



Climate Adaptation in Asia: Knowledge Gaps and Research Issues in South East Asia

Full Report of the South East Asia Team

Climate Change Adaptation
Southeast Asia

June 2008

Bernadette P. Resurreccion
Edsel E. Sajor
with Elizabeth Fajber

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Executive Summary

The Southeast Asia (SEA) region is widely diverse politically, economically, and culturally, yet faces common challenges of impacts of climatic change and variability, poverty and inequity, and increasing vulnerabilities arising from rapid urbanization, degradation of resources and unsustainable development. Largely tropical and monsoonal, the region consists of countries that are low lying and archipelagic (Indonesia, Philippines, Malaysia) and others that comprise a contiguous landmass sharing common borders and rivers such as the riparian countries of Thailand, Lao PDR, Cambodia, Vietnam and Myanmar. While agriculture and fishing continue to be the mainstay of national economies and livelihoods, especially for the poor, the region also is experiencing rapid urbanization, industrialization and expanding commercial tourism that are strengthening economic development but placing stress on fragile natural resource systems and exacerbating social inequities. Climatic changes are expected to severely impact those most dependent on natural resources for their livelihoods, such as poor farming and fishing families, but also vulnerable populations living in urban, peri-urban and rural areas near coasts and deltas. The region is expected to experience increases in frequency and intensity of tropical cyclones, storm surges, sea level rise, and increased flooding, particularly in Vietnam, Philippines and Indonesia. Increased variability in rainfall patterns across the region, especially in the Mekong Region, is resulting in drought and disastrous floods, with serious implications on people's livelihoods and food security.

To date, attention to climate change research in Southeast Asia has largely focused on climate change impacts, especially on the sectors of water, agriculture, coastal resources and forestry. Research on adaptive strategies and options has been emerging in recent years, and increased attention to develop national adaptation plans has materialized in part due to UNFCCC commitments and the attention on adaptation at the recent COP 9 meetings in Bali. Overall, the approach to adaptation has tended to be linear: first, identify expected climate related impacts, next determine vulnerabilities (primarily biophysical) vis-à-vis these impacts, and these in turn provide a template for planning for adaptation. While significant research has emerged on effective irrigation, water conservation, agricultural technologies and practices, and coastal infrastructure that can assist in mitigating climate change impacts, these studies have focused on technical interventions, rather than complex planned and autonomous adaptive responses to factors that contribute to people's vulnerability. Moreover, this framework is dependent on macro-scale climate models that are inapplicable at local scales, and planning of adaptive responses are stalled without confirmation of precise impacts at local levels that will be difficult to predict.

In an attempt to offer more holistic perspectives, this study embraces an understanding of adaptation that builds on the IPCC definition of actions that people take in response to, or

in anticipation of, projected or actual changes in climate to adjust to and cope with impacts, moderate damages, and take advantage of opportunities. We also view adaptation as inextricably bound to multifarious economic, environmental and political stresses, social vulnerabilities and differentiated adaptive capacities of people. Understanding these linkages is essential for researchers to make sense of how and why people adapt to climate changes the way they do, and which adaptation strategies are most feasible to them. Additionally, we expect that climate changes will exacerbate already existing social, political, economic and environmental stresses in the region—or could present new and gainful opportunities.

With this framework guiding the study, the main objective was to identify major areas where locally led research can contribute substantially to policy and implementation programmes for adaptation, particularly as those relate to the poor and other vulnerable communities. The study aimed to learn from and build on the existing knowledge and expertise in the region, and build regional ownership in the assessment of existing challenges, knowledge and activities on climate adaptation in SEA. Given the relative short duration of the project, the research process involved the following steps: first, we held roundtable consultations in Hanoi, Vietnam and Manila, Philippines, two of the most vulnerable countries in Southeast Asia to climate change. These two consultations scoped the issues for further inquiry, introduced us to key informants and interested organizations, and established the legitimacy of the researchers and the research project. Second, we conducted a series of individual semi-structured and unstructured interviews in the Philippines, Thailand, Indonesia, Vietnam, Lao PDR, Malaysia and Cambodia. Individual and small group interviews conducted were with knowledgeable experts in the region. Third, we did a literature review to add to and triangulate earlier information. We proceeded to draft the report on the basis of the first three steps. In May, we convened and organized a regional workshop at the Asian Institute of Technology (AIT) in Thailand to validate and further enrich the major findings in the first draft. Subsequently, we made the final revisions based on the discussions of the regional workshop.

Several findings come out strongly in our consultations regarding planned adaptation. Comprehensive national plans on adaptation to climate change impacts are still in preparatory and planning stages in all countries of Southeast Asia and thus too early to assess where implementation of these planned national programmes are heading. National governments in the region have been implementing and accumulating substantial experiences on programmes addressing poverty, disasters, weather monitoring and forecasting, and environmental issues. There are also focused national measures that address climate risk management of climate risks and impacts on specific sectors. Sector specific measures have been implemented in the countries of Lao PDR, Thailand and Vietnam with moderate and low effectiveness. Generally speaking, planned local adaptations related to climate change common in the region are two types, based on the perspective of the driver-actor. The first type is those initiated and driven by the provincial, municipal, or commune/village-level governments; the second type by NGO, often international, intermediaries.

In a number of SEA countries, the level of knowledge and awareness on climate change impacts, mitigation and adaptation measures are low among local officials and insufficient to prompt them to formulate proactive and anticipatory action agendas. Many local governments traditionally have been responding to climate change extreme events like flooding, storm surges, and typhoons in their own areas, concerns that fall under the conventional mandate of local governments for disaster preparedness, and relief and

rehabilitation. It has been observed that in the strategic management of extreme events there is a strong propensity by local governments with strong support from national government, to employ a purely technical fix by constructing physical structures such as seawalls and breakwaters, and stone breakwater and flood control structures. However, local governments have also employed 'soft technologies' for disaster preparedness.

At the local level, international and domestic NGOs in partnerships with local people, also have been the drivers of planned adaptation measures focused on vulnerability reduction and on strengthening adaptive capacities of households and village communities.

From our interviews and review of existing adaptation strategies and planned measures, we find very little done that examines adaptation from an actor-oriented perspective. Not much has been done to examine factors that make people vulnerable to climate change impacts in the first place, and which in turn constrain rather than enable their adaptive capacities to climate change impacts. Some limited work in the region explores community based adaptation responses in cases of floods, drought, and extreme weather events. These small-scale initiatives primarily concentrate on agricultural practices and water management, although some development initiatives increasingly consider adaptive strategies of livelihood diversification and poverty alleviation.

Studies on autonomous adaptation practices are also few and dispersed, and those that exist fail to inform planned adaptation measures at local and national scales. Most studies are also solely survey based, one slice-of-time assessments, lacking in time series data and dimensions of adaptation that change over time. These studies have also not fully examined elements that may constrain or enable people's adaptive capacities.

In view of the guiding framework and to redress the gaps and the limitations of existing research approaches, we identify particular themes as points of entry for research on people's adaptation to climate change.

Migration:

While a substantial amount of research on migration in the region exists, this has not been contextualized within climate change adaptation; hence there is little understanding of how climatic impacts may further amplify or affect movement. Research is needed to understand mobility as an adaptive measure and its underlying support systems such as transport, banking for flow of remittances, as well as informal trans-local and transnational social networks that may facilitate access to opportunities. Additional understanding is needed of assets that may enable or constrain migration, particularly of poorest groups, who may lack needed financial capital, skills, knowledge and capacities, since migration is known to be a selective process. The less well off may move to more ecologically fragile places such as uplands and coastal, low lying border areas and take up risky and gender specific livelihoods such as factory work under slave-like conditions, commercial sex work and small-scale logging. Movements to smaller urban and peri-urban centres have implications for city planning, access to services, and social protection.

Economic push and pull factors and climate change stressors by themselves are not exclusively the drivers of migration. These drivers are mediated (i) by global and national forces that may create or inhibit labour markets that absorb migrants; (ii) by policy regimes and existing transport and banking systems that constrain or enable the migration process and wellbeing of migrant workers and those they leave behind; (iii) by the relative individual

autonomy of migrants themselves embedded in social and gender norms, as well as in household productive assets and the extent of their supportive social networks. These combined elements can offer more comprehensive explanations to the nature, processes and outcomes of migration as an adaptive strategy in the context of climate change that significantly depart from conventional push-pull explanations.

Social security mechanisms:

Formal and informal social security mechanisms are crucial for strengthening people's resilience to climate change stressors. Examples of formal mechanisms are credit and crop insurance, state-protected land tenure, formal export labour with social protection benefits, opportunities for rice and crop mortgages with government agencies or NGOs, crop subsidies and state social security systems that include benefits, pensions and health insurance. Informal mechanisms, on the other hand, may be forms of migration, informal loans, group sharing losses, keeping livestock and other assets for 'insurance,' and multi-cropping systems to avert single crop failures. Questions that probe into the role and importance of social security mechanisms in the context of climate change stress and shocks could: (i) investigate how formal and informal institutions and mechanisms support or constrain each other; (ii) better understand the factors that differentiate some to have more access to social security benefits and mechanisms than others; (iii) understand the efficacy and resilience of informal social security institutions such as cooperatives, kin enclaves and credit networks in the face of climate stressors; (iv) identify mechanisms, institutions and policies to strengthen reach and accessibility of formal social security mechanisms to poor and marginal groups, including women; and (v) develop appropriate and effective gender-responsive micro-credit and micro insurance models that are relevant to cultures, practices and socio-political contexts of the SEA region.

Livelihood security of small-scale and subsistence fishers and upland farmers: Research is required to (i) better understand how livelihood security of small-scale fishers and farmers may be threatened by climate change combined with other stressors, and explore mechanisms that could strengthen their adaptive capacities. This includes research on agriculture and fisheries production systems, particularly in increasing saline environments, alongside mechanisms for tenure security and equitable access to other productive assets and infrastructure. It involves linking scientific information on climate and weather patterns to local levels, and enhancing accessibility of this information by those most affected by such occurrences.

Research on (ii) the potential and needs for livelihood transitions such as skills upgrading and education, are also critical for strengthening adaptive capacity towards climate change.

Contrary to popular notion, small producers are also dynamic actors who diversify their livelihoods, engage in multiple portfolios and multi-local livelihoods that are dynamic and adaptive. There is also need (iii) to understand the factors and conditions that work to under-represent and exclude the voices of small producers in national and intermediate planning for adaptation and the effects that other mitigation efforts might have on their livelihoods and well-being. The discourse on marginality has often been self-serving resulting in re-taking control of resources of small producers by state and private commercial agencies. They also assume that 'marginal' livelihoods are 'doomed with no future,' thus not venturing to explore their viability and sustainability.

In sum, research on small producers' livelihoods and the means and ways with which they adapt to climate change stressors has thus the potential to unravel the economic, ecological, social and discursive conditions and constraints to their livelihood security in general.

Strengthening resilience to health related impacts:

Health may be considered the "left behind" sector in climate change adaptation research. Attention of the public health sector primarily has been in the context of responsive measures for water and sanitation in climate induced disaster situations, and efforts to control diarrhoeal and infectious diseases, such as malaria and dengue. Increases in floods, droughts and storms and changes in temperature will bring increases in health risks to gastrointestinal and vector-borne diseases, food and nutritional insecurity, and heat-stress morbidity. Currently health responses to these challenges are passive, and research is required to strengthen health systems and services to better anticipate and address potential health challenges, and also respond to the uncertainty of climate change, such as unexpected and sudden changes in temperature and precipitation. This may include development of systems for active surveillance of breeding areas, technologies and institutions for climate robust water and sanitation, and development of gendered and accessible health systems that reach poorest populations. In urban areas, planning of water and sanitation systems and drainage is required to strengthen resilience of marginal lands to flooding, and resulting health problems.

Research on the evidence that links climate change adaptation and health may probe into the following general domains: (i) identification of potential direct and indirect impacts of climate change on human health on different gender and social groups; (ii) barriers to successful health-related planned and autonomous adaptation to climate change stressors; and (iii) effective social, technological, institutional and policy measures to overcome such barriers.

Governance of adaptation across scales:

Research is required on governance systems at (i) multiple levels that facilitate effective linkages across scales, and which can help address horizontal disjunctures between sectors and stakeholders, as well as vertically between national level thinking and policies, and local level discussions and actions. Multi-disciplinary and multi-sectoral research projects can catalyse actions and bridge fragmented and sectarian perspectives and approaches to current adaptation planning by governments.

A much less understood, but (ii) critical area of governance is located between national, centralized and sectoral administrative levels, and the lowest local levels of public management and fields of action (often referred to as city/municipal and grassroots communities). The dynamics, forces and characteristics at work and their potentials at this intermediate level are least explored. However, it is at this intermediate level where area-based integrative management of resources and their facilitating institutions, infrastructure and services (such as finance and commercial, government outreach services, education and training, and transportation, etc.) have an optimal extra-local impact, especially in light of increasing climate change effects on local populations.

Particular attention must also be paid to (iii) trans-boundary governance of water resources. In the Mekong River Basin, for instance, climate- and human-induced variability in the water flow of the Mekong has created trans-boundary winners and losers. There is a need

to understand the constraints, opportunities, conditions and forces for developing effective governance mechanisms necessary for equitably allocating water throughout drought and flooded periods between and among neighbouring countries, cities and municipalities. Likewise, there is a need to examine how trans-boundary governance have built-in norms, procedures and mechanisms that are responsive to the needs for protection and support of the livelihood stakes of the poor that could strengthen their adaptive capacities.

These research points of entry have the potential to offer more holistic insights and explanations to people's adaptation to climate-related changes—their constraining and enabling elements—with a view to inform evidence-based policy at different levels in Southeast Asia.

INTRODUCTION

Adaptation to climate change is, as documented by the Intergovernmental Panel on Climate Change (IPCC), among the most fundamental challenges facing human society over the coming decades. The impacts of climate change will affect all, but poor populations in less developed regions are likely to be among the most vulnerable. Individuals, communities, and even countries need to go beyond only 'coping' with the range of impacts and climate stresses that will arise, and need to be able to adapt well to these changes. Capacities to improve resilience and adaptive responses need to be strengthened. Strategic research can help in identifying insights, mechanisms, institutions, technologies and policies to promote and enable adaptation. With the aim of developing a long term programme of research support, the Department for International Development (DFID) and the International Development Research Centre (IDRC) commissioned a six-month Asia regional study to identify key knowledge areas where research may contribute to this adaptation challenge. The Institute for Social and Environmental Transition (ISET), in collaboration with partners in Southeast Asia (SEA), China and South Asia, engaged in sub-regional efforts to identify strategic knowledge and capacity gaps where research on adaptation could be most effective in supporting countries to "address the threat that climate change puts on development and poverty alleviation". The SEA study was lead by the Asian Institute of Technology (AIT), and this report documents the key findings.

The report is divided into six main sections. Following the introduction, the second section explains additional background to the study, the conceptual framework, and methodology. The third section describes the current context of climate change adaptation research in SEA. The fourth section discusses existing adaptation strategies in the region. The fifth section presents major issues that emerged from the review and analysis. The final section highlights strategic points of entry, responding to major knowledge gaps, and pointing to key points of entry for research, key actors and partners, and efforts required for capacity building.

ABOUT THE STUDY

This study, as in the other regions, engages a conceptual framework that recognizes that social and ecological systems are inherently complex, interconnected and dynamic. Climate change impacts will cut across a range of sectors: agriculture, water, fisheries, coastal, health and infrastructure. They will exacerbate existing problems of food insecurity,

malnutrition, disease and vulnerable livelihoods in contexts along the rural to urban continuum. These impacts will be compounded by other non-climatic stresses, such as globalization, political insecurity, market pressure, weak institutions and poverty. Economic and livelihood systems, access to physical infrastructure, social and gender barriers, political institutions and personal attributes all influence who will be affected by climate change and how they will be affected.

The study embraced an understanding of adaptation that builds on the IPCC definition of actions that people take in response to, or in anticipation of, projected or actual changes in climate to adjust to and cope with impacts, moderate damages, and take advantage of opportunities. We view adaptation as inextricably bound to multifarious stresses, social vulnerabilities and people's differentiated adaptive capacities. Understanding these linkages is essential for researchers to make sense of how and why people adapt to climate changes the way they do, and which adaptation strategies are most feasible for them.

Explicitly considered are both: 1) "planned" responses that may be implemented as programmes and projects by governments or communities to respond to, or in anticipation of, expected climate impacts, and 2) "autonomous" adaptive responses—actions that individuals, communities, businesses and other organizations undertake on their own in response to the opportunities and constraints they face with climatic change and other sources of livelihood shocks and stresses. Planned adaptation responses generally respond to predicted ecosystem and hydrological impacts and human vulnerability, and often focus on sectoral interventions, for example those related to water management or flood control. Autonomous actions are individual or collective unplanned responses. These may involve changes in practices or technologies, diversification of livelihood systems, and migration. Effective adaptation requires a balance between autonomous and planned responses. Consideration also needs to be given to strengthening the enabling environment and underlying systems—such as transport, communication, financial, institutional, health and social network systems—that can support such processes, as well as the range of diverse actors who need to be engaged.

Predictions and evaluations of climate change and impacts should also be related to a sound foresight of development trajectories of regions, of people's changing livelihoods that often implies location and inter-generational shifts. It should be noted that in many places—and especially in fragile eco-zones—middle-aged and young generations of people align their actions not only to climate changes, but to new aspirations, developing and unfolding opportunities in the larger world. Their long-term pathways of making a living may lie beyond their current locations and occupations. These dynamics of societal changes occurring simultaneously with climatic stresses in specific contexts should inform directions of macro- and meso-level perspectives, and planning for long-term future adaptation around climate change impacts and development.

With this framework guiding the study, the main objective was to identify major areas where locally-led research can contribute substantially to policy and implementation programmes for adaptation, particularly as those relate to the poor and other vulnerable communities. The study aimed to learn from and build on the existing knowledge and expertise in the region, and build regional ownership in the assessment of existing challenges, knowledge and activities on climate adaptation in SEA. Given the relative short duration of the project, the research process involved the following steps: first, we held roundtable consultations in Hanoi, Vietnam and Manila, Philippines, two of the most

vulnerable countries in Southeast Asia to climate change. These two consultations scoped the issues for further inquiry, provided key informants and interested organizations, and established the legitimacy of the researchers and the research project. Second, we conducted a series of individual semi-structured and unstructured interviews in the Philippines, Thailand, Indonesia, Vietnam, Laos, Malaysia and Cambodia. Individual or small group interviews conducted were with knowledgeable experts in the region. Third, we did a literature review. We thereafter wrote the first draft on the basis of the first three steps. In May, we convened and organized a regional workshop at the Asian Institute of Technology (AIT) in Thailand to validate and further enrich the major findings of the research in the first draft. Subsequently, we made the final revisions based on the discussions of the regional workshop.

The two roundtable consultations held each in Hanoi, Vietnam and Manila, Philippines were attended by key government, NGO and research actors from those countries engaged in climate change-related research and programming. The final workshop held in AIT involved key informants of the research and several new participants who are experts on particular themes in the draft report. Fifty-two, 27 and 33 participants attended the roundtable consultations in Hanoi, Manila, and at the AIT respectively.

Key actors from Cambodia, Indonesia, Lao PDR, Malaysia, Thailand, Philippines and Vietnam interviewed by the team comprised total of 76 semi-structured and unstructured interviews in the region. Additional interactions with key stakeholders in “local communities” currently experiencing challenges from climate-related events also took place, for example, in Albay, Philippines and in the Red River Delta, Vietnam. Team members participated in a regional conference on climate change adaptation organized by the Environmental Economics Programme of Southeast Asia (EEPSEA) held in Bali, Indonesia in February 2008. The team also reviewed available academic peer-reviewed and grey literature from various disciplines relevant climate impact, vulnerabilities and adaptation focusing on SEA countries. This literature include studies on vulnerability reduction, resilience and livelihood dynamics of people living in some of the fragile eco-zones in the region, which were used to infer unplanned adaptation pathways actually being undertaken and their potentials as entry points for climate change adaptation research. These sources also have been used, where possible to triangulate information and views coming from individual interviews.

In conducting the study and with aims to understand where and to whom adaptive capacity may be most challenged, the team considered different types of eco-zones (coastal, deltaic, upland/mountain) and paid attention to localities that may be highly vulnerable to climate change due to climate related impacts and social vulnerabilities. The analysis of the wealth of data sources described above was embedded in our conceptual approach, and aimed to point to strategic research themes that could make the most impact, including identification of areas that had been under-represented in adaptation research to date.

THE ADAPTATION CONTEXT

Climate Impacts and Vulnerabilities: An overview

The Region

The Southeast Asia (SEA) region is widely diverse politically, economically, and culturally, yet faces common challenges of impacts of climatic change and variability, poverty and

inequity, and increasing vulnerabilities arising from rapid urbanization, degradation of resources and unsustainable development. Largely tropical and monsoonal, the region is composed of countries that are low-lying and archipelagic (Indonesia, Philippines, Malaysia) and others that comprise a contiguous land mass sharing common borders and rivers such as the riparian countries of Thailand, Lao PDR, Cambodia, Vietnam and Myanmar. The region consists of vast upland and forested areas, coastal areas, wetlands, floodplains and deltaic landforms inhabited by diverse ethnic populations with distinct cultural traditions. While agriculture and fishing continue to be the mainstay of national economies and livelihoods, especially for the poor, the region is also experiencing rapid urbanization, industrialization and expanding commercial tourism that are strengthening economic development, but stressing fragile natural resource systems and exacerbating social inequities.

The region, despite making advances in economic growth and education, continues to be hampered by poverty and development challenges. The following table gives some social and economic indicators for developing countries in the region. While these indicators are somewhat limited, they do demonstrate that Myanmar, Cambodia and Lao PDR face the greatest development challenges. These countries rank the lowest for most indicators with 77.7% of the population earning less than 2 USD per day in Cambodia, and 74% in Laos PDR. Except for the more developed countries of Thailand and Malaysia between 27 and 38 % of the population lives below national poverty lines. Even those more developed countries rank in the last third of countries listed globally on the gender empowerment measure that measures inequalities between women and men. Within countries across the region, including those most developed there are large inequities income, access to resources and services, and political voice.

