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Adaptation to Climate Change
Needs and Opportunities in Southeast Asia

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This paper focuses on the adaptation strategies of developing countries and the possible adaptation options available for Southeast Asia. Adaptation refers to the actions taken by individuals, communities, or governments in response to climate change, to reduce the adverse impacts or to take advantage of opportunities offered by such changes. Adaptation strategies have hardly been considered by many Southeast Asian countries in as recently as two or three years ago. The cost of adaptation and the funding available is also discussed, with the possibility of using institutions for risk sharing (disaster management) and risk transfer (insurance and derivatives) as measures to adapt. A regional outlook for adaptation for Southeast Asia concludes the paper.

Keywords: climate change, adaptation options, costs of adaptation, risk transfers, Southeast Asia.

I. Introduction

The impacts of climate change, which include the increasing frequency and intensity of droughts and storms, and rising sea level, are already being felt in Asia and the rest of the world. Whether induced by climate change or other factors, hydro-meteorological hazards cause tremendous destruction. They account for 85 per cent of all natural disasters and caused 75 per cent of the economic losses from natural causes from 1980 to 2005 (Golnaraghi, 2006). The Natural Disasters Data Book (2006) indicated that a thirty-year analysis of statistics on natural disasters in the world had Asia accounting for "about 90 per cent of all those affected by disasters and more than 50 per cent of the total fatalities and economic losses". Projected future impacts of climate change in the region are staggering. A 40-cm sea level rise by 2080 could displace as many as 55 million people in South Asia, and 21 million people in Southeast Asia (IPCC 2001). A World Bank study (Dasgupta et al. 2007) on the impacts of sea level rise shows that a 1 metre sea level rise could displace 60 million people in many of the 84 coastal developing countries; in Vietnam alone, 11 per cent of the population will be affected. The 2007 Intergovernmental Panel for Climate Change (IPCC) report projected an 18–58 cm sea level rise by the end of the century. But these are

conservative estimates and do not take into account the melting of the Greenland and West Antarctic ice sheets, which could easily raise the sea level much higher.

Clearly, efforts to reduce the accumulation of greenhouse gases, the leading cause of climate change, need to be strengthened to curtail the process. But the grim fact remains that the impacts of past and current emissions of greenhouse gases are unavoidable; we need to cope with them through appropriate adaptation measures while mitigation efforts continue. The focus of this paper is adaptation in developing countries, where the impacts of climate change are expected to be the greatest but where adaptive capacity is the lowest. The paper explores the opportunities for adaptation that countries in Southeast Asia can and should take advantage of.

Adaptation refers to actions that people take in response to or in anticipation of projected or actual changes in climate, either to reduce the adverse impacts or to take advantage of opportunities offered by such changes (IPCC 2001). Adaptation measures could be simple ones like shifting planting calendars or changing crops, or more costly ones like investing in protective infra-structures such as river or sea dykes for flood control. In extreme cases, retreat may be the best strategy.

The adaptive capacities of countries differ, but largely depend on their economic status. Generally, developed countries have higher adaptive capacities while developing and least developed countries, which are most vulnerable to climate change, need external support to build theirs.

Despite pronouncements that developing countries must be assisted to adapt to the adverse impacts of climate change, there is still a very limited flow of resources to these countries for adaptation. One reason could be the difficult application requirements imposed by the Global Environment Facility (GEF),[1] one of the main channels for such funds. It may also be due to the lack of knowledge of developing countries about how to access these funds.

Even if the requirements were relaxed and the knowledge improved through training, the funds available are still limited relative to need. Countries have to compete for the funds and then ensure that whatever limited resources they acquire are put to their best use. Towards this end, both economics and institutions could play important roles.

Economics offers useful tools to aid decision-making by providing information on the costs and benefits of alternative adaptation options. The most useful of these tools are cost-benefit analysis and cost-effectiveness analysis. The former identifies options which provide the greatest benefit relative to costs; the latter identifies options that achieve a given objective at least cost. Both face major challenges in assessing climate change because of long time frames and high uncertainty of climate events.

The search for cost-effective adaptation strategies should begin with an assessment of threats faced by local communities and institutions from climate change-related events like floods and storms.

