in higher income for families in sending areas who receive remittances. However, in rural communities in **Bolivia**, the decision to migrate is strongly influenced by social preferences. Temporary migration was not prioritized as an adaptation measure in the studied communities. Rather, the logic of the communities in

the identification of adaptation measures was, “What should we do to adapt so that we do not have to abandon the community?” A woman from the municipality of Beni in the Plains region argued:

“We do not want to move the community; for the authorities this is the easy way out. We want to stay in the community, even if floods occur. It cost us dearly to move our community to this place and it is now in a strategic location, everybody passes by our port. Assistance should focus on helping us to stay in our own place, not to help move us.”

Social preferences may be more influential determinants of adaptation preferences than economic rationale. From the above example, one can see that populations will not always opt for wealth maximizing options. Indeed, in Bolivia, where land is closely

BOX 12

UNDERSTANDING LOCAL SYSTEMS: RESOURCE ACCESS AND LAND TENURE IN GHANA

Understanding local systems is important for understanding local adaptation preferences. In Ghana, access to resources and the form of land tenure system varied from community to community.

Within the forest communities, because some land is reserved to sustain forest culture, land for farming has become very scarce. In addition, acquiring new land is difficult due to the traditional land tenure system in place. In this system, it is the Akyekyerehene – the traditional custodian of the land – who controls community lands. Community chief and elders may only assist in acquiring private land(s) for farming by leading interested persons to the Akyekyerehene. Alternatively, they may link people with landowners prepared to engage in “abunu” or “ye ma yenkye”, a traditional sharecropping arrangement.

- Traditional systems practiced in cocoa farming are the “nhweso”, “abunnu,” and “ye ma yenkye”.
- The “nhweso” is a system whereby a caretaker is engaged on the cocoa farm(s) and is responsible for the maintenance of the farm on behalf of the landowner for some income.
- The “abunu” (halves) is a system where a person cultivates cocoa for a landowner or farm owner and is entitled to half of the farm’s proceeds and land.
- The “ye ma yenkye” system employs similar practices as the “abunu” however proceeds and land are shared on agreed proportions with the farm/land owner.
- Migrant land owners pay levies to the akeykyedie stool and local government for the use of lands.

During focus group discussions, men revealed that most of the farmers in the community have inherited their land from forefathers. In contrast, settler farmers are at a disadvantage as their only recourse is to rent land at four hundred cedis (approximately equal to USD\$400) per acre for three years and abide by the terms of the agreement.

linked not only with subsistence but also with culture and identity, indigenous populations may view remaining on ancestral land as more important than the pursuit of more lucrative endeavors elsewhere.

Hard and Soft Adaptation Options

Adaptation options need to be understood as a suite of possibilities to be undertaken by a host of people and groups. Distinguishing between hard and soft adaptation options will be necessary, as governments may tend to focus attention on the hard adaptation options. These options are often more expensive and more likely to attract donor funding. At the same time, they may also be less flexible in the long term if forecasting of future climate impacts is over- or under-estimated. That is why soft adaptation options (e.g., policy reform), which are often less costly in monetary terms, more flexible and tend to focus on the affected people rather than the affected land, should be considered and combined with hard options. Indeed, in **Mozambique**, a somewhat surprising conclusion emerged from study results: attempting to protect any portion of the coastline with hard adaptation measures would constitute maladaptation, while investment in soft measures such as evacuation plans or relocation of people out of commonly flooded areas would make more economic sense and result more sustainable in the long-term. Yet it is also important to note that evacuation plans and similar soft options may also encounter serious shortcomings including local resistance at the notion of being forcibly displaced and an inability to evaluate an evacuation plan’s effectiveness until it’s too late – that is, until after populations have been moved.

In **Bolivia**, during focus group discussions, it was observed that communities perceive adaptation strategies not as isolated measures, nor as single projects, but rather as a complex set of complementary measures that must comprise both hard and soft measures. Infrastructure investments were perceived to be insufficient if complementary efforts were not made to promote capacity building, institutional development, and in many cases, fundamental transformation

to underlying logic and livelihood strategies. Local residents described these adaptation measures as a hierarchy with a specific order of execution, as some strategies will depend on the sustainable implementation of others. For example, while the need for investment in irrigation infrastructure across the country is clear, the positive impacts of this investment will only be realized if simultaneous investments are made in water resource management including in water user associations and in supporting rural finance.

Similarly, in **Ethiopia**, local communities preferred a combination of hard and soft investments. In PSD workshops, participants noted that investments to strengthen national hydro-meteorological systems would be more sustainable if local institutions are able to support local populations absorb new information and technology through, for example, agricultural extension services.

In **Bangladesh**, regardless of the hazard, some suggestions for soft adaptation options were common in all hotspots, while hard measures were often specific to

particular areas. For example, building embankments to reduce the exposure of a community to floods or storms focus on protection and were suggested by populations living in flood and cyclone prone areas; at the same time, soft measures such as diversifying livelihood opportunities generally were seen as necessary across all hotspots and were tightly aligned with local perceptions of good development practice. During local PSD workshops, participants emphasized the need to invest in specific social policies to reduce local vulnerability. Suggestions included restricting early marriage and polygamy; empowering women and promote female education; and ensuring access to social security. A interesting proposal for improved disaster preparedness was for women to broadcast disaster warning information as other women were more likely to heed female voices and take appropriate action.

In **Mozambique**, the most common adaptation preferences identified in PSD workshops were combined with fieldwork findings to generate the schema presented in Table 5. All of the planned options in the left hand column represent potential government

TABLE 5

KEY ADAPTATION OPTIONS IN MOZAMBIQUE*

	PLANNED ADAPTATION	AUTONOMOUS ADAPTATION
Hard	▪ Flood control dikes and levies ▪ Coastal flood control gates ▪ Dams and irrigation channels ▪ Improved roadways ▪ Improved communication infrastructure ▪ Improved hospitals and schools	▪ More robust buildings ▪ Farm-scale water storage facilities ▪ Deep wells to provide drinking water for people and animals ▪ Grain storage facilities ▪ Improved food processing equipment
Soft	▪ Improved early warning of climatic hazards, and of dam releases ▪ Better planning and management of forest, fish, and other natural resources ▪ Resettlement of populations to lower risk zones ▪ More credit and financial services for small businesses and rural development ▪ Better education and information for the rural areas ▪ Improved health care, social services, and social support for all people	▪ Better utilization of short season and drought resistant crops to prepare for drought, floods, and cyclones ▪ Diversification of flood and drought risk by maintaining fields in both highland and lowland areas. ▪ Better household and community management and use of natural resources, including wild fruits ▪ Practice of soil conservation agriculture ▪ Migration to lower risk areas ▪ Diversification of livelihoods away from agriculture ▪ Better planning of how much grain to save for personal consumption, and how much to sell for income generation

* The options in plain text respond directly to climate hazards, while those in italics represent measures to increase the adaptive capacity of the population, or to make them more resilient to shocks to their livelihoods in general.



interventions. The right hand column represents autonomous measures that people can undertake on their own. These results indicate that more vulnerable groups will not have the resources or skills to undertake all measures they deem priority. This is particularly true for the hard options that require resources. However, in the absence of an enabling economic and political environment, many of the soft options are also challenging to undertake. For example, many participants noted the fact that people would like to diversify income, however there are few opportunities to do so. To support local aspirations, strong, flexible institutions will be needed to support rural economic development. Local PSD workshops in **Ethiopia** similarly emphasized the need for regional development and structural shifts toward service and industry sectors to improve employment outcomes for youth and vulnerable persons.

Interestingly, during PSD workshops in **Vietnam**, most groups envisaged a combination of hard and soft adaptation options necessary for building resilience. In several groups, afforestation of mangroves

ranked above the infrastructure options such as sea dike repair, given the lower costs of mangrove planting and the potential for this activity to be more pro-poor. This supports the cost-benefit analysis that is part of the EACC analysis as well as a main recommendation from the global synthesis report: that ‘cheaper’ soft options should be given due consideration when developing an adaptation strategy. Indeed, these options are very much on the table for many of the people engaged with climate change in Vietnam.

No-Regrets Adaptation Options

Adaptation options that realize co-benefits with sustainable development will fare better in improving the lives and livelihoods of poor and socio-economically disadvantaged groups. In contrast, policies that focus solely on adaptation to climate change may not account for external political economy factors that limit adaptive capacity. For example, flood problems in the pastoralist village of Gola, **Ethiopia** while problematic, are related less to climate variability but more to effects of soil degradation and the protection measures

taken by a nearby sugar estate. High food prices as well as human, animal and crop diseases are additional factors which contribute to vulnerability of rural populations. Indeed, dealing with only one element of vulnerability (e.g., exposure) or focusing development policies too narrowly on climate as a driver of vulnerability will not yield sustainable responses. This is a risk inherent in National Adaptation Program of Action (NAPA) documents that focus first on climate and then on how to prevent climate change from inhibiting development.

In **Mozambique**, results from the PSD workshops—especially the local workshop in the southern coastal city of Xai-Xai—revealed that except within agriculture, development goals were in general not threatened very much by climate change, and that the preferred adaptation options are *no-regrets* options (meaning that they make sense regardless of whether or not climate change is occurring, or under any future climate scenario). These results may be a result of workshop design: in the Mozambique workshops, participants first considered development visions within different economic sectors, the types of factors that could undermine these visions, and only then thought about how climate change could prevent the achievement of development objectives. In the NAPA process, by contrast, the question was somewhat different: what can be done to adapt to those climate impacts that could pose a threat to development? This results in approaches that are much more focused on climate rather than on no-regrets options. Interestingly, results from the PSD workshops in Mozambique nonetheless largely corroborated adaptation needs identified in the NAPA.

Results from research in **Ghana** highlight the need for policies to address both sectoral and geographic circumstances in order to develop climate resilient development interventions for vulnerable populations. For example, participants in PSD workshops agreed that improving crop yields without taking steps to improve road and marketing facilities would be counterproductive. In addition, the Ghanaian

workshop participants' visions and goals for the future were based on a realistic assessment of the strengths, potentials, weaknesses and threats. The future priorities identified included improvements in resilience among the poor by improving basic living conditions such as improved access to health care through health insurance, safe water and affordable clean energy. Adaptation options and pathways were assessed based on the synergies between responses to climate change and the desired development pathway. Specific (and gendered, see Box 13) priorities focused on improving agricultural production, improved land management practices, managed migration, and improved conditions of women, improved governance and functional institutional structures.

Today, the majority of investments at the municipal level in **Bolivia** are targeted at the development of improved water management schemes, as well as to improved agriculture and livestock practices. None of the studied municipalities had developed measures or assigned funding to interventions aimed specifically at

BOX 13

GENDER-SPECIFIC ADAPTATION PREFERENCES IN GHANA

Women in the Savannah region of Ghana prioritized new and improved seed varieties that withstand the current climate conditions are becoming increasingly relevant. Women also mentioned the need for improved access to loan facilities in order to facilitate petty trading which in turn would help them support their families. At the same time, men cited the need for reliable water sources for irrigation, such as dams and wells for dry season gardening. In addition, men underscored the need for cheap and subsidized farming inputs such as bullocks, tractor, fertilizer, and improved seeds to facilitate their farming activities. This mix of hard and soft measures may be considered as good development practice.

Source: Women's focus group discussion in Tetakui (Savannah region)

confronting climate change. However, in the municipality of Yapacani (vulnerable to floods), a disaster risk management program had been crafted to raise awareness among the local population for dealing with flood events through an early warning systems and a series of related measures. While the problem of climate change is still very new to local authorities, it is remarkable to observe emergency response measures being integrated into a longer-term development strategy so that local populations will become more resilient to climate change impacts.

Congruence of National and Local Plans with Local Adaptation Preferences

Do identified adaptation priorities align with existing development strategies?

The PSD workshops conducted in case countries revealed broad support for NAPA documents (where they exist) and related climate strategy priorities in-country, in such areas as agriculture and water resources management, land management, roads, and early warning systems. However, they also revealed stakeholder preferences for investments in governance, social protection, training and education, and land tenure. Training and education was identified as a need not only for livelihood diversification, but also in the area of increased capacity-building in community-based approaches to climate change adaptation and natural resource management.

In **Ethiopia**, three local PSD workshops (in highland, midland and lowland areas), and one national workshop, revealed broad support for NAPA and related climate strategy priorities in-country, in areas as agriculture and water resources management, land management, roads, and early warning systems. However, they also revealed stakeholder preferences for investments in governance, social protection, training and education, and land tenure. Training and education was identified as a need not only for livelihood diversification, but also in the area of increased capacity-building in community-based approaches to

climate change adaptation and natural resource management. The adaptation options identified at local and national levels generally aligned with the natural resource and agriculture focus in the NAPA, which also identifies needed investments in crop insurance, wetlands protection, carbon livelihoods, agro-forestry and anti-malaria initiatives.

In **Mozambique**, there are very few differences in outcomes between the NAPA process and the PSD process. The PSD workshops identified the options previously noted in the NAPA as the most important elements of adaptation pathways that directly addressed climate concerns. In the regional workshop in Beira (central Mozambique), participants focused most closely on the different climate impacts and how to adapt to each of them. All of the options they identified as most important map onto one of the NAPA priority areas. In one respect, however, the PSD workshops in Mozambique—especially the workshop in the southern city of Xai Xai—reached an implicit conclusion different from that of the NAPA process. That conclusion was that, except within agriculture, development goals were in general not threatened very much by climate change, and that far more important are those development initiatives that make sense independent of climate change.

In **Vietnam**, the main adaptation measures mentioned in the National Target Program (NTP) for climate change are mainly hard adaptation measures (sea dikes, reinforced infrastructure, more durable buildings) with less attention to other measures, such as resettlement, storm warning systems and mangrove planting (MONRE 2009). 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. There appears to be a disconnect at the national level in the understanding that soft adaptation can play an important role as well. In some cases, soft adaptation

options are actually discouraged in existing law, such as labor migration.

Interestingly, in the local workshops in Vietnam, some of the groups tended to favor hard options, and several groups preferred only soft options, but no group preferred solely hard options – the dominant focus of the National Target Program.

Similarly, a notable distinction was observed between the views of communities and local authorities with regard to climate change in **Bolivia** which has significant implications for future development and adaptation planning. Local officials interviewed believed that climate change is something that will come about in the future and that tackling it would involve a series of adaptation measures, especially infrastructure-building. This approach differs substantially from that revealed in interviews in the communities, where it is considered that climate change has been an accepted part of life for many years and that addressing it requires strategies to be developed – given that adaptation implies a fundamental change in livelihood strategies for communities, rather than being confined to one-off investments.

Explaining the official approach the Mayor of Curahuara Municipality in the Altiplano stated:

“In our community it would seem that over the last 10 years it has certainly got warmer and at critical times water is in short supply. But for the moment climate change is not a problem here and is not recognized as such in this municipality. It’s true that there are natural disasters but these have always been common in our area and we have an annual budget of Bs35,000 to deal with this. No doubt in future there will be more disasters.”

Adaptation as a Social Process

Strengthened civil society, using decentralized structures; engaging traditional and local authorities in planning; and using existing platforms for

BOX 14

UNINTENDED NEGATIVE IMPACTS OF AGRICULTURE POLICY IN VIETNAM

In Vietnam, government policy to encourage diversification particularly through provision of hybrid and high yielding varieties has led to rising incomes and increased agricultural production in the short-term. In 1980 only 17% of the rice grown in Vietnam was improved, hybrid, or ‘modern’ rice and by 2000 the total was more than 90%. In addition, capacity for triple cropping has increased annual production of rice to well over 10 tons per hectare in some areas.

Nonetheless, these improved varieties have resulted in a decline of indigenous seed varieties including maize in the uplands and ‘floating rice’ in the Mekong Delta. Consequently, many farmers have been forced to adopt less diverse production strategies due to this new reliance on single crops and varieties (McElwee 2007). In addition, these changes may also be contributing to maladaptation in the long-term as increased production capacity has imposed high capital costs on many farmers and required doubling labor input and cut into profits. Thus, despite spikes in agricultural productivity in the long term these farmers may ultimately become less resilient to climate events. (Hoang Tuyet Minh 2000).

community engagement is crucial for ensuring that climate action supports the wider development agenda. In addition, some adaptation measures, including those dealing with roads and water basin management may require cooperation between several communities. It is likely that adaptation measures that are analyzed, prioritized and negotiated with community members and on a cross-community basis will be more sustainable.

As shown by Holden et al. (2006), it is important that the selection of communal strategies is based on a bottom-up approach in which the local community is involved in all stages of the project in order to assure durability of the investments. At the same time, as marginalized groups already are in a more vulnerable



situation and have lower capabilities of improving the situation themselves, it is important that they are explicitly considered in development policies. Strategies proposed by communities themselves should be adequately reviewed, as they may not adequately involve more marginal households.

In **Bolivia**, community members elaborated on the need for processes that underpin the development of adaptation policies to respect existing community practices, which play a role in guiding the prioritization of investments. For example, municipal investments are typically identified and prioritized in community and municipal workshops in which civil society directly makes decisions. Recent changes to Bolivia's Constitution establish the right for indigenous and regional autonomies to exist within departmental limits. These structural changes aim to provide space for greater social and political inclusion for indigenous and peasant groups and establish a framework for a much decentralized government structure reflective of the cultural diversity of Bolivia. While to date these autonomies have not yet formed, it is possible that once created, they will follow the participatory planning structure already established at the municipal level whereby investments are identified and prioritized and decisions are made in community and municipal workshops. Amplifying the voice of indigenous groups and representatives of regional interests as well as provision of more direct access to information and decision-making procedures has the potential to improve adaptive capacity of these traditionally marginalized groups.

The PSD workshops in **Mozambique** identified the need for agricultural extension, effective early warning and information from upstream dam operators on water release to increase capacity to cope with floods. Similarly, the Government of **Ethiopia** plans to improve national hydro-meteorological services by adding weather stations across the country and integrating them with improvements to agricultural extension system to provide farmers with

better information on seasonal forecasts. Facilitating information flows and promoting information exchange between the local, regional and national level authorities increases the likelihood of capturing the comparative advantage of all parties involved and strengthening their adaptive capacity.