TABLE 1 | Selected Quality of Life Indicators by Country, Southeast Asia

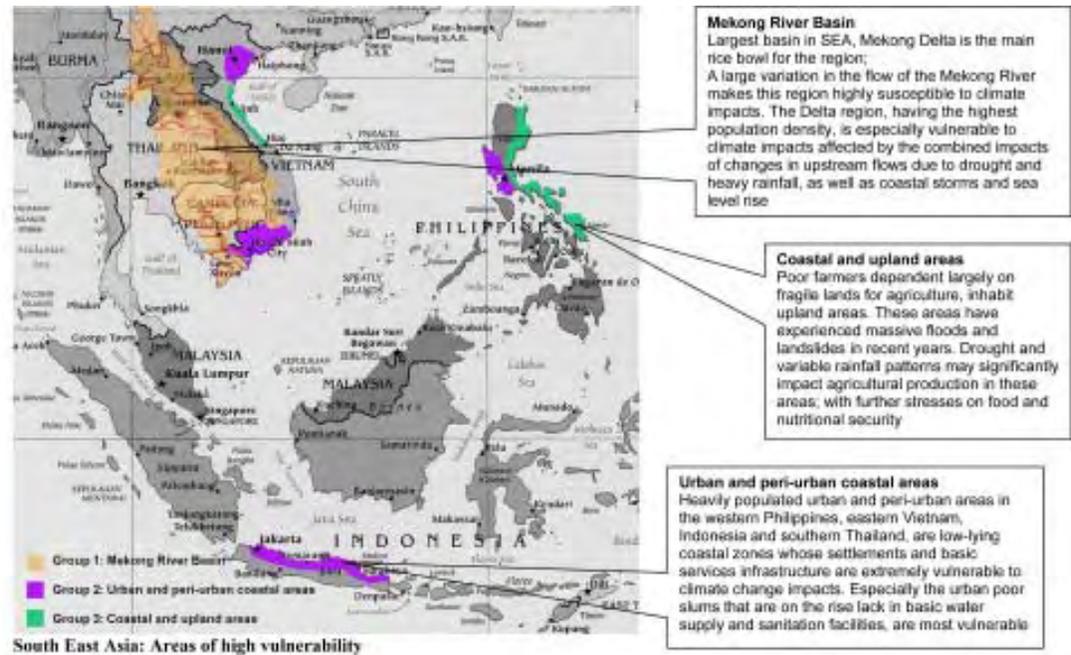
	HDI Rank (of 177)	Pop'n (million) 2005	GDP per capita	Population				GDI Rank (of 156)	GEM rank (of 93)
				\$1/day (%)	\$2/day (%)	The national poverty line (%)	Not using an improved water source (%)		
Malaysia	63	25.3	10,882	<2	9.3	15.5	1	57	65
Thailand	78	64.2	8,677	<2	25.2	13.6	1	70	73
Philippines	90	83.1	5,137	14.8	43.0	36.8	15	76	45
Vietnam	105	80.5	3,071	..	..	28.9	15	90	52
Indonesia	107	220.6	3,843	7.5	52.4	27.1	23	93	..
Lao PDR	130	5.9	2,039	27.0	74.1	38.6	49	114	..
Cambodia	131	14.1	2,727	34.1	77.7	35.0	59	113	83
Myanmar	132	25.3	1,027	..	..	..	22	...	..

HDI = Human Development Index, GDI = Gender Development Index, GDP = Gross Domestic Product, GEM = Gender Empowerment Measure, Sources: UNDP 2007b, World Bank 2007

Climate changes are expected to exacerbate these existing social, economic and environmental stresses in the region. On the other hand, vulnerability to climate change and adaptive capacities are also influenced by the development situation generating these stresses.

Adaptive capacities vis-à-vis climate change therefore depend to a large extent on the levels of development achieved at various socio-spatial scales and within this context, the ability of public actors and households to effectively link climate change adaptation actions with their livelihood trajectories, practices and overall vulnerability reduction strategies.

FIGURE 1:
Southeast Asia



Expected climate changes: conventional forecasts

Southeast Asia is already experiencing, and is expected to face additional climatic changes over the next century including altering rainfall patterns, extreme weather events, sea level rise and temperature change. To date, the frequency of occurrence of more intense rainfall events have increased, causing severe floods, landslides, and debris and mudflows, while the number of rainy days and total annual amount of precipitation has decreased (Cruz *et al.* 2007). This trend is expected to continue with increasing variability in rainfall patterns to result in greater rainfall during the summer monsoon, while winter rainfall is projected to decline (Alam *et al.* 2007), with direct impacts on flows of major river systems and groundwater levels, affecting agricultural productivity and access to drinking water. Increasing droughts or near-drought conditions have already been witnessed in Indonesia during El Nino years, and in Myanmar, Laos, Philippines and Vietnam in the years following El Nino/La Nina Southern Oscillation (ENSO) events (Alam *et al.* 2007; PAGASA 2001; Kelly and Adger 2000). Changes in rainfall patterns, compounded with management of flow regimes and increasing groundwater extraction may contribute to increases in drought conditions in the region, affecting agricultural production, and food and nutritional security.

The region is no stranger to extreme weather events, and has a long history of dealing with resulting extensive destruction, particularly in the Philippines and Vietnam. However, evidence demonstrates that the intensity and frequency of tropical storms originating in the Pacific have increased over the past few decades (Fan and Li 2005 in Cruz *et al.* 2007). In the Philippines, on the average 19 tropical cyclones enter the Philippine Area of Responsibility (PAR) annually, with about 8 or 9 of them crossing the Philippines and an increase of 4.2 in the frequency of cyclones entering the PAR during the period of 1990-2003, (PAGASA 2001, Amadore 2005). In Vietnam, on average there are six to eight typhoons each year. When a tropical cyclone occurs, the affected coastal area can be struck by wind velocity of 40-50 m/s, especially in the Red River Delta and the Central Provinces. Torrential rain accompanied by tropical cyclones with rainfall of 100-300 mm/day and total rainfall for each spell of 500-1000 mm can cause flash floods that regularly submerge low-lying

areas. These floods and triggered landslides displace large populations. It is anticipated that there will be an increase in intensity and frequency of tropical cyclonic systems, including hurricanes, typhoons and tropical storms, in the region.

The current rate of sea level rise (SLR) in coastal areas of Asia is reported to be between 1 to 3 mm/yr, marginally greater than the global average, but data indicates that it is accelerating (Cruz *et al.* 2007). While global SLR is expected to be approximately 3-16 cm by 2030 and 7-50 cm by 2070 (Alam *et al.* 2007), it is uncertain how SLR will play out in the SEA region. There are some concerns that it may be as high as .5 to 1 m (Alam *et al.* 2007). A 1 m rise in sea level alone would flood 5,000 sq km of the Red River Delta and 15,000 – 20,000 sq km in the Mekong River. Sources quoting World Bank reports predict that a one-metre sea level rise would leave 40,000 sq. metre of coastal areas in Vietnam under water and cutting 10 per cent of the GDP (<http://Vietnamnews.vnagency.com.vn>). Changes in sea temperature and coral bleaching will significantly alter coral reefs, with recent risk analysis suggesting that between 24 % and 30% of reefs in Asia to be lost during the next 10 years and 30 years respectively (Cruz *et al.* 2007), affecting marine environments, aquatic resources, tourism and those depend on these for their livelihoods.

Climate modelling suggests fairly moderate temperature increases in the region. Hot days, i.e. days with maximum temperature over 33°C, will increase by 2-3 weeks and cool days, defined as days with minimum temperature under 15°C, will reduce by 2-3 weeks throughout the region thus pointing to longer dry spells in the future (Snidvongs 2007). Changing temperatures may affect crop production patterns and freshwater and coastal fisheries. Older age groups and urban poor are particularly vulnerable to severe heat waves and humid conditions.

Vulnerabilities and Impacts

The social and environmental impacts of climate change will greatly depend on the vulnerability and adaptive capacity of local populations. These impacts are compounded by social, environmental, political and economic changes including settlement patterns, land use, economic activities, and conflict. Vulnerability is officially defined by the IPCC (2001) as “the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity”. However, both vulnerability, and adaptive capacity go beyond ecological attributes and is a function too of overall development and development-related resources and social vulnerabilities. Poverty, gender, and other mechanisms of social exclusion such as ethnicity, along side exposure to risks and biophysical hazards contribute to vulnerability, and these may vary per context and change over space and time. In addition the specific nature of climate impacts are uncertain. While models have generated predictions as outlined above, the local and even national specificities of how these may play out are not at all certain and there are extreme variances within and among models themselves.

Coastal areas of Southeast Asia are extremely vulnerable to climate impacts, including increase in frequency and intensity of tropical storms, increased flooding, sea water intrusion, coastal and beach erosion leading to loss of livelihoods, land and property, and infrastructure. Over half of the four million population of Asia live on or near the coastline, many of these in SE Asian countries, depending directly on coastal resources, such as mangroves and coral reefs, for at least part of their livelihoods. Tropical storms continue to

devastate the region, leading extensive trails of destruction, killing and injuring people, damaging homes, and fishing boats and destroying crops despite efforts to mitigate risk (UNDP 2007b). Both small and large marine and aquaculture fisheries will be heavily affected, although seawater intrusion and declining river runoff may facilitate brackish water fisheries. In Indonesia, many sections of the coast have been rendered even more vulnerable by erosion, which has been exacerbated by human activity such as the building of jetties and seas walls, the damming of rivers, sand and coral mining, and the destruction of mangrove forests. Coastal populations may have to deal with the spread of infectious bacterial diseases such as cholera due to warmer sea surface temperatures along coastlines (Pascual *et al.* 2002). Flooding, and ensuing poor water quality and sanitation, may also increase incidences of diarrhoeal diseases such as giardia, salmonella, cryptosporidium. In addition, temperature changes and flooding will lead to changes in the vectors of insect-borne infectious diseases across the region, such as malaria, schistosomiasis, and dengue fever (Kovats *et al.* 2003 in Cruz *et al.* 2007), the latter especially in urban areas. Increases and changes in diarrhoeal and infectious diseases are not only of concern in coastal areas, but across the region.

Coastal zone deltas of Southeast Asia in which many of the larger and denser human settlements and key rice growing areas are located will be vulnerable to SLR, storms, flooding and salt water inundation, as was witnessed recently in the impact of the cyclone that hit the Irawaddy delta in Myanmar. Other mega-deltas of the Mekong, Red River and Chao Praya are also vulnerable to storm surges and floods from river drainage impacting basic infrastructure, livelihoods, and food security (Cruz *et al.* 2007). The Mekong Delta has a particularly grim forecast. Current SLR projections for 2030 would expose around 45 per cent of the Delta's land area to extreme salinization and crop damage through flooding, and if sea levels rise by 1 m, much of the delta would be completely inundated for some periods of the year (UNDP 2007b). This would affect not only those living in the delta dependant on rice and fisheries for food and livelihood security, but potentially millions of others within the region and beyond facing challenges of food shortages and increasing food prices.

The poor in urban and peri-urban coastal areas are often located in urban slums that may be situated on flood plains, and that may also be areas of waste disposal, which on flooding face lead to loss of property, dislocation and spread of disease (Adger 2003). In more rural areas, vulnerability is often exacerbated by lack of access to basic services, early warning systems, and disaster management.

Deltaic floodplains and wetlands are rich in biodiversity and integral to river/lake ecosystems such as in the Mekong River, where more than 55 million people depend on the river for food and livelihoods. Most floodplains have a natural pattern of regularly flooding or flood pulse which nourish the wetlands that sustain fisheries and agriculture (Lamberts and Bonheur 2007). Changes in flood cycles due to rainfall variability and changing flow patterns may significantly alter fishing and agriculture production systems. In these, and other regions, there is the potential of increasing droughts and floods, challenging local populations to cope and adapt to these extremes. Small and subsistence fisher folk whose varied livelihood portfolio includes fishing as a major resource face diminishing catch and incomes even as they also confront intensifying competition and aggression from big and more powerful lake fishing interests active in the area.

The uplands of SEA are home to ethnic minorities, some of the most poor within the region, who rely on subsistence agriculture and access to surrounding resources to meet livelihood

needs. Drought and variable rainfall patterns are significantly impacting agricultural production in these areas, with direct implications for food and nutritional security. Key cereal crops such as wheat (Fisher *et al.* 2002), rice and soy will decline. Increases in droughts and warm temperatures are also leading to increases in forest fires, particularly in Indonesia and the Philippines, limiting access to forest resources by the poor, and contributing to smog and pollution domestically and across boundaries.

Longer spells and more frequent severe droughts are being experienced in various parts of the region aside from those already cited above—for example, in northern Thailand and in the central part of Cambodia, West Timor, and certain parts of the Philippines. The impact of severe drought reduces food crop outputs, which has led to food insecurity at the household level, eroding the nutrition and health status of local population. It also exacerbates conflicting water use between farmers, between irrigation users and urban and non-agricultural water users, and between interests of hydropower generation and crop farming and aquatic farming activities. In these intensified competition and conflicts due to drought-driven water scarcities, existing dominant consensus on water use priorities come under challenge, and effectiveness and scope of conventional water management institutions also become severely strained.

Across the region, poverty is one of the largest factors that exacerbate vulnerability, and a barrier in developing capacity to cope and adapt (Adger *et al.* 2001). The poor often have limited access to information, technology, and capital assets making them more vulnerable to climate change (Cruz *et al.* 2007). However, not all the vulnerable are poor, as evidenced by the range of people who were killed, injured or lost significant possessions in the Asian Tsunami.

Gender issues are strong factors contributing to vulnerability, for similar reasons of lack of access to or ownership over productive resources (land, water, credit) and access to information and services, such as education and health that can contribute to their capacity to cope. In disaster situations, security of women is also a grave concern, with reports of increases in rape cases and domestic violence in part due to the increased pressures on families. Women are often responsible for the collection of water and food preparation for their families, and significantly constrained in carrying out these important tasks of meeting the needs of children and their families.

Poverty, gender, and other social factors contributing to vulnerability are not static. Similarly, there is a large degree of uncertainty of how climate change events and impacts will play out at the local level. It will be important that efforts towards strengthening adaptive capacities will consider not only exposure to hazards or impacts, but pay attention to underlying causes and factors that contribute to vulnerability.

Current Work on Adaptation: Who is doing what?

There is extreme variety in approaches to research and development on climate change adaptations in each of the countries of Southeast Asia. In the region as a whole, planning for and research on adaptation in the context of climate change is only just beginning. Most governments are still grappling with the concept of adaptation as they have been influenced by the inertia of planning for disaster preparedness and risk management, and at the same time faced with the mega-projects and infrastructure development for climate change mitigation such as the Clean Development Mechanism (CDM). These and other factors shape their understandings and planning of climate change adaptation. There are, however, significant efforts underway to research and plan adaptation. Detailed information and



Bali ricefields

analyses of research and development efforts, and the policy context, is given by country is given in Annex 2.

Across countries in the region, policy and research approaches to adaptation have commonalities that could fall under specific categories, although overlaps may exist between them. These categories are: (1) national efforts to meet obligations of the UNFCCC; (2) assessment of climate change impacts and vulnerabilities, particularly around water and agriculture; (3) community based adaptation strategies including some innovative pilots; (4) disaster management or disaster risk reduction/assessment of coping strategies; and (5) economic analyses and adaptation research.

1. National Adaptation Plans

All countries of Southeast Asia have ratified the United Nations Framework Convention on Climate Change (UNFCCC) and become Parties to the Convention during the past decade. These countries have also officially committed themselves to the Kyoto Protocol since 2000. These developments have spurred the momentum for initiating technical studies on climate change, vulnerability and adaptation in preparation of National Communications (NCs) and National Adaptation Programmes of Action (NAPAs) that are required of Parties of the Convention. The preparations for the NCs and NAPAs have been supported by the Global Environment Facility (GEF), UNDP, ADB and other multilateral and bilateral donors. Thailand, Indonesia, Vietnam and the Philippines have submitted their First National Communications, presenting plans and options for mitigating GHG emissions, with relatively less attention to adaptation measures. Lao PDR and Cambodia, as Least Development Countries in the region, have also completed their respective NAPAs. However, these countries are challenged with a lack of human resources, a lingering top-down approach in the government and weak understanding of both the technical and adaptation aspects of climate change. As a result there has been heavy reliance on international consultants in developing the NAPAs. In Cambodia, where two-thirds of the country faces challenges of flooding or drought, the NAPA focuses on adaptive management of systems of agriculture, water and coastal resources, forests and land use, health, forecasting and surveillance together with research and capacity building measures to support these programmes, although with varying emphases (RGC, 2007). In Laos, the NAPA has recently been completed. While the predominant focus is on agricultural interventions, water management strategies, and infrastructure development (such as bridges), it does consider promotion of secondary professions in order to improve farmers' livelihoods, whereas the priority under forestry was to continue eradicating shifting cultivation (Government of Lao PDR, 2008).

The national adaptation plans of Thailand, Vietnam, and Indonesia, based largely on their respective NCs, tend to focus on agriculture and water interventions such as the one drafted by the Vietnamese Ministry of Agriculture & Rural Development (MARD) that is creating its own Action Plan for Adaptation and Mitigation, where concerns of cultivation technology, resilient crop varieties and changing quality and quantity of water for agriculture are being addressed by adaptation measures (Nguyen, 2007). Governments such as the Philippines and Indonesia have developed inter-agency committees or task

forces to tackle issues of climate change, including adaptations that promote integrated strategies. Indonesia has recently completed the Indonesia Climate Change Adaptation Plan (ICCAP) that aims to support research and development initiatives in a range of sectors including agriculture, water, coastal areas, infrastructure, forests and health.

2. Assessment of climate change impacts and vulnerabilities, particularly around water and agriculture

A bulk of research related to adaptation in the region has concentrated on the assessment of climate change impacts and vulnerabilities. These have tended to focus more on environmental impacts and vulnerabilities due to exposure to (biological) risks, but to a limited degree have also integrated socio-economic assessments. Prominent efforts include the START (SysTem for Analysis, Research and Training) and AIACC (Assessments of Impacts and Adaptations to Climate Change) programmes that aimed to identify potential impacts of and vulnerabilities to climate change, and to document adaptive strategies within natural systems, that addressed adaptation issues. The SEA project was located at the University of the Philippines Los Banos (UPLB) with partnerships in Indonesia, Vietnam, and Cambodia.¹ Other major activities include those of the Asia-Pacific Network for Global Change Research (APN) promoting research and capacities on long-term global changes in climate, ocean and terrestrial systems, and on related physical, chemical, biological and socio-economic processes; the Asian Institute of Technology (AIT) on climate policy modelling activities and assessment of the impacts and vulnerabilities of climate change in coastal areas in Thailand and Vietnam. Increased attention is being paid to mapping of vulnerabilities and hazards such as efforts supported by the World Bank in the Philippines by the Department of Mines and Geosciences under the Department of Environment & Natural Resources (DENR). In addition, there are increased efforts to downscale global climate models to sub-regional levels and focus on shorter timeframes than those in standard climate change scenarios in order to improve forecast changes to provide information on their agricultural implications at local levels (for example, by regional efforts by the Stockholm Environment Institute (SEI) for the Mekong Region and national efforts by the Manila Observatory in the Philippines).

3. Community based adaptation and integrated approaches

More recently, there has been movement from assessment of climate change impacts and vulnerabilities towards more integrated approaches and community based adaptation (CBA) activities to climate change, variability and extreme events. Most of these adaptation activities are small-scale and concentrate on agriculture, water, and natural disaster amelioration. Several of these initiatives have strong approaches to improving livelihoods and resilience, strengthening local institutions and may include diversification of agriculture, conservation of water, infrastructure development such as housing or sanitation, and awareness raising to change practices. However, these efforts are very recent, and for many, research outputs and outcomes have not yet materialized. Initiatives include research by Bogor Agricultural University (IPB) in Indonesia to strengthen farmers' livelihoods and access to climate information through farmers' climate field schools; the Advancing Capacity to Support Climate Change Adaptation (ACCCA) ongoing project of START on CBA measures to weather-related disasters, integration of adaptation strategies into agriculture and water policies; the Community based Adaptation to Climate Change

¹ This project ended in 2005, and research reports conducted globally have been published recently by Earthscan in a two-volume collection on climate change and vulnerability. The AIACC full report can be downloaded at http://www.aiaccproject.org/Final%20Reports/final_reports.html

project implemented by the Canadian Centre for International Studies and Cooperation (CECI) in Vietnam that examined vulnerability, capacity and hazards in two districts in Thu Thien Hue Province, followed by a community exercise on learning and planning for adaptation; and the local government organized Centre for Initiatives and Research on Climate Change Adaptation (CIRCA) formed in Albay, Philippines in 2007 to develop adaptation and vulnerability assessments to provide baselines for monitoring and planning in order to strengthen people's adaptive capacity towards climate-related risks. In addition, a recent project on Tropical Forests and Climate Change Adaptation (TroFFCA) of the Centre for International Forestry Research (CIFOR) and the Tropical Agriculture Centre for Research and Higher Education (CATIE), aims to identify regional development issues related to climate change impacts over forest that can increase people's vulnerability and to develop policy-oriented adaptation strategies and to enable a science-policy dialogue on adaptation (Lasco and Boer, 2006).

Of late, there have also been some innovative engagements with the private sector in supporting community based adaptation activities. For example, the Manila Observatory in the Philippines has partnered with SMART, one of two of the country's cell phone service providers, for a pilot project providing telemetric rain gauges in disaster-prone areas such as in Mindoro province (Castillo *et al.*, 2008). Corporate social responsibility projects of the private sector have also supported adaptation efforts. For example, also in the Philippines, Unilever, a company for home and personal care, has partnered with Yes2Life Foundation in a project to restore formerly dead reefs from over fishing and industrial pollution as an explicit adaptation strategy.

4. Disaster risk reduction and assessment of coping strategies

Another recent emerging area of work has been on strengthening linkages between disaster risk reduction and adaptation. This remains a small body of work led in the region by the Red Cross/Red Crescent Centre of Climate Change and Disaster Preparedness and the Vulnerability and Adaptation Resource Group (VARG). For example, the Red Cross has supported rehabilitation of 12,000 ha of mangrove forests in Vietnam to improve coastal zone management, decrease investments in dyke maintenance, and improve livelihood benefits from collection and sale of crab, shrimp, and molluscs. The VARG study in Vietnam recommended the national government integrate adaptation measures into disaster risk reduction activities that are already part of daily business. Most work in disaster risk reduction has not been directly linked to adaptation, although relevant work on documentation of coping strategies in times of disaster such as those caused by floods, storms, and to a lesser extent, droughts, can inform adaptation efforts. This includes among others, work by the Asian Disaster Preparedness Centre (ADPC) assessment report on flood vulnerability and coping strategies in Attapeu Province of Laos, and Oxfam GB humanitarian programmes that have reviewed how communities and households respond to small scale disasters.

5. Economic analyses and adaptation research

Economic analyses of adaptation are also recent and fairly few in number. The Economy and Environment in Southeast Asia (EEPSEA) is currently supporting projects on climate change adaptation, including valuation and cost-benefit analyses of adaptation strategies. The Asian Development Bank (ADB) is currently managing a regional SEA Review of economic impacts of climate change, including Philippines, Indonesia, Malaysia, Singapore, Vietnam and Thailand, funded by the UK government. The recently launched ADB regional programme on climate change adaptation supported by the UK and Japanese governments

also aims to assess economic impacts of climate change as part its larger objectives of improving mainstreaming of adaptation issues in investment planning; developing national capacities for adaptation; and co-ordinating and strengthening international community responses for adaptation.