"Institutions", in this context, refers to practices, relationships, organizations, markets or networks that help communities pursue goals of importance in their lives. An example would be a farmers' association to manage the use of communal water networks and systems. A village Disaster Committee to help the community during flooding and other natural disasters would be another. Weather insurance markets, often provided by the private sector as a form of risk transfer, would also fall into this category. All these institutions developed over time from the initiatives of private individuals or groups to help communities adapt to their environments.[2] These institutions have an important role to play in the adaptation plans of national governments.

This paper discusses possible adaptation options for communities in Southeast Asia. It also presents the results of some studies on the economics of adaptation and identifies sources of funds available for adaptation projects. Ways to reduce adaptation costs through risk sharing and risk

transfer schemes are then discussed. Finally, a regional outlook for adaptation to climate change in Southeast Asia is given.

II. What Adaptation Options Are Available to Deal with Climate Change Impacts?

Adaptation measures can be classified as *reactive* – those undertaken to respond to impacts of current climate variability and climate change, and *anticipatory* – those undertaken before impacts are observed (Klein 2002). Examples of each are shown in Table 1.

Another way of classifying adaptive responses is found in the IPCC's fourth assessment report: (a) *technological* – building protective infrastructures like river and sea dykes; (b) *behavioural* – changing food and recreational choices; (c) *managerial* – changing cropping patterns or choice of crops; and (d) *policy* – implementing new planning regulations.

Depending on climate change impacts, adaptation options vary. For sea-level rise, for instance, there are three generic types of planned technological adaptation (Klein et al. 2001), which are often combined in practice. They are:

- *Protection*: using soft or hard engineering structures to reduce impacts on areas inhabited by people and businesses.
- *Retreat*: moving back from the coastline; and
- *Accommodation*: adjusting of human activities to the new situation.

Examples of technologies for coastal areas under each type of adaptation are shown in Table 2.

There is no dearth of knowledge on adaptation technologies or practices a country could choose from. Some adaptation measures are fairly well developed in some countries, thus offering the potential for transfer of knowledge and techno-

TABLE 1
Types of Human Systems' Adaptation to Climate Change

Sector	*Reactive*	*Anticipatory*
Private	Moving home	Changing architecture of buildings
	Changing insurance premiums	Buying hazard insurance
	Buying air-conditioning systems	Devising new customer products
Public	Offering compensation or subsidies	Installing early warning systems
	Enforcing building codes	Establishing new building codes
	Beach nourishment	Constructing dykes

SOURCE: UNFCCC (2006).

TABLE 2
Technologies for Adaptation in Coastal Zones

Protection	*Retreat*	*Accommodation*
Hard Structures: dykes, sea-walls, tidal barriers, breakwaters	Establishing set-back zones	Early warning and evacuation systems
Soft Structures: dunes or wetland restoration, beach nourishment	Relocating threatened buildings	Hazard insurance
Indigenous Options: walls of wood, stone, afforestation.	Phasing out development in exposed areas	New agricultural practices
	Creating upland barriers	New building codes
	Rolling easements	Improved drainage
		Desalination system

SOURCE: UNFCCC (2006).

logy. However, the lack of resources and limited adaptive capacity in the recipient countries would be constraining factors to this technology transfer.

How far along are the countries in Southeast Asia in developing adaptation strategies? An analysis of the National Communication documents submitted by some countries to the United Nations Framework Convention on Climate Change (UNFCCC) revealed that adaptation had hardly been considered in many countries (Table 3) as recently as two or three years ago.

Since the Conference of Parties (COP) 11 in 2005, with its focus on adaptation, the situation may have improved. The least developed countries (LDC) like Cambodia and Lao PDR, for instance, have already completed their "National Adaptation Programmes for Action" (NAPAs), since this received top priority for funding under the UNFCCC. Still, it is safe to assume that most governments are struggling with adaptation planning and particularly with how to put concrete adaptation measures in place.

Developing countries often lack the financial resources, access to technology, and capacity to handle disasters, given the demands they face from other development goals. Other parties have an important role to play in helping these countries develop their adaptive capacities. These parties could include other governments, as well as national and international non-governmental and civil society organizations, development organizations, research institutions, and private corporations.

From a research organization's perspective, the Economy and Environment Program for Southeast Asia (EEPSEA) could generate information and analysis to help improve the knowledge of governments and communities about technological and institutional measures for emission reduction and adaptation. Research on the evaluation of local knowledge on and capacity for adaptation, as well as the assessment of the costs and benefits of feasible adaptation measures, are specific examples of useful research.

