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Climate change: is Southeast Asia up to the challenge?: the economics of climate change in Southeast Asia: a regional review

Report

The **economics** of climate change in Southeast Asia: A regional review

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Southeast Asia is already suffering from the effects of climate change and the worst is yet to come. According to IPCC (2007), without global mitigation, by the end of this century, the global mean temperature increase—from 1980–1999 levels—could be more than 4.0°C. The modelling work carried out under this study suggests that the region's mean temperature by 2100 could reach 4.8°C from the 1990 level under the same emissions scenario.

Combating climate change is a global issue and requires a global solution built on common but differentiated responsibility. Given its high stake in actions against global warming, great adaptation needs and significant mitigation potential, Southeast Asia should contribute to the global solution by implementing both adaptation and mitigation measures.

The five countries—Indonesia, Philippines, Singapore, Thailand, and Vietnam—have made significant efforts in adapting to climate change impact, but more is needed to mainstream adaptation in development planning; to enhance and build adaptive capacity, especially of the poor; and to implement proactive measures in key climate-sensitive sectors. While adaptation is the region's priority, Southeast Asia should make greater mitigation efforts — as low-carbon growth also brings significant co-benefits—in particular, by reducing emissions from deforestation and degradation, implementing win-win mitigation options in the energy sector, and exploring the mitigation potential of the agriculture sector.

International funding and technology transfer are essential for the success of adaptation and mitigation actions in Southeast Asia. The region should enhance its capacity to make better use of existing and potential international funding sources.

Regional cooperation offers an effective means to deal with many cross-boundary issues, such as water resources management, forest fires, extreme weather events, and disease outbreaks, as well as for learning and knowledge sharing.

Climate change issues cut across many sectors, and Southeast Asian countries should strengthen policy and planning coordination among different ministries and levels of government.

There is an urgent need in Southeast Asia for more research to better understand climate change challenges, in particular at the local level, and cost-effective adaptation and mitigation solutions. The economic crisis and the fiscal stimulus packages designed to combat climate change offer an opportunity to start a transition toward a climate-resilient and low-carbon economy in Southeast Asia.

A. Climate Change and Its Impact in Southeast Asia

Southeast Asia—highly vulnerable to climate change—is already suffering from its effects, and the worst is yet to come.

This study confirms that climate change has already had an impact on the region, as evidenced by increasing mean temperature, changing precipitation patterns, rising sea level, and increasing frequency and growing intensity of extreme weather events. Climate change is exacerbating water shortages in many parts of the region, constraining agricultural production, causing forest fires and degradation, damaging coastal and marine resources, and increasing the risk of outbreaks of infectious diseases.

Southeast Asia is projected to suffer more from climate change in the years to come, with the impact likely to be worse than the global average. If not adequately addressed, climate change could seriously hinder the region's sustainable development and poverty eradication efforts. The study shows that a wide range of adaptation measures are already being applied, and that the region has great potential to contribute to global mitigation actions. The cost to the region and globally of not addressing climate change now far exceeds the cost of adaptation and mitigation—there is no time for delay.

If no action is taken, the four countries—Indonesia, Philippines, Thailand, and Vietnam—could suffer a loss equivalent to 6.7% of GDP annually by 2100, more than double the global average loss.

The results of an integrated assessment of the economy-wide cost of climate change show that for the four countries as a whole, while the cost is relatively low in the medium term, each year it rises very significantly beyond that; by 2100, the mean cost could reach 2.2% of GDP each year if one considers market impact only, 5.7% of GDP if non-market impacts related to health and ecosystems are included, and 6.7% of GDP if catastrophic risks are also taken into account. This is more than double similar estimates for the global average and, more importantly, would occur annually.

B. The Need for a Global Solution

Addressing climate change requires a global solution built on common but differentiated responsibility.