TABLE 2 | Summary Table: Climate Change Initiatives in SEA

	State /Non-state Policy and Action	Research/Capacity-building
Lao PDR	<ol style="list-style-type: none"> 1. UNFCCC: Draft NAPA (currently under discussion) 2. IUCN: IEC 	<ul style="list-style-type: none"> • NAFFRI: forest emissions • ADPC: disaster risk management & adaptation in Attapeu Province • MRC and START: CC in the Lower Mekong Basin and implications on hydrology, vulnerability and adaptation
Vietnam	<ol style="list-style-type: none"> 1. UNFCCC: First National Communication (section on adaptation) 2. Thematic Ad-hoc Working Group on CC-A 3. MARD currently drafting adaptation plan 4. Department of Dyke Management for Storm and Environment: small scale hydropower and mangrove monitoring (DANIDA) 	<ul style="list-style-type: none"> • EU-VARG: Linkages between DRM and CC-A • Community based action research: CECI; Kyoto University/Oxfam; • M-Power/NISTPASS; Hue University Centre for Social Sciences/NCAP; UNDP/ MARD: Living with Floods in the Mekong Delta • Independent research: Adger et al.; Douglass • EEPSEA: adaptive strategies
Philippines	<ol style="list-style-type: none"> 1. UNFCCC: First National Communication (section on adaptation) 2. Second National Communication currently being drafted by IACCC 3. IACCC: Climate Change Adaptation Project (WB-GEF and UNDP/MDG-F) 4. Three national bodies: IACCC, PTFCC and DENR Advisory Group on CC 5. Pending Senate bill on CC 6. Philippine Network for Climate Change 7. Manila Observatory/klima: local adaptive management 8. SMART cell phone service provider for warning devices 9. Unilever: aquatic resources restoration 10. Provincial Government of Albay: mainstreaming CC-A 11. COPE (Christian Aid) 12. Oxfam 	<ul style="list-style-type: none"> • UPLB: AIACC/START • UPLB: ICRAF/TroFFCA + ACCA: mainstreaming adaptation in natural systems and policy • Independent research: UPLB; PRRM • CIRCA • Manila Observatory: Oriental Mindoro research on DRM and CC-A • Bicol University: building from AusAid research on biodiversity and agro-forestry • Ateneo/ESSC: Science-based knowledge on climate impacts for local planning • EEPSEA: adaptive strategies
Thailand	<p>UNFCCC: First National Communication National Strategy on Adaptation</p>	<ul style="list-style-type: none"> • AIACC/ SEA-START: Climate change impact • Thailand Research Fund: climate change modelling • EEPSEA/Thailand Development Research Institute: local adaptive strategies • Thailand Environment Institute (TEI): governance and climate change • Wetlands Alliance and AIT: adaptation to change • Unit for Social and Environmental Research (USER), Chiangmai University and Mekong Programme on Water, Environment & Resilience (M-Power): adaptation to climate change in Thailand and Vietnam • Coastal Research Institute in AIT



▶▶ Indonesia	<ol style="list-style-type: none"> 1. UNFCCC: First National Communication with adaptation component 2. National Plan Addressing Climate Change (RAN-PI) 3. Draft National Strategy on Adaptation (ICCAP) 4. EcoSecurities: carbon trading 5. Nestle: water management 6. REDD: Reducing Emissions from Deforestation and Degradation 	<ul style="list-style-type: none"> • Pelangi/PEACE • CIFOR/TroFFCA: landslide management • IPB: farmer field schools, capacity building and weather forecasting • SEA-START/AIACC • IRI and CARE in Kalimantan: Curbing slash-&-burn agriculture • University of Indonesia Dept of Public Health: networking on CC and health linkages • SSNAP: poverty alleviation as community based adaptation
Cambodia	<ol style="list-style-type: none"> 1. UNFCCC: NAPA 2. UNDP: proposal to ADB for NAPA implementation focusing on water for agriculture 	<ul style="list-style-type: none"> • Oxfam America: Institutions on CC • PACT and Consortium of NGOs: Tapping CSR of private extractive industry sector • APN Capable through MoE: capacity building of young scientists
Malaysia	First National Communication	<ul style="list-style-type: none"> • Malaysian Climate Change Group (MCCG): (a) Malaysian Nature Society; (b) Environment Protection Society of Malaysia; (c) Centre for Environment Technology and Development Malaysia (CETDEM) (d) PEREK Consumer Association
Other Regional		<ul style="list-style-type: none"> • ADB - SEA Review of Economic Impacts of CC; regional CC-A programme • EEPSEA - CC-A socio-economics programme

HOW IS ADAPTATION BEING FRAMED

In this section, we intend to cull out the assumptions underlying the discourses and practices of adaptation in Southeast Asia arising from policies, interventions and current research that have been surveyed through interviews, roundtable meetings and desk reviews. Since it is not possible to make conclusions about the pervasiveness of these assumptions across countries, this section will only attempt to offer salient points about dominant current thinking on adaptation in this region.

To date, most SEA governments have focused attention on climate change issues and policies on impacts and mitigation strategies. Approaches to adaptive strategies and options have emerged in recent years, and increased attention to develop national adaptation strategies has materialized in part due to UNFCCC commitments and the attention on adaptation at the recent COP 9 meetings in Bali in November 2007. Generally, the approach has tended to be linear: first, identify expected climate-related impacts; next, determine vulnerabilities (primarily biophysical) vis-à-vis these impacts, and these in turn provide a template for planning for adaptation. The usual outcome is a set of measures that serve as technical fixes purported to reduce adverse climate change impacts in a way similar to the means of mitigation. For example, this was felt from the interviews with local planning officers in Cavite province, the Philippines, where they 'wait' for scientific vulnerability assessments

(approved by top officials) before they embark on planning for adaptation. Adaptation planning is also closely linked with the mandates of the ministries initiating them, thus focused on particular sectors.

Additionally, planning for adaptation—as in mitigation in the energy sector—is largely around agriculture, water and environment sectors. This technical approach is aptly described by the IPCC Working Group II Fourth Assessment Report as: ‘technological adaptive responses to climate change (that) are closely associated with a specific type of climate change impact, e.g., drought or decreased rainfall’ (Adger *et al.* 2007: 728). Adaptation is commonly not considered as a complex process of living with climate change, where people’s adaptive strategies are influenced and shaped by climate and non-climatic enabling or constraining factors.

Moreover, most of those who have been historically involved in the climate change planning and research are from the biophysical and natural sciences. Understandably, modelling and scenario building also dominate as the research methodologies in climate change research.

Governments and NGOs, moreover, have increased efforts to manage disaster risks and strengthen coping and recovery strategies to disaster due to the increasing incidences of floods and cyclones. Climate change adaptation is inevitably conflated with these earlier short-term response-related efforts. There is therefore need to disentangle the concept from technical mitigation approaches, disaster response and the predilection to associate adaptation solely with natural systems and sectors. Specific points on this are elaborated in more detail below, together with brief discussions on why and how the current framing may have particular limitations.

Focus on adaptation as a technical means

Adaptation is understood as primarily a technical means with which to reduce and minimize the impact of climate change rather than as a complex set of responses to existing climatic and non-climatic factors that contribute to people’s vulnerability. The usual starting point for understanding adaptation is through the lens of climate change impacts, shocks and stresses, for example, sea level rise, increased precipitation, storm surges and drought. Understandably, adaptation measures are usually planned to respond directly and immediately to these impacts. However, this approach glosses over the reality that people may be under the strain of other factors apart from climate-related stressors. These factors constitute their over-all vulnerability and weaken their capacity to adapt to adverse climate change impacts. To strengthen their adaptive capacity, these constraining factors require adequate attention.

A ‘silo’ approach solely redressing climate change effects sidesteps the fact that vulnerability is due to an existing state of multiple economic, social, cultural and possibly non-climatic stresses and constraints that weaken people’s adaptive capacity. Additionally, adaptation is a more complex process of decision-making, weighing options and is enabled by supportive social, financial and technical resources or constrained by the lack of them.

Adaptation therefore requires a multi-faceted development intervention process where factors that create and sustain vulnerability of people are addressed and that adaptive capacity is enhanced (Schipper 2007; Adger *et al.* 2007; Klein *et al.* 2007; Huq *et al.* 2003). This will necessarily go beyond climate-related solutions. The marked difference in this approach is that vulnerability—in the context of its complex mix of causes and sources—is the starting point



Flooding in Bangkok

in planning adaptation, and that this will require a decentralization of climate change as the sole stimulus for planned and autonomous adaptation. Along this line, a researcher from Indonesia felt that the climate change agenda is better off residing in the development planning ministry rather than in the environment ministry in order to ensure a more holistic approach of enabling people's adaptive capacity and resilience towards climate change. No-regrets approaches to adaptation could also then be supported.

The study of adaptation as currently practiced also employs a particular research methodology that proceeds from a grand scale (spatial mapping of climate variability and patterns that predict effects over a long-term period) that is imposed on a local, nearest-the-ground scale (if possible) to determine biophysical vulnerability. Once place vulnerability is ascertained

based on biophysical parameters, investigating socio-economic impacts through a linear cause-effect relationship then provides conclusions about the vulnerability of people and which in turn assumes their corresponding adaptive strategies (this is often used by *ex-ante* approaches to predict adaptive behaviour).² This approach however contrasts with social scientific research conventions, where the unit of analysis and field of observation begins with the study of people and societies embedded in given ecological, economic, social, political and cultural processes, and which could inform researchers about their (actual or potential) adaptive behaviour vis-à-vis stressors, resource scarcity and insecurity. Understanding adaptive behaviour and planning could benefit substantially from this approach since inquiry begins with examining actually existing adaptive behaviour and their trajectories instead of positing climate change impacts as the primary - and perhaps only - causal factors to adaptive behaviour.

A social scientific approach also allows researchers to explore people's uneven capacities for adaptation according to their class, gender and ethnic locations instead of assuming that these capacities are uniform and homogeneous. The IPCC WGII report underscores this existing unevenness: 'Adaptive capacity is uneven within societies and across societies and influenced by economic and natural resources, social networks, entitlements, institutions and governance, human resources and technology' (Adger *et al.* 2008: 728). In planning to enable adaptive capacity and resilience, it will be equally important to discern the factors that cause, justify and sustain unevenness in order to redress and transform them.

Concentration on sectoral responses in a few areas

In state-led plans and policies, there is a strong focus on strengthening the adaptive capacities around the following sectors: agricultural, water and to some degree, infrastructure systems. The predominant approach to adaptation focuses on sectors and technological interventions. Further, the framing of planned adaptation in general is determined by the functional mandate of a particular ministry. For instance, a number of agriculture ministries currently frame adaptation as a function of agricultural or crop improvement. In turn, the irrigation

¹ There are however recent efforts to downscale climate risk mapping to lower, more practicable scales

department within the ministry will define adaptive capacity in terms of adequacy of supply for irrigation and efficient maintenance of irrigation facilities. Forestry researchers for their part recommend adopting agro-forestry as a 'win-win' livelihood adaptation and climate mitigation option.

While understandable, these views could however overlook the multiple and complex factors that impede and constrain the adaptive capacity of vulnerable groups. For as long as adaptation is framed as a calculated and focused response to an adverse meteorological impact and/or captive to particular official line functions and mandates, this could pose big hurdles to attempts at achieving an integrated enabling of overall livelihood security and resilience in the context of climate changes. Some countries, such as Indonesia and the Philippines, however, have put in place inter-ministerial mechanisms to promote multi-sectoral approaches. This particular initiative on inter-ministry coordination will be discussed and analyzed in later sections.

Lack of attention to autonomous practices and options

State-planned adaptation measures are often uninformed by autonomous adaptation practices and options. At which scale can planned adaptation be effective and influential? This was a question often raised in interviews and discussions. A community forestry researcher remarked that at best, long-term national plans and scenarios of climate change can integrate with local adaptation strategies at the sub-provincial or intermediate level. 'To implement national plans at a lower scale will not work. Ministries have to admit the expediency of allowing huge flexibility when implementing national adaptation plans. With respect to adaptation, the government can really only play a facilitating, enabling role,' he said. This is a point similarly expressed by the IPCC WGII Fourth Assessment: 'national indicators fail to capture many of the processes and contextual factors that influence adaptive capacity at the level where most adaptations will take place' (Adger *et al.* 2007: 728). Even at local planning levels, however, the connection between existing adaptive practices on the ground and planned adaptation is weak. For instance, in Cavite, a coastal Philippine province, local government planners are almost unanimous in claiming that 100 villages of fisher folk are the most vulnerable to storm surges and over-flooding in the province. Yet there is no adaptive action being planned since, as earlier said, they await vulnerability assessments. Ironically, however, there is tacit recognition that action needs to be urgently done in this coastal province, since as a local planning officer in the province remarks: 'In Cavite, climate change is only an abstract concept. It is not tied to the lives and livelihoods of the people as it should be,' What makes the remarks ironical is that there are recent studies that examine local autonomous adaptive practices in the province in the context of climate change, but unfortunately are not harnessed to inform local planning for adaptation (cf Sales, 2008; Penalba, 2007).

A number of studies exploring autonomous adaptation strategies are now emerging but are still relatively few. A good number focus on micro level dynamics, and it is unclear how and whether their findings have influenced even local state planning for adaptation or scale-up to national planning initiatives. A Vietnamese researcher on climate change impacts noted that most local studies are being done by international NGOs and not by the government, thus findings on adaptation do not automatically become a policy uptake of most governments.

Focus on natural systems

Within emerging SEA research, adaptation is understood largely in terms of the adjustment within natural systems to climate change and risks.

Consider the slide below from a presentation on adaptation research in one SEA country.

Adaptation of farmers in P. watershed	
Adaptation Options	
Low land farms	Late rains: +use of short term varieties (early varieties) +shift to drought resistant crops +use of adaptable species +supplemental watering Early rains +installation of SWIP
Upland farms	Use of appropriate variety of planting materials Shift to more tolerant crops Use of drought resistant crops Use of prescribed fungicides/pesticides Installation of fire lines Strict implementation of forest laws Adoption of modern method of farming suited for upland (eg SALT) Visibility of enforcement agencies to the area Delay of planting

The slide indicates a decentralization of the human and socially constructed adaptive capacities and practices of the lowland and upland farmers in favour of technological interventions. The list of adaptation options implicitly assumes that the people under question continue to be sedentary farmers whose livelihoods are based only on agriculture. There is little recognition that rural people (or those living in close proximity with natural systems) often employ a multiple portfolio of livelihoods, diversify when possible in response to opportunities or scarcity, and are increasingly linked through trans-boundary networks of kin, capital and information. In short, people consider adaptation options beyond natural resource-based livelihoods. Southeast Asia—perhaps more than

any other sub-region in Asia—is a site of increasing flows and mobility of people and resources. At present, there is almost an *a priori* assumption that effective adaptive strategies fall only within natural systems, neglecting the fact that adaptive options are possible beyond them. In short, farmers are ‘trapped’ within these systems whereas in reality, farmers often think and behave ‘outside the box.’ The natural systems approach is unfortunately unable to capture multi-local livelihoods and systems that interface with one another (e.g. farming systems with water resources). Starting from an appraisal of people’s vulnerabilities poses less risk of being trapped in the systems box and could allow for looking elsewhere—or beyond a particular sector—for clues to redress them. Adaptation is also contingent on conditions and structures that enable or constrain. Little is being said about economic and social resources, social locations of class, gender and ethnicity and networks of power and influence that may impede or enable people to adapt to a changing climate and its effects on current livelihoods. A ‘vulnerabilities’ perspective widens the exploratory ground for examining constraints to resilience and adaptive capacity, and for locating those factors that are truly and potentially enabling. The IPCC WGII report on adaptation states that adaptation practices are usually behavioural, institutional or technological, and that adaptive capacity is influenced not only by economic development, but also by social factors such as human capital and governance structures (Adger *et al.* 2007: 721, 728). That said, in practice, much of SEA research dwell on the technological nature of adaptation, which in turn, influences planned adaptation measures, often as technical fixes in response to the adverse effects of climate change. A few bright spots that offer a different conceptual and methodological framing however exist. These are studies that examine vulnerability as a starting point to understanding adaptive capacity and adaptation options vis-à-vis a changing climate and increasing insecurity. They are studies that have been independently supported by non-state institutions. [See for example the works of Friend *et al.* (2006); Tran Xuan Binh *et al.* (2006); Pulhin *et al.* (2008); Sales (2008); Allen (2006); Chinvanno *et al.* (2008); Jarungrattanapong and Manasboonphempool, (2007).]

De-linked from disaster risk management

Climate change adaptation is de-linked from the recent tradition of local level disaster risk management. One professor at the University of Indonesia commented: 'Over-all the current focus in Indonesia is one of response, not of adaptation.' In Vietnam, a professor on urban development noted that: 'Climate change is usually identified with extreme events'. They indicate that disaster preparedness and risk management are an established policy community. Synergies with the emerging climate change policy community remain weak at present. Some interviewees see opportunity in making the linkages. UNDP in Indonesia and Philippines, for example, expressed strong interest to link adaptation with disaster risk management and planning. In Indonesia, the disaster risk response infrastructure is in place, thus presenting an opportunity to link with climate risk management. However there is need to widen the practice and understanding of climate risk management to include livelihoods. And for those active in disaster risk management and reduction (DRM/DRR), this may not lie within their scope of work. An EU-funded VARG (2006) (Vulnerability & Adaptation Resource Group) research in Vietnam emphasized the need for proactive adaptation programmes to build from ground-level disaster risk management measures that have been largely emergency response-oriented.

However as described earlier in this report, the IPCC (2007) has confirmed that the extent and intensity of climate-related disasters (cyclones, tropical storms; floods; droughts) and variability of weather patterns will worsen. There is a need to draw stronger linkages with the DRM/DRR and climate change adaptation policy and research communities to embrace longer-term development strategies that support anticipatory approaches to manage these disasters, rather than confine to reactive responses. This involves moving beyond 'coping' to 'adapting', which evokes an approach that involves more effective social and ecological strategies.



Adaptation Strategies in Southeast Asia

There are number of climate change adaptation strategies practiced in the region. Some of these are explicitly and directly oriented to remedy climate change impact and vulnerabilities to climatic stressors. On the other hand, some strategies are unrelated to climate change, but aim to enhance overall adaptive capacity and reduce vulnerability of systems, people, and society in areas of high climate impacts.

As discussed at the beginning of this report, adaptation can be planned or autonomous. Boundaries between planned and autonomous strategies may however blur as in cases where development agents (e.g. government or NGOs) harness and support people's practices; or inversely when people organize themselves in collectives to plan and advance adaptive pursuits.

Adaptation practices can be differentiated along several dimensions. We use the following dimensions as we discuss planned and unplanned adaptation strategies: (a) spatial scale, (b) driver actor/s, and (c) ecological zones.

PLANNED NATIONAL AND LOCAL ADAPTATION

Comprehensive national plans on adaptation to climate change impacts are still in preparatory and planning stages in all countries of Southeast Asia. These are being prepared by focal ministries and departments; or, by *ad hoc* inter-department coordinating bodies of national governments. Implementation of plans has not yet begun, thus being too early to assess where implementation of these planned national programmes are heading.

National governments in the region have been implementing and accumulating substantial experiences on programmes addressing poverty, disasters, weather monitoring and forecasting, and environmental issues. There are also focused national measures that address climate risk management of climate risks and impacts on specific sectors. In the farming sector of the Lower Mekong countries, for example, these involve financial support to farmers; support for transition to other crops and more diversified farming systems; support for marketing of village products; research and development of new seed varieties; development of rural infrastructure and providing information for farm management, including seasonal forecasts. These sector-specific measures have been implemented in the countries of Lao PDR, Thailand and Vietnam with moderate and low effectiveness (Chinvanno *et al.* 2008).

Generally speaking, planned local adaptations related to climate change common in the region are two types, based on the perspective of the driver-actor. The first type is those initiated and driven by the provincial, municipal, or commune/village-level governments; the second type by NGO—often international—intermediaries. In a number of SEA countries, the level of knowledge and awareness on climate change impacts, mitigation and adaptation measures are low among local officials and insufficient to prompt them to formulate proactive and anticipatory action agendas (Bappenas 2006; Sales 2008)³. However, many local governments have been traditionally responding to climate change extreme events like flooding, storm surges, and typhoons in their own areas. These concerns fall under the conventional mandate of local governments for disaster preparedness, and relief and rehabilitation. In disaster-prone municipalities and cities, local public sector agencies, and resources have long existed to address these challenges.

It has been observed that in the strategic management of extreme events such as storm surges and flooding in coastal areas and flood plains, there is a strong propensity by local governments with strong support from national government, to employ a purely technical fix by constructing physical structures such as seawalls and breakwaters, and stone breakwater and flood control structures (Jarungrattanapong and Manasboonphempool, 2007; Sales, 2008; Nakorn, 2006).

However, local governments have also employed ‘soft technologies’ for disaster preparedness. Based on a study of four provinces in the Philippines, (i.e. Pangasinan, Davao, and Cebu and Batangas), local government actions in disaster preparedness included the creation, enhancement or the strict implementation of coastal laws, land regulations, coastal management and disaster programmes (Perez, undated). In Vietnam, the provincial government of Thu Thien-Hue Province forged a three-year project partnership beginning 2004 with the Canadian Centre for International Studies and Cooperation (CECI), a Canadian NGO funded by CIDA, on a programme that focused on strengthening capacity to plan and implement community based anticipatory adaptation strategies through disaster preparedness and integration of risk reduction and mitigation with local development planning. The project covered four communes and a total of eight villages (Shaw, 2006).

At the local level, international and domestic NGOs in partnerships with local people, also have been the drivers of planned adaptation measures focused on vulnerability reduction and on strengthening adaptive capacities of households and village communities. Some examples are community based disaster preparedness in the Philippines (CBDP) that aims at vulnerability reduction and disaster management strategies (Allen, 2006). The International Federation of Red Cross (IFRC) project in urban Jakarta setting up community based action teams to strengthen disaster response capacity and plan community disaster response; water supply provisioning in 6 villages in Kravanh district of Pursat in Cambodia (www.CareCambodia.Org/projects.html); livelihood projects of Oxfam GB in four provinces of Vietnam (i.e. one in the North, another in Central and three in the South region) for poor farmers and labourers, for delivering humanitarian assistance and helping communities in disaster preparedness, and for empowering people to have a voice in the policy process. Also in Vietnam, international and domestic NGOs have started a forum to discuss ways of integrating the climate change agenda into their ongoing programmes as part of their

³ Lack of knowledge and awareness on climate change impact and adaptation among local leaders at the provincial and commune-level in Vietnam has also been pointed out in interviews with researchers on climate change impacts and mitigation in Vietnam.

adaptation capacity building thrust among vulnerable people and places. While their current local programmes are not explicitly and by design climate change adaptations, nevertheless they are oriented towards generic vulnerability-reduction and enhancement of household adaptive capacities through empowerment and welfare projects. As one key informant from an Indonesian NGO emphasized, “addressing existing poverty issues is essential to build adaptive capacity and resilience”.

As earlier noted, some universities in the region have ongoing projects on climate change adaptation directly serving farmer clients on climate forecasting for farming through a more informed crop schedule to cope with climate changes. There are also a few initiatives, as in one case in Vietnam, involving the faculty of hydrology and water resources, where academic-public authority collaboration in planning is being conducted with the district authority.

Inter/intra Household and Individual Autonomous Adaptation Strategies

Based on available reports, there is a wide range of inter/intra household- and individual-autonomous adaptive measures that have been documented in SEA (See Table 3). These include: physical accommodation (e.g. physically reinforcing the house structure); retreat actions; cropping system alterations; diversification of livelihood sources; insurance; information and knowledge acquisition; resort to credit and borrowing; receiving gifts and aid from kith and kin; labour migration; claim-making vis-à-vis public agencies; and, moderating individual and household consumption behaviour. Some of these measures directly and immediately reinforce adaptive capacity vis-à-vis a particular climatic stress (e.g. use of drought-resistant crop variety to deal with drought). Others are less direct. Like planned measures, autonomous actions can improve overall adaptive capacity of the household (e.g. overseas work and remitting earnings to cover the costs of one’s entrepreneurial activities in the village) without necessarily targeting a particular climatic stressor or addressing a climate extreme event. Between these climate change-specific and non-climate specific adaptive actions, no discrete boundaries exist, only analytical distinctions of the same pathways of livelihood practices.