III. How Much Will It Cost to Adapt?

Perhaps the question should be: What would it cost not to adapt? There are many estimates of the net economic cost of damages (also called, the

TABLE 3
Coverage on Adaptation Policies and Measures in the National Communication Documents of Selected Southeast Asian Countries

Country	*Total no. of pages*	*No. of pages on impacts and vulnerability*	*No. of pages on adaptation*
Cambodia	63	10	2
China	79	8	2
Indonesia	116	10	3
Lao PDR	97	2 lines	1 line
Malaysia	131	30	7
Mongolia	106	18	7
PNG	83	20	6
Singapore	75	5	1 line
Sri Lanka	122	12	5
Thailand	100	15	2.5
Philippines	107	20	12
Vietnam	135	17	4

SOURCE: Srinivasan (2007).

social cost of carbon) resulting from climate change. The Fourth IPCC Report came up with peer-reviewed estimates of the average social cost of carbon at US$43 per tonne of carbon or US$12 per tonne of carbon dioxide based on 2005 estimates. This translates to global mean losses of 1–5 per cent of the gross domestic product (GDP), assuming a 4°C increase in temperature. The Stern Report (2006) estimated the social cost of carbon to be around US$85 per tonne of carbon dioxide (US$314 per tonne of carbon). This figure is much higher than the IPCC estimate, which Tol (2006) attributes to the choice by the authors of impact studies that show pessimistic results and their failure to consider that adaptation measures could reduce damage from greenhouse gases (GHG), among others. Citing the results of the Global Vulnerability Assessment (GVA) of coastal communities in several countries in the 1993 IPCC report, Frankhauser (2006) reported that coastal adaptation could reduce the number of people at risk from flooding by almost 90 per cent at an annual cost of around 0.06 per cent of the GDP (Table 4) while in agriculture, adaptation could result in avoided yield losses of as much as 30 per cent.

Indeed, adaptation costs are already a significant part of the impacts of climate change and the results cited earlier show that adaptation investments could potentially have high, positive net benefits. Tol, Frankhauser, and Smith (1998) estimated adaptation costs to be 7–25 per cent of total damages for a doubling of the atmospheric concentration of carbon dioxide. If total damage were 1–2 per cent of world income, then adaptation costs would range from 0.1–0.5 per cent of the GDP. The Stern Report cited a much higher cost of adaptation of US$15–150 billion each year (0.05–0.5 per cent of the GDP) for OECD countries alone and only for making new infrastructure and buildings climate-resilient.

Adaptation costs could be much higher for areas that are most vulnerable to climate change. For a small-island developing states (SIDS) like Jamaica, the cost of protecting the country's coastline from a 1-metre sea level rise could

TABLE 4
The Impact of Coastal Protection on Sea Level Rise Damage
(No. of people at risk from a 1-metre rise in sea level)

GVA-case countries	*People at risk[a] without measures ('000 people)*	*People at risk[a] with additional measures ('000 people)*	*Cost of measures (per cent of GNP per year)[b]*
North America	170	90	0.02
Central America	56	6	0.23
Caribbean Islands	110	20	0.21
South America, Atlantic Coast	410	48	0.25
South America, Pacific Coast	100	11	0.01
North and West Europe	130	130	0.02
North Mediterranean	37	31	0.02
South Mediterranean	2,100	250	0.07
Africa, Atlantic Coast	2,000	220	0.25
Gulf States	14	3	0.05
Asia, Indian Ocean Coast	27,360	3,040	0.52
Indian Ocean Small Islands	100	12	0.72
Southeast Asia	7,800	880	0.20
East Asia	17,100	2,200	0.06
Pacific Ocean Large Islands	17	4	0.17
Pacific Ocean Small Islands	34	4	0.77
World	**61,300**	**7,380**	**0.056 (ave)**

NOTES:
a. Number of people living in the risk zone, multiplied by the probability of flooding per year.
b. Undiscounted, assuming 100 years lifetime, i.e. annual cost is 1 per cent of total cost).
SOURCE: Frankhauser et al. (1998) based on IPCC (1994) and Delft Hydraulics (1993) cited in Frankhauser (2006).

account for 19 per cent of the country's GDP or US$462 million per year (UNFCCC 2005). At the household level, an EEPSEA-funded study in Bangkok (Jarungrattanapong and Manasboonphempool, forthcoming) revealed that people living along coastal areas are spending as much as 23 per cent of their household annual income for measures such as building stone or concrete pole breakwaters and water gates, and heightening dykes.