Climate change is the most significant market failure the world has ever witnessed. Like any market failure, it can only be resolved through the intervention of public policy. Governments need: (i) to put in place effective national climate change policy frameworks; (ii) devise cost-effective implementation strategies; (iii) mobilize sufficient resources from both external and domestic sources including the private sector and ensure their efficient allocation; (iv) create strong incentives for implementing adaptation and mitigation actions and eliminate various market distortions that impede such actions; (v) fill knowledge and information gaps; (vi) and raise public awareness of the urgency of addressing climate change. But government interventions alone are not enough. Successfully tackling climate change problems requires the participation and action of all stakeholders, including households, firms, individuals, non government organisations, and civil society.

As a global public good, addressing climate change requires all nations in the world, developed and developing, to work together on a global solution.

Large income gaps among different parts of the world today imply that there are significant variations among countries in capacity and affordability when undertaking adaptation and mitigation actions. Further, the observed climate change and its impacts are a result of past emissions largely by developed countries. These considerations raise an important issue of equitable burden sharing, and point to the need for common but differentiated responsibility. Developing countries need to be aware that without adequate global effort in reducing GHG

emissions, their prospects for income growth and poverty reduction would be under serious threat. Developed countries should also recognise the need and legitimacy of developing countries to narrow their income gaps with the developed world, and appreciate their desire to ensure that addressing the climate change challenge would not come at the cost of a slower pace of development. These considerations also highlight the importance of including both mitigation and adaptation in any global solution to the climate change problem.

An essential component of an effective global solution would, therefore, involve adequate transfer of financial resources and technological know how from developed to developing countries.

Estimates of financing needs for climate change mitigation and adaptation vary widely, reflecting the uncertainties associated with potential climate change scenarios and their likely impact. However, emerging estimates of the additional investment needed for mitigation and adaptation in developing countries indicate a financing gap of hundreds of billions of dollars per annum for several decades to come. This is far greater than the resources that have been committed or established by developed countries through global financing mechanisms, such as the Clean Development Mechanism (CDM), the Global Environment Facility (GEF), the various dedicated funds such as the Clean Energy Investment Framework and Climate Investment Fund, and other regional and bilateral mechanisms. This is a cause for serious concern.

Global climate change cannot be tackled without the participation of developing countries.

This is because, first, there is great potential for cost-effective emissions reductions in developing countries; and, second, GHG emissions by developing countries are expected to grow faster than those by developed countries in the coming decades, given their more rapid population and economic growth. An effective global solution would therefore, inevitably involve developing countries mainstreaming climate change considerations in policy making and integrating adaptation and mitigation actions into strategies for economic growth, poverty eradication, and sustainable development.

The international community has now agreed to the Bali Road Map to step up efforts to combat climate change.

The past few years have witnessed the emergence of a consensus on the urgency of addressing climate change, culminating in the formulation of the Bali Action Plan by the 13th Conference of Parties (COP13) of the United Nations Framework Convention on Climate Change (UNFCCC) in December 2007, in order to enhance the implementation of the UNFCCC and to initiate negotiations toward comprehensive, long-term cooperation. The Bali Action Plan has set the COP15 in Copenhagen in December 2009 as the deadline for agreeing to the terms of an international climate regime beyond 2012.

The terms will embrace climate change mitigation, including reducing emissions from deforestation and degradation (REDD), adaptation, technology development and transfer, and provision of financial resources in support of developing countries' actions. In July 2008, the Group of Eight rich nations agreed to adopt the goal of achieving at least a 50% reduction of global emissions by 2050, recognising that the global challenge can only be met by a global response, in particular, by contributions from all major economies, consistent with the principle of common but differentiated responsibilities and respective capabilities.

C. What Should Southeast Asia Do?

Southeast Asia has in recent years taken encouraging action to adapt to climate change impacts and to mitigate GHG emissions.

Each country in Southeast Asia has developed its own national plan or strategy for climate change, established a ministry or agency as the focal point to deal with climate change and its impact, and implemented many programs supporting adaptation and mitigation activities. But more action is needed. There is urgent need for: (i) raising awareness of climate change impacts and risks; (ii) mainstreaming climate change considerations in development planning and policy making; (iii) putting in place an effective institutional framework for better policy coordination; (iv) investing more resources in climate adaptation and mitigation; (v) providing adequate information on win-win adaptation and mitigation; (vi) addressing market failures and eliminating market distortions that impede the implementation of such options; (vii) strengthening international and regional cooperation in knowledge, technology, and financial transfers; (viii) undertaking more research and filling knowledge gaps on climate change-related challenges and solutions at local levels; and (ix) making more capacity building efforts.