The divide between individual and collective autonomous adaptation actions also sometimes blurs. For example, individual women in flood-prone villages in Binh Dinh Province, Vietnam, temporarily migrate to urban areas for additional income. However, researchers on local adaptation strategies in Vietnam remark that once in the city, these women who usually move as village bands, take collective decisions and pool their resources to delegate and send one or two among them to assist left-behind families during a flood.

While autonomous adaptive actions are universal and pervasive, in Southeast Asia good studies on these are few, patchy, and diffused. These practices are not regularly and widely recorded. The state of documentation does not keep up with planning for adaptation programmes. (These programmes form an integral part of GO or NGO projects’ regular baseline data recording, internal monitoring, end-of-programme evaluation reports and external public relations and communications activities.) Inter/intra household and individual adaptation practices only become sporadically documented through academic research, scoping and needs assessment of development organizations and through special commissioned studies by state programmes.

Collecting focused indicators of inter/intra household and individual adaptation activities has also not been included government data-gathering activities. Accounts from field

TABLE 3 | **Examples of Inter/Intra Household and Individual Autonomous Adaptation Measures Related to Climate Stress in Southeast Asia**

Country	Climate-Related Stress	Adaptation Practices
CAMBODIA <i>Royal Government of Cambodia (2005)</i>	Flood, Windstorm, Seawater Intrusion	Reinforcement of housing structures, strengthening of protective structures, building of elevated enclosures for livestock, increasing household food stock, increasing feedstock for animals, preparation of emergency transportation, movement to safer areas, shifting planting dates, switching to flood-resistant crop varieties, reduction of mobility
	Drought	Organizing religious ceremonies, reduction of water consumption, construction of wells
	Malaria	Use of mosquito nets
INDONESIA Keil, A. et al (2005)	El Nino-Southern Oscillation (ENSO)-Induced Drought	Reduction of expenditures for food and other basic necessities, re-allocation of financial resources, search for additional income sources such as temporary employment, obtain loans from informal sources at high interest rates, sale of liquid assets, diversification of crops planted, alteration in amount of agricultural inputs applied to crops, storage of food stocks
Marfai, M.A. (2007)	Tidal Flooding, Sea-Level Rise, Coastal Inundation	Construction of protective structures such as dikes and small dams, movement of physical assets to safer areas, reinforcement of housing structures
LAO PDR ADPC, (2003)	Intense Rainfall, Floods	Transfer household members and livestock to safer areas or temporary shelters, switch livelihood sources from farming to fisheries, diversification of food sources, seek out assistance from family and social support groups, sale of livelihood assets such as land and farm animals, acquisition of loans from informal sources at high rates, obtain financial and in-kind assistance from government or NGOs, search for alternative or temporary employment
PHILIPPINES Sales, R.F. (2008)	Tropical Cyclones, Increased Flooding, Coastal Erosion, Sea-Level Rise	Reinforcement of housing structures, movement to safer areas, construction of protective structures such as sandbags and dikes, increase level of food stocks, obtain low-interest loans from social network and community cooperatives or high-interest loans from informal sector, temporary migration to seek alternative income sources in other areas, diversify livelihood sources Increase use of bottled water
<i>Lasco, R. and Boer, R. (2006)</i>	Drought, Salt-Water Intrusion	Use of early maturing and drought-resistant crop varieties, change in planting schedule, use of water conservation strategies such as rainwater harvesting, obtain bank loans to construct water storage tanks, use of shallow tube wells, construction of water-impounding basins, construction of fire lines, scheduling of irrigation



▶▶	THAILAND Jarungrattanapong, R. and Manasboonphempool, A. (2007)	Coastal Erosion, Sea-Level Rise, Intense Flooding, Coastal Inundation	Construction and expansion of protective structures such as dikes and breakwaters, movement to safer areas, reinforcement of housing structures, collective claim of financial assistance from government, obtain loans from social network or financial institutions
	Pandey, S. et al (2006)	Drought, Low Rainfall	Switch to drought-resistant crop varieties, seasonal migration to seek alternative employment in other areas, sale of livelihood assets such as farm animals, diversification of food sources, reduction in consumption of food, medicine and basic necessities
	VIETNAM <i>Tran, X.B. et al (2006)</i>	Coastal Erosion, Windstorm, Flood	Strengthen protective structures, reinforce housing structures, movement of family members and physical assets to safer areas or temporary government shelters, utilization of alternative transportation such as rubber boats, adjustment of aquaculture cycles, obtain financial help from social network and family members, reliance on traditional weather and early warning practices
	Nguyen, T. Q. (2007)	Drought	Adjustment of cropping calendars and cropping patterns, diversification in crops planted

researches in SEA suggest that local governments do not conduct nor commission special studies on autonomous adaptation practices to inform their policy development (Sales, 2008; Friend, Janprasart, Petchkham and Blake, 2006). Moreover, key informant interviews and institutional mapping results also suggest that at present, there are no strong centres of research in the region that specialises on studying autonomous adaptations of households, individuals and grassroots communities.

Most studies and accounts of inter/intra household and individual adaptation practices and strategies in the region have been based on cross-sectional survey data. They focus analysis only on one slice of time. As such, these studies fail to capture one important attribute of autonomous adaptation: that it comprises iterative and dynamic pathways (De Bruijn, Van Dijk, Kaag, & van Til, 2005), and that adaptation changes over time (Adger, Agrwala, and Mirza 2008). A number of studies, however, have hinted at the iterative and changing nature of autonomous strategies by using life-history data-gathering techniques and recall qualitative interviews on past activities (see for example, Janprasart, Petchkham and Blake 2006). Oxfam and Red Cross in Vietnam, Indonesia and other countries in the region have documented local coping responses to disaster, some of them capturing the dynamism of autonomous strategies.

Although largely common across groups, autonomous adaptive strategies vary according to ecological zones and climate stressors. In the coastal areas of Thailand and Philippines, for instance, some adaptive measures undertaken are dike heightening, building bamboo revetments, and concrete-pole breakwater (Jarungrattanapong and Manasboonphempool 2006); reinforcement of house structure, sandbags on the shoreline, shift to bottled water/private water supply (Sales 2006). In upland Pantanbangan, Philippines, floods from

prolonged rains prompted farmers to dig canals and install drainage systems, diversify crops and plant rain-tolerant species (Pulhin, Lasco, Espaldon, and Garcia 2008). In the ENSO-prone upland Sulawesi, Indonesia, farmers surprisingly proceed with ‘standard’ crop management both in non-drought and drought seasons but reduce their household expenditure on food, clothing and housing during drought periods (Keil, Zeller, Wida, Sanim and Birner, 2008). But in lowland Java, farmers’ adaptation to ENSO impacts takes the form of reducing the area planted and harvested (Naylor et. al, 2001; Falcon et. al 2004). On the other hand, in lowland, rain-fed rice farms in Kandal Province, Cambodia, farmers adapt to rainfall uncertainty by dividing their rice plots — on one half, utilizing conventional wet-paddy rice techniques (resistant to heavy precipitation) and on the other plot half, applying the system of rice intensification [SRI] (a drought resistant cultivation technique)⁴. In the floodplains and wetlands of the Lower Songkram River Basin, Thailand, uncertainties and risks of floods and drought are spread out by farmers through livelihood diversification that includes farming, fishing, raising Eucalyptus and rubber trees, and non-farm occupations.

Major Issues Related to Climate Change Vulnerabilities and Adaptation in Southeast Asia

From consultations, interviews and from the literature review, a number of major issues related to climate change vulnerabilities and adaptation contexts in the SEA region emerged. They are: the context, domain and dynamics of vulnerabilities and adaptation (urbanization; water management); the pervasive forms of autonomous adaptive practices (labour mobility, remittances and outmigration; finance mechanisms); vulnerabilities of special sectors (small scale and subsistence farmers and fishers; health); and, challenges to translate key development normative principles into public action for climate change adaptive measures (equity and fairness; effective and participatory governance).

These major issues emerged and were expressed from varied perspectives in the consultations, as well as culled from relevant secondary documents. Discussions below also provide important premises and rationale for strategic points of entry for research (Section 6).

URBANIZATION

Since the 1970s, a shift to urbanized living has become a major trend in major Southeast Asia countries. Accelerated urbanization in the last two decades is a major development transformation in many countries (See Table 4 below). Except for Laos, Cambodia and East Timor, urbanization, including peri-urbanization, is undoubtedly the immediate development future of most countries of SEA in the current and next decades.

This demographic and development shift is important in identifying and evaluating key sites of eco-zone vulnerability, and understanding non-rural forms of social vulnerabilities and the dynamics and spatial radius of people's adaptation to climate change in particular, and other non-climatic stressors in general.

TABLE 4 | Urban Population In Selected Major SEA Countries (2006)

	Total Population (In Millions)	Urban Population (In Millions)	% of Urban Population
Malaysia	24.4	15.6	63.9
Thailand	61.8	19.7	31.9
Philippines	80.0	48.8	61.0
Indonesia	219.9	100.3	45.6
Vietnam	81.4	20.9	25.6
Total	467.5	205.3	43.9

Source: The Economist 2006

This issue emerged strongly particularly in the most recent consultation. Population of main urban centres is growing resulting in mega-cities and metropolitanization and expansion of urban life. The urban-rural divide in many regions, in terms of livelihood and economic activities, population distribution and mobility, and residential patterns, is fast diminishing. As a result, peri-urban zones are fast expanding. There is no doubt that living and working in cities and adopting urban lifestyles are the immediate future in SEA. Future predictions of climate change impact and people's adaptive capacities in several countries of SEA should foresee this clear trend as one major premise.

Urbanization and peri-urbanization processes include massive mobility of the labour force between urban and rural, and in-migration into big cities, side by side with conversion of lands bordering the city core from agriculture to residential use for the expanding middle class and for industrial use. These land conversions spawn new informal settlements around new residential and industrial areas in the periphery, while densely populated slums, often in urban floodplains in the city core, also grow. Peri-urbanizing processes also result in population growth in the periphery characterized by highly unplanned and mixed – non-agriculture and agriculture – land uses, and an absence of basic urban service infrastructure in place. Moreover, it is in these peri-urban and peri-rural/peri-urban areas where local government administrative structures and authorities are weakest due to a lack of effective jurisdiction by conventional government arrangements. These factors give a distinct dimension to the social vulnerability of people in these places.

The urbanization process and blurring of the rural-urban divide introduce both new sources of adaptive capacity and new types of vulnerability in the context of climate change. These new sources of adaptive capacity and vulnerability are a consequence of enhanced links that economic diversification and mobility create through the urban nodes of regional to global systems. Where adaptive capacity is concerned, as documented by research elsewhere, access to urban-driven non-farm livelihood activities and migration are key mechanisms rural individuals and households use to maintain income and adapt when affected by floods, droughts and many of the types of events anticipated as a consequence of climate change. At the same time, the rapid growth of the urban population in the demographic transition leads to a corollary phenomenon of 'urbanization of poverty' or the growing concentrations of poor and vulnerable households in cities. This expanding poor segment of the urban population becomes vulnerable to climate change impacts through market-mediated scarcities and rising food prices that climate-change shocks and stresses in food producing regions in the country or foreign lands have triggered. The growing urban poor's food entitlement and security thus becomes seriously threatened.

WATER MANAGEMENT

Climate changes may further affect already existing water management and allocation practices. Human-induced and natural occurrences in the Mekong River Basin, for instance, may have even more adverse effects as water levels and flows become more variable due to longer dry spells. Climate change may act as an additional stressor in an already disadvantageous situation as well as the creator of new conflicts. For instance, China, the upstream riparian country, is building a cascade of eight dams along the stretch of the Mekong envisaged to produce approximately 15,000 MW by 2017. Withholding an amount of water in the upstream for a considerable duration would distort downstream crop production, which is highly adapted to the seasonal flow (Miller 2005). Utilizing stored

water largely for energy production may also aggravate the flooding downstream. Negative downstream impacts, especially on fisheries, have already been reported with only two dams in operation. A number of different services thus stand in competition with each other: hydropower generation, irrigation, flood protection and fisheries. Given the predicted decrease of rainfall in the upper part of the basin, Chinese farmers may change from rainfed to irrigation agriculture and use the water stored within the dam cascade to do so. This, in turn, would reduce the available water quantity further downstream (Hinkel and Menniken 2007).

The deltaic plains are usually the rice bowls of Southeast Asia, and which increasingly face the threat of salinization. While salinization is a natural process, decreased flow from freshwater sources due to longer dry seasons, human-controlled water allocation and/or higher sea level rise could increase the timing of and distance that the salinity intrusion goes which negatively affects cropping patterns, thus placing food security at serious risk. Fortunately, technical measures to control or even prevent salinity intrusion exist. In the case of the Mekong Delta threatened by the decreased allocation of water by upstream dams and climate change effects, the responsibility of installing downstream control mechanisms remains a political, adaptive and yet unanswered question.

In case of a Mekong basin-wide drought and decreasing predictability of rainfall patterns, the politics of flow regulation is therefore key to water management in this region.

Most likely, the envisaged patterns of a shorter, more intense wet season will increase the number and severity of floods. The Philippines and Vietnam notably have experienced strong cyclones. Vietnam experienced its worst ever flood in 70 years in 2000, causing severe damage and major livelihood disruptions. Climate change compounds the existing challenges of managing annual floods that have become adaptive strategies in most low lying areas in Southeast Asia. Increases in the frequency or intensity of rainfall exacerbate risks of disastrous flooding both in upland watersheds where such events can trigger landslides, and in lower floodplains, deltaic and coastal areas, which are often densely settled such as in the Mekong Delta, Irawaddy Delta, and in the western regions of Java in Indonesia.

FORMS OF AUTONOMOUS ADAPTATION

From case reports and interviews with field researchers, a number of common issues in autonomous adaptation emerge. These issues underscore the fundamental significance of the dynamic role of strategizing actors in reducing their vulnerabilities in multiple ways. While evidence is undeniable, the agency of people is very seldom constituted as central topics in adaptation research, but if present, these instances are simply treated as incidentals. This is due to the lack of an actor-oriented approach in research that is focused on vulnerability reduction (Long 2001; Schipper 2007; de Bruijn, van Dijk, Kaag, van Til; 2005). As noted in an earlier section of this report, the sectoral approach that frames adaptation research and planning accounts for this gap, which is further compounded by a strong techno-physical or natural science analysis to adaptation. This perspective also tends to overlook the complex factors that shape people's vulnerability and their trajectories along the lines of multi-local and diverse livelihoods.

LABOUR MOBILITY, REMITTANCES, AND OUTMIGRATION

Adaptation measures of households and communities commonly include external linkages and off-site options to reinforce their multiple livelihood portfolios and the overall capacity of households. These include off-farm labour in rural areas, in the urban economy, or in overseas work, which Table 4 also indicates. These activities are also gender-specific and women constitute a big segment of these migratory flows. Female rural-to-urban and transnational migration is generally higher than in other sub-regions of Asia due to fewer cultural constraints, labour markets with increasing demand for female labour, the global care deficit, and the facilitating presence of transnational and trans-local social networks (Resurreccion 2005).

Commune officials say that in coastal communes in Hanoi, Vietnam, for example, roughly 30% of the local economy comes from earnings of migrant workers to Taiwan, Malaysia and South Korea. Remittances of overseas workers are used, among others, for housing improvement and higher education of children (see also Tran Xuan Binh et. al. 2006, for Hue Province). A key informant who conducted primary research in the floodplains around Hanoi said that the most effective adaptive strategy against flooding would be by developing more opportunities for people to earn in non-farm activities in the nearby urban centre.

The importance of labour migration is also highlighted in an adaptation study in the Songkram River Basin (Friend *et al.* 2006), revealing that remittances from household members who work in Bangkok or abroad have helped to accumulate capital for starting or expanding craft or non-farm enterprises. This enhances their overall adaptive capacity to absorb the impact of drought or flooding. Further, preliminary data of another adaptation study in coastal urban Bang Khun Thian near Bangkok threatened by sea-level rise and land erosion, suggest a strong motivation by present residents to invest in the higher education of their children. They believe that the investment can bail their children out of being aquaculture farmers like their parents, and from residing in the same fragile and degrading environment (Jarungrattanapong and Manasboonphempool, 2008).

In the Philippines, coastal dwellers are moving to the uplands due to recent years of flooding due to torrential rains and fiercer cyclones. On the other hand, more well-off coastal dwellers move to the urban areas. This occurrence causes spatially stretched-out dynamics and ecological changes in both the uplands and urban areas.

Over-all, research on the effects of remittances, labour mobility and migration as adaptive strategies that informs public policy is lacking in the climate change research and policy agenda.

Finance mechanisms

Taking loans and applying for credit are measures commonly studied in research on autonomous adaptation in SEA. These include taking loans both from formal credit institutions (such as bank and legal cooperatives), and from informal moneylenders. A study on the coastal province of Cavite in the Philippines (Sales 2008) shows that after storm surges and damage to their homes, persons in regular formal employment took loans from relatives and neighbours, while the poor took loans from informal moneylenders. In a study in Thuan Tien-Hue Province in Vietnam, the story of a poor family highlights the

critical role that loans from an informal source has played in building shelter after a storm (Tran Xuan Binh et. al. 2006). The study in Lower Songkram river, Thailand, reports the relief felt by farmers after receiving loans with a yearly interest of 3-4% offered by a lending institution (Friend et. al 2008). In addition, a study in upland Sulawesi, Indonesia, points to credit access and possession of liquidated assets as the two most important determinants of household resilience (Keil *et al.* 2008). Micro-finance activities, because of their importance and wide relevance, have also been included in an IFRC community disaster preparedness project in the urban slums of Jakarta.

However, similar to labour mobility and outmigration adaptive measures, little consideration has been given to formal and informal credit, or to (micro-) insurance options that can enhance the resilience of vulnerable families. Furthermore, access to these financial institutions may be gender-unequal, and women's vulnerability can be exacerbated if they are not able to access these micro-finance institutions, in part due to absence of official land ownership for collateral ends and limited access to these institutions. Additionally, when women access credit, unequal gender relations in their households may weaken their use of the loans. Social relationships and social networks also have been critical in providing financial resources during these critical times. There is also increasing attention being paid to local micro-credit savings groups in Jakarta, Indonesia and in rain-fed farming areas of Cambodia, although not to the same degree as initiatives in South Asia. According to interviews and review of the literature, some limited attention has been given to crop insurance in Indonesia and the Philippines although this is extremely minimal. However these initiatives have tended to focus on more traditional approaches that are dominant in northern countries and are less effective and less accessible to smallholder farmers engaged in multi-crop cultivation such as those predominant in Southeast Asia. No work has been done as yet on alternative micro-insurance options such as weather-indexed insurance. Overall, there is a need for greater attention to the critical role of access to credit, insurance and other financial mechanisms—both formal and informal—and how they play in multiple livelihood portfolios and multi-local livelihood strategies that the poor in climate hotspots undertake.

SMALL-SCALE FARMERS AND FISHERS

To date, the linkages between the livelihood security of small-scale and subsistence fisher folk and marginal upland farmers with climate change vulnerability and adaptation are extremely weak. Small and subsistence fisher folk and marginal upland farmers have been historically neglected and discriminated social groups in Southeast Asian societies. While their natural resource-based productive activities (such as inland capture fishing in lakes and swidden or terraced farming in the uplands) are their basic sources of subsistence, these groups are officially regarded as marginal producers. Unlike commercial fishing operations and those of plantation and agribusiness firms in the uplands, these groups' economic outputs are lowly valued in terms of their contribution to their country's GDP. Their social and economic marginality renders these groups extremely vulnerable to abuse and displacements by bigger commercial interests, practices that have remained unchecked or even officially tolerated in the absence of a strong legal framework recognizing and protecting their access to natural resources and land tenure entitlements.

However, climate change impacts on these marginal producers and their habitats bring to fore another dimension to their historical problems of government neglect and

discrimination. This underscores the graveness of their vulnerability and the urgency of addressing their livelihood insecurity through rights-based protection.

At present, in the Mekong Basin, small-scale and marginal fisher folk livelihoods are disrupted by changes in hydrological flows by a number of hydropower projects that hinder fish migrations. On the other hand, in upland areas of the Philippines' eastern Luzon's coastal provinces, farmers and indigenous minorities are now being buffeted by stronger and more powerful typhoons causing massive landslides and damage to their crops, in addition to their displacements by commercial loggers and agri-business interests in view of their insecurity of tenure. Moreover, present-day government carbon sequestration projects aiming to strengthen forest reserves may curtail and prohibit forest-based livelihoods of upland dwellers.

Linkages between historical discrimination and climate change impacts on marginal producers do not figure in existing adaptation studies or in earlier literature about these marginal groups. Hence, while climate change impacts on these marginal groups and their habitats exacerbate their livelihood insecurity stemming from historical neglect and discrimination, climate change itself as an issue may pose opportunities for governments to provide them protected and secure access to fishing grounds, forest resources and land tenure as a necessary first condition for developing their adaptive capacity.

HEALTH

The most adverse health effects of climate change are expected in low-income countries, and will involve complex systems arising from changes in temperature, exposure to extreme events, access to nutrition, air quality and other vectors (UNDP 2007b). Changes in temperature and rainfall patterns, flooding and water-logging will increase or change vectors for diseases such as malaria and dengue. Evidence of this is already taking place. In Indonesia, warmer temperatures have led to the mutation of the dengue virus, leading to increase in fatalities in the rainy season. In addition, while not directly associated with climate change, severe outbreaks of both dengue and malaria, including spreading of malaria to highlands of Irian Jaya were associated with ENSO events (UNDP 2007b). Impacts of increased heat stress and pollution in urban centres will be worst on the elderly, and on marginalized groups and informal workers who lack clean, spacious and sanitized settlements. Diarrhoeal diseases (*giardia*, *salmonella*, *cryptosporidium*) will be compounded in areas of high flooding due to water and sanitation problems.

Limitations of food production during drought periods are already having impacts on food security and malnutrition. For instance, in West Timor, the impact of severe and prolonged drought has reduced food crop output, which has led to food insecurity at the household level and thus reduced food intake, eroding the nutrition and health status of its population. Variability in the water flow and level of the Tonle Sap Lake in Cambodia due to long dry spells is disrupting the flood pulse and fish migration and thus threatening a major protein source for the poor populations who subsist from fishing the lake (Bonheur and Lamberts, 2007).

The highest health impacts of climate change are likely to be on the poorest populations, such as those in urban slum areas, who generally have low health status and limited

access to services. This results in a vicious cycle of further exacerbating conditions of poverty, increasing vulnerability, and limiting resilience to negative impacts of climate change.

SOCIAL AND GENDER EQUITY AND FAIRNESS

Fairness, as an issue in adaptation policies and measures to climate change, is of fundamental importance at any scope or level (Adger, Paavola, Huq and Mace, 2006). However, in current studies, practices on, and options for adaptation in Southeast Asia, this dimension is almost totally ignored or inadequately investigated. It is often assumed that planned adaptation targets vulnerable, poor people, thus fulfilling the requirement to address the equity question. Planners create programmes without adequately investigating redistributive mechanisms and how social cleavages apart from class such as gender, age, and ethnicity and other cultural elements, mediate the fairness outcomes of an adaptation programme. This connects with an earlier section that cites the current framing of adaptation as overlooking unevenness in adaptive capacities and its possible reasons.