The UNDP Human Development report estimated that developing countries would need around US$86 billion per year for adaptation by 2015, a value that corresponds to about 0.2 per cent of rich nations' GDPs (*Antara News* 2007).

Priority setting for the expenditure of limited adaptation funds is thus needed. Studies of the impact of climate change have focused mainly on impacts on agriculture and coastal communities because these sectors are both important to developing countries and highly vulnerable to climate change. Focusing on the most and least vulnerable sectors is one way of prioritizing the use of adaptation funds. Leveraging some adaptation initiatives with counterpart funding — from the community, local government and/or national government — is another way to attract funding.

Whatever strategies national or local governments take to mobilize resources for local adaptation projects, economic analysis to justify

expenditures on these projects over other competing uses of funds plays an important role. Economics is useful in estimating the damages from climate change and the costs of mitigation and adaptation; in evaluating alternative policies for mitigation and adaptation; and in modelling impacts based on alternative climate change scenarios.

IV. Where Could Funding for Adaptation Come From?

The UNFCCC and the Kyoto Protocol make available several funding sources through the Global Environment Facility (GEF) to support adaptation initiatives in developing countries (GEF 2006 and http://www/undp.org/gef/adaptation). The GEF in turn is governed by the Conference of Parties (COP) to the Kyoto Protocol, which decides on the policies, priorities and eligibility criteria for the utilization of the funds.

The first fund, initiated in July 2001, was the Least Developed Country Fund (LDCF). This was earmarked to help the poorest countries (least developed countries and the small island developing states) develop their National Adaptation Programmes of Action (NAPAs). Priority activities in these NAPAs could also be supported through this fund. In July 2004, the Strategic Priority on Adaptation (SPA) Fund was launched to support pilot projects that could demonstrate how climate change adaptation and planning could be integrated into country policy and sustainable development planning. In October 2005, the Special Climate Change Fund (SCCF)[3] was put into operation to support adaptation activities in areas most vulnerable to climate change. These included agriculture, water resource management, health, disaster risk management, and coastal resource management.

The 2007 meeting in Bali by parties to the Kyoto Protocol succeeded in making operational a fourth fund, the Adaptation Fund (AF), to be financed by a 2 per cent levy on Clean Development Mechanism Projects.[4] In addition to these funding sources,[5] adaptation support could also be secured through bilateral and multilateral channels.

Reid and Huq (2007) say that the above-mentioned funds for adaptation could amount to US$310 million, although Muller (2007) say that the Adaptation Fund alone is expected to generate US$160–950 million by 2012.

The World Bank estimates that between US$10 billion and US$40 billion will be needed to assist developing countries for new infrastructure alone (Haag 2007) while the UNDP estimates the adaptation requirement of poor countries in 2015 will be US$86 billion per year (*Antara News* 2007). A mid-range estimate by OXFAM is US$50 billion per year, specifically for scaling up urgent adaptation measures and community-based initiatives (OXFAM 2007). The *Antara News* (2007) says that in the past two years, multilateral sources have made available US$26 million for adaptation support, a very small amount relative to what is needed. Other ideas for mobilizing funds are being explored.[6] In the meantime, developing countries are left with the burden of generating these resources internally or exploring ways to reduce adaptation costs through risk sharing or risk transfer options. These are discussed in the next section.

V. Reducing Costs of Adaptation through Institutions for Risk Sharing and Risk Transfer

One way to reduce the burden of adaptation cost is by sharing it among those who stand to benefit from adaptation measures. Another way is to transfer risk through the use of catastrophe bonds, catastrophe pools, weather index-based insurance or micro-insurance schemes. In risk sharing and risk transfer, the contributions of social institutions like community groups and private organizations are important. In the case of risk sharing, groups of people who are likely to be affected by an adverse climate event jointly carry out adaptation measures by contributing their time and resources. Community-based adaptation projects or activities fall within this category. In the case of risk transfer, the burden of loss from the disaster is transferred to another party for a premium or a fee.