(i) Adaptation toward enhanced climate resilience

Southeast Asian countries should continue efforts to enhance climate change resilience by building adaptive capacity and taking technical and non-technical adaptation measures in climate-sensitive sectors.

A country's resilience to climate change depends first and foremost on its adaptive capacity. At a more fundamental level, a country's adaptive capacity depends on its economic, social, and human development, which are closely related to: (i) income, inequality, poverty, literacy, and regional disparity; (ii) capacity and governance of public institutions and public finance; (iii) availability or adequacy of public services including education, health, social protection, and social safety nets; and (iv) capacity for economic diversification, especially at local levels. In all these aspects, there are wide variations across Southeast Asia and significant gaps between the region as a whole and the developed world. Eliminating these gaps by keeping growth strong and making development sustainable and inclusive will go a long way toward improving Southeast Asia's adaptive capacity.

Strengthening adaptive capacity also requires mainstreaming climate change adaptation in development planning. This means that adaptation should be considered as an integral part of sustainable development and poverty reduction strategies. In this context, the study identified some immediate priorities: (i) stepping up efforts to raise public awareness of climate change and its impact; (ii) undertaking more research to better understand climate change, its impact, and solutions, especially at the local level, and stepping up efforts in information and knowledge dissemination; (iii) enhancing policy and planning coordination across ministries and different levels of government for climate change adaptation, including linking climate change adaptation with disaster risk management; (iv) adopting a more holistic approach to building the adaptive capacity of vulnerable groups and localities and their resilience to shocks, including developing their capacity

to diversify local economies, livelihoods, and coping strategies beyond tackling the natural systems; and (v) developing and adopting more proactive, systematic, and integrated approaches to adaptation in key sectors that are cost-effective and that offer durable and long-term solutions.

Many sectors have adaptation needs but water, agriculture, forestry, coastal and marine resources, and health require particular attention.

Adaptation action has been taken in a number of key sectors where climate change impacts are most visible or damaging in Southeast Asia, including in these sectors. But adaptation inherently suffers from several market failures. The market failures arise because of uncertain information associated with large-scale and long-term investment such as climate proofing of building and defensive infrastructure; the positive spillover effects and the public goods nature of certain adaptive measures such as research and coastal protection; and the need for coordination among many multiple stakeholders. As a result, private markets and autonomous actions alone will not lead to an adequate level of adaptation.

Many measures need to be driven by public policy and government interventions. Box 1 describes areas of adaptation for scaling up in the key sectors.

Box 1. Policy Recommendations on Adaptation

- Enhance adaptive capacity by keeping growth strong, sustainable, and inclusive; and by mainstreaming climate change adaptation in development planning.
- Step up efforts at raising public awareness of climate change and its impact.
- Undertake more research to better understand climate change, its impact, and solutions, especially at the local level, and step up efforts in information and knowledge dissemination.
- Enhance policy and planning coordination across ministries and different levels of government for climate change adaptation, including linking climate change adaptation with disaster risk management. Addressing climate change requires leadership at the highest level of government.
- Adopt a more holistic approach to building the adaptive capacity of vulnerable groups and localities and their resilience to shocks, including developing their capability to diversify local economies, livelihoods, and coping strategies.
- Develop and adopt more proactive, systematic, and integrated approaches to adaptation in key sectors that are cost-effective, offer durable and long-term solutions, and are relevant to each country's circumstances:
  - » Water resources sector: scale up existing good practices of water conservation and management, and apply more widely integrated water management, including flood control and prevention schemes, early warning flood systems, irrigation improvement, and demand-side management.
  - » Agriculture sector: strengthen local adaptive capacity by providing public goods and services, such as better climate information, research and development on heat-resistant crop variety and other techniques, early warning systems, and

efficient irrigation systems, and explore innovative risk-sharing instruments such as index-based insurance schemes.