In a couple of local-level studies on adaptation, however, evidences of inequities have emerged. The Cavite study demonstrates how the provincial government's construction of a kilometre-long concrete seawall and breakwater minimized flooding, but which disrupted livelihoods of poor local fisher folk. They now have to walk longer distances daily to go to their fishing boats (Sales 2008). The project also has not provided any specific counter measure against solid waste dumping and pile-up that the construction of the seawall has triggered, which has become a health hazard to the poor living nearby. The study in the Huong River Basin in Vietnam hints at the differential access to calamity relief goods between poor households and the well-off in the village. Those more well-off residing near roads are able to receive government relief goods right after typhoons, while households farther off the coast missed these goods (Tran Xuan Binh *et al.* 2006). Gender equity has been conspicuously absent in adaptation studies in Southeast Asia. Some have made gender-disaggregated surveys to serve socio-economic community profiling needs. However, these did not address issues of gender in the access to information, or within adaptation practices and options.

Addressing the equity dimension is also important in government-initiated credit programmes aiming to reduce vulnerability to climate variability of a particular sector. In Vietnam, for example, the fisheries sector in government lending and credit policy has been implicitly treated as homogenous sector in terms of vulnerability to climate risks. There are, however, two segments of the sector: the big commercial export-oriented fishing firms that have greater adaptive capacity to disaster and climate risks, and the small-scale fisher folk employing less sophisticated technologies and equipment, and who are obviously more vulnerable to climatic variability. Singular, possibly one-off, government-lending packages may not be able to differentiate its strategies for the whole fishery sector, so as a result, big commercial firms can take huge loans which may disadvantage small scale fisher folk, explained a university researcher on the fisheries sector.

GOVERNANCE

A recurring theme throughout the consultation was governance in the domain of planned adaptation, and the role of governments at national and local levels. The adaptation policy domain is new and offers a broad range of potentials for planning, regulation, and public resource allocation. On the other hand, existing conventional institutional arrangements and priorities, and dominant institutional cultures of governments at various levels strongly influence the shaping of policy and public sector work in this field. Primarily drawing from interviews and consultations, our analysis pointed to a number of key challenges constraining effective governance of adaptation in formal government environments.

Challenges of Inter-ministry co-ordination

While global climate change issues have stimulated governments' commitment and concern for adaptation (and mitigation) measures, initiatives may be hampered by inter-ministry competition and turf wars. For example, formulating an integrated policy action agenda on climate change and adaptation together with national implementation mechanisms have to date been bogged down in the Philippines by turf disputes between two ministries. Control of potential domestic and international resources expected to fund climate change-related programmes, potential restructuring of administrative authority, as well as political and media mileage are stakes said to be contested by top level officials⁵. In Indonesia, setting up the formal institutional framework to oversee climate change impact/adaptation work has also become sensitive. Interviewees felt that initially there are internal conflicts over who would host and lead the programme portfolio that includes wielding authority and budgetary allocations. Just recently, climate change planning in Indonesia has been shifted to the powerful development planning ministry (Bappenas), which is a positive step towards avoiding turf competition between less influential ministries.

In Vietnam, meanwhile, turf competition is not the major problem but rather, the overlapping of ministries' mandates and duties. Further, appropriate division of mandates between agencies need to be fine-tuned with particular competencies and capacities of government bodies. For example, the Ministry of Planning and Investment has now taken the lead in mainstreaming climate change with sustainable development, but this particular agency does not possess the relevant expertise as yet. There is thus a need to clarify and effectively appropriate mandates among ministries to avoid conflicts.

In Thailand, inter-ministry competition seemed not to be a significant problem partly because the country has just completed a draft of its adaptation and mitigation framework, which the Cabinet under the outgoing government of Prime Minister Surayud, approved. It could be that the timing⁶ might have shifted attention away from inter-ministry claims for overseeing climate change agenda at the moment.

On the other hand, in Lao PDR and Cambodia, drafting of the NAPA has principally been driven by UNDP-GEF funding, and tapping the UNFCCC's LDC resources and network of experts. Ministry officials are still waiting for external funding to drive the implementation

⁵ This point was made by government representatives who have requested anonymity.

⁶ At the close of 2007 and early 2008, the Thai government was in a state of transition facing pressing reorganization issues and tasks.

of NAPAs. A ministry official indicated that there is a greater problem getting the cooperation and stimulating interest among other ministries on climate change issues in the current absence of funding sources.

Inter-ministerial competition may also matter with classifying places as vulnerable. Generally, vulnerable places in the region are Vietnam, Philippines and Indonesia where there are strong cyclones, storm surges, flooding and drought; whereas Cambodia, Lao PDR and Thailand are experiencing increasing floods and drought. Identifying hotspots within countries and across the region could be politically-laden, especially in view of the increasing funding and human resources being channelled to developing countries for planned climate change adaptation programmes.

The location of a ministry within the hierarchy of inter-ministry relations also influences the visibility of its concerns in the climate change agenda.

Sectoral and department silos

Traditional bureaucratic rigidities and administrative separatism within governments in Southeast Asia can stymie flexible ways of planning, implementation and problem solving for climate change adaptation at various levels. In varying degrees, SEA governments to date remain mired in a long public administration tradition strongly characterized by rigid separatism of functions and tasks between various line agencies and bodies. As a result, progress in official planning and implementation for climate change mitigation and adaptation is being slowed by a history of bureaucratic inflexibility and administrative separatism. This constrains effective management, such as in the case of water management where concerns often transgress the mandates of a single ministry⁷. In Indonesia, for example, these have led to contradicting regulations and overlapping lines of authority between line agencies that can endanger planned adaptation efforts (Bappenas, 2006).

Water management provides other important lessons. Governments in SEA have created *ad hoc* apex groups (e.g., river basin authority) or inter-agency coordinating bodies for focal points to address the need for flexibility and multiple tasking. These measures aim to overcome separatism and bureaucratic rigidities. A number of national governments in the region (i.e. Philippines, Vietnam, and Thailand) are adopting the same inter-agency strategy for the climate change agenda in the hope that integration and flexibility around the policies and actions of government will effectively address mitigation and adaptation needs.

However, as water management lessons demonstrate, this formalistic, one-off, administrative approach and hortatory policy for enhancing coordination will face severe limitations.⁸ Serious appraisal of dominant institutional cultures and needed reforms are needed for reforms towards more effective operations. Further, the incentive structure for coordination and a special legislative framework to support it are needed for these bodies to be real drivers of integration employing flexible approaches.

⁷ A case in point is the field of water management. The trans-boundary nature of water flows and multiplicity of water uses and stakeholders render single-focus mandates and inflexible arrangements by traditional government bodies ineffective (e.g. irrigation agency).

⁸ For a good discussion on the shortcomings and failures of creating apex water and coordinating bodies to achieve effective integration in water management in Mekong Region countries, see Molle (2003).

Need for more participatory governance mechanisms

Scholars of Southeast Asia politics and governance generally agree that tradition and institutions of inclusive, accountable and transparent governance have yet to deepen and mature in almost all developing countries in the region (see for example, Case 2002; McCargo 1998; Bierling and Lafferty 1998). This is not to say, however, that important institutions and the culture of democracy are absent and not vibrant in countries in the region. But like in many developing countries elsewhere, the levels and quality of civic activism, stability and strength of civil society organizations, and citizens' participation in the public domain debating on public interest issues are quite low. More importantly, states in the region have also remained, by and large, top-down, and officials generally lack transparency, accountability and inclusiveness in their styles of leadership. (There are, of course, many exceptions to these.) Moreover, meaningful multi-stakeholder engagement, dialogue, and collaboration for local development planning and policy processes, while making some progress, are in huge deficit and, in many instances, in need of supporting institutional frameworks, mechanisms and capacities.

This pervasive political environment in countries, cities, and municipalities in the region has influenced and shaped relations between state and societal actors in development. It is also bound to affect progress in government-initiated programmes and planning in climate change adaptation measures since these obviously require cooperation and collaboration between citizens, communities, various organizations, and societal institutions on one hand, and state officials and agencies, on the other. Early signs of problems in this area can be seen, for instance, in according least priority to consulting directly affected communities and local people for adaptation planning. In Vietnam, at present there is a dominant notion among key officials that grassroots and citizens' inputs to national and ministerial planning on adaptation might not be useful and necessary at this stage. Thus, consultation processes have been exclusively conducted only within government and also only with a ministry's line counterparts at the local level, according to a researcher and official from an international organization in Hanoi. In the case of the coastal province of Cavite, Philippines, there has been no consultation with local people regarding sea wall construction done by the government (Sales, 2008). In Indonesia, on the other hand, the need for communities' and citizens' participation in formulating planned adaptation by the government at various levels is not mentioned in the list of identified needs and tasks for effective mainstreaming of climate change into development planning (Bappenas, 2006).

Alternatively, grassroots communities and citizens seem to be oblivious to climate change issues and the need for public action. This obliviousness to climate change is also often interpreted as a lack of scientific knowledge and low awareness on the issue. While such is certainly a valid factor, this apparent passivity on the part of grassroots communities and ordinary citizens may however be part of a bigger and more fundamental problem of a historical lack of progress in developing healthy state and society relations in addressing public interest issues and concerns.

Domestic and international NGOs which have been working in grassroots communities on vulnerability-reduction and empowerment projects have contributed meaningfully and immensely not only in informing the public on environment and climate change issues, but more importantly, in developing civic awareness and a culture of participation among farmers, urban poor, women, and other sectors in the public domain. These are indeed important building blocks of multi-stakeholder partnership in tackling climate change

issues. However, in many cases, bridges and mechanisms for engagement and cooperation have still to be built between these civil society forces and the government at various levels. But surely there are spaces for state and society democratic and healthy collaborations being created by NGO initiatives and in varying degrees in different places enjoying official support from governments.

Moreover, in connection with improving governance to meet the challenge of climate change, there is a need to involve the private business groups⁹ and the universities¹⁰ in developing partnerships and synergies between and among societal forces and state agencies around climate change adaptation measures. To date, these two groups are generally delinked from government-led planning and discussions on climate change mitigation and adaptation. University-based research and outreach programmes closely linked with local government, local NGO intermediaries, and local communities may lead to grounded, responsive, and sustained climate change impact and adaptation studies. On the other hand, harnessing and linking measures and instruments of adaptation in market institutions need the initiative, support and entrepreneurship of the private business sector. This social sector is most important if adaptation measures are to spread wide and far with the help of market forces.

Disjuncture across scales

A predominant theme that emerged in the consultations was the disjuncture between broad-scale scoping and national level discussions, and local level realities in adaptation and need to interlink macro scale analyses of climate change impact and planning with intermediate and local scales.

National planning on climate change and the scoping of scenarios and models are generally regarded by officials and other public actors as irrelevant and unresponsive to their needs and realities for adaptation. There is growing demand for more locally based research that is useful and practical. In Indonesia, several interviewees expressed that local people and officials need to understand how climate change impacts are playing out now at (local) levels most immediate and meaningful to them. In discussions and formulation of adaptation plans, local realities and needs have also not been taken into account and made to shape national level adaptation planning. Also in this regard, upon learning of recent government fast-tracking the national action plan on adaptation a Vietnamese key informant said: *“That is certainly necessary, and coming up with a national action plan on adaptation is easy. But the major problem is having the relevant data and information of local situations and feeding them into the national planning process”*.

In the Philippines, except for a number of strongly development-oriented municipal, city and provincial executives, local governments’ leadership passively wait for guidelines, plans and instructions to come from the national government regarding climate change concerns. They have not been initiating local information gathering and participatory consultative processes for local development planning and climate change issues. Bottom-up feeding into the national planning process is constrained in this set-up. Ironically, it is at the local level of governance where other public interest actors, groups, grassroots

⁹ The importance of involving the private business groups have come up strongly in a number of interviews in Indonesia and the Philippines

¹⁰ The importance of universities in local adaptation initiatives have come up in a number of individual and group interviews in Indonesia and Philippines

communities stand a better chance to be able to have a voice and meaningful participation in planning public decision making processes. It has to be pointed out though that it is at the local level that a number of public executives have been taking developmental and environment initiatives based on government and civil society partnerships in recent years.

The disconnect between the national-level planning initiatives in adaptation and the local becomes even worse in the context of decentralization (e.g. in the Philippines and Indonesia) where there are uneven capacities at local levels, and some municipal and city governments are weak with very limited resources. These local governments with marginal capacity and their constituencies are not be able to lead effective planning, implementation and mobilization of resources necessary for sound adaptation measures and good outcomes, said an official of an international organization based in Jakarta. They would obviously need strong vertical support from the central government and an equally important embedding into an intermediate level of governance that can provide the important link between the national and the local to cope with the task.

Windows of opportunity

Climate change-related issues and events create windows of opportunities for strengthening commitment of governments and for developing collaboration and synergies between organizations and public institutions across scales to meet the challenge. Climate change related public events have highlighted the urgency for action and have catalyzed stronger commitment of governments at various levels. For instance, the COP Conference in Bali last December 2007 drew public attention not only to climate change concern but to Indonesian government's own initiatives thus far on the issue, remarked an environment ministry official. Various informants now acknowledge that this event stimulated and resulted in a stronger commitment on the part of the Indonesian government to adopt plans and policies on adaptation.

In the typhoon-prone province of Albay, Philippines, the convergence of a popular environmental movement against commercial mining, recent killer typhoons and massive devastation, and the timely incumbency of a provincial governor with green ideological leanings, provided the condition for strong partnerships and synergies of an ecology of public interest group and institutional actors (the local church, university faculty, students, farmers, political parties, and the local government) around climate change issues and adaptive measures. This sustained and quality collaboration can be understood as a product of a unique convergence of forces, triggered by climate-related developments.

The current explosion of climate change-related advocacies and increased high-profiling in the public domain of extreme climate events and their impacts on lives, properties, and resources are indeed creating a new favourable policy environment for greater involvement of governments, public officials and the general public on addressing the issue. These open windows of opportunity for good policy and synergistic actions by various public interest parties. But while convergence of forces and developments catalyzed by climate change-related events provides *ex post* explanation for success stories of collaboration and synergies, they only seem to happen in the context of a prior sustained effort in capacity building— including research and information build up— among the key actors in the field¹¹.

¹¹ A similar point was raised regarding the Albay experience in the Manila Roundtable Meeting, 7 January 2007.

Capacity

There is an urgent need to build capacities for research, planning, and action at various levels in all countries in the region in order to effectively address climate change adaptation tasks. The amount of progress to be made in each country in the region in the immediate and long term on climate change mitigation and adaptation will depend on current capacities of public sector institutions and organizations at various levels. At present, countries in the region differ widely on this score.

In Cambodia and Lao PDR, governments have been generally slow at making progress in climate change-related initiatives especially in the area of community based development and vulnerability reduction because of serious capacity and resource deficits, noted interviewees from a development organization and government ministry. Cambodia lacks meteorological science expertise in climate change impacts to provide basic information services.

While Vietnam has a strong capacity for research and implementation of adaptation programmes, its current initiatives in this field are also largely foreign donor-driven, with roughly less than ten per cent propelled by domestic public sector resources, according to an interviewee from a research institute in Hanoi.

Although Philippines and Indonesia, two middle-income developing countries in the region, have adequate research institutions with sufficient expertise for both technical and development research relevant to climate change, their national governments have not channelled significant funding for research and capacity expansion on mitigation and adaptation studies and training. Thus, these countries' institutions in recent years have been relying on international sources of support for their climate change research and action programmes.

Thailand, another middle-income developing country in the region, is perhaps in the best position today in terms of capacity and resources for research among the developing countries in the region. It has a number of well-equipped research centres with adequate technical and social science and development experts. The Thai government has also started to allocate significant funds for research and action projects on climate change impact and adaptation (of at least 24 million Baht)¹². Some research and academic centres based in Thailand have actually been taking a lead role in regional-level research and capacity building programmes on climate change.

Capacity for planning and action on climate change adaptation by local governments is lacking in all countries across the region. As in Vietnam and the Philippines, it may be that this deficit has delayed progress in the initiatives of universities to link their research and training activities to the needs of provinces and districts, as pointed out by leaders in university research institutes in Manila and Hanoi. At the local level, some of the more urgent capacity building needs clearly identified by key university informants in Indonesia are land use planning and effective management and enforcement¹³, and disaster management¹⁴. Moreover, the historical weakness of farmers' extension services, much worsened by decentralization, has slowed down progress of field-based capacity building projects among farmers.

¹² This figure is based on separate interviews with an environment ministry official and a key representative from a national research grants awarding body.

¹³ Discussions in the Manila Roundtable Consultation, 7 January 2008.

¹⁴ Focus group interview with forestry researchers in Indonesia.

Strategic Points of Entry for Research

MAJOR GAPS IN KNOWLEDGE AND ACTION

Based on available key informant interviews, roundtable meetings with researchers, reports, documentation, and review of academic journal articles and grey literature on Southeast Asia, there are particular major substantive gaps in adaptation research. A major gap is the lack of understanding of autonomous strategies at individual and household levels, particularly those that are multi-local and that go beyond sedentary or 'in-place' productive activities, and of the underlying systems that may assist or directly enable adaptive capacity. Extremely limited attention has been paid to social networks and informal institutions on which people rely to facilitate adaptive measures, and how these may be further strengthened and supported. There is a striking absence of analysis of social equity, fairness and gender equality issues in the adaptation context, and in particular how both mitigation and planned adaptation strategies could exacerbate poverty and social inequities. Furthermore, how differential access to services, knowledge and skills could inhibit autonomous adaptation efforts have not been considered. In addition, there is a disjuncture of climate change knowledge, information and adaptation planning between national and local level actors, and sectoral segmentation of knowledge that exists within these levels. No discussion exists on intermediary institutions that can facilitate flow of information, as well as enable or constrain adaptive measures.

POINTS OF ENTRY FOR RESEARCH

In view of these gaps and the limitations of existing approaches discussed earlier in the report, there are a number of specific important themes that are clearly missing or scarce in current adaptation research that we identify as points of entry. These are: migration; social security mechanisms; livelihood security of small-scale farmers and fishers; strengthening resilience to health related impacts; and governance of adaptation across scales. Accompanying boxes illustrate how these issues are pertinent in cases of different geographical areas throughout Southeast Asia in order to draw attention to the need to strengthen the adaptive capacity of the vulnerable people within them.

Migration

Labour mobility, remittances and out-migration are critical autonomous strategies for adaptation. In Southeast Asia, poor families, partly in response to climatic impacts on production systems, are diversifying livelihood portfolios through short and long-term migration. Women constitute a large segment of migrants, more so than in other regions of Asia, partly due to fewer cultural constraints emerging labour markets that seek cheap, female labour.

Increasing conflict and competition over water due to growing scarcity and drought may compel affected and disenfranchised groups to opt for migration and seek insecure livelihoods elsewhere. Similarly, excessive flooding or increased salinization of agricultural land may be contributing “push” factors leading to migration. Pervasive moves to privatize common property resources combined with stronger climate change stressors may also compel people to seek access to marginal resources and move to informal settlements to get them, often in areas of high biophysical vulnerability to climate impacts, creating environments of insecurity where there is weak tenure arrangements and control of resources as well as access to government services.

While a substantial amount of research on migration in the region exists, this has not been contextualized within climate change adaptation; hence there is little understanding of how climatic impacts may further amplify or affect movement. Research is needed to understand mobility as an adaptive measure and its underlying support systems such as transport, banking for flow of remittances, as well as informal trans-local and transnational social networks that may facilitate access to opportunities. Additional understanding is needed of assets that may enable or constrain migration, particularly of poorest groups, who may lack needed financial capital, skills, knowledge and capacities, since migration is known to be a selective process. The less well-off may move to more ecologically fragile places such as uplands and coastal, low lying border areas and take up risky and gender-specific livelihoods such as factory work under slave-like conditions, commercial sex work and small-scale logging. Movements to smaller urban and peri-urban centres have implications for city planning, access to services, and social protection.

Often unexplored are the adaptation strategies of left behind elderly and children who may rely on remittances to increase food security and resilience against climate-related changes. Equally noteworthy are migrant workers in captive fisheries, aquaculture and agriculture who are unable to move elsewhere and are also left behind by their employers due to dwindling livelihood opportunities as a result of increasing coastal erosion and water scarcity in irrigation.

Economic push and pull factors and climate change stressors by themselves are not exclusively the drivers of migration. These drivers are mediated (i) by global and national forces that may create or inhibit labour markets that absorb migrants; (ii) by policy regimes and existing transport and banking systems that constrain or enable the migration process and well-being of migrant workers and those they leave behind; (iii) by the relative individual autonomy of migrants themselves embedded in social and gender norms, as well as in household productive assets and the extent of their supportive social networks. These combined elements can offer more holistic explanations to the nature, processes and outcomes of migration as an adaptive strategy in the context of climate change that significantly depart from conventional push-pull explanations.

In sum, research is needed to:

- (i) Increase understanding of the current and potential future role of migration and remittances as adaptation strategies in the region;
- (ii) Identify opportunities to strengthen underlying support systems such as transport, banking for flow of remittances, as well as informal trans-local and transnational social networks that may facilitate access to opportunities; and

- (iii) Improve understanding of the necessary assets that may enable migration, particularly of poorest groups, who may lack needed financial capital, skills, knowledge and capacities, and identify actions and policies that may support them.

Social Security Mechanisms

Formal and informal security mechanisms are crucial for strengthening people's resilience to climate change stressors. Examples of formal mechanisms are credit and crop insurance, state-registered land tenure, formal export labour, rice and crop mortgages with government agencies or NGOs, crop subsidies and state social security systems that include benefits and pensions. Informal mechanisms, on the other hand, may be forms of migration, informal loans, group sharing losses and supporting the worst off, keeping livestock and other assets for 'insurance,' multi-cropping systems to avert single crop failures.

Formal and informal mechanisms, however, are generally interconnected and the relationships complex. It may be more instructive to examine ways with which people access social security mechanisms and how some are more benefited than others.

Credit and access to liquefiable assets have been identified as critical strategies for strengthening resilience at times of climate-induced extreme events. Households and individuals rely on both formal institutions (banks, legal co-operatives), but even more so on informal credit institutions such as money lenders who charge exorbitant interest rates that may exacerbate vulnerability, as well as kin and social networks, who themselves may lack resources if facing similar climatic impacts. However, there is limited research on formal and informal access to credit, insurance, or micro-finance institutions, particularly in climate-vulnerable places in the region.

Attention must be paid to how access to formal institutions may be enhanced, particularly of poor and marginal populations, and of women, who may lack official land titles or collateral required. Formal social security arrangements may be governed by rent-seeking behaviour in many developing regions. Thus formal mechanisms may also be supplemented by informal mechanisms.

Access to social security mechanisms such as credit and insurance may be differentiated. For instance, women's access is even more restricted in part due to limited direct ownership over physical assets, and alternative strategies for improving reach and accessibility are required. Similarly, research on and strengthening of informal institutions, such as co-operatives at local or even meso-levels, for more fair and accessible microcredit and savings, is required.

Questions therefore that probe into the role and importance of social security mechanisms in the context of climate change stress and shocks could: (i) investigate how formal and informal institutions and mechanisms support or constrain each other; (ii) better understand the factors that differentiate some to have more access to social security benefits and mechanisms than others; (iii) understand the efficacy and resilience of informal social security institutions such as cooperatives, kin enclaves and credit networks in the face of climate stressors; (iv) identify mechanisms, institutions and policies to strengthen reach and accessibility of formal social security mechanisms to poor and marginal groups, including women; and (v) develop appropriate and effective gender-responsive micro-credit and micro insurance models that are relevant to cultures, practices and socio-political contexts of the SEA region.