V.1 Risk Sharing through Community-based Climate Change Adaptation

Efforts to reduce climate risks are under way in many parts of Southeast Asia. These efforts are often made as part of a bigger task of training communities in disaster management. The International Federation of Red Cross and Red Crescent Societies (IFRC), for instance, is quite active in such efforts in the region. Over the last few years, it has helped a number of countries develop community-based disaster management planning programmes, which include preparing for climate change events. In Cambodia, for instance, the IFRC helped train 525 volunteers in 306 villages in 7 provinces. The villagers learned to undertake disaster management planning and carry out flood control activities such as digging and rehabilitating canals, as well as building small dams, water gates and culverts. Similar initiatives exist in Thailand, Indonesia, the Philippines, and Vietnam. In all these areas, it was clear that making communities better prepared to deal with disasters could minimize loss of lives and community assets (Raksakulthai and Wilderspin 2005).

Community-based initiatives can also take place outside of disaster management planning. In one EEPSEA-funded research site amongst coastal communities in the Philippines, (Bayani, forth-coming), the communities formed a cooperative, the Green-Creek Multipurpose Cooperative, in order to establish and sustain riverbank protection activities such as mangrove planting and propagation.

How does one go about building community-based climate adaptation capacity? The experience of the Capacity-building for Adaptation to Climate Change (CACC) project in Vietnam[7] is informative.

Illustrating the Process — The Case of a Successful Project for Community-based Adaptation to Climate Change in Vietnam: CACC was implemented in four communes and eight villages in the Quang Dien and Phu Vang Districts of Thua Thien Hue Province in 2002. The villages are subjected to three to four floods yearly, with about 30 days of flooding each year (Shaw 2006). The 1999 flood brought about the loss of several hundred lives and attracted an international flurry of support to the Vietnamese government. One such initiative is the CACC project that followed from relief operations to help the victims of the 1999 flood. The motivation is to help build communities' adaptive strategies to deal with recurrent climatic catastrophes and minimize the loss of lives and property.

Preparing each community to adapt to the situation involved three major steps: (a) scenario-building; (b) planning; and (c) implementation of some of the sub-projects identified in the plan.

(a) *Scenario-building* included research to analyse the hazards, vulnerability to climate change, and existing and required adaptive capacity of the respective village. Using interviews, field surveys, historical profiling and mapping of vulnerable sites and areas, and focus group discussions, the community concerned defined what scenarios for future climate events. This part of the process also identified the adaptation mechanisms of the households, communities, and social institutions that could contribute to hazard and disaster management.

(b) The *planning process* involved discussions with the leaders of the various social groups, i.e., farmers, youth, women's groups, and village political leaders. During these consultations, information on the threats and potential impacts arising from climate change were discussed. Proposals on how to deal with these through livelihood improvements in agriculture and aquaculture, disaster management protocols and other strategies were identified. The main output of the planning activity was the "safer village plan" (a plan to increase the resilience of communities to climate disasters). The involvement of local government officials was critical to this process to ensure that the plan was incorporated into commune and district plans. This will also increase the

chances of local government co-funding for some of the sub-projects identified in the plan.

(c) In the *project implementation* stage, the community took part in implementing some of the sub-projects in the plan through in-kind and cash contributions to the community adaptation fund. The sub-projects comprised measures to ensure the safety of the people, the infrastructure and the livelihood of the village. These included the construction of an inter-commune road, a multi-purpose school (as an emergency shelter), and technical support for agriculture and fishery. Representatives of various social groups were also trained in the use of early warning devices, and in rescue and relief operations. They were also provided with equipment like boats, life jackets and megaphones, which are critical in giving timely warnings of impending disasters.

The processes described above show how communities can be involved in developing their own adaptation strategies and that preparing for adaptation fits well with disaster management planning. It also demonstrates the importance of understanding local conditions and capabilities through a research-based process that is anchored in community involvement at all stages. It further illustrates how knowledge of the threats from climate change can be easily communicated to people who are familiar with climate-related disasters. Finally, it shows how adaptation costs can be shared when community groups take part in all stages of the process of developing and implementing a "safer village plan".

A recent visit to the project area, three years after CIDA support ended in 2005, revealed that the community-based institutions are still in place and local villages have found them useful in minimizing losses to property and even saving lives. This case study attests to the success of this model[8] in building local capacity for climate change adaptation. Understanding what factors are critical in the success of collective management will be useful and could be a subject of research (Adger et al. 2003).

V.2 Risk Transfer through Weather-index Insurance or Derivatives

Insurance can play an important role in reducing risk, not only by helping affected communities recover from catastrophes through financial compensation, but also in influencing or encouraging behaviour that could reduce the exposure of vulnerable communities to risks (Parry, Hammill, and Drexhage 2005). Examples of such behaviour would be avoiding vulnerable areas with limited insurance coverage or taking measures to increase risk-resilience, for example, by planting drought/flood-resistant crop varieties.