- Forestry sector: enhance early warning systems and awareness-raising programs to better prepare for potentially more frequent forest fires as a result of climate change; and implement aggressive public private partnerships for reforestation and afforestation.
- Coastal and marine resources sector: implement integrated coastal zone management plans, including mangrove conservation and planting.
- Health sector: expand or establish early warning systems for disease outbreaks, health surveillance, awareness-raising campaigns, and infectious disease control programs.
- Infrastructure sector: introduce "climate proofing" of transport-related investments and infrastructure.

(ii) Mitigation toward a low-carbon economy

Southeast Asia should be an important part of the global solution to stabilise GHG concentrations in the atmosphere.

While the response of the largest current and future GHG-emitting economies under the UNFCCC is key to a successful global solution, southeast Asian countries should also be an important part of this global solution given that its rapid economic and population growth will likely cause its GHG emissions to grow further, and because a low-carbon growth path brings significant co-benefits. This study has shown that Southeast Asia has considerable potential for GHG emissions reductions. Based on the contribution of different sectors, mitigation should target the land use change and forestry sector, the energy sector, and the agriculture sector (Box 2).

As Southeast Asia's largest contributor to emissions, the forestry sector is key to their successful reduction.

Major mitigation measures for the forestry sector include maintaining or increasing forest areas through REDD; afforestation and reforestation; and improving forest management. Reducing and/or preventing deforestation would have the largest and most carbon stock impact in the short run.

Since REDD also provides significant sustainable development co-benefits, Southeast Asian countries should address the causes of deforestation relevant to their own national circumstances. The creation of global financing mechanisms that are effective, predictable, sustainable, performance-based, and supported by diversified resources, including market and non-market mechanisms, is an urgent priority for REDD. In order to benefit from a future global REDD mechanism, the region's technical and institutional capacities to undertake forest carbon inventories and implement appropriate forest policies and measures should be strengthened.

Southeast Asian countries should also step up efforts in reducing deforestation, supporting reforestation and afforestation, and enhancing national and provincial governance systems for sustainable forest management. These require policy reforms appropriate to national and local circumstances, such as monitoring and controlling illegal logging, increased government rent capture for forest concessions, lengthened concession cycle and tenure

security, and enhanced competition for access to concessions. Since forests are also home to many indigenous communities, policies must be designed to fully recognize and respect their rights and priorities, and ensure their participation in the design and implementation of REDD policies.

Mitigation in the energy sector should start with win-win options with which GHG emission reductions can be achieved at a relatively low cost or even a negative net cost.

Although Southeast Asian countries together contributed about 3.0% of global energy-related CO2 emissions in 2000, this share is expected to rise in the future, given relatively higher economic and population growth compared to the rest of the world. Southeast Asia has considerable mitigation potential in both the energy supply and demand sectors. On the supply side, major mitigation options include efficiency improvement in power generation, fuel switching from coal to natural gas, and use of renewable energy including biomass, solar, wind, hydro and geothermal resources. On the demand side, the key sources of GHG emissions are the residential and commercial building, industry (steel, cement, pulp and paper, and others), and transport sectors.

Box 2. Policy Recommendations on Mitigation

Target key sources of the region's emissions, namely, the land use change and forestry sector, the energy sector, and the agriculture sector.

Land use change and forestry sector

- Address key drivers of deforestation, and strengthen technical and institutional capacities to undertake forest carbon inventories and implement appropriate forest policies and measures, in order to benefit from the future global REDD mechanism. Step up efforts in reducing deforestation.
- Step up efforts in reforestation and afforestation.
- Enhance national and local governance systems for sustainable forest management by implementing context-specific policy reforms, such as monitoring and controlling illegal logging, increased government rent capture for forest concessions, lengthened concession cycle and tenure security, and enhanced competition for access to concessions.
- Design policy to fully recognize and respect rights and priorities of indigenous communities and ensure their participation in the design and implementation of REDD policies.

Energy sector

- Explore mitigation options both on the demand and supply sides.
- On the supply side, improve efficiency in power generation, promote fuel switching from coal to natural gas, and encourage the use of renewable energy, including biomass, solar, wind, hydro and geothermal resources.
- On the demand side, improve energy efficiency and promote energy conservation in the

residential and commercial building, industry (steel, cement, pulp and paper, and others), and transport sectors.