Case 1: Urban and peri-urban coastal areas of central Vietnam, Indonesia and Philippines



Vietnam, Philippines and Indonesia are countries in the region with the longest coastlines. Climate change impacts expected in coastal areas are increases in frequency and intensity of tropical storms including cyclones, sea-level rise, and coastal erosion resulting in flooding, increasing saltwater intrusion, and changes in marine ecosystems. Coastal erosion has been exacerbated by human activity such as the building of jetties and sea walls, increased industrialization, damming of rivers, sand and coral mining, and the destruction of mangrove forests. Flooding is aggravated by poor drainage systems within cities. Deltaic areas are especially vulnerable as they face combined impacts of climate change on upstream water flows (both floods and droughts) as well as the coastal challenges of storms and sea level rise, exacerbating flooding conditions and salinization.

Heavily populated urban and peri-urban areas in the western Philippines, eastern Vietnam, Indonesia and southern Thailand, are low-lying coastal zones whose settlements and basic

services infrastructure are extremely vulnerable to climate change impacts. In these zones, urban poor slums are on the rise, and tend to locate themselves in low-lying and marginal areas of big and medium-size cities where they engage in urban petty trade and in irregular informal sector services, with limited social protection. Already lacking in basic water supply and sanitation facilities, they are most vulnerable and least capable to adapt to recover from shelter destruction and health problems in cases of typhoons and storm surges. In some peri-urban areas where livelihoods rely on aquaculture, pond embankments are being destroyed by severe storm surges, and may be vulnerable to flooding and salinization due to sea level rise. Existing governance mechanisms are limited in their ability to effectively plan and manage strategies to mitigate and anticipate impacts arising from climatic changes including attention to settlement patterns, and the infrastructure and institutional support required. While some research on climate-proofing of large-scale infrastructure such as transport systems is taking place, little has been done to consider the challenges of identifying points of refuge in areas of such high population densities, or of needed approaches to strengthen the adaptive capacity of these poor and vulnerable groups particularly through access to services such as health, finance, and education or skill development.

Research that can contribute to addressing factors that contribute to vulnerabilities of these social groups will effectively enhance their adaptive capacity. Hence, research on effective measures to augment social security of poor women and men in urban and peri-urban areas, including improved and gendered working standards and access to credit, can contribute to enhancing their ability to cope and adapt to changes. This also includes more effective health response systems, and the ability to access appropriate health services. Access to appropriate information, education and training may enable poor women and men to avail of better job and livelihood opportunities, that may enable them to shift from living in these most marginal areas. Understanding of reasons for mobility and patterns of migration and settlement in these urban, peri-urban and *desakota* areas can directly inform municipal planning. In addition, research on more effective and governance mechanisms that enable not only voices of these groups, but effective participation – of women and men – to articulate needs, priorities and design of potential interventions are critical.

Livelihood security of small-scale and subsistence fishers and upland farmers

Climate-related impacts will have significant effects on agriculture production systems and fisheries on which poor fishing families and upland farmers largely depend. In the Mekong River Basin, excessive flooding and drought will threaten sensitive aquatic habitats and spawning grounds, threatening livelihoods of the 40 million people who subsist on inland capture fishery resources. Hydropower plants will alter hydrological flows further disrupting fish migration. When summers get hotter, the water level of the largest freshwater body in Southeast Asia—the Tonle Sap Lake—will drop and disrupt 60% of

Cambodia's food supply for at least one million fishers and farmers dependent on the lake. In coastal areas, it is not yet clear how sea level rise, coral bleaching and higher temperatures will affect marine biodiversity. However, increasing salinization will significantly alter rice-fish and other agricultural production systems. In upland areas of Indonesia, Vietnam and the Philippines where the poorest marginal farmers live and depend on forests and subsistence agriculture, climatic variability are already limiting productivity. Local knowledge of agricultural practices may be less applicable in the context of altered weather patterns and increasing uncertainty—but is this case for all affected groups all the time? Furthermore, national mitigation efforts such as REDD and demarcation of protected forest areas may affect tenure security of poor who may practice subsistence agriculture in these areas, or rely on forest resources to meet livelihood needs.

Research is required to better understand how livelihood security of small-scale fishers and farmers may be threatened, and explore mechanisms that could strengthen their adaptive capacity. This includes research on agriculture and fisheries production systems, particularly in increasing saline environments, alongside mechanisms for tenure security and equitable access to other productive assets and infrastructure. It involves linking scientific information on climate and weather patterns to local levels, and enhancing accessibility of this information by those most affected by such occurrences. It also requires research on potential informal social institutions such as co-operatives that can strengthen linkages with markets through developing economies of scale and enhancing potential returns from small-scale agriculture and fisheries. Current small-scale fishing and farming also need to be examined from the perspective of changing production systems and economic dynamics at the meso- and macro-levels.

Research on potential and needs for livelihood transitions, through for example, skills and education, are also critical for strengthening adaptive capacity towards climate change. Contrary to popular notion, small producers are dynamic actors who diversify their livelihoods, engage in multiple portfolios and multi-local livelihoods that are dynamic and adaptive. Although opportunities and assets are differentiated according to class, gender and ethnicity, small producers are nevertheless opportunistic actors who strategize within the latitude of their existing—and sometimes threatened—assets. However, they often lack enabling and supportive action from governments and NGOs, where policies frame them as *a priori* 'marginal,' or alternatively as 'culprits' of degradation, rather than actors who actively engage in diverse livelihoods and actually adapt to the changing climate. The outcome may often be programmes that are placing new yet unrealistic programme burdens on their time and already existing long list of adaptation efforts.

There is also need to understand the factors and conditions that work to under-represent and exclude the voices of small producers in national and intermediate planning for adaptation and the effects that other mitigation efforts might have on their livelihoods and well-being. For instance, how are 'marginal livelihoods and peoples' framed in policy? How are they and their livelihoods represented in official discourses on resource degradation or made invisible in priority environmental and livelihood programmes? The discourse on marginality has often been self-serving resulting in re-taking control of resources of small producers by state and private commercial agencies. They also assume that 'marginal' livelihoods are 'doomed with no future,' thus not venturing to explore their viability and sustainability. The current discourse on 'vulnerabilities and adaptation' in the climate change agenda may likewise inadvertently accelerate the process of marginalization, thus placing small producers further at risk. Does the lens of climate change make the margins worse or shift the risk onto the 'marginalized'?

Case 2: Coastal and Upland areas of eastern Philippines and north-central Vietnam



Extremely poor farmers, dependent largely on fragile lands for agriculture, inhabit upland areas located near the eastern coastlines of the Philippines and Vietnam where the most vigorous cyclones are formed. They are in the Philippines, upland and hilly regions of the Sierra Madre ranges in Luzon and the Bicol and eastern Visayan regions facing the Pacific Ocean; and in Vietnam, the north-central region by the South China Sea, where mountain and hilly areas comprise three-quarters of these coastal provinces. Frequently visited by tropical cyclones, these areas have also experienced La Nina-induced heavy rainfall and cyclones producing massive floods and landslides in recent years. These have caused unprecedented heavy tolls on lives, shelter, crops and livelihoods. Climate variability in rainfall patterns, increasing sea level rise and temperatures will affect the agriculture and fisheries production systems on which these populations rely. However, research systems have given relatively limited attention to production systems in these marginal lands.

The remoteness of the eastern Philippines also exacerbates inhabitants' vulnerability compounded by their lack of access to basic services. Ethnic groups such as the Vietnamese H'mong, Tay and Philippine Aetas marginalized by mainstream populations also inhabit parts of these upland areas and face higher climate-related risks with weaker social and economic capacities to adapt to such risks. Parts of these areas have become places of refuge for temporary migrants who have fled low-lying coastal areas in view of more frequent climatic impacts severely affecting their former farming livelihoods, or displacement of farming caused by land conversion for urban use. They have fled to the uplands since they are too old or have no skills with which to qualify them for urban or peri-urban employment niches, and farming remains to be the only occupation they know. They have limited options to diversify livelihoods to increase resilience due to lack of access to skills, training and services. Local governing processes are extremely weak in these marginal and isolated environments. Improved accessibility of scientific information on climate and weather patterns by these populations may enhance their ability to prepare and respond to climate events. Research that strengthens agriculture and fisheries production systems in changing climate contexts and leads to better economic returns through improved market linkages will strengthen capacity of these populations to adapt. Research on formal and informal mechanisms that may enhance social security of these more isolated groups through improved access to credit and insurance could strengthen resilience to impacts. However, additional support for livelihood transitions of women and men through access to skills and education will enable these small producers to better diversify livelihoods and reduce vulnerability.

In short, research on small producers' livelihoods in the context of climate change adaptation has the potential to unravel the economic, ecological, social and discursive conditions and constraints to livelihood security.

In sum, research is required to:

- (i) better understand how livelihood security of small-scale fishers and farmers may be threatened by climate change combined with other social and environmental stressors;
- (ii) explore mechanisms that could strengthen their adaptive capacities including research on agriculture and fisheries production systems, particularly in increasingly saline environments; instruments for tenure security and equitable access to other productive assets and infrastructure; and means to enhance accessibility to scientific information on climate and weather patterns relevant to local levels;
- (iii) identify the potential and needs for livelihood transitions such as skills upgrading and education; and
- (iv) understand the factors and conditions that work to under-represent and exclude the voices of small producers in national and intermediate-level planning for adaptation and the effects that other mitigation efforts might have on their livelihoods and well-being.

Strengthening resilience to health related impacts

Health may be considered the “left behind” sector in climate change adaptation research. While the sector is often included in global or even national discussions on adaptation (see for example IPCC 2007, UNDP 2007b, Alam *et al.* 2007), this does not appear to translate into adaptation planning or research. As a result, health impacts of climate change and associated adaptation measures have been least explored in research and action programmes in all countries in the region. This in part is due to the lack of specialized expertise in this area. There is also insufficiency of attention to this particular problem area by national agencies and their counterparts at the lower levels.

Attention of the public health sector has primarily been in the context of responsive measures for water and sanitation in climate induced disaster situations, and efforts to control diarrhoeal and infectious diseases, such as malaria and dengue. Increases in floods, droughts and storms and changes in temperature will bring increases in health risks to these diseases, particularly among poor, and more exposed populations. In addition, increases in temperature, particularly in urban areas, may lead to increase in heat-stress illnesses or death, particularly of the elderly poor, and in increases in pollution-related health problems. However, currently health responses to these challenges are passive, and research is required to strengthen health systems and services to better anticipate and address potential health challenges, and also respond to the uncertainty of climate change, such as unexpected and sudden changes in temperature and precipitation. This may include development of systems for active surveillance of breeding areas, technologies and institutions for climate robust water and sanitation, and development of gendered and accessible health systems that reach poorest populations. In urban areas, planning of water and sanitation systems and drainage is required to strengthen resilience of marginal lands to flooding, and resulting health problems.

A critical but under-discussed area in the health and climate change nexus is that of the implications of limited food production due to drought, increasing salinization, or extreme events for food and nutritional insecurity. Additional research is needed to explore this relationship, and in particular implications for poor populations. In addition, gendered aspects of health and human security are of concern, particularly in extreme-event situations where women may be vulnerable and exposed to increases in violence.

Overall, poor health in developing countries is a major factor contributing to poverty and vulnerability, and directly affects the capacity of individuals and families to adapt to climate change. The range of severe health impacts that may emerge from climate change will exacerbate these conditions. As a result, it is essential that research and development efforts increase investment and development of capacities to manage these new and dynamic health threats in order for any adaptation efforts to be effective.

Research on the evidence that links climate change adaptation and health may probe into the following general domains: (i) identification of potential direct and indirect impacts of climate change on human health on different gender and social groups; (ii) barriers to successful health-related planned and autonomous adaptation to climate change stressors; and (iii) effective social, technological, institutional and policy measures to overcome such barriers.

Governance of adaptation across scales

Research is required on governance systems at multiple levels that facilitate effective linkages across scales, and which can help address disjunctures horizontally between

sectors and stakeholders, and vertically between national level thinking and policies, and local level discussions and actions. At the national level, effective mechanisms to facilitate holistic adaptation planning across ministries and that engage non-state actors need to be identified for adaptation efforts that transcend sectoral boundaries. Stronger involvement of economic or planning ministries to lead co-ordinated planning has been raised as a possible strategy in some countries. Equally important, there is an urgent need for national level perspectives and policy decisions to be informed by local-level discussions of climate change realities and ground-level adaptation strategies. In turn, national level policies need to be flexible enough to be implemented at local levels in a way that responds to local specificities. Local agencies also need to improve capacities and mechanisms for inter-sectoral and multi-stakeholder planning, and for enhanced and meaningful public participation in design and implementation of planned adaptation.

To build commitment, social consensus and cooperation for public action, climate change information and research have to be communicated effectively to government officials at various levels. Raising general awareness of various non-government stakeholders and the general public is also necessary. Multi-disciplinary and multi-sectoral research projects can also catalyse actions and bridge fragmented and sectarian perspectives and approaches to current adaptation planning by government.

A much less understood, but critical area of governance is located between national, centralized and sectoral administrative levels, and the lowest local levels of public management and fields of action (often referred to as city/municipal and grassroots communities). The dynamics, forces and characteristics at work and their potentials at this intermediate level are least explored. However, it is at this intermediate level where area-based integrative management of resources and development and their facilitating institutions, infrastructure and services (such as finance and commercial, government outreach services, education and training, and transportation, etc.), have an optimal extra-local impact. At the intermediate level, markets, business and media, as well as traditional pillar institutions such as education and religion can play an important facilitating role in mobilizing resources for improving people's adaptive capacity.

In the case of the Mekong River Basin, particular attention must also be paid to trans-boundary governance of water resources. In the Basin, climate- and human-induced variability in the water flow of the Mekong has created trans-boundary winners and losers. There is a need to understand the constraints, opportunities, conditions and forces for developing effective governance mechanisms necessary for equitably allocating water during drought periods and flood management between and among neighbouring countries, cities and municipalities. Likewise, there is a need to research on how trans-boundary governance could have built-in norms, procedures and mechanisms that are responsive to the needs for protection and support of the livelihood stakes of the poor and to strengthen their adaptive capacities. While politically sensitive to discuss issues of water management across national borders, it is also critical to facilitate accountable governance mechanisms to respond to changing flow due to climate variability and hydropower development, and to impacts of alterations of flow regimes on vulnerable populations in the region

In sum, research on governance of adaptation should (i) identify institutional mechanisms that may facilitate more effective linkages horizontally between different departments and vertically between local, meso and national levels; (ii) explore how intermediate level

Case 3: The Mekong River Basin

The Mekong River Basin is the largest basin in SEA, spanning a wide range of altitude, latitude, climate and vegetation zones along the 4200 kilometres length of the river. The Lower Mekong Basin (LMB, or downstream of where the river leaves China) and its four lower riparian countries (Lao PDR, Thailand, Vietnam and Cambodia) comprise 77% of the Basin area and account for more than four-fifths of the water that passes through the Basin each year. The great variation in the flow of the Mekong River through seasonal flooding and low water levels drive and constrain the productivity of the agro- and aqua-ecological systems critical to alternating seasons of rice cultivation and fishing in wetlands and floodplains. These are food and livelihood sources to more than 55 million people throughout the basin, and the Mekong Delta is a main rice bowl for the region.

The Delta region, which is the area of highest human density, is especially vulnerable to climate impacts affected by both changes in upstream flows due to drought and heavy rainfall, as well as coastal storms and sea level rise. Change in hydrological flow and flooding will affect crop production, fisheries, and human health. Projected sea-level rise for 2030 alone would expose 45 per cent of the Delta's land area to extreme salinization and crop damage through flooding, with forecasts of a fall in rice production by 9% that will affect not only local inhabitants but the wider population in the region dependent on this staple food source. Degradation of wetland areas, in part due to land conversion, is also affecting regulation of flood plains, regulation of waste from increasing urban areas, and fish spawning habitat. Increasing variability in hydrological flow is also compounded by hydropower dam constructions in China, Laos and Vietnam to meet increasing energy needs in the region. Knowledge gaps exist on how these climatic changes will alter wetland production systems, inland capture fisheries, and coastal floodplain fisheries in increasing saline environments.

In addition, longer dry spells and drought in the region are intensifying competition for water use for irrigation both among and within countries in the region. The severity of drought and flooding in rainfed areas is resulting in crop failures particularly affecting those small, poor farmers with marginal landholdings, who then rely on selling livelihood assets such as land and farm animals and acquire loans from informal sources at high rates, pushing them further to impoverishment. Some family members search for alternative employment, particularly as migrant

labourers in the Lower Basin. Partly as a result, the Lower Basin is experiencing a huge and growing segment of poor, landless farmers, small fisher folk, and migratory labourers with limited social protection alongside the emergence of a few local big businessmen and traders, who are also the power elite in localities. Many of these poor lack basic health protection, and are more likely to live in areas vulnerable to flooding. For these groups, small declines in income or loss of employment opportunities results from flooding will have adverse consequences for nutrition, health and education (UNDP 2007b).



Furthermore, the poor, whose livelihoods are highly dependent on the Mekong River, usually do not have a voice in the decisions and policies on water allocation and resource use. The trans-boundary dimension of issues of conflict in water use and management politically marginalizes them further to meaningfully take part in major decision making and planning development. In the existing socio-political conditions in the Basin, climate change impacts will strain most seriously the adaptive capacities and resilience of the poor unless serious and focused enabling measures are put in place. Research support that can strengthen agricultural and fisheries in these increasingly saline environments, not only of large-scale production systems as is currently focused, but also small producers will be essential. Research that can lead to strengthening provision of health services social security measures, particularly to the poor women and men, often landless, in the region is essential to enable these groups to adapt to impending climate impacts. More inclusive and effective governance mechanisms can ensure that voices of these poor women and men are heard, and that adaptation strategies respond to their priorities and concerns.

of governance may facilitate infrastructure, institutions and services that can enhance adaptation; and (iii) understand the constraints, opportunities, conditions and forces for developing effective governance mechanisms for trans-boundary management of resources in contexts of climatic variability.

Learning strategies that create communities of knowledge, such as among local universities, local/meso-level government units, the private sector and civil society can facilitate mechanisms for communicating and translating climate-related information into accessible

formats while also supporting the uptake of successful initiatives, processes and mechanisms that may enhance adaptation. An important step to develop learning communities is institutionalizing co-ownership of action and policy research between universities, local government units and NGOs from the early stages of research design towards exploring action strategies. This is an important platform or mechanism that allows people to deliberate on local climate, social and ecological conditions and findings from adaptation studies, together with options offered by scientific global or national climate change assessments.

KEY ACTORS AND PARTNERS

As described in Section 3.2, there are a number of research and development organizations increasingly becoming involved in climate change adaptation efforts. In order to advance the above agenda of implementing research to enhance adaptation strategies, it will require active engagement of actors from various levels of government, research organizations, private sector, and civil society. Critical is the need for inter- and multi-disciplinary teams to conduct research, as well as networks that link researchers, governments, and civil society as partners in research efforts. Research efforts within countries are imperative to respond to national contexts and social and political specificities, and to effectively mobilize national responses. However, regional networks that strengthen cross-learning across the region, and provide technical support will be crucial to move forward this research agenda, build technical capacity, and a critical mass of researchers considering these under-explored, yet central, aspects of adaptation.

A number of regional scientific and interdisciplinary organizations and networks are already engaged in climate change adaptation research in the region, and could continue to play key roles in any adaptation programme. These include, among others, SEA-START, AIT, EEPSEA, SEL, Asia Disaster Preparedness Centre, the Mekong Programme for Water, Environment & Resilience (M-Power), and the Mekong River Commission. International research centres of the CGIAR (such as CIFOR, IWMI, the World Fish Centre) and multilateral agencies (UNDP, WHO, ADB) are also important partners.

National level governments are critical partners for engagement in ensuring the results of any research programme may be implemented at scale. This includes economic and planning ministries and sectoral ministries (environment, natural resources, agriculture, fisheries, health and social welfare agencies). As highlighted repeatedly in the consultations, of equal importance are local government bodies that play a significant role in facilitating adaptation planning at local levels.

National research institutes and universities, particularly those with interdisciplinary programmes, will need to be central actors in any research initiative. While existing work on climate change adaptation has been concentrated mainly in meteorological, agriculture, forestry, and hydrology departments, it will be important to also engage with social science, health, and economics departments.

As mentioned, government-research institute partnerships (along with civil society) should be encouraged where possible. There are some interesting and recent initiatives in the region focused on climate change adaptation including the Centre for Initiatives and Research on Climate Change Adaptation [CIRCA] of the Philippines and the Indonesia Climate

Change Adaptation Plan that plans the establishment of a government-research institute research granting facility. The National Institute for Science and Technology Policy and Strategy Studies (NISTPASS) of Vietnam, established for a longer period, is also beginning to explore adaptation issues. Opportunities also exist to move beyond ‘national’ actors, and strengthen capacities of research of sub-national universities and ‘local’ governments to respond to adaptation needs and knowledge priorities.

To date, international and national non-governmental organizations primarily have been engaged in development and livelihood related initiatives, especially linked to disaster risk reduction. Opportunities exist to engage actively with such organizations to pilot strategies and interventions that support adaptation, especially at local levels, that then may be replicated at scale through private sector initiatives or public sector interventions. Such organizations can also play complementary roles in facilitating access to information.

Private sector organizations with interests in climate change adaptation research have been the un-tapped partners to date. There have been small innovative pilots in the region, such as strengthening access to and delivery of climate-related information through information communication technologies, and corporate social responsibility projects facilitating ecosystem management, these are extremely few and limited. Larger opportunities exist to engage with private sector agencies with direct business interests in adaptation measures such as companies providing infrastructure for water, transport and communications; private small loans and insurance companies; marine and aquatic production companies; as well as chambers of commerce.

CAPACITY BUILDING

Effective programmes for climate change adaptation require building research capacity at various levels and among public sector agencies and organizations. Least developed countries in the region, particularly Laos and Cambodia, require basic capacity building for research at all levels of government, and also within national and local universities. Across the region, there is need to educate staff members of government departments in order to influence higher-up officials. Strengthening higher education processes to better consider both planned and autonomous adaptation efforts across sectors and levels can strengthen the capacities of the “next generation of policy makers and researchers” on climate change. Research capacity building should also be encouraged to support local government units to appropriately use climate change information in adaptation planning. Knowledge hubs across sub-national universities, NGOs and other civic and business groups can strengthen learning mechanisms. These can then be supported and reinforced by major research centres or universities in the national capital or through regional collaborative research programmes.

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ANNEX I:

Climate Change Adaptation-related Activities: Country Summary Sheets

CAMBODIA

Climate change impact studies in Cambodia have reported increasing episodes of drought and flooding hence giving priority to programmes in the National Adaptation Programme of Action (NAPA) that focus on adaptive management of systems of agriculture, water and coastal resources, forests and land use, health, forecasting and surveillance together with research and capacity building measures to support these programmes, although with varying emphases (RCG, 2007). “Two thirds of Cambodia is prone to flooding and drought,” (Interviews). The Climate Change Project Committee of Cambodia’s Ministry of Environment led the drafting of the NAPA, with the assistance of technical consultants. Implementation of the NAPA however has proceeded slowly due to lack of funding and dependence on multilateral support that stimulated its creation in the first place. Officials from the Climate Change Project together with UNDP Cambodia stated that they are still negotiating for a loan from the Asian Development Bank (ADB) for the implementation of the NAPA (Interviews).