Traditional crop insurance suffers from the high transaction costs of establishing crop losses; from moral hazard (farmers will not take the same care for the crops as they do without insurance); and adverse selection problems (only those farmers who are sure to be affected by climate disasters will apply for insurance). Weather-indexed micro-insurance solves these problems (World Bank 2003; ADB 2004). Because the insured party or policy-holder could not influence the weather and since payment is made solely on the basis of the weather data, transaction cost is reduced. Under this system, payments are based on a pre-determined weather index (rainfall, temperature, or wind speed). For drought insurance, for instance: no payment is made once rainfall exceeds a maximum level (called a "strike"). Payment is made per mm of rainfall less than the strike but greater than the "exit" or the minimum level. Once rainfall is less than the "exit", a big lump sum payment is made.

This kind of insurance exists to a limited extent in developing countries. Weather-indexed micro-insurance was pioneered in India, it also exists in Ethiopia and Malawi (Bals et al. n.d.).

The India model is a partnership between local micro-finance institution, BASIX; an insurer (ICICI-Lombard); and the Commodity Risk Management Group of the World Bank (Bals et al. n.d.; UNEP-FI 2006). It started with small pilot areas and a few crops until its big launch in 2005. By 2006, several thousand policy-holders were covered by the insurance as other insurance providers get into the picture. Insurance can also

be sold to government or donors such as the World Food Programme.

There are still constraints to the full development of insurance markets for climate change impacts. Risks are not easy to predict with the limited information available and climate-related disasters usually cover a large area. It is therefore not surprising that even in developed countries, insurance companies are reluctant to cover climate change-related risks. When they do, the indemnity is low. This problem is more serious in developing countries. Hoff et al. (2004) say that only 1 per cent of disaster losses are insured in low-income countries.

Given the limited prospects for insurance markets, other risk transfer mechanisms have evolved, such as catastrophe pools and "cat" (short for catastrophe) bonds. A catastrophe pool combines contributions from various entities in a fund. This fund will serve as a pool in the event of a catastrophe, to pay any claims made or to purchase reinsurance to spread the risk of a catastrophic loss. If no claims are made, then the pool's resources increase over time.

The issuance of cat bonds transfers part of the risks from natural disasters to independent financial investors. Bonds are issued by insurance and reinsurance companies to protect their business from extreme losses that could result from natural disasters. Investors could include hedge fund companies (particularly those specializing in natural catastrophes), and other insurers, re-insurers, and pension fund establishments.

The concept of transferring risk to financial markets was pioneered in the United States after the 1992 Hurricane Andrew and has performed well there since; it received a big boost from the Atlantic hurricanes of 2004 and 2005. From US$2 billion in 2005, cat bond issuance grew to US$4.7 billion in 2006 and US$5.7 billion in the first seven months of 2007 (Stahel, Paul, and Brums 2007). The increase in cat bond markets is partly due to investors' desires to diversify their risks, since cat bonds are not subject to the economic risks that plague financial markets. In addition, the bonds pay higher returns to investors (Wikipedia, n.d.).

VI. A Regional Outlook for Adaptation in Southeast Asia

The need for adaptation is no longer debated. The threats posed by climate change are real and it is widely recognized that developing countries need help to prepare for the disasters that climate change is likely to bring. Some countries are already experiencing climate change-related catastrophes. So, what is the regional outlook for adaptation in Southeast Asia?

The review of adaptation efforts shows that autonomous adaptation is already taking place, mostly in areas vulnerable to climate change-related disasters. Most of these adaptations are at the household level. Over the last few years, efforts to integrate adaptation planning into disaster risk management planning have taken place with funding from external sources. Experience seems to show that these are effective in communicating the concept on the risks of climate change to local communities and getting them involved in assessing hazards, designing options, and even implementing some of the adaptation projects.

Community-based initiatives are not new in Southeast Asia. The grassroots have plenty of experience in managing natural resources like forests, coastal and mangrove areas, although success usually depends on support from national and local governments. Successful cases have proven that where communities are driven by a common goal like protecting their property and lives against impending disasters, and are involved in deciding how this goal can be achieved, they become committed to seeing their project succeed.