In **Vietnam**, there is a significant lack of horizontal integration as each ministry and each province and locality designs its own separate action plan. Sectoral

approaches also dominate, with specific ministries developing their own plans for agriculture, the water sector, energy sector, and the like. This can lead to competition among agencies. This division of activities among ministries and sectors (e.g., agriculture, industry) runs the risk of purportedly inter-sectoral approaches (like urban planning) not approaching adaptation in an integrated fashion but rather simply replicating existing administrative divides and 'silo' behavior, such as not sharing information.



Seven

Key Findings and Recommendations for Achieving Climate-Resilient Development

What follows is a set of key findings and recommendations drawn from the six social component country study reports and the final EACC global synthesis report. These findings convey that a social lens, which emphasizes the importance of considering all factors that determine exposure, sensitivity and adaptive capacity, is vital for improving analysis, diagnosis, process, policy and instrument design and outcomes for vulnerable populations.

The use of innovative, participatory methods in this study, such as participatory scenario analysis tools, is valuable for developing evidence-based policy recommendations to guide future pro-poor adaptation planning and processes. By bringing together local stakeholders' knowledge with expert information, the social component generated new evidence on how vulnerability is socially differentiated; identified the risks and benefits of adaptation options for a range of actors in an integrated and cross-sectoral manner; and highlighted the importance of transparency, social accountability, and strong governance for achieving pro-poor, climate resilient development interventions over the medium- to long-term.

Embedding these findings in ongoing policy processes would help to enable real-time dialogue with policy-makers, frame opportunities for future involvement of poor and vulnerable groups in decision making, and facilitate adaptation planning that maximizes co-benefits with sustainable development.

Key Findings

Vulnerability to Climate Change

- **Vulnerability to climate change is socially differentiated.** Exposure to climate risk will pose different risks to different groups of people. The ability to weather a cyclone or a drought will be shaped by a host of social factors including degree of social inequality; access to resources; poverty status; lack of representation; and effectiveness of systems of social security, early warning and planning. For example, gender inequities may lead women to experience climate hazards differently than men; similarly, the poor are likely to suffer disproportionately compared to the rich; and children and the elderly or people with a limited skill set may suffer more than others. Social identity may also lead to restricted access to certain resources and subsequent lower adaptive capacity. Social as well as political-economic structures will influence the impact of climate shocks and trends.
- **Across all countries, those consistently identified as most vulnerable to climate risk were those already socially vulnerable** (elderly, women, children, sick, disabled); ethnic minorities; indigenous peoples; people dependent on

natural resources for their livelihoods (e.g., pastoralists); and migrants. The poor were identified as particularly vulnerable, but in some cases “richer” groups will also be greatly impacted.

■ **People that contend with multiple inequalities will be most vulnerable to climate change.**

For example, many of the poorest belong to ethnic minority groups; largely depend on natural resources for their livelihoods; live in rural areas away from market centers; and have low levels of education. Their vulnerability to climate change is conditioned by climate and non-climate related factors. This highlights the need for adaptation measures and development interventions to address the multiple underlying drivers of vulnerability in order to build local resilience.

■ **Sensitivity factors to climate-related hazards are increasingly concentrated in particular regions** within countries. In many cases, the poor (such as recent urban in-migrants) are relegated to the most marginal areas where access to institutional support and basic social services is difficult or nonexistent.

Adaptation to Climate Change

■ **Local adaptation preferences are socially differentiated and conditioned by a host of social factors.** ‘One size fits all’ adaptation planning does not work; different communities among different regions will have different ideas about how to match their development objectives to the realities of climate change impacts on these development trajectories. Interventions need to be designed in an integrated and cross-sectoral manner in order to address risks and benefits of adaptation options for different stakeholders across scales.

■ **Experience with climate events to date and past coping measures hold valuable lessons for the future;** but future adaptation require new knowledge and improved access to information

– otherwise the risk of adopting maladaptive actions is high. Most actions taken by vulnerable groups today are really only short term coping mechanisms; planning for adaptation over the long-term is generally weak.

■ **Most adaptation actions to date have focused on hard infrastructure development.** Decisions to invest in hard adaptation measures may be “high-regrets” options in social and economic terms; the consequent irreversibility of these options merits very careful review. Longer-term adaptation options are generally lacking though there is some focus on building response capacity: e.g., investing in disaster risk management; having yearly evacuation drills; providing weather data to local authorities, etc. “Thinking outside the box” on adaptation was not very common across most field sites and may be attributed to the tendency for individuals to be constrained by their current context and inability to plan for future uncertainty.

■ **Lack of knowledge for dealing with climate impacts is a major obstacle to achieving socio-ecological resilience.** For example, coral bleaching and loss of fish is likely take place over a longer period, even as households may want to scale up their opportunities for ecotourism and home stays. If they pursue these options just as they are losing the natural resources on which the tourism would be based, they may be left worse off than before. If households had better access to long term forecasts for marine reef resources, they might choose to develop a different pathway for the future.

■ **Enabling livelihood diversification is essential to manage climate risk;** in some cases, profound transformation of livelihood activities will be required. Enabling social, political and economic structures will be necessary to support sector-specific investments aimed at strengthening the adaptive capacity of vulnerable groups.

- **Preferred adaptation options vary remarkably across sites.** Yet findings consistently revealed local preferences for both autonomous and planned adaptation; a mix of hard and soft measures; and awareness of the importance of pursuing both communal and individual adaptation measures was evident. In addition, the most effective adaptation strategies were perceived to be those that address overall drivers of vulnerability rather than those that focus on climate change alone. Examples of such measures include no-regrets options; provision of better access to credit; and improved training and capacity building initiatives.
- **Local adaptation preferences largely coincided with adaptation plans and climate change strategies at the national level (e.g., NAPAs).** Broad support exists at sub-national levels for national

priority areas such as agriculture and water resources management; land management; roads; and early warning systems. In addition, additional investments in governance; social protection; training and education; and land tenure are strongly favored at sub-national levels.

Recommendations

These findings lead to the following recommendations:

1. **Combine investments in hard and soft adaptation options to meet the needs of the poorest and most vulnerable.** Scaled-up investments in human capital (education and training) as well as organizational development (user committees,



disaster preparedness groups) can help reduce vulnerability in the medium and long-term, and complement hard infrastructure investments such as irrigation and roads.

2. **Consider and build on past strategies to cope with climate variability as they may hold valuable lessons for future climate change adaptation.** Past adaptation experience (combining indigenous knowledge and introduced best practice) can offer insights, though planned development policies and measures must avoid supporting maladaptive actions and processes that deliver short-term gains or economic benefits but may exacerbate vulnerability in the medium to long-term.
3. **Better access to information, budget setting, and planning processes are needed across scales** in order to foster socially-sustainable adaptation investments. This includes improved citizen access to information; improved coordination between institutions both across vertical and horizontal scales; and provision of better early warning systems and climate forecasting technology. The principle of subsidiarity (i.e., decisions devolved as close to end-users as possible) should be considered.
4. **Social policy interventions, including social protection, and education and training, are needed to help reduce shocks and stresses to households from climate variability and change** and support livelihood diversification. Programs need to ensure they target the poorest and most marginalized, and that they support area resilience.
5. **Adaptation interventions that realize co-benefits with sustainable development should be pursued.** Policies should not focus solely on climate change adaptation but also address underlying drivers of vulnerability including lack of infrastructure, poor governance, regional bias in investments, and the need for flexible natural resource management institutions and an enabling market environment. Such no-regrets options can be implemented now and will improve livelihoods even in the absence of climate change.
6. **Governance matters.** Improving climate change policies will require action that supports inclusive and participatory decision making; transparency among parties concerned; accountability for decisions made; capacity to secure implementation and enforcement of decisions made; integration and coherence of policies across sectors and scales; and communication and consultation with vulnerable populations. A strong state will address vulnerabilities by designing, implementing and enforcing sustainable development policies. This includes translating policies into incentives and opportunities while using disincentives to discourage investments that may perpetuate vulnerability in the long term.
7. **Developing adaptation interventions through a participatory and inclusive stakeholder process helps ensure that climate action supports the wider development agenda.** Strengthened civil society, using decentralized structures, engaging traditional and local authorities in planning, and using existing platforms for community engagement is crucial to help ensure users are involved in needs assessment, investment choices, and assessment of service delivery.
8. **Target geographic regions where sensitivity to climate hazards is high and consider multi-sectoral investments that build area resilience.** As sensitivity to climate hazards are increasingly concentrated in particular regions within countries, adaptation policies at the national level should take into account the diverse socio-ecological settings within the country, and devise area-specific interventions that support the livelihoods of these vulnerable populations. Multi-sectoral interventions that aim to improve area resilience are particularly

effective forms of investment, including programming in education and skills training, social protection, roads, market services, and natural resource management.

9. **Invest in enabling policies that enhance sector-specific interventions.** Climate change adaptation portfolios that feature stand-alone

investments in infrastructure and services should be complemented by enabling policies such as improved land policy, improved natural resource management and the transfer and adoption of new technology. Without these supportive elements, planners may inadvertently support maladaptive actions that perpetuate vulnerability in the long-term.



Eight

Next Steps and Challenges Ahead

As the world's poor and most disadvantaged groups will be hardest hit by climate change, a social perspective is crucial for gearing climate action in a direction that prioritizes their most urgent and pressing needs in the short, medium and long-term. Indeed, building resilience to climate risk has become a core development issue. Understanding vulnerability to climate change as socially differentiated and recognizing that adaptation is shaped by a range of social, economic and political factors is fundamental for devising effective responses that address the myriad causes of vulnerability and ultimately support the wider sustainable development agenda.

Many of the recommendations in this synthesis report make sense in the absence of climate change. Yet climate change adds an additional layer of complexity to this challenge. The prevailing context of uncertainty and the irreversibility of impacts on human and natural systems make building resilience and achieving sustainable development more urgent than ever. A *no-regrets* approach to development targeted at the poor and most vulnerable is the only viable course.

To pursue this approach, the involvement of the full range of stakeholders from communities, civil society,

government, the private sector and faith-based organizations will be required. Identifying and coordinating the development needs, preferences and priorities of relevant actors will be the first step. Anchoring development visions in the notion of social justice must follow. A socially just approach to climate change emphasizes the need to empower those most vulnerable by amplifying their voices, improving institutional capacity to better service their needs and reducing existing inequalities in access to assets and resources. This approach helps define roles and responsibilities towards one another and towards the planet and must be integrated from the local to the global scale.

Evidence generated from the social component of the EACC study helps to shape our diagnosis of climate change; alters our understanding of vulnerability and informs our perception of what adaptation means for poor and vulnerable populations. This study provides an important complementary perspective to the sector-based and global analyses of the EACC study. Integrating a social perspective into national efforts to design adaptation strategies will help to ensure that development interventions target poor and disadvantaged groups and socio-ecological resilience to climate risk is achieved.



Annex One

Bangladesh Study Overview

Projected Climate Change Impacts

As a low-lying, deltaic country with a large and highly dense population, Bangladesh is extremely vulnerable to climate change. Key climate impacts for the country include sea level rise, cyclones, storm surge, flooding, land erosion, waterlogging, and salinity intrusion in soil and water. With regard to *sea level rise*, Bangladesh has been ranked as the third most vulnerable country in the world in terms of number of people affected. By 2050, assuming a sea level rise of 27 cm, around 33 million people would be affected by flooding (Pender 2008). A 1m rise in sea level would inundate a full 18% of the total land in Bangladesh. Sea level rise reduces river gradients causing backwater effects that induce drainage congestion. It would also induce saline water “overtopping” of flood protection coastal embankments, causing further saline intrusion and damage to agriculture and freshwater sources (Ahmed 2006).

Extreme events such as *cyclones and floods* are projected to increase in Bangladesh due to climate change. The predicted increase in rainfall, changes in rainfall timing, and melting of Himalayan glaciers will increase the frequency, duration and extent of flooding. Large populations living in environmentally fragile coastal areas, dependent on natural resource-based livelihoods and vulnerable to regular flash and riverine floods, will thus become even more vulnerable. In

the short term, glacial melt is likely to increase seasonal river flooding in the Ganges and Padma basins during the spring and monsoon months. In the long term, however, the shrinking Himalayan glaciers will lead to overall basin water scarcity (Pender 2008).

Riverine flooding and related *river bank erosion* has extreme negative impacts for the 5% of the Bangladesh population (6.5 million people) who live on the 7,200 square kilometers of *char* riverine islands. The *char* dwellers are dependent on agriculture, and face lack of basic services and access to good governance mechanisms. More powerful cyclones and rising sea levels also affect *coastal erosion*. It is estimated that with climate change, more than 5,800 hectares of land could be lost by 2030 (with nearly 12,000 by 2075), together with 13,750 tons of food grain production lost by 2030 and 252,000 tons by 2075. *Drought* is also predicted for some parts of the country due increasing evapo-transpiration from higher temperatures, diminished winter rains, and increasing rainfall variability across the country. Both *rabi* and *kharif* season crops would be affected by this drought, especially in the northwest, north-central and southwest regions (Rahman et al. 2007).

Overview of Hotspots

As discussed above, Bangladesh is exposed to a wide variety of climate change impacts and induced hazards

including drought, river floods, flash floods, cyclones and tidal surges, salinity intrusion, water-logging and drainage congestion. Each of the selected hotspots was chosen on the basis of its representing a key hazard in order to better understand the impact on the community. While each ‘hotspot’ represents a main hazard, many areas are in fact exposed to multiple hazards which reinforce negative shocks. Further, the country has uneven socio-economic development, leading to differentiated patterns of vulnerability to climate change.

Taking these hazards into account, a total of eight study sites or ‘hotspots’ were selected (see Figure 4). In this study, the term ‘hotspots’ refers to those regions already vulnerable to climate variability and likely to suffer substantial impacts in future from climate change, with poverty and vulnerability characteristics also present. The sites shown are large areas (districts). Actual fieldwork was conducted in particular villages or urban slums (see Table 6).

Site Selection Rationale

Different parts of the country are exposed to various types and magnitudes of climate hazards. Further, pockets of high poverty incidence generally coincide with ecologically poor areas of Bangladesh: i. low-lying depression area, called *haor*, in the north-east; ii. drought-prone area on relatively higher land in the

north-west; iii. several *upazilas* fringing the major rivers, particularly along the Jamuna River; and iv. several of the south-eastern *upazilas*, including the Chittagong Hill Tract. The hotspots selected exhibit variation in socio-economic development, resource availability and exposure to natural hazards.

Empirical Findings

Vulnerability to Climate Change

Vulnerability was found to stem from exposure factors such as physical location and hazard-proneness (as in the riverine *char* islands); sensitivity factors such as economic geography and levels of regional development; socio-economic status and degree of economic “power” (e.g., in value chains), and social differentiation including gender. Socio-economic factors exacerbating sensitivity at the household level included: landlessness, illiteracy of adults and children, temporary migration status, large family size, and female-headed household status. At the community level, these included latent social conflict and lack of political voice (e.g., urban in-migrants).

Social capital and organizational presence are important aspects of household and area adaptive capacity. Urban respondents expressed more concern than

TABLE 6

EIGHT HOTSPOTS SELECTED FOR BANGLADESH STUDY

HOTSPOT (REF. HAZARDS)	REGION	DISTRICT	UPAZILA	UNION	VILLAGE
Drought-prone	NW	Naogaon	Porsha	Nitpur Sadar	Nitpur
Salinity-prone	SW	Satkhira	Assasuni	Protapnagar	Sonatankathi
Cyclone-prone	SW	Bagerhat	Shorankhola	Southkhali	Gabtala
River Flood- prone	NW	Sirajganj	Kazipur	Natuar Para	Ghora Gacha
Flash Flood-prone	NE	Sunamganj	Tahirpur	Dakshin Sreepur	Janjail
Waterlogging-prone	SW	Jessore	Keshobpur	Safalakathi	Kalicharanpur
Tidal Flood-prone	SE	Cox’s Bazaar	Cox’s Bazaar Sadar	Khurushkul	Rastarpar
Drainage congestion-prone	Dhaka	Dhaka	Mohammedpur	Adabor	Comfort House

rural residents about leaving assets unattended during floods, suggesting that urban households may take dangerous risks (i.e., not evacuating) due to a heightened sense of social insecurity. Fieldwork revealed that NGO presence was highly unequally distributed, with an overwhelming presence in cyclone-prone Bagerhat district (rebuilding houses, providing radios

and delivering cyclone warnings) but no presence in saline Satkhira district that also suffered, secondarily, from cyclones. Here, failure to consider the role of overlapping hazards meant that neither disaster response infrastructure, nor the social learning that accompanied it, as in Bagerhat were present in the saline area.

FIGURE 4

Map of Study Sites in Bangladesh





Area asset status, including infrastructure: Poor communication and transport facilities reduce people's mobility and livelihood options as seen in the north-east region, where lack of road infrastructure also left villages isolated and suffering from underinvestment by government and NGOs. In Cox's Bazaar, poor communication meant that people could not travel to safe shelter easily and relief materials did not arrive in time. Further, just as asset depletion can lead to chronic poverty at the household level, at the area level too repeated hazard events can reduce a region's adaptive capacity. For example, rising water levels can completely sever road links for months at a time, with consequent impacts on regional growth. Diversified structure of the regional economy is important in providing a base for effective adaptation. For example tourist areas offer a broader range of livelihood opportunities for area households than those solely reliant on agriculture, thereby reducing vulnerability to climate impacts.