- Explore and implement win-win mitigation options—involving mainly energy efficiency improvements—by identifying and eliminating the binding constraints to the adoption of these options, including information, knowledge, and technology gaps; market and price distortions; policy, regulatory, and behavioural barriers; lack of necessary finance for upfront investment; and other hidden transaction costs.
- Cut general subsidies on the use of fossil fuels, and provide targeted transfers to poor and vulnerable groups.
- Step up efforts in developing and switching to clean, renewable, and low-carbon energy sources as well as clean and sustainable transport by putting in place an appropriate policy framework, including creating incentives and supporting research and development, with the support of existing and future international financial and technology transfer mechanisms.
- Incorporate the negative externalities of GHG emissions in cost-benefit analysis of public sector energy investment.

Agriculture sector

- Improve land and farm management.
- Promote emissions reduction through a combination of market-based programs, regulatory measures, voluntary agreements, and international programs.

There are many win-win mitigation options in Southeast Asia, with cost savings from mitigation exceeding expenses. Energy efficiency improvement measures fall in this category. A policy priority is to identify the binding constraints to the adoption of these options. Such binding constraints could include information, knowledge, and technology gaps; market and price distortions; policy, regulatory, and behavioural barriers; lack of necessary finance for upfront investment; and other hidden transaction costs. A thorough review of these possible constraints is needed in order to eliminate them. A prominent market distortion in the energy sector in many Southeast Asian countries involves general subsidies for fossil fuels and electricity generated from such fuels. Governments should gradually reduce general fuel subsidies and provide targeted transfers only to the poor and vulnerable.

Given its rapid economic and population growth, Southeast Asia's energy demand is likely to continue to expand, and new sources of energy supply will have to be developed in the longer term. With the support of existing financial transfer and technology cooperation mechanisms and those to be agreed in the near future, Southeast Asian countries should step up their efforts in developing and switching to clean, renewable, and low-carbon energy sources as well as clean and sustainable transport systems. Governments should encourage this switch by putting in place or further strengthening an appropriate policy framework, creating appropriate financial and tax incentives, and supporting research and development. Public sector energy investment should incorporate the negative externalities of GHG emissions in cost-benefit analysis. Southeast Asia should join the global effort in moving toward a low-carbon economy.

Southeast Asia is estimated to have the highest technical potential to sequester carbon in agriculture in the world.

Being the third largest source of GHG emissions in Southeast Asia, the agriculture sector also provides significant potential for mitigation. Major mitigation options in agriculture include improved crop and grazing land management; restoration of organic soils (including peatland) that are drained for crop production, and restoration of degraded lands; livestock management; manure and bio-solid management, and bioenergy use (IPCC 2007). These measures can lead to a reduction of fertilizer and methane related emissions, reversal of emissions from land use change, and increased sequestration of carbon in the agro-ecosystem. Currently, however, progress in implementing these measures in the region has been slow.

Measures for reducing GHG emissions from the agriculture sector could be explored through the combination of market-based programs, regulatory measures, voluntary agreements, and international programs. Examples of market-based programs are taxes on the use of nitrogen fertilizers, and reform of agricultural support policies. Regulatory measures could include limits on the use of nitrogen fertilizers and cross-compliance of agricultural support to environmental objectives. Voluntary agreements on better farm management practices could be promoted, alongside labelling of green products. International programs could support technology transfer in agriculture.

(iii) Funding, technology transfer, and international/regional cooperation

International financial and technology transfers are essential for the success of adaptation and mitigation efforts in Southeast Asia.

The region should enhance institutional capacities to make better use of the existing and potential international funding resources. Existing funding sources, albeit inadequate in view of the vast task at hand, provide initial support and can be used as a catalyst for raising co-financing. Southeast Asia has not yet made full use of these funding sources, and its representation in the global carbon market is still limited. Government needs to facilitate access to these current and potentially available sources through better information dissemination and technical assistance. There is a need to increase the region's presence in making use of CDM, REDD-related, and other financing mechanisms (Box 3).