This is clearly the case for climate change adaptation. The threats are real and the impacts are local. Solutions, therefore, have to be generated from the local community, with enabling support provided by the government. This trend towards community-based adaptation planning is likely to continue in the future. This is a logical way to proceed with planned adaptation that is merged with autonomous adaptation. The model of linking both autonomous and planned adaptation planning to disaster risk management planning is also a

sensible strategy and should be pursued more strongly in the future.

In the cases reviewed, the necessity for external support to push the process is clear. There are several international agencies supporting pilot cases in various parts of the region. There is a need, however, to influence disaster planning and management at all levels. For one thing, the level of support by international agencies is limited to selected villages. Even when other villages see the good results of this capacity-building, their own limited resources prevent them from following their neighbour's model. The national government can play a big role in facilitating the transfer or diffusion of knowledge in the country, using the communities who received training as local trainers. A more systematic approach to link local planning efforts to higher-level government planning is also required to help scale up the experience. Time is of the essence in addressing the impacts of climate change. The sooner we build capacity to prepare for climate change in as many vulnerable communities as possible, the more lives and properties we can protect.

On the positive side, the developed countries are committed to supporting the needs of the developing and least developed countries. Funds are already available under the UNFCCC and the Kyoto Protocol for this. One of the constraints faced by the developing and least developed countries is lack of knowledge about how to obtain these funds. Although the requirements are posted on the UNDP and GEF websites, concerned groups are needed to help these countries develop proposals to take advantage of these funds. Organizations with the expertise to assist Southeast Asian governments in developing proposals for the GEF have an important role to play.

Even if a country can obtain some of these funds, this can only support a small part of its adaptation requirements. Governments in the region must find ways to put these limited resources to optimal use. Building on local institutions is one way to reduce the cost of adaptation. Using economic analysis to support decision-making about different options is also necessary. Furthermore, governments need to facilitate adaptation — either through legislation or by removing barriers to adaptation by private and civil society. Responsibilities across levels of decision-makers need to be defined and communicated. For measures that entail big investments, like infrastructure for flood protection and retreat strategies, national governments will have to play the central role; local governments can take care of disaster management, early warning systems and capacity building to support civil society participation.

Asian governments should explore ways to encourage the collaboration of the private sector in developing weather insurance schemes for the region. Partnerships between international organizations, national governments, non-government organizations and the private sector to explore the potential for developing micro-insurance index-based schemes in Southeast Asia should be pursued. Since such schemes have worked well in some countries, they should be pilot tested in the region. ASEAN could make representation to the World Bank to seek its support on this through the latter's ProVention group.[9]

These are some workable strategies that countries and regional bodies in Southeast Asia should consider in making adaptation plans to address the challenges of climate change.

NOTES

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1. The GEF requires that the projects it supports provide incremental global benefits. For adaptation, where benefits are mostly local, this requirement is not easy to meet. This requirement has been modified lately to include projects that support sustainable development goals of the country.
2. Private adaptation initiatives are termed autonomous adaptation while those led by governments are referred to as planned adaptation.
3. COP 9 clarified that funding from the LDCF and SCCF could be used to finance the climate change-imposed incremental costs of achieving sustainable development goals.
4. A significant breakthrough in the Bali meeting is the formation of a 16-member board drawn from rich and poor nations from the COP to the Kyoto Protocol; this board will oversee use of this fund (Abano 2007).
5. The first three funds (LDCF, SPA, and SCCF) were established in the Marrakech Accords of COP 7 in 2001, but the latter two were put into operation at a later date.
6. Recently, the proposal to create an International Air Travel Adaptation Levy (IATAL) has also been raised (Muller 2007). This is potentially a huge source of adaptation funds given the big volume of international travels in the world.
7. The project was implemented by the Canadian Centre for International Studies & Cooperation with funding from the Canadian International Development Agency (CIDA),
8. This model in Vietnam has since been replicated in other parts of Vietnam with funding from the Asian Development Bank (ADB) and Kyoto University for the Enhancing Human Security and Environment through Disaster Management Project in Hue; the UNDP for the Water Risk Reduction Project in DaNang City and Binh Dinh Province; and the USAID for the Hydro-meteorological Risk Reduction Project in Da Nang City (personal communication with Nguyen Phuc Hoa, December 2007).
9. ProVention was established by the World Bank in 2000 to help developing countries deal with potential losses from natural disasters. Collaborators include reinsurers like Swiss Re and Munich Re.

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