Climatic shocks and the effects of multiple hazards: Climate hazards subject households to economic shocks. Natural disasters were mentioned by more than half of all respondents in Bangladesh as the reason for sudden loss of household income, while illness or death of family members named by only 12 percent of households. It is important to consider the *temporal scale* of climate-related shocks i.e., rapid-onset (such as cyclones) or slow-onset (e.g., floods and waterlogging), and also their frequency. Multiple extreme events arriving one after another do not allow households sufficient time to recover their earlier asset base. Further, hotspots investigated were found to be doubly- or triply-exposed to hazards. For instance, river bank erosion leads to agricultural land loss in cyclone-prone areas, further reducing household ability to cope with frequent disasters. The compound effect of these events was often enough to tip households into chronic poverty status. None of the hotspots had particularly strong adaptive capacity given their poor asset bases that prevented livelihood diversification in times of crisis. Long-term adaptation planning (beyond short and medium-term

measures as changing crop types and planting dates) includes the need for economy-wide diversification, as well as significant improvements in human capital levels to allow households to take advantage of risk-prevention strategies at household and area levels.

Preferred Adaptation Options Identified through PSD Workshops

Participants in local and national PSD workshops identified similar adaptation preferences (e.g., in disaster risk management, fisheries support, agriculture, and governance arenas). However, local workshop participants particularly emphasized the need for social protection, livelihoods diversification and gender-specific support.

Overall, preferred adaptation options were identified in:

- Environmental Management (mangrove preservation; afforestation; coastal greenbelts; waste management);
- Water Resource Management (drainage; rain-water harvesting; drinking water provision, and flood control);
- Infrastructure (roads; cyclone shelters);
- Livelihood Diversification;
- Social Protection (especially for fishers during cyclone season);
- Education;
- Agriculture (development of salt-tolerant and high-yield varieties; crop insurance);
- Fisheries (storm-resistant boats; conflict resolution between shrimp and rice farmers);
- Governance (especially access to social services for urban poor) and;
- Disaster Risk Management that is gender-responsive (e.g., for separate rooms for women in cyclone shelters; mini-shelters closer to villages; use of female voices in early warning announcements; and mobile medical teams in *char* areas).

Integration of Results in Overall EACC Country Study

Conclusions from the overall EACC-Bangladesh country study highlighted the high *incidence of poverty in those parts of the country most vulnerable to climate hazards*, and recommended a scaling-up of investments for poverty reduction (including high-yielding crop varieties, protective infrastructure, and disaster management). Governance and social protection issues raised in the social study featured less prominently in the overall report, which emphasized for urban populations in particular a balance between government support and “strategic relocation” (the latter was not raised in PSD consultations). Transboundary water resource management was highlighted in the overall report, but not raised by respondents in the social study.



Annex Two

Bolivia Study Overview

Projected Climate Change Impacts

Climate change models¹ for Bolivia indicate that the country will be hotter in the coming years, with average temperatures rising by 0.8–3.9°C over the next 100 years². Rainfall projections are less certain and at times contradictory. Some scenarios predict an increase while others suggest less rainfall. Nevertheless, all the scenarios appear to agree that the rainy season will be shorter and more intense. Climate change is already apparent throughout most of the country.

According to the National Climate Change Program (PNCC), the Andean glaciers that supply drinking water and energy for major cities like La Paz and El Alto are experiencing rapid melting. EACC climate models developed under other components show that average temperatures are increasing. The rainfall pattern has undergone changes, with the rainy season getting shorter but more stormy. As a result, the Altiplano (high plateau), the inter-Andean valleys and the Chaco which host three-quarters of Bolivia's population, are experiencing a rapid process of

desertification, with areas of desert becoming larger and rivers and catchment areas drying up. This is in the context of large-scale drought vulnerability for the country as a whole, given that only 15% of agricultural land is irrigated. The majority of cultivated areas thus rely on rainfall, which in most parts of the country is only seasonal (i.e., present for four months of the year). Further, the Amazon region of Bolivia is itself already experiencing a higher incidence of drought, as well as increased frequency and intensity of flooding during the rainy season.

Overview of Hotspots

Bolivia can be divided into four separate agro-ecological macro-regions:

- **Highlands:** At a height of over 3500 meters above sea level the highlands (the high plateau or 'Altiplano' and the Andes mountain chain) contain municipalities such as La Paz, Oruro, Potosí and Cochabamba. The climate is generally cold and dry. This macro-region can be further divided into northern and southern regions, with the former subject to the highest humidity.
- **Valleys:** Located in the foothills of the eastern mountains, the height of the inter-Andean valleys ranges from 1000–3500m above sea level. The valleys fall within the departments of La

¹ Here we refer to the study undertaken by the PNCC in which a comparative analysis was done of the climatic models HADCM2, HKHI, GISSEQ, MAGICC y SCENGEM, employing three CO₂ emission scenarios: IS92a, IS92c, IS92e. The results were applied in a vulnerability study of Bolivia's main ecosystems. See PNCC, Escenarios climáticos, 2007.

² IS92a scenario

TABLE 7

SITES SELECTED FOR BOLIVIA STUDY

	MUNICIPALITY	PROVINCE	DEPARTMENT	LANGUAGE	MACRO-REGION
1	Tarvita (Villa Orias)	Azurduy	Chuquisaca	Quechua	Valleys
2	Villa Vaca Guzman	Luis Calvo	Chuquisaca	Spanish	Chaco
3	Calacoto	Pacajes	La Paz	Aymara	Altiplano
4	Pucarani	Los Andes	La Paz	Aymara	Altiplano
5	Sicaya	Capinota	Cochabamba	Quechua	Valleys
6	Carangas Curahuara	Sajama	Oruro	Aymara-Spanish	Altiplano
7	Vitichi	Nor Chichas	Potosi	Quechua	Valleys
8	Porco	Antonio Quijarro	Potosi	Quechua-Spanish	Altiplano
9	El Puente (Tomayapo)	Mendez	Tarija	Spanish	Valleys
10	Yapacaní	Ichilo	Santa Cruz	Quechua-Spanish	Plains
11	Charagua	Cordillera	Santa Cruz	Spanish-Other	Chaco
12	Saipina	Manuel M. Gentleman	Santa Cruz	Spanish	Valleys
13	San Ignacio	Moxos	Beni	Spanish	Plains
14	San Pedro	Manuripi	Pando	Spanish	Plains

Sample by department: Chuquisaca (2 municipalities), Santa Cruz (3 municipalities), La Paz (2 municipalities), Potosi (1 municipality), Cochabamba (1 municipality), Oruro (1 municipality), Tarija (1 municipality), Beni (1 municipality), Pando (1 municipality).

Paz, Cochabamba, Potosí, Chuquisaca, Tarija and Santa Cruz. The climate is temperate. Again, this area can be divided into two regions: the 'dry' valleys and the more humid Yungas.

- **The Chaco:** Located in the southeast. This area - with a hot, dry climate - is less than 1000m above sea level and contains the departments of Tarija, Chuquisaca and Santa Cruz.
- **The Plains (llanos):** In the northeast, lying at under 1000m height and with a warm, humid climate, contain the departments of Santa Cruz, Beni, Pando and parts of La Paz and Cochabamba departments.

Fourteen municipalities were selected for the study to cover the four agro-ecological macro-regions of country, and also to represent diversity in livelihood

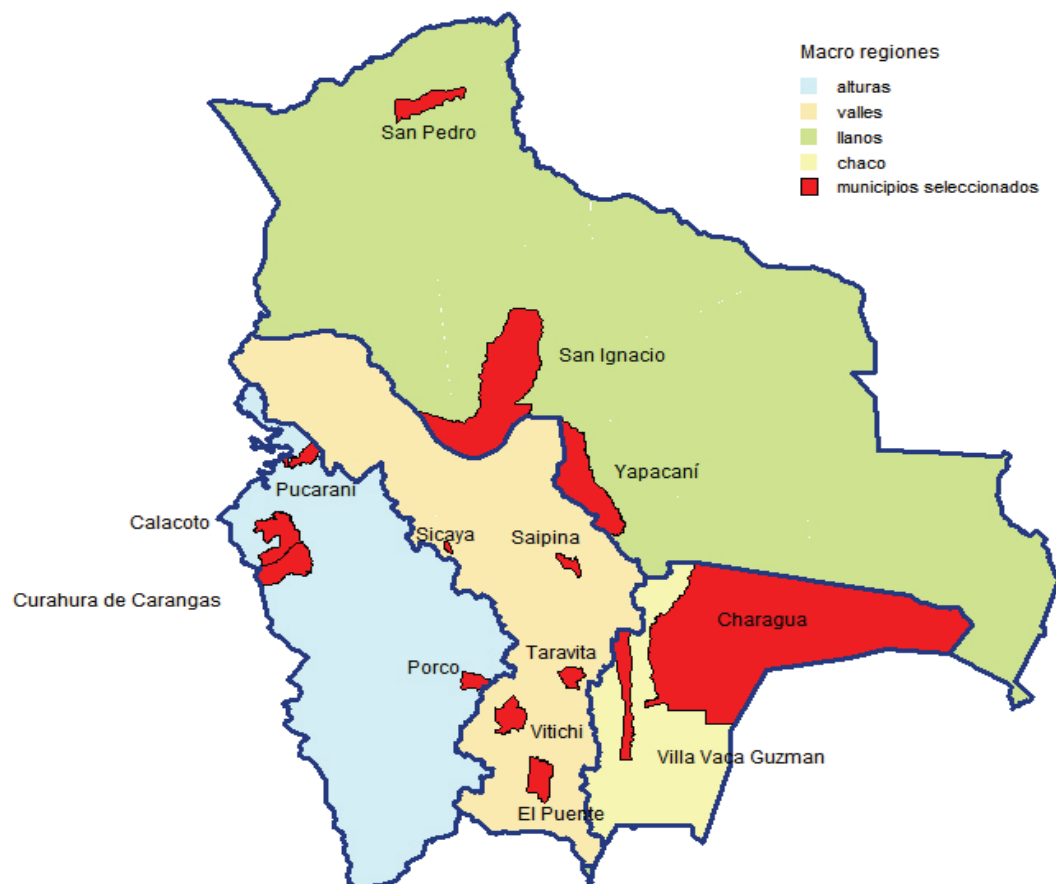
systems, poverty indicators, and altitude. There were 4 sites from the Altiplano, 5 from the Valleys; 2 from Chaco region; and 3 from the Plains area (see Figure 5). The sites are listed in Table 7.

Site Selection Rationale

Sites were selected to cover all of the macro-regions, with a focus on those areas most vulnerable to climate change. Vulnerability to climate change was considered not only in terms of physical exposure but also in terms of adaptive capacity, that is, areas that were low in response capacity, education, and economic development was selected. In addition, sites were selected to cover a range of livelihood systems, ethnic groups, levels of population density, and poverty levels. In addition, sites were purposively sampled that would cover areas most exposed to drought risks. At least two sites exposed to flood risks were included.

FIGURE 5

Map of Study Sites in Bolivia, by Macro-Region



Urban-rural: The study focused on Bolivia's rural population, and the most vulnerable groups i.e., the indigenous *campesinos* in particular as these groups are highly vulnerable to climate change. It is recommended that a separate study be dedicated to Bolivian cities who are also vulnerable, due to melting of glaciers that provide water for water supply, agricultural production for urban good supply, and which in the case of cities near large rivers are also vulnerable to floods during the rainy season.

Empirical Findings

Vulnerability to Climate Change

The populations most vulnerable to climate change are the poorest groups who generally reside in dry zones (central and southern Altiplano, valleys and plains), and along riverbeds in lowland areas. Their particular sensitivity to climate change comes from physical location and the climate-sensitive resource dependency of their livelihoods which are based on rain-fed agriculture, small-scale livestock farming, forest harvesting, hunting and fishing, and seasonal



labor.³ Salient differences in socioeconomic status are mostly explained by ownership of livestock and arable land.⁴ The region with the greatest inequality is the Plains macro-region, where indigenous and peasant communities live side-by-side with agro-industry, large-scale cattle breeders and timber industries. Indigenous groups face particular sensitivity due to social exclusion.

Slightly better-off households engage in a combination of rain-fed and irrigated agriculture; livestock farming; non-agriculture work; and temporary migration. Those households most resilient to climate change have livelihood strategies based on irrigated agriculture; semi-enclosed livestock production or large-scale livestock farming; dairy farming; and service sector employment. The most vulnerable households due to sensitivity factors of socio-economic status are those with elderly, disabled or young members, as well as female-headed households.

Past Adaptation and Coping Practices

Households considered past coping strategies in the event of a flood, drought, hailstorm and/or frost. Half of the 70 households interviewed did not engage in new activities to manage the extreme event. The remaining 50 percent of households interviewed engaged in diverse adaptation practices (see Figure 6). Thirty-six percent engaged in temporary migration. Seventeen percent of households interviewed developed new livelihood activities such as production of artisan goods, or engaged in petty trade or daily labor as part of adaptation. Twenty-five percent of families reverted to ancient indigenous practices including

3 Focus group discussions, community workshops, expert interviews and household interviews were conducted. Poverty levels of 70 interviewed households were classified based on indicators such as land tenure, livestock holdings, family prestige, children's occupation, and type of housing.

4 In the study areas, all of the families are considered poor, according to the definition of poverty from the National Institute of Statistics.

rituals to call for rain, creating smoke to combat frosts, and lighting fireworks to combat hailstorms.

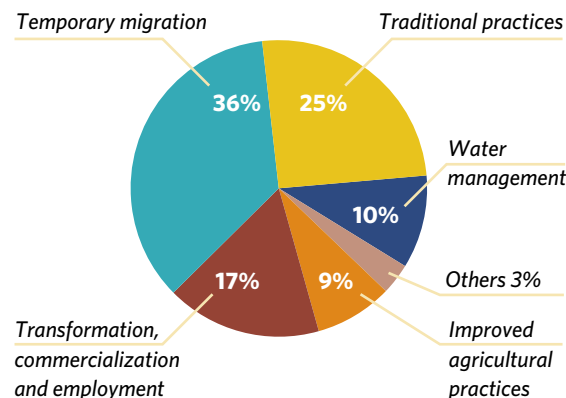
Adaptation Preferences Arising from Community Consultations

The adaptation measures prioritized by the communities reflected their past experiences dealing with climate hazards, own cultural criteria and considered economic values. The preferred measures included: water management; infrastructure; improving livestock farming; improving agriculture practice; better environmental management; training and capacity building; credit and finance; transformation and employment. Communities in the Altiplano and Valleys prioritized adaptation measures in water management, followed by improved agricultural and livestock practices. They viewed drought as the main threat to their livelihoods. In contrast, communities from the Chaco and Plains regions asserted that improved agricultural practices were a priority for their region, and considered water management measures to be of secondary importance.

Complementary investments in both hard (i.e., new infrastructure) and soft (i.e., safety nets, capacity building, knowledge sharing) adaptation options will be vital to meet the needs of the most vulnerable. Improving extension services and increasing access to markets, for example, will be needed to complement the development of hard adaptation measures such as the construction of infrastructure. Local government authorities favored investment in discrete, hard measures, while community members preferred more comprehensive strategies that support enhanced

FIGURE 6

Past Responses to Climate Events in Bolivia



diversification of livelihood systems threatened by climate change.

Integration of Results in Overall EACC Country Study

The Bolivia country report for EACC has mainstreamed the conclusions from the social component throughout its text. Key conclusions include the importance of: i. decentralized approaches to adaptation planning, and use of indigenous knowledge; ii. combining hard and soft adaptation measures as part of country responses to climate change; and iii. addressing the place-specific vulnerabilities of rural and indigenous peoples who are dependent on agriculture and highly vulnerable to predicted increases in water scarcity - in order to reduce the negative distributional consequences of climate change for Bolivia.



Annex Three



Ethiopia Study Overview

Projected Climate Change Impacts

Climate change represents a profound threat to the livelihoods of the poor and other households in rural and urban Ethiopia. The country is highly vulnerable to climate change, with increasing extremes of both drought and flood predicted. Ethiopia's population is also heavily rural and dependent on natural resource-based livelihoods, further exacerbating vulnerability. Land and water management are central concerns. Significant regional differences in production systems, rates of urbanization, and road connectivity, among other factors, place specific locales in different positions of vulnerability to climate change.

Climate change in Ethiopia is projected to increase the frequency of drought and flood. Although climate models vary, there is general agreement that Ethiopia will see greater climate variability and extreme events. Reports by the National Metrological Agency (NMA) show that rainfall will decline in some parts of the country, but increase in other places. Baseline climate data prepared for the NAPA shows that there has been a warming trend in the annual minimum temperature over the past 55 years. Temperature has been increasing by about 0.37 degrees Celsius every ten years. Scenarios performed for desert areas show great variation across Africa for the period 2071–2100 relative to the period 1961–1990 (IPCC 3rd Synthesis Report, 2001). Other regional predictions

for changes in temperature and rainfall suggest the following likely effects over the next 50 years (2010–2039): i) A decrease in rainfall over the northern parts of Africa; ii) An increase in rainfall on the western part of the continent in normally dry months. On the other hand, East Africa has displayed a stable rainfall regime. For instance, the drier areas of eastern and South Eastern Ethiopia are shown to exhibit a change in mean precipitation of 0–0.25 mm/day. However, these general trends may include hidden variations within the regions. Elasha et al. (2006) report that in relation to extreme events results of the Global Circulation models, in general terms the climate in Africa will become more variable with climate change. The exact nature of the changes in extreme events is still debatable, but there is general consensus that extreme events will increase and may get worse.

Key impacts and vulnerabilities to future climate change include the impact on water availability. Along with other Horn and Northern African countries, Ethiopia is one of the countries that will face freshwater scarcity by 2025. The NAPA concludes that current climate variability is already imposing a significant challenge to the country by affecting food security, water and energy supply, poverty reduction and sustainable development efforts, as well as by causing natural resource degradation and natural disasters. Climate hazards, mainly rainfall shortage and drought, have caused instability in national

economic performance. The NAPA document identified major adverse impacts of climate variability in Ethiopia, including: i. food insecurity from drought and flood incidence; ii. disease outbreak such as malaria, dengue fever, water borne diseases (such as cholera, dysentery) from floods and respiratory diseases associated with droughts; iii. damage to land from heavy rainfall; and iv. damage to communication, road and other infrastructure from floods.