Technology needs vary greatly within and across Southeast Asian countries. The international climate regime will need to do more to facilitate the transfer of technologies that have been identified, while key performance indicators for transfer of low-carbon technologies should be developed. A regional framework should also be established to support south-south technical cooperation and information sharing among neighbouring countries in Southeast Asia, as it is likely easier to apply mitigation and adaptation measures introduced by neighbouring countries that successfully utilise locally available materials and traditional environmental management skills. Opportunities for technological leapfrogging, especially in the energy, infrastructure, and waste management sectors, should be effectively explored.

In the longer term, there is also a need to explore innovative forms of financing, such as risk-sharing instruments like catastrophe bonds, weather derivatives, and micro-insurance index-based schemes through partnerships involving the private sector. Following the example of the International Finance Facility for Immunisation, a regional financing facility for supporting adaptation initiatives, could be considered. Private investment in the form of venture capital and mutual funds focusing on low-carbon and energy efficiency technologies could also play a role in funding adaptation and mitigation.

Southeast Asian countries could also consider creating a regional emissions trading scheme (ETS) in the longer term.

Besides making use of international funding mechanisms and participating in the international carbon market through effective use of mechanisms such as programmatic CDM—and possibly sectoral approaches and policy-based CDM likely to become part of the future climate regime—the region could, in the longer term, also consider creating a regional ETS. Such a scheme would help reduce costs associated with emissions reductions and facilitate faster deployment of low-carbon technologies. The scheme would also help create a mechanism to consider environmental externalities, thereby encouraging energy-intensive firms to adopt low-carbon technologies in an incremental manner. The experiences of the Republic of Korea and Hong Kong, China in launching pilot domestic ETS, and of India in mandating specific energy consumption decreases in large energy-consuming industries through a system of trading energy savings certificates among companies, could be helpful. However, several functional prerequisites, including institutions and governance systems, must be met before introducing a regional ETS.

Many climate change issues can be better addressed through regional cooperation.

Because most countries in the region experience similar climate hazards, regional strategies are likely to be more cost-effective than national and sub-national actions in dealing with many transboundary issues, including integrated river basin and water resources management, forest fires, extreme weather events, threatened and shared coastal and marine ecosystems, climate change-induced migration and refugees, as well as regional outbreaks of heat-related disease, such as dengue, malaria, and cholera.

Regional cooperation could effectively address some climate change mitigation challenges, for example, by promoting power trade using different peak times among neighbouring countries to minimize the need for building new generation capacity in each country; developing renewable energy sources; and promoting clean energy and technology transfer, and regional benchmarking of clean energy practices and performance.

Regional cooperation also has an important role to play in promoting good policies and practices, sharing information and knowledge on issues such as disaster management, and promoting and undertaking climate related research and development in the region. Regional cooperation is important in developing regional climate scenarios and models to monitor and evaluate the impact of climate change.

Box 3. Funding, Technology Transfer, and International/Regional Cooperation

Funding

- Promote the region's use of CDM, REDD-related, and other international financing mechanisms, existing or likely to become available in the future, by facilitating access through better information dissemination and technical assistance and by enhancing institutional capacities for using such mechanisms.
- Explore innovative forms of financing, such as catastrophe bonds, weather derivatives, and micro-insurance index-based schemes through public-private partnerships. Private investment in the form of venture capital and mutual funds focusing on low-carbon and energy efficiency technologies could also play a role in funding adaptation and mitigation.

Technology Transfer

- Facilitate the transfer of technologies of low-carbon technologies.
- Establish a regional framework to support south-south technical cooperation and information sharing among neighboring countries in Southeast Asia.
- Explore opportunities for technological leapfrogging, especially in the energy, infrastructure, and waste management sectors.