Interestingly, improving adaptive capacities in the fisheries sector - especially small-scale captive fisheries - is not a huge priority in the NAPA since it is not perceived to be a vulnerable sector to climate change impacts. Cambodia’s Tonle Sap Great Lake is the largest source of freshwater capture fisheries in the region and where more than a third of the population living in surrounding floodplains ekes out a living. Adaptation practices of local groups include rice planting prior to flooding, rain-making religious rituals and overall acceptance of climate changes. For instance, people do not consider floods as a threat since floods bring better soils and vegetation. Drought is a bigger problem and one that is considered disruptive to agricultural livelihoods for those living on the floodplains where water supply easily dries up (Interviews)

‘Climate change’ is not used as a term at the local levels of government (especially at the ‘*sangkat*’ or local councils). There are no national experts on climate change impacts. The Department of Meteorology has limited number of field stations and their services are not made available for the use of agriculture and fisheries. There are only few donors supporting climate change initiatives, which is why national efforts are slow. There is still lack of political attention to climate risks, said a government ministry official.

UNDP is currently preparing a proposal that will enable the implementation of Cambodia’s NAPA. It will principally focus on water resources management for agricultural development. The focus on water resources management for agriculture has been a result of the recognition that 85% of Cambodians live in rural areas and rely on agriculture. Only 15% of this population has access to piped water and this is becoming even scarce due to droughts. The proposal focuses more on integrated water resource management and integrated agricultural development in order to adapt to climate change (Interviews).

National reports focused on the employment of CDM for mitigation purposes. Interestingly, a CARE report on disaster risk management in 2001 explored the impacts of climate change-related events on households and recommended innovative and traditional adaptation and mitigation measures for disaster-prone communities. The lead author of this report became one of the technical consultants who conducted a vulnerability and adaptation assessment to climate change in Cambodia (RCG, 2001), which later became the 2005 vulnerability and adaptation report on which the NAPA was based. The point being raised here is the proximity between earlier concerns with disaster management with adaptation and vulnerability issues in the era of climate change.

PACT, an international NGO in Cambodia, recently went through a strategic thinking process and interviewed about 60 most influential leaders from multiple sectors regarding their priorities for development and governance. Global warming was an agenda that emerged although it was not raised as a major issue as huge public awareness has yet to be reached on this issue. The private sector in Cambodia does not fully understand the implications of global warming on economic development compared with members of the international NGO community of which PACT is part. There is a huge lag in understanding unlike in the case of HIV-AIDS. Very few believe that global warming is an issue in Cambodia (Interviews).

The private sector is contributing substantial growth to the economy, especially the extractive sector since Cambodia has oil and mineral deposits. The private sector has a high level of influence in the government and they

have more accumulated revenues than development assistance. The international private sector is a big player in the extractive sector of Cambodia. PACT is considering working with the Cambodian government to enable the industry heads to sign EITIs (extraction industry transparency initiative) for them to comply with norms of corporate social responsibility and with standards of the cleanest technologies. International companies in Cambodia such as BHP Billiton and Chevron present themselves as 'green'. PACT formed a coalition with other NGOs like Oxfam America that address extractive issues and clean technology which they see as an opportunity to stimulate corporate social responsibility for development and adaptation/mitigation to climate change. In Cambodia, champions in high places have proven to be useful especially in the campaign against HIV-AIDS. Raising awareness on climate change and global warming can potentially go through a similar route, PACT believes.

Lao PDR

The *National Adaptation Plan for Action to Climate Change* (NAPA) was completed recently (Government of Lao PDR). Like Cambodia, UNDP Laos supported the drafting process since a major drawback in Laos is lack of human resources, a lingering top down approach in the government and weak understanding of both the technical and adaptation aspects of climate change (Interviews). Currently most climate change initiatives are being created in individual ministries where the approaches for projects are sector driven. Most of the environmental and disaster projects are infrastructure-related, for example, bridges are being planned. However, an officer of the National Mekong Committee of the Mekong River Commission (MRC) states that the Lao government is still in the "talking phase," so changes may still happen (Interviews). As for the Lao National Mekong Commission their climate change agenda is being set by the MRC. In Lao PDR, the (draft) NAPA stated that an adaptive priority under agriculture was to promote secondary professions in order to

improve farmers' livelihoods, whereas the priority under forestry was to continue eradicating shifting cultivation (Government of Lao PDR, 2007). Most farmers in Laos engage in shifting cultivation as a primary or secondary occupation and to eradicate this will weaken their livelihood security. Clearly, there are livelihood and mitigation tradeoffs under these proposed priority adaptation programmes that require further deliberation, and must revisit earlier debates on shifting cultivation in Laos. The most vulnerable groups are those who live from wetland resources, such as fisheries and rice farmers. Rice farmers that engage in rainfed farming must learn new agriculture techniques. Irrigation will continue to be a problem and may worsen especially when dams upriver controlled by China will impact on down river farming exacerbated by increasing drought periods. A village-level vulnerabilities assessment is being conducted by the MRC to inform Lao policy on climate change response and adaptation. The Asian Disaster Preparedness Centre (ADPC) has

published an assessment report on flood vulnerability in Attapeu Province where people and organizations employ a number of coping strategies with the increase in flooding (ADPC, 2003). SEA-START is partnering with the Mekong River Commission (MRC) in Vientiane on studying trends of climate change, with implications for hydrology, agriculture, vulnerability, adaptation, capacity building in the Lower Mekong Basin for some years now. The National Forest Research Institute (NAFRI), together with the University Michigan, is currently researching carbon emissions in forestry. The research will inform the National Master Plan on Forestry that will be completed in 2009. There is not enough research available to convince decision makers or local populations that the climate is changing. A study on coping mechanisms of climate risks identified 'coping strategies of respondents in selected villages for floods which included

household level strategies' (Friend *et al.* 2005). This appears to be the closest recognition of autonomous climate-related strategies in any study on Laos so far. In Southern Laos, a DFID-funded project on adaptive management and learning has also been started. IUCN Laos is creating an umbrella group to coordinate climate change-related activities, largely information, education and campaign activities: an hour-long radio programme about environmental issues including climate change. The radio programme also encourages local communities to report changes. Concern, an international NGO, uses the livelihoods framework to assess climate change adaptation. The framework allows them to understand vulnerability. Concern predicts those most vulnerable are those living along the Mekong River since they have insecure livelihoods and are subjected to hydrological changes of the river.

VIETNAM

Vietnam's National Target Program for Climate Change Adaptation is being carried out by the Institute of Meteorology and Hydrology for the Environment (IMHEN) under the Ministry of Natural Resources and Environment (MoNRE) with technical and funding assistance from UNDP and Danida. The Thematic Ad Hoc Working Group on Climate Change Adaptation has only been constituted in November 2007. IMHEN is currently conducting the benefits of small and medium scale hydropower plants on climate change adaptation with a view of exploring synergies and trade offs with rural development (Dang Thu Phuong, 2008). This study is being done in the coastal provinces of Northern Vietnam (Ha Tinh and Quang Ninh Provinces) and is supported by DANIDA.

The Ministry of Agriculture & Rural Development (MARD) is currently designing its own Action Plan for Adaptation and Mitigation, where concerns of cultivation technology, resilient crop varieties and changing quality and quantity of water for agriculture are being addressed by adaptation

measures (Nguyen The Quang, 2007). From a report on institutional cooperation and mapping of climate change-concerned institutions in Vietnam commissioned by Oxfam GB, it appears that coordination between MoNRE and MARD on the National Target Programme for CC-A has been observed to be weak (Dang Thu Phuong, 2008). Further, studies from Vietnamese scholars at the Kyoto University Graduate School of Global Environmental Studies that examine the linkages between climate change adaptation and health in Vietnam initially show that there is weak collaboration between the planning, health and environment sectors and ministries translating into low involvement of health experts in climate change adaptation research and planning. As a whole, climate change is yet to be integrated with overall development planning (Trai Mai Kien, 2008).

In Vietnam, the local government initiatives to date are technology-oriented. For example, the provincial offices of the Department of Dyke Management and Flood Control of the

Ministry of Environment and Rural Development (MARD) have set in place an environmental information system that monitors changes in the mangrove areas along the coast of northern Vietnam (Ha Tinh and Quang Ninh Provinces) to strengthen their buffer role against sea levels and storm surges. As a result of their monitoring, the Department is able to prioritize parts of the mangrove areas that may require immediate attention (Dang Thu Phuong, 2008). For the entire country, the main body for co-ordinating disaster management in Vietnam is the Central Committee for Storm and Flood Control (CCSFC) with the Department of Dyke Management and Flood and Storm Control in the Ministry of Agriculture and Rural Development acting as its standing office. The CCSFC have responsibility for gathering data, monitoring flood and storm events, issuing official warnings and coordinating disaster response and mitigation measures (VARG, 2006). The EU-funded VARG study observed that one way forward for the government to push adaptation programmes forward was to examine adaptation measures on the ground, in particular measures that can link with and integrate into disaster risk reduction activities that are already part of daily business (Ibid).

There have been a number of recent community adaptation action research projects implemented by government or NGOs have also begun in Vietnam. One such project is the Community based Adaptation to Climate Change implemented by the Canadian Centre for International Studies and Cooperation (CECI) supported by CIDA. The project examined vulnerability, capacity and hazards in two districts in Thua Thien Hue Province and followed this by a community exercise on learning and planning for adaptation. Local government agencies were reported to co-finance the implementation of the community plans for adaptation (Shaw, 2006; Interviews).

Another noteworthy local adaptation study is that of a team from Hue University Centre of Social Sciences and Humanities that examines livelihoods, vulnerability and adaptation to

natural calamities in another district of Thua Thien Hue Province by employing participatory and ethnographic research methods, and which was commissioned by the Hanoi Institute of Hydrometeorology of MoNRE through the NCAP project (Tran Xuan Binh *et al.* 2006). Kyoto University Graduate School of Environmental Studies and Oxfam in Vietnam recently completed a study on drought-related management strategies and the implications of these on local adaptation. The study has yielded valuable information about how communities perceive drought and climate change, and how local governments and NGOs could manage drought. It concludes that the drought impacts are in a real sense a reflection of development problems, and it provides policy options that could be implemented by communities, local governments, and NGOs.

Other community based researches focus on flood resilience and the influence of informal institutions which is being conducted by research fellows of the National Institute for Science and Technology Policy and Strategy Studies (NISTPASS) and the Mekong Programme on Water, Environment and Resilience supported by the Challenge Programme on Water and Food (CPWF) (Interviews). The UNDP and MARD have commissioned a study on 'living with floods' in the Mekong Delta arguing that annual flooding can be considered a resource for socio-economic goals that employs new and traditional credit relations and resources instead of regarding flooding as a nuisance (Tinh *et al.* 2003).

Apart from the local studies supported by international development organizations, independent researchers have studied resilience, adaptation and vulnerability in Vietnam. Noteworthy are those of the team of Neil Adger (Adger *et al.* 1998; 1999; 2001) and Michael Douglass (2002) among others. Despite the growing body of knowledge on adaptation in Vietnam, one distinguished researcher remarked that Vietnam still lags with respect to state initiatives and planning for adaptation (Interviews).

PHILIPPINES

The Philippines is currently preparing the Second National Communication for submission to the UNFCCC. The draft process is slow due to three existing state bodies addressing climate change issues nationwide. In February 2007, the Presidential Task Force on Climate Change (PTFCC) was created to conduct rapid assessments on the impact of climate change, especially on the most vulnerable sectors such as water, agriculture, coastal areas, as well as on terrestrial and marine ecosystems. Former Department of Environment and Natural Resources (DENR) secretary Angelo Reyes, who is now chief of the Department of Energy (DoE), heads the PTFCC. Meanwhile, Reyes' successor, Mr Lito Atienza, created the Advisory Council on Climate Change Mitigation, Adaptation and Communication shortly after he took over the DENR. The initial executive order creating the PTFCC had the DENR Secretary as its head, but the Philippine President later modified the composition of the task force, designating instead the DOE Secretary as PTFCC chief. Another earlier body created at the time of the ratification of the UNFCCC in 1992, the Inter-Agency Committee on Climate Change (IACCC), has been mandated to serve as the 'national mechanism' for climate change in the country and whose chief task is to coordinate all activities pertaining to climate change-related activities and representations of the Philippines in international negotiations. The three bodies presently overlap functions and whether there are clear lines of coordination between them. As a result, the Philippine Climate Change Response Action Plan (PCCRAP) has yet to be fully completed.

Meanwhile, the Environment Management Bureau (EMB) of the DENR, which hosts the IACCC Secretariat, has initiated the Climate Change Adaptation Phase 1, a project funded by the WB-GEF for a period of 9 months beginning May 2007. The project aims to establish the institutional set-up best suited for guiding country to develop sector-responsive adaptation activities to reduce the country's vulnerability to climate change risks and reliable climate risk information. Simultaneously, a proposal was also recently submitted to the UNDP/Spain MDG Achievement Fund (MDG-F)

for capacity development of concerned national government institutions, local governments, local higher education institutions and communities to develop demonstrable climate change adaptation measures. Expected outputs are as follows: (i) Baseline scenario and climate risk/adaptation monitoring system developed for priority sectors (water, agriculture, forestry, coastal, health); (ii) Vulnerability maps for 43 provinces plus other priority areas; (iii) Adaptation options for key sectors assessed, valued & prioritized, including "no regrets" options; (iv) Entry points for climate risk reduction (CRR) in key national plans/planning and regulatory processes identified and (v) CRR compendium of adaptation best practices recommended for integration and upscaling (Interviews). A Senate bill was recently filed as the Climate Change Act of 2007 pushing for a framework for adaptation, a national commission on climate change and budgetary provisions for this from the national government.

However, due to existing programmatic uncertainties created by boundary problems at the national level, the Provincial Government of Albay has moved forward on its own to hold the first national conference on climate change adaptation last October 2007 which were attended by leaders of ministries and non-state organizations. The Provincial government has also begun to 'mainstream' climate change adaptation into its economic and social development programmes. Two ordinances were created by the Provincial Government to give flesh to their mainstreaming commitment: (i) 'all behaviour, projects, programmes grants of license and permits should be consistent with adaptation. Incompatibility to adaptation is basis for not granting or cancelling business permits;' and (ii) the creation of a budgetary item for adaptation activities.

The Centre for Initiatives and Research on Climate Change Adaptation (CIRCA) was also created and launched during the national conference in Albay. CIRCA is a partnership of Bicol University, the Department of Environment & Natural Resources Environment Management Bureau of Albay and the Provincial Government of Albay. CIRCA aims to develop adaptation and

vulnerability assessments to provide baselines for monitoring and planning which aims to strengthen people's adaptive capacity towards climate-related risks. Bicol University for its part has initiated research on biodiversity and sustainable development of the uplands. Local adaptive strategies to changing weather conditions were documented as follows: increased rice cultivation in upland areas identifying 14 varieties, planting of fruit trees, digging canals for fish farming, planting root crops that are resistant to heavy rainfall such as taro, mix-cropping and fish farming with duck raising and in some spontaneous and planned resettlement areas, a number of well-off farmers were beginning to cultivate high value vegetables due to smaller farm spaces (40-80 sq m) which have a short period for crop maturation but which could yield incomes, water storage from rainfall.

Marginal farmers, however, cannot risk employing or experimenting with new farming technologies since they have weaker access to capital for new inputs. Researchers also observed a fall in student enrollment overall in the province due to recent extreme events (storm surges with floods with volcanic *lahar*) that prompted reconfiguring livelihoods including increased child labour and urban migration. The engineering department has recently invented a mobile coconut shredder for upland farmers who are option. The local offices of the Department of Agriculture (DA) in Albay have been organizing farmer cluster groups for generating agribusiness, which includes assistance for farm inputs for crop diversification and food for work for rice production subsidy. (Interviews).

In the NGO front, COPE, an Albay-based NGO supported by Oxfam, has been active in resettlements in the wake of recent storm surges and heavy flooding that displaced hundreds of rural villagers whose homes and property were inundated. COPE has been active in re-working the Comprehensive Land Use Plan (CLUP) of Albay for a fairer and pro-poor land tenure system in the context of long term climate change impacts, as well as providing small loans and free information on potential jobs for those who are considering outmigration as an option (Interviews).

Much of the earlier research on climate change in the Philippines were mitigation-oriented such as the ADB-supported *Philippine Climate Change Report* (1995) highlighting the initial GHG inventory and which identified general measures to mitigate climate change impacts. In recent years, exemplary studies have explored adaptation and vulnerability issues often in the context of specific natural ecosystem sectors in the country — and their vulnerability towards climate risks. The Environmental Science for Social Change (ESSC) is one such research NGO that aims to provide science-based knowledge (such as reliable data on rainfall and soil depth) in particular areas for local land use planning or for resettlements during extreme events (Interviews).

At the University of the Philippines Los Banos (UPLB), scholars have initiated studies supported by regional research programmes on climate change and adaptation such as SEA-START, AIACC, EEPSEA and ICRAF/ACCCA, ICRAF/TroFFCA and ICRAF/APN. The START research grant came in 2000 and was located at UPLB with partnerships in Indonesia, Vietnam and Cambodia. Prior to the START programme, much of the research on climate change in the Philippines was on mitigation. After their participation in the programme that was completed in 2005, the UPLB researchers were recommended as co-lead authors in the publication of the global experts' group, the IPCC. The research had a strong participatory approach component, with built-in enabling elements for meaningful participation. The research was however limited to only one site – the Pantabangan watershed and covered extreme events of El Nino, typhoons and drought. The START research programme in UPLB closed in 2005. TroFFCA is a four-year project of the Centre for International Forestry Research (CIFOR) and the Tropical Agriculture Centre for Research and Higher Education (CATIE). The main objective is to contribute to national processes of adaptation to climate change, in particular, and create efforts to mainstream adaptation into development policies. TroFFCA aims to Identify regional development issues related to climate change impacts over forest that can increase people's vulnerability and to develop policy-oriented adaptation strategies and to enable a science-policy dialogue on adaptation (Lasco *et al.* 2006).

The research and publications under these programmes explore impacts of climate change on forests, agriculture and water resources and tangentially discuss aspects of adaptation within these sectors. Some of these studies are based on on-site investigations and stakeholder consultations, thus making a case for (a) improved decision making and coping strategies of farmers through access to scientific climate and crop forecasting information; (b) recognizing that multiple stresses arising from climate changes spur varied coping strategies; (c) local stakeholder adaptation strategies could inform planned adaptation options; and that (d) vulnerability varies among different social groups depending on their assets and arising from combined climate and non-climatic factors (Tibig and Lansigan, 2008; De los Santos, Lansigan and Hansen, 2007; Pulhin *et al.* 2008).

Apart from the foregoing studies supported by research programmes such as START, independent research on local adaptation strategies from other scholars within UPLB (Penalba *et al.* 2007), Social Research Associates, UK (Allen, 2006), the Manila Observatory (Capili, Ibay and Villarin, 2005; Castillo *et al.* 2008), the EEPSEA-Philippine Rural Reconstruction Movement (PRRM) and the Philippine Network on Climate Change (Sales, 2008) has emerged. Many of these studies demonstrate the disconnection between local planning and actual adaptation strategies, *in situ*, and more explicitly examine adaptation from a stronger social lens. Overall, there is yet however to be explicit inter-disciplinary partnerships in these research projects that could offer more holistic analyses and findings on adaptation processes within natural systems in the future.

Private sector initiatives on climate change adaptation in the Philippines are still few. The Manila Observatory (MO) and klima, which are both based at the Ateneo de Manila University, are documenting adaptation research initiatives across the country, with the aim to influence public policy to prioritize funds to adaptation. Further, MO has partnered with SMART, one of 2 of the country's cellphone service providers, for a pilot project providing telemetric rain gauges in disaster-prone areas such as in Mindoro province (Interviews).

Yes2Life Foundation has piloted a 'reforestation' project that brings formerly dead reefs from over fishing and industrial pollution back to life by throwing in reefbuds made from organic and inorganic residual material for spawning algae and eventually restoring marine life. Unilever, a company for home and personal care, has partnered with Yes2Life for this initiative which they altogether envisage as a climate change adaptation strategy for fisher-folk to boost livelihoods out of a deteriorating resource base possibly also exacerbated by temperature rise impacts on marine life. The HWK Foundation is a private organization engaged in providing technical assistance and Hydromex technology to communities and their partner institutions in waste management and rehabilitation of degraded ecosystems. The current activities of the Foundation in Cavite Province include technical assistance to an initiative of the Yes to Life Foundation and Unilever Philippines in coastal and marine ecosystem rehabilitation in the Municipality of Rosario. The partners plant organic-based reef balls on a selected site of Manila Bay along the shoreline of Rosario for the purpose of cleaning up and attracting coral, fish and plant growth in the degraded area (Interviews).

INDONESIA

Apart from a national strategy for climate change (RAN-PI), a national strategy on adaptation (Indonesia's Climate Change Adaptation Plan on ICCAP) has just been completed in time for the COP in Bali last

December 2007. The ICCAP conceptually rests on the dynamic and interaction between ecology, economy and society. Principally, the UNDP-supported ICCAP aims to embed a climate risk and opportunity management

mechanism (C-ROM) within national, provincial and local development plans in the next five years. C-ROM is envisaged going beyond managing risk to making better use of opportunities emerging with climate change. The Government of Indonesia is also developing a new agency for climate change, which may be a high level agency delegated by the President. This agency would have controlling authority and prioritize incentives for adaptation and allocation of investments (i.e. budgets) – in particular investments in climate-proof infrastructure (Interviews). The ICCAP will be implemented by a Steering Committee comprising selected UNDP officials, civil society organizations and representatives from Ministries on behalf of the Government of Indonesia (GoI), which will be coordinated by a programme coordination unit (UNDP, 2007).

Indonesia therefore has just begun planning its adaptation measures. There is still substantial need for vulnerability and capacity assessments to be completed across the country. Broad national climate change adaptation plans of the ICCAP need to connect with local level realities, according to interviewees. There have also been some institutional intramurals with respect to the hosting of the national committee on climate change and contested territories, and which requires some resolution for both RAN-PI and ICCAP to fully be implemented. Current donors heavily supporting work on climate change in Indonesia are the Netherlands, Australia, GTZ, EU, Norway and to a lesser extent, with DFID. Those interested to fund adaptation activities include the Dutch, and possibly Australia and DFID. DFID and the WB are supporting a large global project on cost benefit analysis of climate change impacts and adaptation. There are plans to give a core loan to Indonesia where they can avail of funds to use as they would like but the caveat is that the GoI has to show progress on addressing climate change adaptation (Interviews).

Bogor Agricultural University (IPB) is a lead actor in research on climate change adaptation – especially around water and agriculture – in Indonesia. There are also plans for IPB to be a Regional Centre on Climate Risk Management and Opportunity in Asia and Pacific, and they

have some support for this from IRI. IPB is engaged in a number of action research pilots: (i) working with farmers to use information on climate forecasting through climate field schools (adopted from farmer field schools); (ii) strengthening resilience of farmers to cope with climate change by identifying strategies to improve livelihoods in order to manage challenges arising from climate change; (iii) working with the Asia Pacific Network (APN) Project to build capacities (CapABLE) aiming to scale up Climate Field Schools, but which needs the support of extension. IPB is also working with the Ministry of Public Works (funded by GTZ) on water sector tools and approach to integrate CC issues into development and planning (Interviews).