Overview of Hotspots

The team created a typology of vulnerable zones for the entire country. These zones, eight in total, represented a range of agro-ecological, climate hazard, farming system, and social scenarios, namely: i. Highland *belg* zone with cereal and livestock; ii. Highland zone with cereal, livestock and degraded soils; iii. Lowland pastoral/agro-pastoral zone; iv. Lowland—mixed farming and degraded soils zone; v. Midland irrigable zone; vi. Midland high agricultural potential; vii. Mid Highland Perennial and roots crops zones; and viii. Urban zone.

From these zones, sites were selected to reflect vulnerability to drought, diverse production systems (agriculture, agro-pastoral, and pastoralist systems), and areas where Government of Ethiopia /World Bank-supported projects were ongoing. Projects represented included the Productive Safety Net Program (PSNP) in Kalu *woreda* (district) in the Amhara region in

South Wollo zone (both highland and lowland sites in Kalu), and both the PSNP and Pastoral Community Development Program (PCDP) in Fantalle *woreda* of Oromia Region, which is a lowland pastoralist area. Local PSD workshops were conducted in these *woredas*, as well as Kindo-Koysha *woreda* in the mid-highland perennial and root crops zone. With Ethiopia's long experience of drought, areas of the country have already been designated as having different levels of drought probability. Much of the low land areas in the East, Southeast, and Northeast parts of the country are areas of high drought probability. The field sites selected fall within the high and medium drought probability zones. In total, the 7 field sites (i.e., 6 *kebele* villages, as well as Kindo-Koysha) across three *woredas* represent: i. Highland *belg* zone with cereal and livestock; ii. Lowland pastoral/ agro-pastoral zone; and iii. Mid-Highland Perennial and root crops zones (see Table 9). Selection of villages from these *woredas* was done with the *woreda* administrations and the PSNP and PCDP programs. The *kebele* selected for the survey work are given in Table 8.

Site Selection Rationale

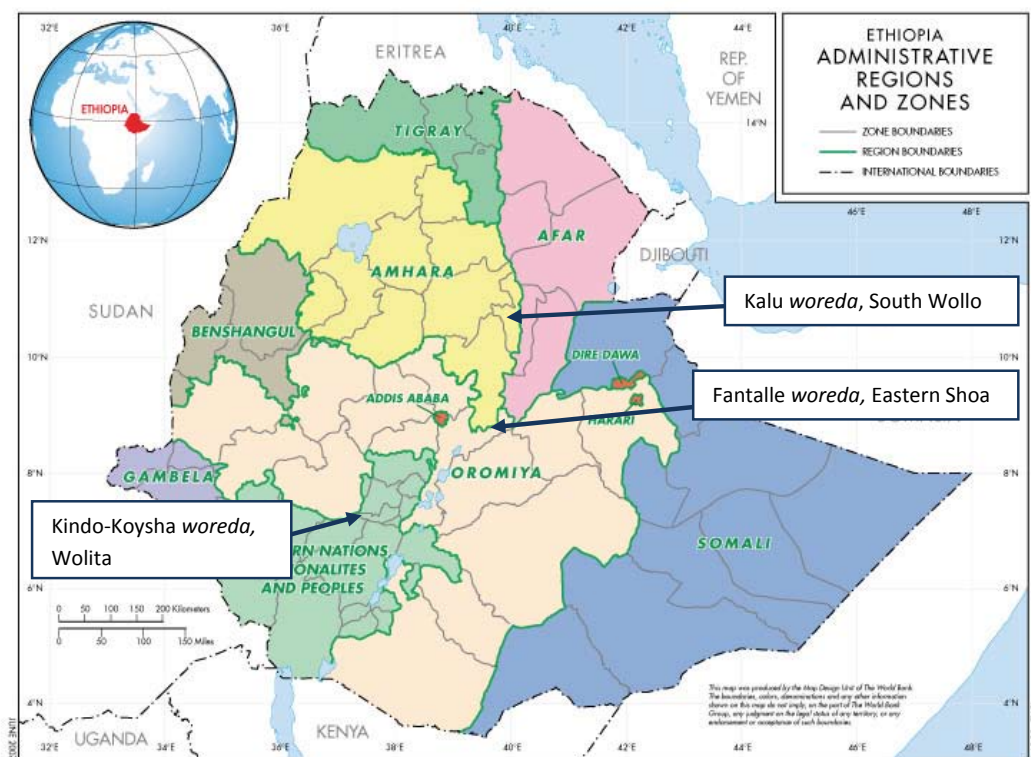
Sites were selected to represent drought vulnerability, a range of production systems, and also to overlap with Government of Ethiopia/ World Bank project areas for Productive Safety Nets Program and Pastoralist Community Development Project. Budget constraints

TABLE 8
KEBELLE (VILLAGES) SELECTED FOR FIELD SURVEY IN ETHIOPIA

	KEBELLE	WOREDA	REGION- ZONE	ALTITUDE	POPULATION SIZE	DISTANCE TO NEAREST TOWN
1	Haro Kersa	Fantalle	Oromia (North Shoa)	800 m	904	30-35 km
2	Gola	Fantalle	Oromia	800 m	2,213	15 km
3	Choresa	Kalu	Amhara (South Wollo)	1,450-2,000 m	5,829	10 km
4	Birko Debele	Kalu	Amhara	1,450-2,000 m	8,571	20 km
5	Keteteya	Kalu	Amhara	2,000-2,600 m	9,338	45 km
6	Hardibo	Kalu	Amhara	2,000-2,600 m	7,900	35 km

FIGURE 7

Map of Ethiopia, with Regional Administration Boundaries



allowed for only six sites for survey work within a defined area. PSD sites were selected to coincide with those where the survey was undertaken (i.e., in Kalu and Fantalle, as well as a third site in Kindo-Koysha).

Empirical Findings

Vulnerability to Climate Change

Vulnerability was found to stem from exposure factors such as physical location/ hazard-proneness; as well as sensitivity factors including economic geography/ regional development levels; socio-economic status including high dependency ratios in households and low education; and social differentiation variables including ethnic and migrant status, and gender.

Physical location and hazard proneness greatly affect household sensitivity to climate change, as in the drought-prone lowlands which are chronically exposed to low rainfall. Thus vulnerability to climate change stems in part from households' location in degraded and threatened environments. Households surveyed already face significant deprivation, with 84 per cent reporting food shortages during part of the year. *Governance and political economy issues* were also identified as aspects of sensitivity: these included non-transparent policy regimes, such as those that have favored external investment and park development e.g., in pastoralist areas of lowland Ethiopia.

Vulnerable groups with high sensitivity to climate change included asset-poor households with very limited means of coping with climate hazards, the

TABLE 9

IDENTIFIED VULNERABILITY ZONES IN ETHIOPIA (FINAL STUDY SITES IN BOLD)

VULNERABLE ZONE	AGRO-ECOLOGY (MOARD ZONES)	PROPOSED WOREDA	REGION (ADMIN ZONE)	CLIMATE HAZARDS	FARMING SYSTEM	SOCIAL VULNERABILITY; OTHER FEATURES	GOE/ WB PROJECTS
1. Highland, belg zone, cereal and livestock	Cool moist mid highland (M2)	Wuchale	Oromia (North Shoa)	Drought	Mixed farming; belg crop in highland areas	Failure of belg; shortage of fodder and water; water logging problem in rainy season	PSNP
		Kalu	Amhara (South Wollo)	Drought	Mixed farming	Harvest failure, land degradation, history of food aid	PSNP
2. Highland, cereal and livestock, degraded soils	Tepid sub-humid mid highland (SH2)	Sodo-Zuria	SNNPR (Gurage)	Poor agric.	Mixed farming, good onset culture	Land degradation scarcity, food insecurity; labor migration	PSNP
	Tepid sub-moist mid highland (SM1)	Wukro	Tigray (East Tigray)	Drought	Mixed crop and livestock farming	Droughts; land degradation; harvest failure; poor agric.	PSNP
3. Low land pastoral/ agro-pastoral	Warm moist lowland (M1)	Dire/ Yabello	Oromia (Borena)	Drought	Pastoralism and agro-pastoralism	Drought, feed, water shortage; livestock death; food insecurity; land tenure	PCDP
	Warm semi-arid lowland (SA1)	Kuraz	SNNPR (South Omo)	Flood (Omo)	Pastoralism; some flood recession cultivation	Underdeveloped; Vulnerable conditions;	PCDP
	Warm arid lowland (A1)	West Imi	Somalie	Flood, drought	Pastoralism; cropping	Flood disasters; drought and famine	—
	Warm sub-moist lowland (SM2)	Fantalle	Oromia (East Shoa)	Drought	Pastoral/ agro-pastoralism; camel migration to highlands	Drought; lost land to comm. estates, conflict (highlanders; Afar pastoralists)	PSNP
	Warm arid lowland (A1)	Amibara/	Afar (Zone 3)	Floods (Awash), Drought	Pastoralists; agro-pastoralists	Poor local dev.; conflicts with Issa community	PSNP; PCDP
4. Lowland, mixed farming, degraded soils	Warm humid low land (H1)	Konso	SNNPR (Konso Special)	Drought; land degrade	Mixed farming	Severe land shortage; land degradation; poor agric; Good adaptation via SWC (FAO award)	Highest number of PSNP clients
	Tepid semi-arid lowland (SA2)	Adami Tullu	Oromia (East Shoa)	Drought, land degraded	Mixed dry land farming	Drought; land degradation; food insecurity; Lake Zeway depleting; charcoal production	PSNP
5. Mid land, irrigable	Tepid moist mid highland (M1)	Libo kemkem	Amhara (South Gonder)	Flood	Some flood recession agriculture; small scale irrig.	Flood; Crop loss malaria	Irrigation project
6. Mid land, high agric. potential	Tepid moist mid highland (M2)	Ilulu/ Sebeta Hawass	Oromia (West Shoa)	Flood, malaria	Mixed farming; flood recession pulse cash crops,	High population; scarce land, malaria, migration to escape flood	—
7. Perennial and roots crops	Tepid moist mid highland (M2)	Kindo-Koysha	SNNPR (Wolita)	Drought; land degradation	Mixed farming; livestock in lowlands	Land degradation; crop failures; food insecurity	PSNP
8. Urban	Tepid moist mid highland (M2)	Harar town	Harari (Regional capital)	Water shortage	Urban economy; cash crops	Town in a mountain; water scarcity for urban uses; Lake Alemaya dry	—
	Warm arid low land (A1)	Dire-Dawa town	Dire-Dawa (Admin capital)	Flood in town; rural drought	Urban economy; semi-pastoral rural areas.	Big flood disaster in 2006; frequent rural droughts	PSNP (rural)

expanding group of rural landless who lack income opportunities, the urban poor living in flood-prone areas of cities, and the elderly and the sick due to their limited adaptive capacity. In terms of *adaptive capacity*, lack of grievance or conflict resolution mechanisms was found to harm potential for adaptation and exacerbate local conflicts around access to water and grazing lands for livestock. However, outreach of agricultural extension agencies in field site villages in highland, midland, and lowland areas surveyed was high however, suggesting the importance of building upon networks of existing public service providers when planning for adaptation responses.

Social capital is an important aspect of adaptive capacity of both households and areas. For example, Afar pastoralists' mobility has been restricted in Fantalle district in Oromia region of eastern Ethiopia, leading to recurrent conflicts with neighboring agricultural communities (including in-migrant highlanders) over resource access and land rights. The violence in the area around these issues was presented as an equally significant threat to pastoralist livelihoods as physical exposure factors of recurrent droughts, erratic rainfall, and floods. Social capital levels also help determine household resilience to climate change. In Ethiopia, 52 per cent of large farmers accessed informal village social assistance institutions, compared to an average for all income groups of 34 per cent. This demonstrates the likely inequities in community social protection mechanisms and the importance of supporting public social protection transfers with transparent targeting processes, such as the Productive Safety Nets Program (PSNP).

Preferred Adaptation Options Identified through PSD Workshops

The PSD workshops conducted at local and national levels revealed broad support for NAPA and related climate strategy priorities in-country, in such areas as agriculture and water resources management, land management, roads, and early warning systems. However, they also revealed stakeholder preferences for investments in governance, social protection, training

and education, and land tenure. PSD adaptation options identified through the workshops that were not present in the NAPA included urban planning and market development, as well as education.

Specifically, the three local PSD workshops in highland, midland and lowland areas identified: soil and forest rehabilitation, irrigation and water harvesting, improved agricultural techniques and drought-resistant varieties, education, and land use rights for pastoralists as adaptation preferences. Regional development and the need for structural shifts toward service and industry sectors to improve employment outcomes were also raised as issues. At the national level, similar options were identified, along with a focus on early warning systems and flood control measures, agricultural technology, finance and market development, renewable energy, and urban planning. Between local and national levels, there were many overlaps in terms of participants' preferences for adaptation, though capacity-building and social protection were additionally revealed through discussions at the local level.

Integration of Results in Overall EACC Country Study

Key conclusions from modeling exercises in the overall EACC country study in Ethiopia echo some of the main concerns raised by local stakeholders in PSD workshops. These include the importance of investments in: i. road connectivity to reduce regional disparities and isolation and improve market integration; ii. improved agricultural productivity including agricultural extension, on-farm technology; improved seeds and other inputs; and weather forecasting; and iii. non-farm diversification for more resilient rural income and livelihoods. In addition, the EACC Ethiopia team is now planning economic modeling of the livestock and pastoralist economy which was not undertaken in the first phase and has been requested by Government of Ethiopia. The livestock sector proved through the PSD and fieldwork investigations to be of prime importance to poor households and regions in Ethiopia.



Annex Four

Ghana Study Overview

Projected Climate Change Impacts

Three major physical impacts of climate change are distinguishable for Ghana, namely temperature change, change in rainfall and sea level rise. Based on climate models, it is expected that mean daily temperatures will increase by 2.5°-3.2 °C by 2100, while annual rainfall totals will decrease by 9-27 per cent by 2100, depending on geographic location (Minia 2004). Using an assumed global sea level rise of 1m by 2100, a large part of the eastern coast of Ghana would be inundated, with coastal erosion and saltwater intrusion into surface and groundwater sources also increasing. In general, the rainfall reductions seen in the transitional and savannah zones in the north are minimal, compared to those in the forest and coastal zones. Such changes are likely to have significant impacts on the rainfed agriculture prevailing in the country. There is a shift in the rainfall regime in Ghana towards a longer dry season and vanishing short dry spell (Owusu, Waylen et al. 2008). The short dry spell has become wetter in the second period while the wet September/ October months are becoming drier. This has meant diminished rainfall towards the end of the rainy season, and a prolonged dry season, with effects of increased evaporation, and reduction in lake levels.

The impacts of these trends on the country can be understood with reference to different socio-

geographic regions. Rainfall variability poses the most serious challenge in all regions except the Rainforest zone, with impacts on all sectors of the economy. The Coastal Savannah is the most vulnerable to sea erosion and inundations. Flooding has also been severe along the sprawling urban cities and towns of coastal Ghana, due to increasing frequency of storm activities and poor urban planning. Rising sea levels will impact the coastal zone through shoreline recession, increased flood frequency probabilities, inundation of coastal lands and wetlands, and salinization of surface and ground water (EPA 2000). Estimated recession due to sea level rise of 1 m varies between 250 m and 300 m, which translates to land loss of between 37 km² to 45 km². Indigenous fishing communities will be most affected in terms of lost physical assets and livelihoods. Both drought and floods affect incidence of diseases and food security. Increased heat stress and drought-related deaths in both humans and livestock are already being experienced in the extreme north of the country. Changes are also expected in the range of some infectious disease vectors. Flooding will increase the range of the mosquito, leading to different malarial strains, and the incidence of parasitic infections may increase. Poverty is highly spatial in Ghana, with poverty concentrated in rural areas especially in the northern savannah. Climate is inter-related with poverty levels, given the high dependence of a majority of the population on agriculture.