Pelangi is one of the key NGOs working on issues of climate change, with a long track record working on the issues since early 1990s. PEACE (Pt. Pelangi Energi Abadi Citra Enviro) is the consulting ‘arm’ of Pelangi. Pelangi did work on climate change scenarios in 1994, but this information has not been integrated into development planning due to inertia. It may be useful to involve the new cadre of development planners and policy makers since some of the earlier environmental activists are now in positions of ‘policy influence.’ PEACE, together with the World Bank and DFID, completed a study with the title, ‘Indonesia and Climate Change: Current Status and Policies (2007). This was a review of existing literature in preparation for the COP that outline current issues and policy gaps in climate change in Indonesia. This is heavily focused on emissions, mitigation and impacts, and very little on adaptation efforts. There is minimal mention of the need for people to adapt to floods and droughts.

The International Research Institute for Climate Prediction (IRI) and CARE International are working in Kalimantan not to use slash and burn technologies especially during the drought years. This project aims to support the use of and access to climate information since they are acting on the premise that if farmers have information 2-3 months ahead and that they know that it will be a drought year, they might be convinced not to practice slash and burn for risk of fire. However, in practice this is difficult because

alternatives involve high costs (\$100/ha), and the cultural practice/norm still supports slash and burn agriculture (Interviews).

One of the issues raised by interviewees is that many things attributed to climate change that may not actually be the case, so there's need not to lose sight of the broader goal of sound ecosystem management. For instance, the increase in flooding in areas may not be attributed to climate change, but rather to poor ecosystem management such as deforestation (leading to high runoff) or poor management of infrastructure. Ecosystem management must link well with climate change adaptation and not compromise one for the other (Interviews).

CIFOR located in Bogor, manages TroFCCA in Indonesia which has prioritized two research themes: (1) forest and land fires and (2) landslides/land movements. Landslides cause huge economic loss in Indonesia (more than forests) and are expected to increase with climate change. They are working with the Ministry of Environment to investigate the type and extent of vegetation cover needed to minimize land movement. They are also researching on land management and how to enhance land regulations, land use planning, and infrastructure development – together with disaster management strategies – in landslide prone areas.

A number of independent researches explore climate variability through ENSO (El Nino - Southern Oscillation) and its impacts on rice production in parts of Indonesia (Falcon *et al.* 2004; Naylor *et al.* 2001; Keil *et al.* 2008). One noteworthy research assesses the resilience of households towards drought periods, and factors that enable resilience that in turn can inform policy (Keil *et al.* 2008). The study demonstrated that households largely rely on their existing assets to keep themselves resilient from drought effects on rice farming such as access to credit and their level of efficiency in rice production. The study recommends that farmers should have regular access to ENSO forecasts, credit and extension services to boost low levels of rice productivity.

Most work on climate change in Indonesia is currently on mitigation and REDD (Reducing Emissions from Deforestation and Degradation), especially since Indonesia is among the top three GHG emitters worldwide due to deforestation and land conversion. However, there are concerns arising with REDD projects especially since the government allocates areas of forests or peat land for REDD but in practice, prevents people from using or accessing these areas. The Faculty of Public Health in the University of Indonesia hosted a side-meeting at Bali on climate change and health. This meeting involved 75 participants and several key speakers to strengthen networking nationally and internationally on climate change and health linkages. After the Bali meeting, there have been discussions for the university to host a National Centre for Climate Change and Health. There is very limited understanding of climate change adaptation issues in all sectors in Indonesia, but especially in health. There needs to be stronger evidence of climate change and impacts on human health (Interviews).

With regards to the private sector, interviews indicated that there is potential to look more at how incentives can strengthen adaptation efforts. For example, the government has just begun to provide concessions to small hydropower developers on provision that: (i) they rehabilitate and conserve the water catchment areas; and (ii) carbon credits generated go to the state owned (hydropower) company. UNDP is working with Nestle on improved groundwater management. A Nestle plant in Eastern Java was decreasing rapidly. With Nestle's support, wastewater treatment now releases zero wastewater, so the groundwater is being conserved, which can sustain the plant in the long term. This worked because Nestle has capital to invest in these technologies. The insurance sector is an untapped market: currently there is only 4% penetration of insurance (personal, business), and this can be strengthened substantially. There is also a need mobilise capital from the domestic banking sector and other government revenue (Interviews).

THAILAND

In Thailand, the Office of Natural Environmental Protection (ONEP) under the Ministry of Natural Resources and Environment (MoNRE) has conducted a study on vulnerability assessment scenarios and has completed the National Strategic Plan on Climate Change for the period of 2008-2012 (ONEP, 2007). The Plan has five strategies for adaptation: (i) development of monitoring systems; (ii) prevention of natural resource deterioration; (iii) increase in resource efficiency by promoting value added products; (iv) climate risk management and (v) mitigation of climate change impacts (ONEP, 2007). The Plan's adaptation strategy focuses on the sectors of water resource, agriculture, forest and biodiversity, ecosystem and health, and disaster. The national policy framework provides measures and the guidance but it does not have defined activities. The identification of the latter depends on the ministries. Once approved by the Cabinet, various ministries will translate the framework into action plans.

This is the first time that the Thai government is integrating the climate change agenda through a national framework. In the past, the government had an integrated focus on the environment. Climate change was not an integral aspect of plans and actions of various ministries. For instance, the Ministry of Energy has its own policy for energy, but this is not informed by the climate change agenda. This initiative to create one policy framework for climate change starts this year and will remain valid for the next 5 years. Other Thai government climate change-related activities combined environmental conservation and climate change mitigation: For instance, the Ministry of Agriculture encourages farmers to shift to organic fertilizers, which has the effect of reducing GHG emissions. The Ministry of Environment and Natural Resources (MoNRE) encourages recycling and reduction of waste (Interviews).

The Climate Change Impact Research Programme Fund of Thailand, which is part of the Royal Thai Government's fund for scientific research was set up in early 2007. So far there are 12 projects funded under the fund. The total aggregate funding of these projects is 20 million Thai baht. These projects are: 6 climate

scenario modelling projects; 2 water resource management and climate change; observational research on ocean and land linkages; research of the impact of aerosol on climate change variability; crop modelling in the context of climate change; economic assessment of climate change.

The entire focus of the research fund was on climate change impact (modelling) and capacity building for this task through the invitation of experts from foreign countries. We wanted to get a model or the climate change scenario for Thailand,' remarked a prominent Thai researcher on climate change (Interviews). Starting 2007, six modelling projects were launched will be completed in 2009. Economists are collaborating with physico-technical scientists and crop scientist. The research projects may also widen to include social assessments at a later period. Due to limited funds, the Climate Change Impact Research Programme Fund had to set its priorities based on experts' meetings held since January 2007. In the first two meetings 70% of the scientists who attended were came from the physico-technical disciplines and 30% of the participants were public sector programme experts. There were no social scientists in these expert meetings.

Most of the work at START-SEA is research and scoping studies that facilitate capacity-building and faculty exchange focusing on climate assessment and mitigation issues, although not centrally adaptation (except for the Philippines). The global START papers have been published recently in a two-volume Earthscan publication on climate change and vulnerability. In SEA-START, the director, Anond Snidvongs of Chulalongkorn University, says that in Thailand, much of the earlier climate change research was on impacts and mitigation. Due to the START-SEA project more than five years ago, some attention was devoted to vulnerability and adaptation. It also took about five years to create a network of scientists in Thailand on climate change, which began due to increasing funding from various sources such as GEF and Japan. Most of these scientists were from Khon Kaen and Chiangmai Universities, but today there are more. The

Thailand Environment Institute (TEI), Thailand Development Research Institute and the National Institute for Development Administration (NIDA) are today engaged in various climate change studies. However a nationwide vulnerability and adaptation study has yet to be made despite the fact that there are micro studies in specific localities in parts of the country (Interviews). TEI, for its part, is preparing a proposal on CC in Greater Mekong Subregion, in partnership with UNEP, for submission to EU. The main audience for the study will be donors: it is intended to help assess and prioritize work on resource impacts (especially water and soil erosion), adaptation, energy and food security including biofuels conflicts, and governance issues (Interviews).

Research by the Mekong Wetlands Biodiversity and Sustainable Use Programme on the Lower Songkhram River Basin is especially noteworthy since it almost is one of its kind in the country. Two studies discuss and assess local knowledge, adaptation and vulnerability to climate change in the basin. The studies are premised on the understanding that vulnerability and adaptation are best approached through an understanding of household and community level livelihood strategies and their diversification. The assessment takes vulnerability as a starting point, which requires an integrated understanding of 'place vulnerability', livelihood strategies and community dynamics. The studies also draw attention to a more nuanced view of vulnerability which may not link with poverty in straightforward ways, since under certain conditions vulnerability may be more attached

to land-based livelihoods in flooded forests which are more vulnerable to climate change impacts and could affect more well-off households than others (Friend *et al.* 2006; Nakorn, 2006). The researchers of the Songkhram River Basin study further pursue the theme of adaptation to change through their work with the Wetlands Alliance and the Asian Institute of Technology. Regional NGOs doing studies on climate change adaptation are the Stockholm Environment Institute (SEI) currently finalizing a funding proposal to SAREC/SIDA for capacity building in Cambodia and Bangladesh focusing on universities, using visiting international researchers to teach short courses and develop curriculum, as well as fellowships to support joint research between local and international scholars with a view to link to policy. They are working with SEA-START to downscale global climate models to sub-regional level and focus on shorter timeframes, as well as working with CGIAR Challenge Programme for Water and Food on forecasting changes and agriculture implications at local level (Interviews).

Private food processing companies in Thailand are currently taking active interest in climate change. Mitr Phol, a sugar company, has been interested in possible impacts of climate change on sugarcane cultivation. They are exploring whether cultivating sugarcane variety for alcohol production is a good adaptive strategy and a good source for renewable energy. They have visited the START offices for meetings, but are crafting their own independent plan.

MALAYSIA

Malaysia has published its first national communication to climate change. The document is titled, " National Response Strategies to Climate Change". A new Cabinet Committee on Climate Change headed by the Prime Minister has been set up in September 2007. Also, the Institute of Environment and Development (LESTARI) housed in the National University of Malaysia is now working on a climate change policy. The Ministry of Natural

Resources and Environment is now working on the second communication. The Ministry has also set up three working groups on a) Green House Gas Inventory b) Vulnerability and Adaptation c) Mitigation. The National Hydraulic Research Institute of Malaysia is the chair for the group on vulnerability and adaptation. The Department of Irrigation and Drainage is also carrying out a study on coastal vulnerability to identify low lying areas along

the coastline that are vulnerable to sea level rise of half a metre and above and assess the associated impacts. There is also a study carried out on the hydraulic regime and water resources for peninsular Malaysia. This study has been completed. Projections have been done for up to 2050. A similar study is now being carried out for East Malaysia particularly the Sabah and Sarawak regions. The Borneo Marine Research Institute has developed modelling software to predict sea level rise taking into account population, land elevation and human impacts. The Malaysian Institute of Maritime Affairs (MIMA) has set up a "Think Tank" on marine issues. MIMA is working on a preliminary study of climate change impacts on marine areas. In terms of gaps, Malaysia is not really addressing adaptation issues (Interviews).

Despite the fact that Malaysia has been actively engaging with climate change issues at the international level (it had one of the largest delegations at the COP in Bali),

awareness on climate change issues is not very high in the country (Interviews).

Four NGOs have got together to form the Malaysian Climate Change Group (MCCG). These include: (a) Malaysian Nature Society; (b) Environment Protection Society of Malaysia; (c) Centre for Environment Technology and Development Malaysia (CETDEM); (d) PEREK Consumer Association. This group is focused on organizing seminars and workshops on climate change. Malaysia prides itself in being the most CDM active country in the ASEAN region. However in terms of adaptation, there has been no urgency of action since there are no perceivable impacts so far. There is however a concern about palm oil being promoted as a biofuel. Palm oil is at present being used as a cooking medium in Malaysia. Ever since it is being promoted as a biofuel, its demand and subsequent price has also gone up. In the future it is likely that people will have to choose between palm oil as biofuel and as cooking oil.



ANNEX II:

Interviews

INDONESIA

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LAO PDR

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PHILIPPINES

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- 2 Busalanan, Genie, Office of the Mayor. Cavite City: February 22, 2008.
- 3 Cruz, Rex Victor O. (University of the Philippines Los Banos), (EEPSEA Conference). Bali: February 14, 2008.
- 4 Elvira, Jojo, Department of Agriculture. Legazpi City: January 11, 2008.
- 5 Goco, Joy, Department of Environment & Natural Resources (DENR) – Environment Management Board and Philippine Task Force on Climate Change. Quezon City: January 4, 2008.

- 6 Lauraya, Dr Fay, Ligaya Vargas, Dr Marissa Estrella, Leilani Pavilando, and Mr Gilbert Gonzalez, Bicol University and Centre for Initiatives for Research on Climate Change Adaptation (CIRCA). Legazpi City: January 12, 2008.
- 7 Legarda, Loren, Senate of the Philippines. Manila: January 5, 2008.
- 8 Lijas, Antonio S., Office of the Mayor. Cavite City: February 22, 2008.
- 9 Loyzaga, Toni Yulo, Manila Observatory. Mandaluyong City: January 4, 2008.
- 10 Maerten, Bert, Oxfam Great Britain. Manila: January 8, 2008.
- 11 Magracia, Antonio, Farmer-leader. Legazpi City: January 12, 2008.
- 12 Miclat, Sylvia, Environmental Science for Social Change. Quezon City: February 8, 2008.
- 13 Notario, Leonardo A., General Services, City of Cavite. Cavite City: February 18, 2008.
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- 15 Rangasa, Manuel, Centre for Initiatives in Research on Climate Adaptation (CIRCA). Legazpi City: January 11, 2008.
- 16 Roop, Jay, Asian Development Bank. Manila: January 8, 2008.
- 17 Salceda, Joey Sarte (Governor), Albay Province. Legazpi City: January 10, 2008.
- 18 Sales, Dr Manuel Jr., Philippine Rural Reconstruction Programme (PRRM) and Philippine Network of Climate Change NGOs. Quezon City: January 4, 2008.
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CAMBODIA

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THAILAND

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- 2 Chidthaisong, Dr Amnat, The Joint Graduate School of Energy & Environment, King Mongkut's University of Technology Thonburi. Bangkok: February 28, 2008.
- 3 Daoroung, Premrudee, Foundation for Ecological Recovery. Bangkok: November 11, 2007.
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- 8 Manasboonphempool, Rawadee Jarungrattanapong and Areeya (Thailand Development Research Institute), (EEPSEA Conference). Bali: February 14, 2008.

VIETNAM

- 1 Cuong, Dr. Hoang Duc, Research Centre of Meteorology and Climatology, Institute of Meteorology and Hydrology. Hanoi: January 28, 2008.
- 2 Dang, Dr Phan Ngoc, and Tran Ngoc Quang, Faculty of Environmental Engineering; Hanoi University of Civil Engineering. Hanoi: January 29, 2008.
- 3 Dao, Dr Phan Thi Anh, Centre for Environmental Research, Vietnam Institute of Meteorology, Hydrology and Environment. Hanoi: December 22, 2007.
- 4 Hoi, Prof Dr Nguyen Chu, Fisheries Planning, Environment & Policy, Vietnam Institute of Fisheries Economics and Planning, Ministry of Fisheries. Hanoi: January 28, 2008.
- 5 Hung, Dr. Hoang Vinh, Faculty of Urban Management, Hanoi Architectural University. Hanoi: December 21, 2007.
- 6 Lai, Mr Dao Xuan, United Nations Development Programme (UNDP). Hanoi: January 28, 2008.
- 7 Loan, Ngo Thi, and Bui-Viet Hien, National Institute for Science and Technology Policy and Strategy (NISTPASS). Hanoi: December 22, 2007.
- 8 Ninh, Dr Nguyen Huu, Centre for Environment Research Education and Development. Hanoi: December 21, 2007.
- 9 Tuan, Prof. Ngo Dinh, Hanoi Water Resources University. Hanoi: January 28, 2008.
- 10 Viet, Dr Nguyen Van, Vietnam Institute of Hydrology-Meteorology and Environment. Hanoi: December 21, 2007.
- 11 Yen, Nguyen Thi Hoang, Oxfam Great Britain. Hanoi: January 29, 2008.
- 12 Nguyen Duy Hung, Department of Science, Education, Natural Resources and Environment (DSENRE), Ministry of Planning and Investment (MPI). Hanoi: March 7, 2008.
- 13 McNally, Richard, WWF. Hanoi: November 30, 2007.
- 14 Nguyen Van Thang (Director), Centre for Meteorology and Climatology, Vietnam Institute of Meteorology, Hydrology & Environment (IMH), MoNRE. Hanoi: November 30, 2007.

MALAYSIA

- 1 Khairulmaini Osman Salleh, (EEPSEA Conference): Department of Geography, Faculty of Arts and Social Sciences, University of Malaya Centre for Climate Change Affairs (UMCCA), University of Malaya. Bali: February 13, 2008.
- 2 Dr Loh Chi Leong (Executive Director), Malaysian Nature Society (Persatuan Pencinta Alam Malaysia). Kuala Lumpur: February 18, 2008.
- 3 Preetha Sankar (Policy Coordinator), WWF-Malaysia. Kuala Lumpur: February 18, 2008.
- 4 Eugene Lee, Environmental Consulting Services. Kuala Lumpur: February 18, 2008.
- 5 Anthony Tan Kee Huat (Executive Director), Centre for Environment, Technology & Development, Malaysia (CETDEM). Kuala Lumpur: February 19, 2008.

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ANNEX III:

Roundtable Consultations

First Consultation: Hanoi, Vietnam (organized by the Center for Research and Environmental Studies [CRES], University of Hanoi, 28 November 2007, 33C Pham Ngu Lao

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1	Tran Tu Anh	The Dutch Red-Cross in Vietnam
2	Vo Tong Anh	Department of Agriculture and Resources, An Giang University
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4	Jeremy Carew-Reid	International Centre for Environmental Management (ICEM)
5	Phan Anh Dao	Centre for Environmental Studies, University of Hydro-meteorology and Environment
6	Mike Digregorio	Ford Foundation
7	Tran Du	Department of Environment, Tien Hai People's Committee, Thai Binh province
8	Vo Thanh Giang	CRES
9	Bui Viet Hien	Vietnam Red-Cross
10	Hoang Manh Hoa	Office of Climate Change, Ministry of Environment
11	Nguyen Chu Hoi	Institute of Aquaculture Economics, MARD
12	Le Thi Van Hue	CRES
13	Pham Viet Hung	CRES
14	Vu Thi Huong	CRES
15	Tran Trung Kien	Hanoi Agriculture University
16	Dang Tu Loan	CRES
17	Ngo Thi Loan	NITSPASS
18	Tran Van Luu	Giao Thuy People's Committee, Nam Dinh province
19	Dinh Tuan Minh	
20	Trinh Le Nguyen	Centre for People and Nature
21	Nguyen Huu Ninh	Centre for Education and Environment, VUSTA
22	Dang Thu Phuong	Environment Programme, World Bank in Hanoi
23	Vo Quy	CRES
24	Pham Binh Quyen	CRES
25	Edsel Sajor	AIT
26	Vo Thanh Son	CRES
27	Nguyen Van Tai	Department of Environment, MONRE
28	Le Van Thang	Centre for Resources, Environment and Biological Technology
29	Vu Guyet Thang	University of Natural Science, VNU
30	Hoang Van Thang	CRES
31	Dang Thi Thuy	Vietnam Farmer's Association
32	Le Trong Toan	CRES
33	Cao Xuan Trieu	Information Centre, MARD
34	Kim Van Trinh	Dept of Environment, Vietnam National University at Hanoi
35	Tran Chi Trung	CRES
36	Vu Ngoc Tu	International Relation, Vietnam National University, Hanoi (VNU)
37	Ngo Dinh Tuan	University of Water Management

38	Nguyen Van Tung	Institute of Policy and Strategy, MOST
41	Le Nguyen Tuong	Department of Science and Technology, Institute of Hydro-meteorology and Environment
42	Nghiem Phuong Tuyen	CRES
43	Truong Van Tuyen	Hue University of Agriculture and Forestry
44	Stephen Tyler	IDRC
45	Pham Tuong Vi	CRES
46	Nguyen Van Viet	Centre for Agricultural Meteorology, Institute for Hydrology-meteorology and Environment
47	Nguyen Phuong Vinh	Institute of Policy and Strategy, Ministry of OST
48	Nguyen Dinh Vuong	Southern Institute of Water Resource Research
49	Anna Nileshwar	DFID - Vietnam
50	Vivien Chiam	IDRC
51	Dr Hermi Francisco	IDRC / EEPSEA
52	Bui Dung The	EEPSEA

Second Consultation: Manila, Philippines (organized by the De La Salle University [DLSU] Manila) Banquet Asia, 2nd Flr., Angelo King International Conference Centre, CSB Hotel, January 7, 2008.

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	FULL NAME	INSTITUTION
1	Dr. Angel Alcala	Siliman University and former Secretary of DENR
2	Ms. Rebecca Fontanilla-Andong	AIT
3	Ms. Seema Bhatt	ISET
4	Mr. Arcadio Cruz	FAO-Philippines
5	Dr. Antonio Contreras	DLSU (Chair)
6	Dr. Rex Victor Cruz	University of the Philippines, Los Banos; Member, IPCC
7	Dr. Benjamin Espiritu	Office of Sen. Loren Legarda
8	Ms. Liz Fajber	ISET
9	Dr. Pag-asa Gaspillo	College of Engineering, DLSU
10	Ms. Joy Goco	Dept of Environment & Natural Resources - Environment Management Board
11	Atty. Angela Consuelo Ibay	Manila Observatory
12	Dr. Felino Lansigan	University of Philippines Los Banos; Member, IPCC
13	Dr. Rodel Lasco	ICRAF; Member, IPCC
14	Atty. Antonio Laviña	Ateneo de Manila School of Government
15	Bro. Armin Luistro	DLSU
16	Ms. Lyra Magalang	Oxfam GB
17	Dr. Francisco Magno	DLSU
18	Dr. Hein Mallee	IDRC Singapore
19	Ms. Resi Palma-Marinas	Office of Sen. Loren Legarda
20	Dr. Stephen McGurk	IDRC
21	Dr. Rosa Perez	Dept. of Science & Technology - PAGASA
22	Dr. Juan Pulhin	University of Philippines Los Banos
23	Ms. Natalie Pulvinar	AGHAM
24	Dr. Babette Resurreccion	AIT
25	Dr. Edsel Sajor	AIT
26	Dr. Ramon Faustino Sales Jr.	Philippine Network on Climate Change
27	Dr. Celine Vicente	Manila Observatory

Final Consultation: Hosted by Asian Institute of Technology (AIT), Thailand, 23-24 May 2008

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Mr. Manuel Rangasa	Centre for Research on Climate Change Adaptation (CIRCA), Albay, Philippines
Dr. Rex Victor Cruz	University of the Philippines Los Banos, Member, IPCC
Dr. Ramon Sales	Philippine Rural Reconstruction Movement, Southeast Asia Network of NGOs on Climate Change
Dr. Richard Friend	CGIAR World Fish Centre
Dr. Bernadette Resurreccion	Gender & Development Studies, AIT
Dr. Edsel Sajor	Urban Environmental Management, AIT
Ms. Seema Bhatt	ISET
Ms Uma Wirutskulshai	AIT
Dr. Carolyn Sobritchea	Centre for Women' Studies, University of the Philippines, Diliman
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Dr Orapin Nabangchang	EEPSEA
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Dr Supakhorn Chinvanno	START Project-SEA, Chulanlongkorn University
Dr Robert Arthur	CGIAR World Fish Centre
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