Overview of Hotspots

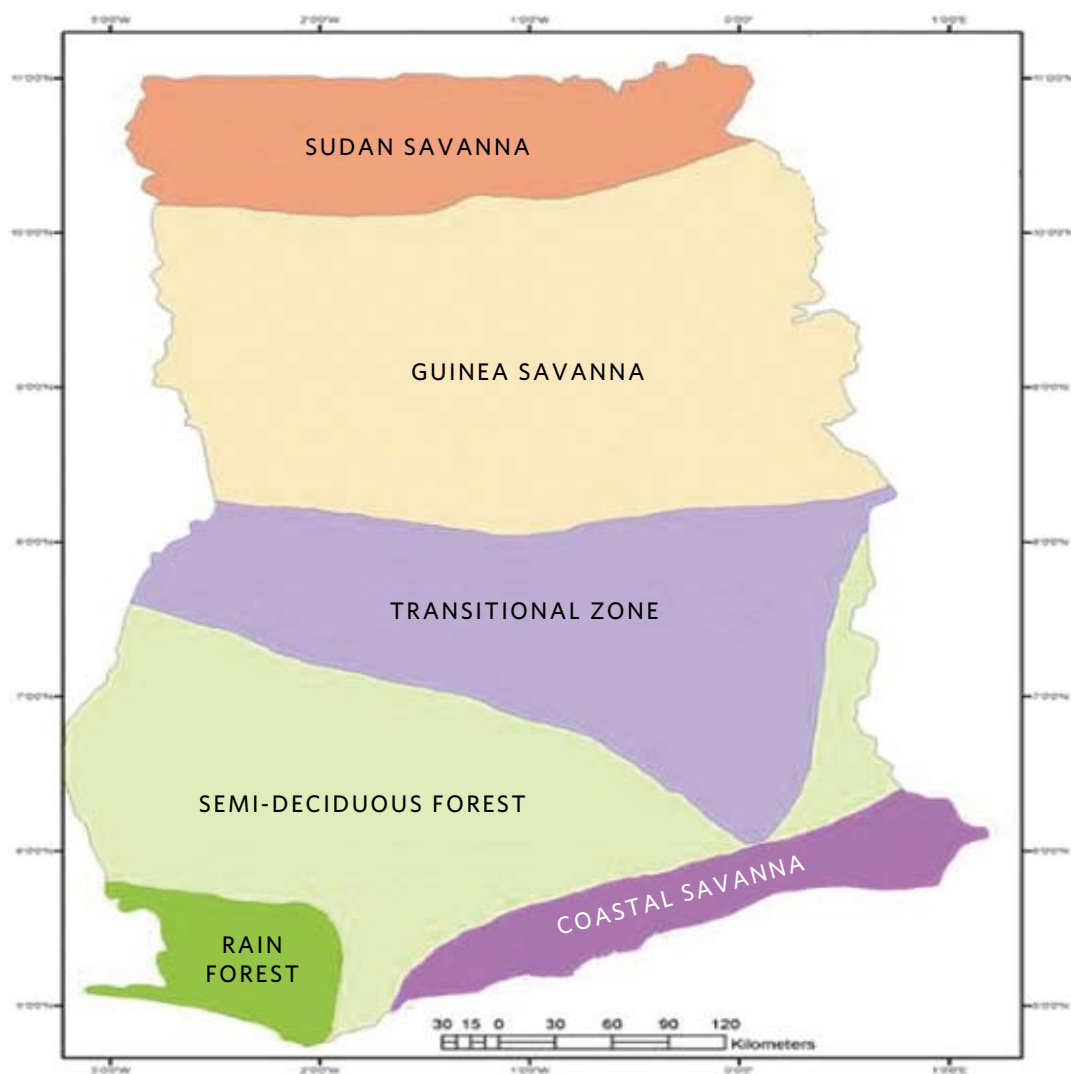
Traditionally, Ghana has been divided into six agro-ecological zones, namely, Guinea Savannah, Sudan Savannah, Forest-Savannah or Transition zone, Semi-Deciduous Forest, Rainforest, and Coastal Savannah (see Figure 8). This study merges Guinea Savannah and Sudan Savannah into one zone, known as Savannah zone. Also, we merge

Semi-Deciduous Forest and Rainforest into one zone, namely, Forest zone.

The districts selected for fieldwork were chosen based on a literature review, and on knowledge of cases that would explain the differential vulnerabilities and adaptation options across the country. Sites were also selected with reference to ongoing NGO and donor initiatives in the area. They are not representative of

FIGURE 8

Map of Agro-Ecological Zones of Ghana



entire ecological zones are these zones have micro-ecological, economic, cultural, and political differences. The selected research sites are presented in Table 10.

Forest Zone: Gonukrom and Kamaso: The rainfall distribution pattern in the forest is bi-modal from April to July and September to November. There is a main

dry season from November to February–March. The annual rainfall record is distributed throughout the year with a mean monthly rainfall of 250 mm. Gonukrom largely consists of persons who belong to the Wassa ethnic group while Kamaso is purely a migrant/settler community composed of migrants from different parts of the country. Both communities

TABLE 10

SITES SELECTED FOR STUDY IN GHANA

SELECTED SITES	FEATURES	CLIMATE VULNERABILITIES	EXISTING INITIATIVES
Coastal Savannah Zone - Site 1: Ada-Anyakpor, in the Dangbe-East (Ada) District - Site 2: Nima in the Accra Metropolitan Assembly (AMA) - Both sites in Greater Accra Region	Shows livelihood profiles of fisher folks Exemplifies the struggles of a coastal community Hosts most of the urban poor in Accra Shows relationship between poor urban planning and disaster risk	Dry climate with increasing rainfall variability and hotter temperatures; Sea erosion and tidal flooding Prone to flooding; Increased risk of disease; Poverty and disaster response systems in place; Poor shelter provision and drainage systems	Civic Response present, e.g., Radio Ada in Dangme East district, coastal zone One of the communities included in 1995 Participatory Poverty Assessment
Forest Zone - Site 3: Gonukrom in Wassa Amenfi West (Asankragwa) District - Site 4: Kamaso in Wassa Amenfi West (Asankragwa) District - Both in Western Region	Major cocoa growing area. New frontier for agricultural migrants Issues of land tenure, economic policy and migration	Decreasing rainfall will affect cocoa production; High temps harm agriculture; Logging and mining will reduce carbon sinks Economic policy reducing forest cover	Among the communities of the IUCN's Livelihoods and Landscapes Initiative (REDD) and proposed under WB's Forest Carbon Partnership Facility (FCPF)
Transitional Zone - Site 5: Buoyem in Techiman District - Site 6: Dzatakpo in Pru District - Both in the Brong Ahafo Region	Major food crop zone; Migrant receiving region Increasing environmental problems Urban growth and alternative livelihoods Inland fishing community Shows livelihoods of fishermen and fish mongers	Variations in rainfall and temperature to affect production; Migration increases land pressure; Poverty reduces adaptation Effects of climate on Lake Volta; Decreasing fish stocks and adaptation by fishing communities; Human capital and adaptable livelihoods	(EPA and National Development Planning Council with UNDP piloting district-level planning for CCA in Techiman District No existing initiative
Northern Savannah - Site 7: Boayini (Guinea Savannah) in East Mamprusi District in Northern Region - Site 8: Tetauku (Sudan Savannah) in Bawku East District in the Upper East Region	Fragile environment High poverty incidence; Female outmigration to cities Dry environment Highest poverty incidence in Ghana; Agrarian economy; High out-migration	Highly variable weather and agriculture Environmental bankruptcy Resilience of households Highly variable weather and agriculture; Environmental bankruptcy; Sensitivity of households	Among the communities in which CARE-Ghana is supporting local-level adaptation to climate variability and change in Northern Ghana Included in 1995 WB Participatory Poverty Assessment

have a significant population of migrants. Cocoa production dominates the economy, leading to substantial growth in this sub-sector.

Transition Zone: Buoyem and Dzatakpo: The Transition zone is a major food crop zone, and a migrant-receiving region. The Transition zone experiences rainfall values between 1000 mm and 1500 mm adequate to support luxuriant vegetation. The major livelihood activity in Buoyem is food crop farming including maize and tomatoes, while in Dzatakpo fishing is the major livelihood activity due to its location on the Pru river. Dzatakpo is largely dominated by Ewe migrants from Marfi and Anlo in the Volta Region and has an estimated population of 1000 persons. Buoyem, however is an Akan community with an estimated population of over 5000 people.

Northern Savannah Zone: Boayini and Tetauku: The northern savannah zone is predominantly a grassland agro-ecosystem with scattered shrubs and trees, with annual average rainfall of 1000 mm. The guinea savannah portion occupies most of the Northern Region and has better ecological conditions for farming than the Sudan savannah. Boayini is located in the East Mamprusi District in the Northern region of Ghana, with total population of 1400. The tribes in the community include Tampulensi, Mamprusis, Bimobas, Mosis and, Fulanis. Tetauku is also located in Bawku East District in the Upper East Region, with total population of 898. The community is dominated by the Mamprusi tribe.

Coastal Savannah Zone: Anyakpor and Nima: The coastal savannah zone occupies the entire east coast from the Central Region through the Greater Accra Region to the Volta Region. It has the highest population concentration in Ghana with the Accra Metropolitan Area, having a population density of 3,388 persons per km² (EPA 2000). It has the dry equatorial climate type. Rainfall is of double maxima type. This belt receives the least amount of rain in Ghana and hence is the driest region in the country. The main activities of people in

this zone are fishing and farming in rural areas, while the urban centers are integrated into the global economy. Anyakpor community, located on the outskirts of Ada-Foah, is a typical coastal village with a population of about eight hundred people. The major ethnic group is called Dangme. The main livelihood activities include fishing, food crop farming and fish mongering. Nima is an urban slum composed of mostly vulnerable migrants, with mixed livelihoods.

Empirical Findings

Vulnerability to Climate Change

Vulnerability was found to stem from exposure factors of physical geography; as well as sensitivity factors of economic geography/ regional development levels; governance; socio-economic status; and social differentiation including migrant status and gender. Key socioeconomic groups vulnerable to climate change include those dependent on natural resource-based livelihoods (such as smallholder farmers, artisanal coastal and inland fishers), migrants, women, and urban slum dwellers.

Physical location and hazard proneness greatly affect household vulnerability, as in the drought-prone areas that are chronically exposed to low rainfall. *Economic Geography* also shape adaptive capacity. For example, the export-oriented path following by the national government has led to preferential investment in social services and economic infrastructure (including roads) in certain areas, meaning that the Northern Savannah and Coastal rural locations now have lower adaptive capacity than the Forest and Transitional zones which have received more state intervention to date. Similarly, a key sensitivity factor is *governance*. Livelihoods across Ghana, from forest-based resources, to fisheries, and agriculture, depend on clear and effective rule of law regarding natural resource ownership and use rights, and more transparent use of resources. At the local level, formal and informal institutions structure the extent

of individual and group access to resources. Specifically, the gendered nature of the inheritance system, local governance and customary law, and multiple forms of land tenure systems can disproportionately harm both women and migrants' adaptive capacity in many areas. Rural-rural migrants, for example, in the Transitional zone, forgo income by not planting long gestation cash crops for lack of secure title in receiving areas.

Socio-economic Status: Poverty status (including low physical, financial and human capital asset levels) leads to extreme vulnerability of households. Key vulnerable livelihood groups include smallholder farmers, rural migrant farm laborers, artisanal coastal and inland fishermen and fishmongers, and urban slum dwellers.

Preferred Adaptation Options Identified through PSD Workshops

The PSD workshops conducted revealed broad support for NAPA and related climate strategy priorities in-country, with additional stakeholder preferences for investments in governance, social protection, land tenure, and training and education. Key adaptation investment preferences identified by stakeholders in local and national PSD workshops includes social protection measures, health and education services, flood early warning system, land tenure reform, support to fisheries sector, training for livelihoods diversification, agricultural research and extension, and integrated soil and water management.

Local participants in the zonal workshops were more concerned with declining living standards

due to degraded natural resources and with the lack of public services. National workshop participants looked for investments that would help local areas achieve national goals, often through more expensive adaptation investments that featured limited inputs by local communities. Specific priorities at local level included a focus on: improved agricultural production and land management practices; managing migration; improving conditions for women; and improved governance and institutional structures.

Key pro-poor adaptation investments identified by participants in local PSD workshops included social security measures (safety nets); health services and awareness raising; urban social services and infrastructure; early warning systems investments; improved tenure security; community-based land administration systems; and skills training.

Integration of Results in Overall EACC Country Study

The EACC-Social study recommendations on safety net provision, community-based natural resource management, disaster preparedness, and improved governance through enhanced decentralization have been incorporated in the EACC Ghana country report. The country report's recommendations in the areas of agriculture and coastal zone development including fisheries largely echo those raised by PSD stakeholders and respondents in fieldwork, while the overall study also prioritized additional areas of roads, energy and regional integration (including trans-boundary water management) that were not raised in the social investigation.



Annex Five

Mozambique Study Overview

Projected Climate Change Impacts

Mozambique's vulnerability to climate change is largely defined by its vulnerability to natural hazards, namely droughts, floods, and tropical cyclones. Droughts have affected the largest number of people, and caused the highest number of deaths. Floods, while not typically affecting as much of the population, typically cause loss of life, as well as great infrastructure loss. While usually resulting in less loss of life than droughts, floods are often the most visible hazard hitting the country. Storms, most prominently tropical cyclones, are the third major hazard. These cause a great deal of infrastructure loss. Health epidemics are an indirect impact brought on by the above hazards, due to deterioration of safe drinking water, and spread of tropical disease vectors.

With climate change, it is likely that southern Mozambique will experience a trend towards drier conditions, while the northern part of the country will become wetter. The 2009 study by the Instituto Nacional de Gestao de Calamidades (INGC - National Institute for Disaster Management) made projections for changes in temperature and average precipitation as primary impacts (Asante et al 2009). As secondary impacts, the report projected changes in soil moisture availability (influenced by both temperature and precipitation), and flooding (influenced by precipitation and mapped out onto a statistical

flooding model). It is clear that temperature will rise. It also seems reasonably clear that most of the country—with the exception of the south—will experience an increase in average precipitation. For floods, there is a great amount of uncertainty about the direction of change. Flood risk could increase in the future, or decrease. Sub-national trends are also difficult to specify.

The INGC study identified the likely direction of changing risk levels due to tropical cyclones. Both models and empirical data suggest a positive correlation between sea surface temperatures and cyclone intensity, but no obvious correlation between sea surface temperatures and cyclone frequency. Given that sea surface temperatures are likely to increase, one can be confident that there will be a shift towards stronger cyclones, but not necessarily any change in their overall frequency. However, since damages are related to the cube of the wind speed, strong cyclones cause a much higher amount of damage than do weaker cyclones. Overall, then, one can expect more damage due to cyclones in future.

Overview of Hotspots

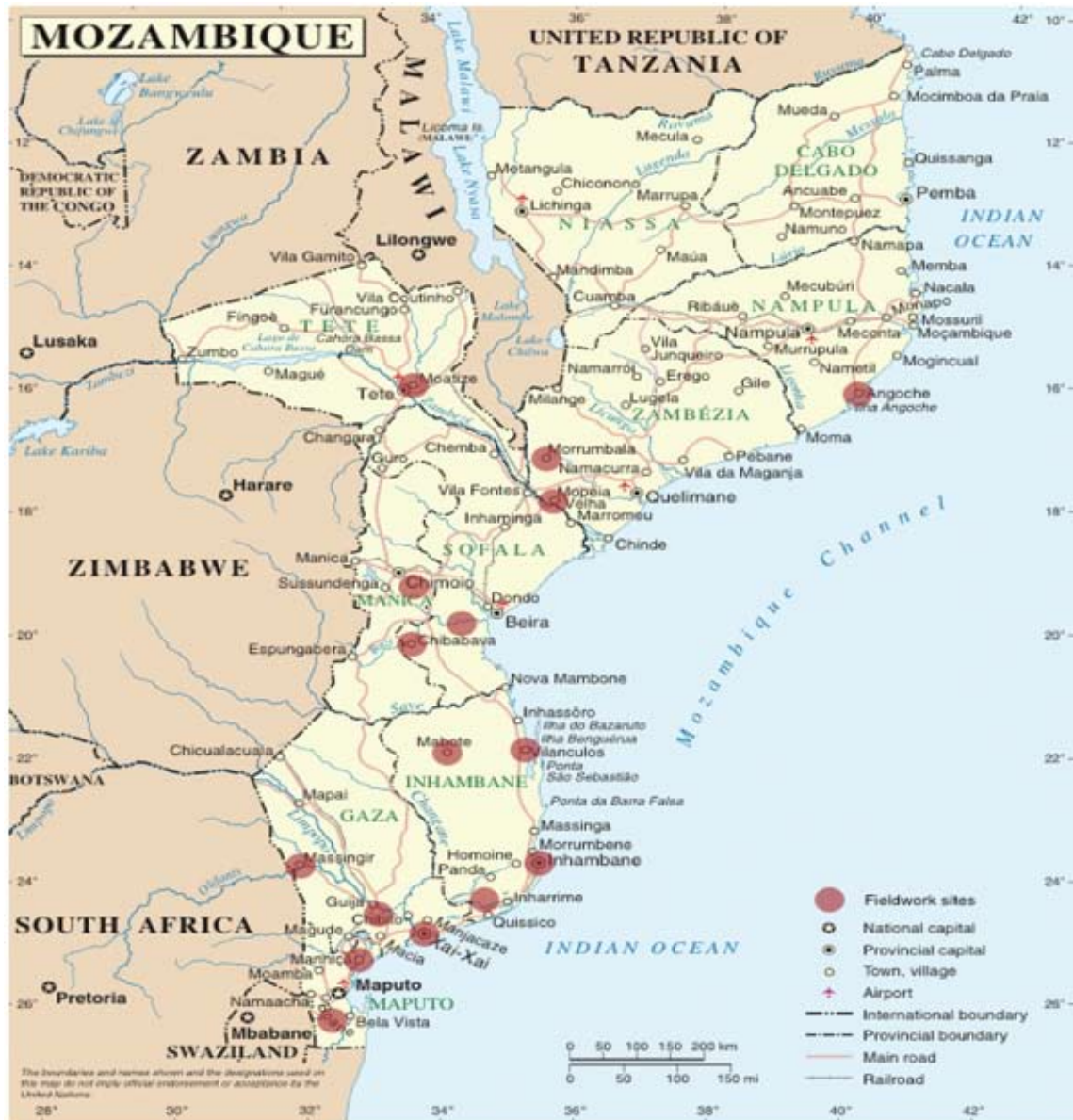
Six vulnerability zones in Mozambique were identified based on secondary literature, and poverty and disasters data on vulnerable populations. These were:



- **Coastal urban areas**, most importantly Maputo and Beira. This zone is marked by highly differential vulnerability across income groups, with large peri-urban areas vulnerable to flooding from both rivers and the ocean.
- **Non-urban coastal strip.** This zone is marked by high vulnerability to coastal flooding and storm surges from tropical cyclones, as well as threats of erosion. It is relatively food secure, with low rates of poverty.
- **Limpopo River valley districts upstream of Xai Xai.** This zone is unique in being highly exposed to two very different threats: river flooding, and drought. It has relatively high population density, and thus high numbers of poor people. Further, this region has been studied extensively and significant baseline data is available.
- **Other flood-prone river valleys** (less susceptible to droughts). These zones, in particular in the Buzi and Zambezi river valleys, are highly susceptible to flood risk, and to flooding caused by tropical cyclones, but less so to droughts. The Buzi River region has also been extensively studied, as part of German funded activities, and so there is no shortage of baseline data.
- **Drought-prone inland areas** (especially in south). These areas are highly susceptible to drought: years of adequate rainfall to support agriculture are the exception, rather than the rule. The people are often dependent on remittances for survival. Population densities are low.
- **Inland areas of higher agricultural productivity**, including the highly productive and populated areas in Zambézia. These areas are perhaps the least vulnerable in Mozambique, facing adequate rainfall most years, and no extreme risks from flooding or tropical cyclones. They are somewhat heterogeneous in terms of poverty rates, and in food security. The highly productive regions in

FIGURE 9

Map of Study Sites in Mozambique





Zambézia stand out for their high population density, and relatively low vulnerability.

Site Selection Rationale

Sites were selected for fieldwork by mapping districts against major risks (floods, droughts) in order to identify hotspots representing the above six zones. Within each of these districts, fieldwork took place at multiple administrative posts to capture potential variation within the district. Figure 9 shows the locations of these 16 sites.

Empirical Findings

Vulnerability to Climate Change

Results suggest that rain-fed agriculture takes the hardest direct hit from climate hazards, particularly drought. Thus climate-sensitive resource dependency, coupled with a lack of infrastructure (irrigation) investment, formed a key sensitivity variable. Four major livelihoods activities were identified across the zones. These were: fishing; forestry (including agro-forestry, and non-timber forest product collection); agriculture and ranching (both subsistence and commercial); and trade and commerce.

Sensitivity factors included livelihood type, socioeconomic status and social exclusion. Subsistence farmers and economically and socially marginalized were identified as the most vulnerable groups to climate change. Economically and socially marginalized individuals include the elderly, orphans, widows and female heads of households, and the physically handicapped.

Socioeconomic impacts of climate hazards were also identified. These included impacts of water scarcity, including reduce crop productivity, food insecurity, and out-migration. Floods were identified as causing damage to infrastructure, settlements, and household assets, and also contributed to disease outbreaks. Soil degradation and desertification were understood by

respondents to result in increased pressure on alternative livelihood sources (e.g., as farmers joined the fisheries sector). Finally, wildfire was understood to result in loss of vegetation, as well as loss of timber for shelter and fuel.

Expected Future Adaptation Practices:

Survey respondents were asked what, if anything, they would do if the climate hazards in their regions were to become significantly more severe. The most common answers were:

- Nothing
(70 respondents)
- Move to a safer or more productive area
(23 respondents)
- Seek help from others
(9 respondents)
- Raise and sell animals
(7 respondents)
- Improve the durability of the house
(6 respondents)
- Practice drought-resistant cultivation
(5 respondents)

These responses suggest severe constraints (whether real and/or perceived) on households' capacity to undertake autonomous adaptation, implying a need for extension and outreach on adaptation options at local level. At a minimum, technical assistance for improving land management practices and effective early warning will be crucial to enhancing adaptive capacity. Thus adaptation, even when undertaken by household themselves, requires support from the state and other actors, in terms of extension, training, or more extensive investments in improving area characteristics such as road connectivity, or weather station monitoring.

Preferred Adaptation Options Identified through PSD Workshops

Preferred adaptation options through the PSD workshops identified included a mix of hard and soft options. Key hard adaptation options were centered on infrastructure investments, including road construction, dams, flood protection and drainage investments, small-scale water storage, silos, housing; and coastal protection. Soft measures identified included the development of early warning systems, improvement of local and regional planning capacity, and promotion of participatory approaches to natural resource management. Soft, centralized adaptation options such as improvements to existing government programs and practices were viewed by local populations as important for building resilience. Improved access to credit, better health care and social services, as well as programs that enhance the capacity of community associations to manage local resources effectively and support livelihood diversification were also prioritized.

Integration of Results in Overall EACC Country Study

The EACC-Social study contributed to the overall Mozambique country study for EACC, with results from the former aligning well with overall country results. In particular, the overall study concluded that soft adaptation measures (including in disaster preparedness) were a priority for the country, as well as immediate, no-regrets investments. The importance of complementing hard measures such as road infrastructure and flood management, with soft adaptation was also noted. CGE model results also highlighted the importance of investments in human capital through education.



Annex Six

Vietnam Study Overview

Projected Climate Change Impacts

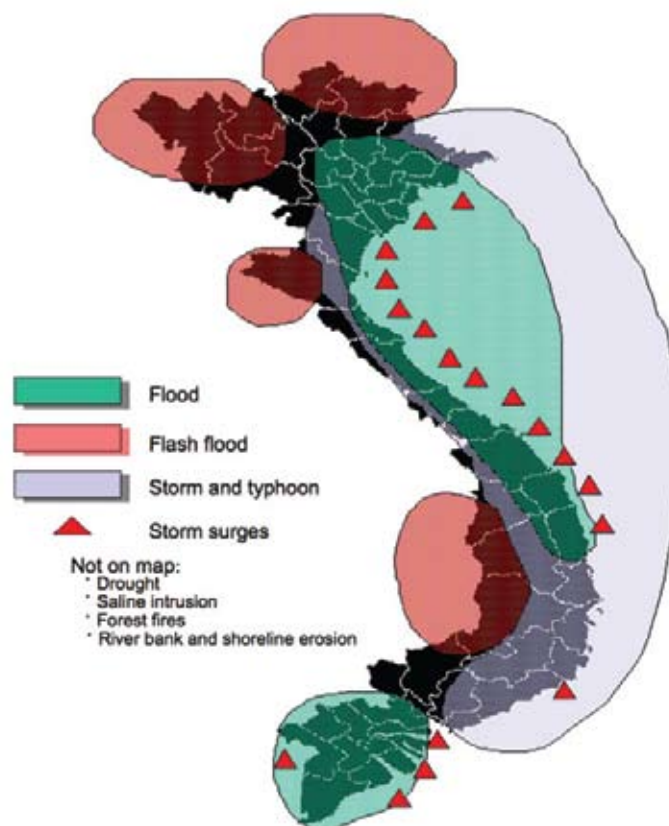
Vietnam is likely to be highly impacted by climate change, due to a very long coastline, dependence on agriculture, largely rural population (70%), low levels of development in rural areas, and location of the largest urban center in a low-lying coastal zone (i.e., Ho Chi Minh City). Vietnam has been 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). Forecasted temperature increases will exacerbate this condition to levels previously not experienced. 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. 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 likely be an increase in rainfall in wet seasons and decrease in rainfall in dry seasons of around 10% or more; increased intensity and frequency of storms and

floods; and likely sea level rise of at least 1 meter (Government of Vietnam 2008)(see also Figure 10). Different regions in Vietnam are likely to have unique climate impacts, making a single national policy for adaptation difficult. Climate change impacts will be experienced amid a host of ongoing national trends that can increase vulnerability. These include extensive losses of mangroves to shrimp farming for global export; declines in agricultural crop diversity; household livelihoods that are becoming less diverse; privatized natural resource commons; and eroded public social safety nets. Current development trajectories are likely to clash with the realities of global climate change, hampering current growth and poverty reduction.

For storm and typhoon vulnerability, regional climate models indicate that typhoons may continue to track further south under global warming scenarios. Further, the season for storms will likely extend, meaning that areas which have not typically suffered from storms (the southeastern portion of the country and HCMC) may become increasingly vulnerable. 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 the decreased rainfall in the dry season for the Central Highlands and South Central Coast. There will thus be expansion of the depths of flood areas, particularly into newer regions

FIGURE 10

Geographic Distribution of Primary Climate Exposure Hazards in Vietnam

Source: Vietnam Natural Disaster Risk Management Program

of the southern part of the delta. With regard to droughts, decreased rainfall in the dry season will put increased pressure on the Central Highlands, Central Coast, and Mekong Delta.

Vietnam may be one of the top 5 countries in the world likely to be most affected by sea level rise (SLR), with “potentially catastrophic” consequences (Dasgupta et al. 2007). A recent assessment of a 1 meter sea level rise asserts that 5% of the country’s land area would be ‘permanently inundated’, affecting 6 of Vietnam’s 8 agro-ecological regions and 39 of 64 provinces, with around 8% of the total national

population affected (Carew-Reid 2008). Two thousand individual communes (from a total of 10,000) were identified as being at risk of partial or full inundation from sea level rise. 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%). Forty-three per cent of the area is at risk of inundation, and many poor people have been identified as living in these inundation zones. Sea level rise will likely also increase salinity of shallow coastal aquifers, from which much drinking water is drawn. It would also worsen coastal erosion and urban land subsidence.

Overview of Hotspots

The EACC-Social analysis for Vietnam identified key vulnerability zones for the country, combining socio-economic and biophysical factors. It concluded that the Mekong Delta Region has high exposure and moderate sensitivity; the Central Highlands has moderate exposure and high sensitivity; Northern Mountains has low exposure and high sensitivity; Central Coast has high exposure and moderate sensitivity; Red River Delta has moderate exposure and low sensitivity; and the South-east Region has low exposure and low sensitivity.

The team selected four regions to visit for local assessments: the Northern Mountains, the

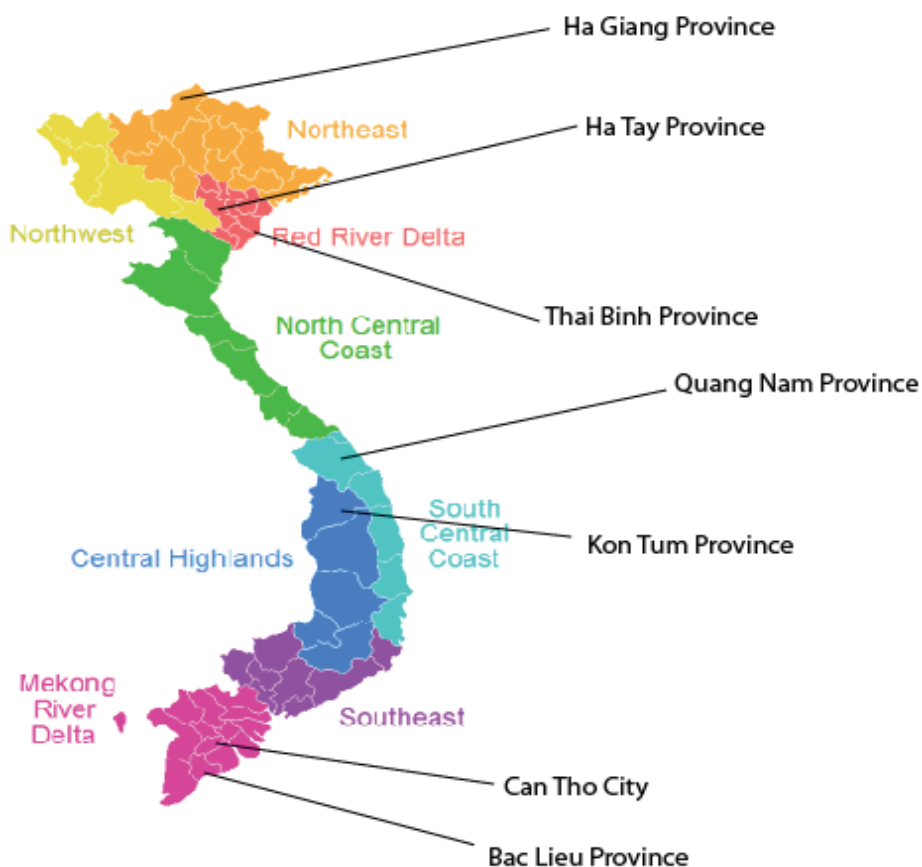
Central Coast region, the Central Highlands, and the Mekong Delta.

Site Selection Rationale:

1. **Northern Mountains:** Little work has been carried out in ethnic minority areas on climate impacts, particularly in the Northern Mountains. To understand adaptation practices in the mountainous region, Ha Giang province was selected, with a particular focus on ethnic minorities.
2. **Central Highlands:** Within the Central Highlands, Kon Tum was chosen as the field research site due to a relative lack of research on this

FIGURE 11

Map of Study Sites in Vietnam



province generally. It also is a much less open economy than other areas, like Dak Lak to the south, with higher levels of poverty than other provinces in the region thus helping to demonstrate climate impacts in a vulnerable region.

3. **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 1m above sea level, an area up to 20 or more km inland from the coast is vulnerable to storm surges that bring salt water intrusion inland. For the EACC-Social research on coastal vulnerability, Quang Nam province was chosen, with field research taking place in two sites, Hoi An city and Cu Lao Cham islands off the coast. Quang Nam was selected as an urban area vulnerable to climate events, with economic sector (tourism) likely to be quite vulnerable to climate events. Hoi An city is a well known tourist destination.
4. **Mekong Delta:** The Mekong Delta faces climate threats from flooding and sea level rise. There are four million people living in poverty in the Delta. Many lack basic health protection and school drop-out rates 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 selected as study sites.

While each of Vietnam's eight agro-ecological regions will experience climate impacts, time and budget limitations meant that not every region could be assessed through local fieldwork. Thus criteria for selection of study sites for the local field work were provinces that were:

- located in regions with high exposure and sensitivity and low adaptive capacity;
- representative of their agro-ecological region;
- places where little fieldwork had been conducted on livelihoods or climate adaptation.

Empirical Findings

Vulnerability to Climate Change

Vulnerability was found to stem from exposure factors such as physical location and hazard-proneness (including remote and physically vulnerable areas such as upland or river communities); and sensitivity factors at area and household levels such as degree of regional development, external investment (particularly in infrastructure and education), and economic diversification; socio-economic status including poverty levels, including in urban areas; climate-dependent resource livelihoods; and social exclusion, including gender, age, and ethnic minority and migrant status. Often, inequalities intersect, e.g., ethnic minority populations are also concentrated in remote upland areas that suffer from underinvestment in infrastructure and education.

TABLE 11

SITES SELECTED FOR STUDY IN VIETNAM

ZONE	PROVINCE	VILLAGE
Northern Mountains	Ha Giang	Quang Ba
		Quong Binh
Central Highlands	Kon Tum	Dien Binh
		Dak Tram
Central Coast	Quang Nam	Hoi An town
		Cu Luo Cham islands
Mekong Delta	Bac Lieu	Long Dien
		Long Dien Tay
	Can Tho City	Ninh Kieu District



Temporal aspects of shocks to households were also highlighted by respondents. Extreme events cause immediate shocks to household income and also ongoing effects, if crops are destroyed either at one go or during slow-onset events, such as droughts. In Hoi An and Can Tho towns in the Mekong Delta, the poor had unstable employment (mostly wage labor) which could be lost if excessive flooding and storms occurred. Overall, losses due to climate events were strongest in agriculture, livestock, and aquaculture. Even urban businesses can be climate dependent. In Hoi An, businesses related to tourism were highly negatively affected by extreme events.

Past Adaptation Practices: Past household adaptation responses to climate variability identified took several forms. These included: expanding scale of

existing livelihood activities or diversifying, making small physical improvements to canals and pumps (by well-off households); shifting to hardier crops or cash crops (also both only done by well-off households), or changing cropping schedules. Across the country, migration varied in its importance to adaptation strategies at household level, and was prevalent in the South. Disaster risk management preparations took place seasonally at household level in flood-prone areas, e.g., Hoi An City. Richer households contract laborers in advance of flood season to be assured of ready access to sufficient physical support for evacuation during storms. However, it is clear that local people in both sites do not have long-term plans for coping with extreme weather events. Almost 60% of households in Bai Huong fishing village in Quang Nam had no idea about how they would adapt (see Table 12).

Preferred Adaptation Options Identified through PSD Workshops

Participants at local and national PSD workshops prioritized the following adaptation options: i. integrated regional development, including area development and planned urbanization; ii. agricultural investments; iii. sustainable infrastructure

development (roads, irrigation, energy, and river dredging); iv. water sector investments, including water resource management and flood management; v. early warning systems and disaster preparedness; vi. social protection; vii. afforestation and “greening” of urban environments; viii. integrated land use planning and benefit-sharing for tourism and environment sectors; ix. training and

TABLE 12

ADAPTATION STRATEGIES PLANNED BY HOUSEHOLDS IN QUANG NAM, VIETNAM IF FUTURE BRINGS MORE FREQUENT STORMS AND FLOODS

ACTIVITIES	AN THANG	%	BAI HUONG	%
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 situation will be; then think of plan	0	0	1	5
Total	21	100%	20	100

Source: Household survey



capacity-building on adaptation and disaster risk management. Most groups identified combinations of hard and soft adaptation priorities. In no group were only hard options identified.

The Government of Vietnam has prepared a National Target Program (NTP) for Climate Change. However, the NTP takes little account of local vulnerabilities and variation. Vulnerability and adaptation assessments in the NTP tend to be focused on sector-wide and quantitative assessments for the whole country, and on policy or capital-intensive solutions, such as hard adaptation measures. The main adaptation measures mentioned in the NTP include sea dikes, reinforced infrastructure, and more durable buildings, along with some soft measures, such as resettlement, storm warning systems and mangrove planting (MONRE 2008). Less attention has been paid to date on 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.

Integration of Results in Overall EACC Country Study

Interim results from the overall EACC study in Vietnam were presented in the May 2010 EACC Country-Track Synthesis Report. This report reiterated that the impact of climate change is particularly large on the lowest quintiles of rural and urban income distributions. For rural areas, investments in agricultural improvement and expansion of irrigation were reported to offset this impact and reduce inequality in the MoNRE scenario. Notably, adaptation investments for the urban poor were not addressed in the overall summary for Vietnam contained in EACC synthesis report.



Annex Seven

Fieldwork Methodology

The social component of the EACC study was designed to explore vulnerability in diverse country contexts in order to identify implications for pro-poor climate adaptation planning. The study aimed to answer the following research questions:

- What factors make particular individuals, households, or sub-national regions more vulnerable to the negative impacts of climate change?
- What has been people's experience of climate events to date and what adaptation measures have they taken (both autonomous and planned)?
- How do different groups, and local and national representatives judge various adaptation options and pathways?
- How do identified adaptation priorities align with existing development strategies and policy emphases?

In order to address the above questions, a methodology was designed that included literature review, fieldwork, and Participatory Scenario Development (PSD) workshop components, as well as dialogue with other sector teams for integration across individual country reports. The PSD approach is detailed in Annex 8. This Annex focuses on the field methodology.

Preparation for fieldwork included a first phase of reviewing existing literature to identify “socio-geographic zones” for the country (i.e., around 6-10 agro-ecological zones with a social and hazard overlay). The literature review, summarized in country inception reports, surveyed climate change impacts and poverty and vulnerability in the country; undertook a brief institutional and policy review; and examined such key issues as land tenure, and formal and informal forms of governance in the country.

The literature review was followed by teams identifying up to two “hotspot” sites of climate vulnerability per socio-geographic zone. Climate vulnerability was defined as the combination of physical exposure and sensitivity to climate risk). Hotspots were identified using country team knowledge, primary data sources, and interviews with key informants. These hotspots were the sites for in-depth qualitative as well as quantitative investigation, and also considered for local and/or regional workshop locations under the PSD component. Sites were selected with a view to covering key hazard types, a mix of urban and rural sites, and to ensure alignment with Bank or other donor projects operating in the country.

Fieldwork was undertaken at these sites, using qualitative and quantitative tools. Participatory Rural Appraisal (PRA) exercises (village history/ timelines; focus group discussions of men, women and different



age groups; wealth ranking; mapping of institutional and tenure issues; impact diagrams of climate events and community risk mapping, matrix ranking of adaptation options) were undertaken, as well as key informant interviews with local government, NGOS and traditional leaders (see Figure 12 for an example of community risk mapping). Household interviews were also undertaken (10-20 per site from different income tiers, with questionnaire modules covering household composition, labor allocation, asset base, livelihood sources, ethnicity, migration, patterns of income and expenditure, agricultural practices, landholdings and land tenure regimes, responses to climate and other shocks participation in formal organizations, local governance, adaptation practices, collective action and risk-sharing, and current access to public investments and services).

Results were synthesized to develop typologies of: livelihood strategies for different income tiers and zones:

adaptation practices in relation to household and area assets; reported determinants and household/ local criteria in adopting particular adaptation strategies; and preferred adaptation and development investments. Field results regarding local assessments of climate impacts on livelihoods, and preferred adaptation investments were then validated through structured exercises undertaken under the PSD workshop track. Those workshops at local, regional and national levels identified local development visions, expected impacts of climate change on these visions, and preferred adaptation options and combinations of options over time.

The final phase of the social component comprised integration and dialogue with other sector teams for preparation of a final country report incorporating results from all sectors. Results regarding adaptation practices and preferences were shared to identify effective investments and program approaches at national level.

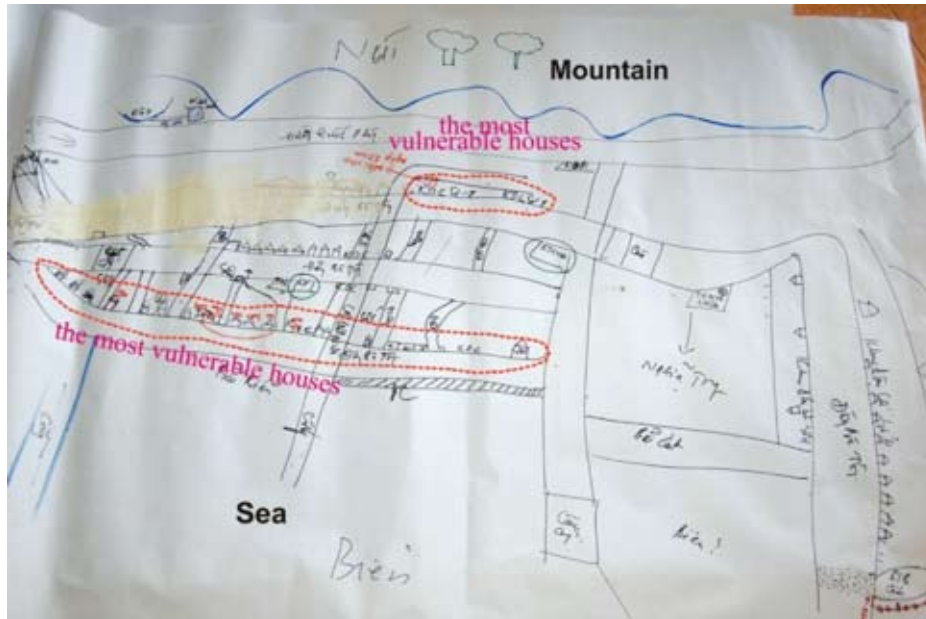


Figure 12. Example of Community Risk Map from Quang Nam, Vietnam



Annex Eight

Participatory Scenario Development Approaches

Overview

The aim of the Participatory Scenario Development (PSD) workshops was to help local and national actors explore different climate futures, and engage in structured debates around development priorities and preferred adaptation responses. Participants included national and local government representatives, academic and civil society members, donors, and representatives from vulnerable communities, and were held at local/ regional (17 workshops) and national (8 workshops) levels in all countries.⁵ Each workshop was 1–2 days in length. Workshop participants organized themselves into discussion groups, based on the knowledge of particular sub-regions.⁶

Process: The national workshops began with presentations by local experts to characterize current climate and socioeconomic projections for the coming decades, as inputs to participants creating visions of a “preferred future” for 2050. This was followed by considering the specific impacts of climate change on the future vision, and then identifying adaptation options necessary to reach the desired vision (see Figure 13). Finally, participants created an adaptation pathway showing diverse priorities for adaptation actions over

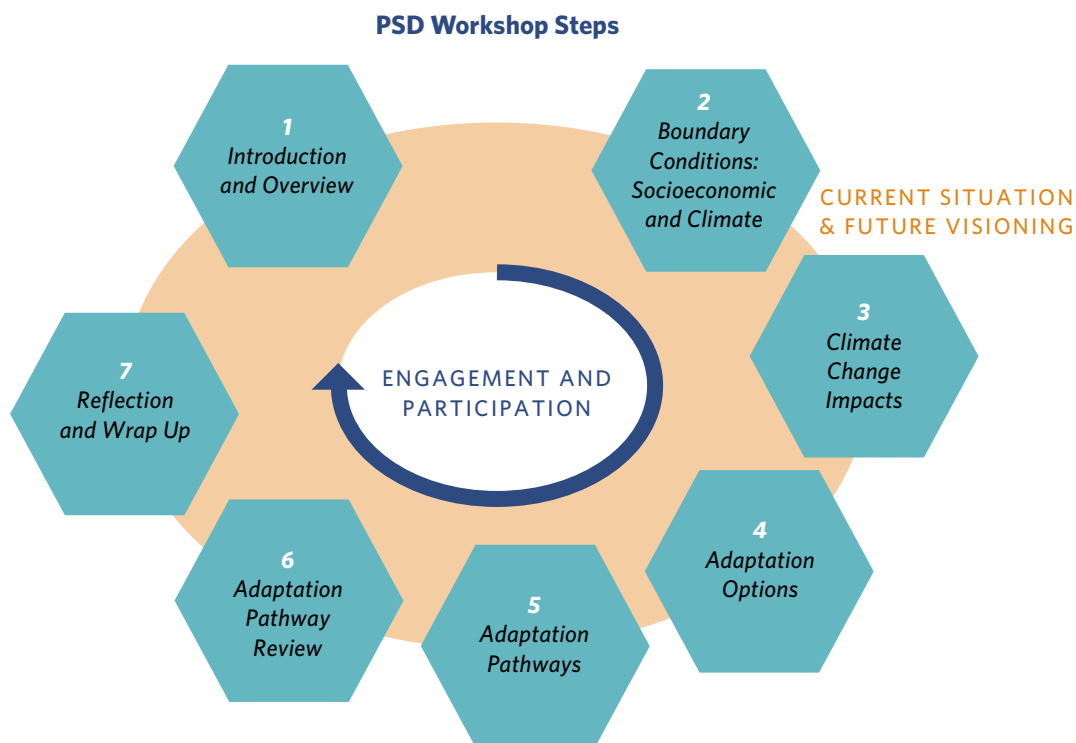
time. They also identified prerequisites, synergies and trade-offs among their adaptation options, and with other known development priorities (see Box 15). The PSD workshops drew from down-scaled climate and poverty scenarios offered as graphic “visualizations” used in handouts, presentations and posters (see Figure 15). The PSD workshops helped identify locally-relevant pathways of autonomous and planned adaptation, in the context of development choices and decisions, and informed local actors on potential trade-offs, and possible consequences of adaptation actions.

The process allowed for joint assessment of required interventions and distribution of benefits, and also pointed to key political economy issues in adaptation planning and implementation. National PSD workshop invitees included government, NGO and donor representatives, as well as academics, researchers, and World Bank staff. Local PSD workshops included local government, male and female farmers and representatives of other livelihood groups, local and international NGOs, and researchers, and World Bank staff. Local-level PSD workshops followed similar approaches, with some modifications of materials and exercises, depending on the audience (e.g., adding a timeline exercise of past adaptation practices in responding to extreme events; or matrix ranking of different adaptation options). The PSD approach was particularly effective in identifying

⁵ The Bolivia social study followed a slightly different approach to their workshops (see Bolivia social report).

⁶ Mozambique participants were grouped according to their knowledge of particular livelihood groups.

FIGURE 13



multi-causal linkages and drivers of vulnerability in climate-affected regions. The PSD component of the study had a capacity-building emphasis from the start, including participation of national teams in workshop design, and in training on development of visualizations and scenarios (ESSA-IISD 2009).

Results

Specific adaptation actions identified during workshops comprised a combination of hard and soft adaptations (with some emphasis on the latter), and largely aligned with priorities identified in NAPAs. Adaptation investments were identified in key sectors such as agriculture, forestry and water resources including relatively high-cost investments such as flood protection, dykes, flood-resistant roads but also several soft investments in improved public services and outreach, good governance, training and education (including in alternative livelihoods), as

well as in value-addition for agricultural production such as processing and storage. Significant improvements in governance including decentralization, increased participation, conflict resolution and natural resource management, and secure land tenure were emphasized, particularly to increase the adaptive capacity of communities and fully utilize all adaptation investments. Other key adaptation priorities identified by participants include: effective early warning systems and disaster preparedness, water storage and water harvesting, and improved social protection and safety nets, with a focus on urban and peri-urban areas.

Reflection: In sum, the PSD process fostered an integrative discussion around development vision, climate impacts, preferred adaptation investments; detailed discussion of sub-national difference, and triangulation of results (e.g., between sub-national and national levels, and between the PSD results and

NAPAs). Scenario approaches are useful as heuristic tools that make mental maps more explicit (Berkhout et al. 2002). They also explicitly incorporate normative elements, particularly in the development vision exercise but also throughout the inductive process of identifying preferred adaptation investments (see Swart et al. 2004).

Nonetheless, the PSD process must still be recognized as a participatory method for *joint analysis and reporting* of stakeholder preferences and assessments. Such a discussion on future adaptation needs, no matter how structured, is inevitably conditioned by the limits of the past experience of participants (and facilitators) and exposure to information, and the prevailing policy discourse of what seems possible and needed *in the current context*. Difficulties in people's ability to imagine and plan for a different future abound, and one must recognize the possibility of inherent path dependence in identifying routes forward.

BOX 15

QUESTIONS ADDRESSED IN PSD WORKSHOPS

What is the local vision of the future, in terms of development priorities, perceived climate change impacts, and feasible response strategies?

Which areas/sectors are viewed as most vulnerable? What are the key drivers contributing to that vulnerability?

What specific adaptation option investments and sequenced combinations of investments (pathways) are needed to respond to climate change impacts at national and sub-national levels?

- How pro-poor are these identified options?
- Where in the region should these be applied and who are the vulnerable groups?
- What are the preconditions including policy elements needed to implement these effectively?
- What are the synergies and trade-offs among these options?



Figure 14. Participants Making Presentation on Regional Adaptation Pathways in Ethiopia

FIGURE 15

Sample Visualizations Prepared for Bangladesh National PSD Workshop

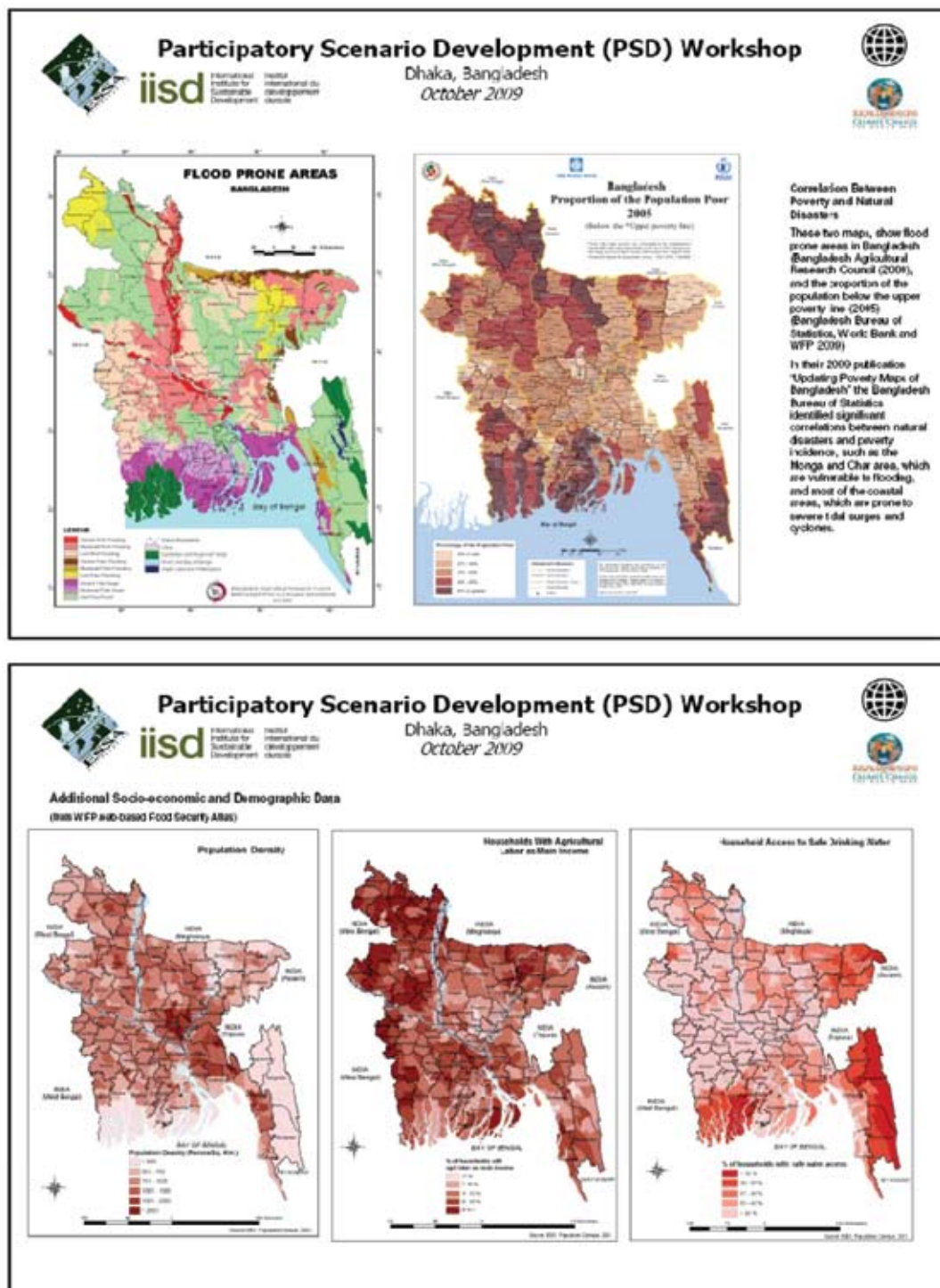




Figure 16. PSD Participants in Kalu District, Ethiopia, Discussing Past Adaptation Practices



Annex Nine

List Of Outputs from EACC-Social Component

Bangladesh Institute of Development Studies (BIDS). 2009. Economics of Adaptation to Climate Change – EACC (Social Component). National Synthesis Report for Bangladesh.

Bizikova, Livia, Samantha Boardley, and Simon Mead. 2009. Participatory Scenario Development for Costing Climate Change Adaptation – Climate Visioning. SEL: 100018962. Prepared by ESSA Technologies Ltd. Vancouver BC and International Institute for Sustainable Development (IISD) Winnipeg, Manitoba, Canada.

Ethiopian Economics Association/Ethiopian Policy Research Institute. 2010. Economics of Adaptation to Climate Change (Social Component): National Synthesis Report for Ethiopia. Draft.

ESSA Technologies Ltd and International Institute for Sustainable Development (IISD). 2009. Capacity Development Manual: How to Prepare and Deliver a Participatory Scenario Development Workshop. Report prepared for World Bank under Participatory Scenario Development for Costing Climate Change Adaptation – Climate Visioning.

Kuriakose, Anne T., Livia Bizikova and Carina A. Bachofen. (2009). Assessing Vulnerability and Adaptive Capacity to Climate Risk: Methods for Investigation at Local and National Levels. *Social Development Working Paper 116*, World Bank.

McElwee, Pamela, Tuyen Nghiem, Dang Thu Phuong, and Nguyen Van Be. 2010. Economics of Adaptation to Climate Change – Social Component. National Synthesis Report for Vietnam. Draft Report prepared by the Center for Natural Resources and Environmental Studies, Vietnam National University, Hanoi (CRES), Challenge to Change UK, and Dragon Institute, Can Tho University, and Arizona State University.

Morales, Miguel. 2010. Economics of Adaptation to Climate Change Bolivia: Country Study Report on Social Component.

Patt, Anthony with Raul Varela, Isilda Nhantumbo, and Livia Bizikova. 2010. Economics of Adaptation to Climate Change: Social Component of Mozambique Country Study.

Ruijs, A., A. Mekonnen, K. Gebreselassi, M. de Bel, V. Linderhof, N. Polman, GJ Prins, M. de Bruin, and HJ Raad. 2010. Costing Adaptation through Local Institutions – Village Results for Ethiopia. Shebelle Consulting, Lei Wageningen and Royal Haskoning.

Yaro, Joseph A. with Tony Dzidzinyo Dogbe, Livia Bizikova, Philip Bailey, George Ahiabile, Tia Yahaya, and Kamil Abdul Salam. 2010. Economics of Adaptation to Climate Change (Social Component) – National Synthesis Report for Ghana.

References

- Adger, W.N. (1999a). "Evolution of Economy and Environment: An Application to Land Use in Lowland Vietnam". *Ecological Economics* 31(3): 365-379
- Adger, W.N. (1999b). "Social Vulnerability to Climate Change and Extremes in Coastal Vietnam". *World Development* 27(2): 249-269.
- Adger, W.N et al. (2004). "New Indicators of Vulnerability and Adaptive Capacity". *Technical Report 7*. Tyndall Centre for Climate Change Research. Norwich: University of East Anglia.
- Adger, W.N. et al. (2005). Property Rights, Institutions and Resource Management: Coastal Resources under Doi Moi. In *Living with Environmental Change*. London: Routledge.
- Adger, W. N. and Kelly, P. M. (1999). "Social Vulnerability to Climate Change and the Architecture of Entitlements". *Mitigation and Adaptation Strategies for Global Change*. Vol. 4: 253-256.
- Agrawal, A. (2008). "The Role of Local Institutions in Adaptation to Climate Change". Paper prepared for the meeting on Social Dimensions of Climate Change, Social Development Department, World Bank, Washington DC, March 5-6, 2008.
- Ahmed, Ahsan Uddin. (2006). *Bangladesh Climate Change Impacts and Vulnerability: A Synthesis*. Dhaka: Climate Change Cell, Department Of Environment. Accessed April 15, 2009 from <http://www.climatechange-cell-bd.org/publications/06ccimpactvulnerability.pdf>
- Asante, K. (2009). *Study on the Impact of Climate Change on Disaster Risk in Mozambique: Synthesis Report*. Maputo: National Institute for Disaster Management (INGC).
- Asian Disaster Reduction Center. (2003). *Role of Local Institutions in Reducing Vulnerability to Recurrent Natural Disasters and in Sustainable Livelihoods Development - Case Study Vietnam*. Rome: FAO and Asian Disaster Reduction Center (ADRC).

- Benin, S. and J. Pender. (2006). "Collective Action in Community Management of Grazing Lands: The Case of the Highlands of Northern Ethiopia". *Environment and Development Economics* 11(1): 127-149.
- Berkhout, F., J. Hertin, and A. Jordan. (2002). "Socio-Economic Futures in Climate Change Impact Assessment: Using Scenarios as 'Learning Machines'". *Global Environmental Change* Vol. 12: 83-95.
- Bizikova, Livia, Samantha Boardley, and Simon Mead. 2009. Participatory Scenario Development for Costing Climate Change Adaptation – Climate Visioning. SEL: 100018962. Prepared by ESSA Technologies Ltd. Vancouver, B.C. and International Institute for Sustainable Development (IISD) Winnipeg, Manitoba, Canada. Final Report prepared for the World Bank Economics of Adaptation to Climate Change Study.
- Brenkert, A and E. Malone. (2005). "Modeling Vulnerability and Resilience to Climate Change: A Case Study of India and Indian States". *Climatic Change* 72(1): 57-102.
- Brooks, N., W.N. Adger and P.M. Kelly (2005). "Determinants of Vulnerability and Adaptive Capacity at the National Level and the Implications for Adaptation". *Global Environmental Change* 15(2): 151-163.
- Carew-Reid, J. (2008). Rapid Assessment of the Extent and Impact of Sea Level Rise in Vietnam. Hanoi: International Centre for Environmental Management (ICEM).
- Chowdhury, A., R. Mushtaque, I. Abbas, A. Bhuyia, Yusuf Choudhury, and Rita Sen (1993). "The Bangladesh Cyclone of 1991: Why So Many People Died." *Disasters* 17(4): 291-304.
- Commission on Climate Change and Development. (2009). *Closing the Gaps*. Stockholm: Commission on Climate Change and Development, Ministry of Foreign Affairs, Government of Sweden.
- DANIDA (2005). Vietnam – Denmark: Development Cooperation in the Environment (DCE) 2005 – 2010 Component Document: Sustainable Livelihoods in and around Marine Protected Areas. Hanoi: DANIDA.
- Dasgupta, S. et al. (2007). The Impact of Sea Level Rise on Developing Countries: A Comparative Analysis. *World Bank Policy Research Working Paper* 4136. Washington DC: World Bank.
- Dasgupta, S., B. Laplante, S. Murray, and D. Wheeler. (2009). "Sea-level Rise and Storm Surges: a Comparative Analysis of Impacts in Developing Countries". *Policy Research Working Paper* 4901. Washington DC: World Bank.
- Dilley, M., R. S. Chen et al. (2005) *Natural Disaster Hotspots: a Global Risk Analysis: Synthesis Report*. New York: Columbia University and Washington DC: World Bank.
- Dovers, S.R. and A.A. Hezri. 2010. "Institutions and Policy Processes: The Means to the Ends of Adaptation". *Wiley Interdisciplinary Review of Climate Change* 1(2): 212-231.

- Eakin, H and A Luers. (2006) . “Assessing the Vulnerability of Social-Environmental Systems”. *Annual Review of Environment and Resources* 31(1): 365-394.
- East Meets West Foundation (2009). *Climate Change Adaptation Survey- Quang Nam Province – Central Region, Vietnam*. Hanoi: East Meets West Foundation. Available at http://downloads.eastmeetswest.org/pubs/emw_climatechangeadaptsurvey.pdf
- Elasha, B.O., Medany, M., Niang-Diop, I., Nyong, T., Tabo R., and Vogel, C. (2006). Background paper on Impacts, Vulnerability and Adaptation to Climate Change in Africa. Prepared for the African Workshop on “Adaptation Implementation of Decision 1/CP.10 of the UNFCCC Convention”, Accra, Ghana, 21-23 September, 2006.
- Environmental Justice Foundation. (2004). *Risky Business: Vietnamese Shrimp Aquaculture: Impacts and Improvements*. London: Environmental Justice Foundation (EJF).
- Environmental Protection Agency. (2000). Climate Change Vulnerability and Adaptation Assessment of Coastal Zone of Ghana. Final report. Accra: Environmental Protection Agency (EPA).
- ESSA Technologies Ltd and International Institute for Sustainable Development (IISD). 2009. Capacity Development Manual: How to Prepare and Deliver a Participatory Scenario Development Workshop. Report prepared for World Bank under Participatory Scenario Development for Costing Climate Change Adaptation – Climate Visioning.
- Evans, M. et al. (2007). How Progressive is Social Security in Vietnam. *UNDP Policy Dialogue Paper*. Hanoi: UNDP.
- GOV. (2008). National Target Program for Climate Change. Draft Document – 8th Version. Hanoi: Government of Vietnam (GOV).
- Ho Long Phi. (2008) Influences of Man-made Activities on Local Climate Change in HCMC. Ho Chi Minh City: Ho Chi Minh City Technological University.
- Hoang Tuyet Minh. (2000). “Rice Biodiversity in Vietnam: Current Status and the Causes of Erosion” in *In-situ Conservation of Native Landraces and their Wild Relatives. Institute of Agricultural Genetics Vietnam*. Hanoi: Institute of Agricultural Genetics (IAG), pp. 58-60.
- Holden, S., C.B. Barrett, and F. Hagos. (2006). “Food-for-Work for Poverty Reduction and the Promotion of Sustainable Land Use: Can it Work?”. *Environment and Development Economics* 11(1): 15-38.
- IPCC. (2001). *Climate Change 2001: Impacts, Adaptation and Vulnerability. A Contribution of the Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change* (eds. McCarthy, J.J., O.F. Canziani, N.A. Leary, D.J. Dokken and K.S. White). Cambridge: Cambridge University Press.

- IPCC. (2007). *Fourth Assessment Report: Impacts, Adaptation and Vulnerability. Summary for Policy Makers*. Inter-governmental Panel on Climate Change and World Meteorological Organization, Geneva.
- Kates, R.W. (2000). "Cautionary Tales: Adaptation and the Global Poor". *Climate Change* 45: 5–17.
- Kelley, P.M. and W.N. Adger. (2000). "Theory and Practice in Assessing Vulnerability to Climate Change and Facilitating Adaptation". *Climatic Change* 47: 325–352.
- Klein, R. et al. (2005). "Integrating Mitigation and Adaptation into Climate and Development Policy: Three Research Questions". *Environmental Science and Policy* 8: 579–588.
- Kuriakose, Anne T., Livia Bizikova and Carina A. Bachofen. (2009). Assessing Vulnerability and Adaptive Capacity to Climate Risk: Methods for Investigation at Local and National Levels. *Social Development Working Paper 116*, World Bank.
- Le Thi Van Hue (2006). "Gender, Doi Moi and Mangrove Management in Northern Vietnam". *Gender, Technology and Development*. 10(1): 37–59.
- Le Thi Van Hue and S. Scott (2008). "Coastal Livelihood Transitions: Socioeconomic Consequences of Changing Mangrove Forest Management and Land Allocation in a Commune of Central Vietnam". *Geographical Research* 46(1): 62–73.
- Leach, M., R. Mearns and I. Scoones. (1997). "Environmental Entitlements: A Framework for Understanding the Institutional Dimensions of Environmental Change". *IDS Working Paper* No. 359. Brighton: IDS Sussex.
- Leach, M., R. Mearns and I. Scoones. (1999). "Environmental Entitlements: Dynamics and Institutions in Community-Based Natural Resource Management". *World Development* 22(7): 225–247.
- Lim, B. and Spanger-Springfield, E. (eds). (2005) *Adaptation Policy Frameworks for Climate Change: Developing Strategies, Policies and Measures*. UNDP and Cambridge University Press.
- London, J. (2004). *Social Provision and the Transformation of the Socialist State: Mass Education and Health Provision in Vietnam's Market Transition*. Ph.D. Dissertation. University of Wisconsin-Madison.
- MONRE. (2009). *Climate Change, Sea Level Rise Scenarios for Vietnam*. Hanoi: Ministry of Natural Resources and Environment (MONRE), Government of Vietnam.
- Mani, M. et al. (2008). *Policy and Institutional Reforms to Support Climate Change Adaptation and Mitigation in Development Programs: A Practical Guide*. Washington DC: World Bank. Available at <http://siteresources.worldbank.org/EXT/EEI/Resources/DCCToolkitCRAlores.pdf>
- McElwee, P. (2007). "Of Rice, Mammals, and Men: The Politics of Wild and Domesticated Species in Vietnam." In *Where the Wild Things are Now: Domestication Reconsidered*, Molly Mullin and Rebecca Cassidy (eds). 2007. London: Berg, pp. 249–276.

- McElwee, P. (2009). "Reforestation 'Bare Hills' in Vietnam: Social and Environmental Consequences of the 5 Million Hectare Reforestation Program." *Ambio: A Journal of the Human Environment* 38(6): 325-333.
- McGray, H. et al. (2007). *Weathering the Storm: Options for Framing Adaptation and Development*. Washington DC: World Resources Institute
- Mearns, Robin, and Andrew Norton (eds.). 2010. *Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World*. Washington, DC: World Bank.
- Minia, Z. (2004). *Climate Scenarios Developed for Climate Change Impacts Assessment in Ghana*. Report prepared for the Environmental Protection Agency (EPA) under the Netherlands Climate Change Studies Assistance Program (NCCSAP). Phase 2 - Part 1. Accra: NCCSAP.
- Moss, R. H., Brenkert, A. L., and Malone, E. L. (2001) *Vulnerability to Climate Change: A Quantitative Approach*, PNNL-SA-33642, Pacific Northwest National Laboratory, Washington, DC, <http://www.pnl.gov/globalchange/projects/vul/index.htm>.
- Netherlands Climate Assistance Program (NCAP) Project (2006). *Climate Change Impacts in Huong River Basin and Adaptation in its Coastal District Phu Vang, Thua Thien Hue Province*. Hanoi: NCAP.
- Nguyen Ngoc Quynh (2003). *Responses to Poverty and Risks in Vietnam: How Effectively Does the Vietnamese Public Safety Net Target Vulnerable Populations?* Manuscript, Australian National University (ANU).
- Owusu, K., et al. (2008). "Changing Rainfall Inputs in the Volta Basin: Implications for Water Sharing in Ghana." *Geojournal* 71(4): 201-210.
- Parry, M., Arnell, N., Berry, P., Dodman, D., Fankhauser, S., Hope, C., Kovats, S., Nicholls, R., Satterthwaite, D., Tiffin, R. and Wheeler, T. (2009) "Assessing the Costs of Adaptation to Climate Change". London: International Institute for Environment and Development (IIED) and Grantham Institute for Climate Change, Imperial College.
- Pender, J.S. (2008). *What Is Climate Change? And How Will It Affect Bangladesh?* Briefing Paper. (Final Draft). Dhaka, Bangladesh: Church of Bangladesh Social Development Programme. Retrieved April 15, 2009 from <http://www.kirkensnodhjelp.no/Documents/Kirkens%20N%C3%B8dhjelp/Publikasjoner/Temahefter/FINAL%20Draft%20WHAT%20IS%20CLIMATE%20CHANGE%20AND%20HOW%20IT%20MAY%20AFFECT%20BANGLADESH.pdf>
- Phong Tran et al. (2008). "Flood Risk Management in Central Viet Nam: Challenges and Potentials." *Natural Hazards* 46(1):119-138.
- Phong Tran and Shaw, R. (2007). "Towards an Integrated Approach of Disaster and Environment Management: A Case Study of Thua Thien Hue Province, Central Viet Nam". *Environmental Hazards* 7 (4): 271-282.

- Pretty, J. and Ward, H. (2001). "Social Capital and the Environment". *World Development* 29(2): 209 - 227.
- Rahman, Atiq, Mozaharul Alam, Sarder Shafiqul Alam, Md. Rabi Uzzaman, Mariam Rashid and Golam Rabbani. (2007). *UNDP Human Development Report 2007*. Dhaka: Bangladesh Centre for Advanced Studies (BCAS). Accessed April 15, 2009 from http://hdr.undp.org/en/reports/global/hdr2007-2008/papers/rahman_alam_alam_uzzaman_rashid_rabbani.pdf
- Resurreccion, B.P, E.E. Sajor, and E. Fajjber. (2008). *Climate Adaptation in Asia: Knowledge Gaps and Research Issues in Southeast Asia*. London: ISET-International and DFID.
- Ribot, J.C. (2010). "Vulnerability Does Not Fall from the Sky: Toward Multi-scale, Pro-poor Climate policy," in Robin Mearns and Andrew Norton (eds.), *Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World*. Washington, DC: World Bank.
- Scoones I. 1998. "Sustainable Rural Livelihoods: A Framework for Analysis". *IDS Discussion Paper 72*. Brighton: IDS Sussex.
- Smit, B. and J. Wandel. (2006). "Adaptation, Adaptive Capacity, and Vulnerability". *Global Environmental Change* 16(3): 282-292.
- Smit, B., et al. 2001. "Adaptation to Climate Change in the Context of Sustainable Development and Equity" in J.J. McCarthy and O.F. Canziani (eds.) *Climate Change 2001: Impacts, Adaptation and Vulnerability*. Contribution of Working Group III to the 3rd Assessment Report of the Intergovernmental Panel on Climate Change.
- Smith, D. and J. Vivekananda. (2009). "Climate Change, Conflict and Fragility: Understanding the Linkages, Shaping Effective Responses". *International Alert*. Institute for Peacebuilding – Early Warning (IfP-EW). http://www.international-alert.org/pdf/Climate_change_conflict_and_fragility_Nov09.pdf
- Stern, Nicholas. (2007). *The Economics of Climate Change: The Stern Review*. Cambridge: Cambridge University Press.
- Swart, R., P. Raskin, and J. Robinson. (2004). "The Problem of the Future: Sustainability Science and Scenario Analyses". *Global Environmental Change* 14: 137-146.
- Trap, N. (2006). *Vulnerability of Fishing Communities in Vietnam: an Exploration of the Scope to Adapt to Environmental Change*. PhD Thesis. Amsterdam: Vrije University.
- Van de Walle, D. (2004). "Testing Vietnam's Public Safety Net". *Journal of Comparative Economics*. 32(4): 661-679.
- Vu Thi Hong Anh. (2010). "Gender and Sustainability: Negotiating Risky Business in Vietnam's Mekong Delta". In: *Gender and Sustainability: Lessons from Latin America and Asia*, edited by M. Cruz-Torres and P. McElwee. University of Arizona Press. Forthcoming.

- World Bank. (2008). *Social Dimensions of Climate Change: Report of an International Workshop*. Washington, DC: World Bank.
- World Bank. (2009a). *Development and Climate Change – World Development Report 2010*. Washington , DC: World Bank.
- World Bank. (2009b). *Country Social Analysis: Ethnicity and Development in Vietnam*. Washington, DC: World Bank.
- World Bank. (2010a). *The Economics of Adaptation to Climate Change: A Synthesis Report*. Final consultation draft, August 2010. Washington, DC: World Bank.
- World Bank. (2010b). Adaptation Guidance Notes: Key Words and Definitions. Available at <http://beta.world-bank.org/climatechange/content/adaptation-guidance-notes-key-words-and-definitions>
- Yohe, G. and R.S.J. Tol (2002). “Indicators for Social and Economic Coping Capacity: Moving Toward a Working Definition of Adaptive Capacity”. *Global Environmental Change* 12: 25–40.
- Yusuf, A., Francisco, H. (2009). *Climate Change Vulnerability Mapping for Southeast Asia*. Singapore: Economy and Environment Program for Southeast Asia.



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