Regional Cooperation

- Consider creating a regional emissions trading scheme in the longer term, after meeting several functional prerequisites including enhancing institutions and governance systems.
- Adopt regional strategies in dealing with transboundary issues, including integrated river basin and water resources management, forest fires, extreme weather events, threatened and shared coastal and marine ecosystems, climate change-induced migration and refugees, as well as regional outbreaks of heat-related disease and vector-borne infectious diseases such as dengue and malaria.
- Improve regional cooperation toward effectively addressing climate change mitigation challenges, for example, by promoting power trade using different peak times among neighboring countries to minimise the need for building new generation capacity in each country; developing renewable energy sources; promoting clean energy and technology transfer, and regional benchmarking of clean energy practices and performance.
- Expand the role of regional cooperation in promoting good policies and practices, sharing information and knowledge on issues such as disaster management, and promoting and undertaking climate-related research and development in the region, such as in developing regional climate scenarios and models to monitor and evaluate the impact of climate change.

(iv) Strengthening government policy coordination

Given that climate change is an issue that cuts across all parts and levels of the government, there is a need for strong inter-governmental agency policy coordination. Addressing climate change requires leadership at the highest level of government.

Climate change is an issue involving not only the ministries of environment and related offices, but also the economic and finance ministries, and so on. Strong inter-ministerial coordination and planning are critical for the effective implementation of adaptation and mitigation policy. For example, if the environment ministry plans to raise tax on petrol as part of an overall climate change strategy, this proposal should have full government backing and not be blocked by a ministry which, for example, is concerned about the objections of automobile producers. In the case of adaptation, there is a strong case for linking it with disaster risk management. There is also a need for putting in place or enhancing central government-local authority coordination, planning, and funding mechanisms to encourage local and autonomous adaptation actions, and to strengthen local capacity in planning and implementing adaptation initiatives. For effective coordination strategies, see (Box 4).

Box 4. Strengthening Government Policy Coordination

- Strengthen inter-government agency planning and policy coordination for the effective implementation of adaptation and mitigation policy, involving not only environment ministries but also economic and finance ministries.
- Put in place or enhance central government-local authority coordination, planning, and funding mechanisms to encourage local and autonomous adaptation actions, and to strengthen local capacity in planning and implementing adaptation initiatives.
- Improve coordination by having the government agency responsible for formulating and implementing the development plan and strategy take the lead.
- Build in fiscal stimulus packages "green investment" programs that combine adaptation and mitigation measures with current efforts to shore up the economy, create jobs, and reduce poverty

(v) Undertaking more research on climate change–related issues

More research is required to better understand climate change challenges and cost-effective solutions at the local levels and to fill knowledge gaps.

Despite the emergence of more and more regional and country-specific studies on climate change in Southeast Asia in recent years, knowledge gaps remain huge. There is an urgent need for undertaking more research in Southeast Asia to better understand:

- climate change and its impact, risks and vulnerability, adaptation needs, and mitigation potential at local levels;
- cost-effective technical and non-technical adaptation solutions in key climate-sensitive sectors including water resources, agriculture, forestry, coastal and marine resources, such as optimal cultivation and cropping patterns, heat-resistant crop variety, sound practices in forestry management, early warning systems for extreme weather events;
- sound adaptation practices and strategies dealing with issues beyond the natural Systems, such as migration, social protection mechanisms, livelihoods of small-scale farmers and fishermen, and governance of adaptation at all levels;
- cost-effective mitigation measures, in particular those win-win options, and policy, institutional, behavioural, and technological constraints to their adoption.

Southeast Asia also needs to develop regional research and development networks for climate change and strengthen regional climatic research capacity. Regional bodies such as the Association of Southeast Asian Nations could enhance collaboration with international agencies to enable better information sharing on low - carbon technologies. Technical cooperation and information sharing among neighbouring countries in the region should be encouraged. Measures that promote the use of renewable energy sources could also be undertaken in the framework of regional cooperation, such as capacity building programs and benchmarking of clean energy practices.

(vi) Turning the economic crisis into an opportunity

The world is experiencing its worst economic turbulence since the Great Depression of the 1930s on the back of multiple crises—fuel, food, and financial—in 2008. The impacts of the crises are still unfolding. The global economy has already slid into recession. Developing Asian countries face weakening external demand, lower flows of remittances, falling investment, and rising unemployment, with adverse consequences for the region's poverty eradication prospects. Southeast Asian countries are not immune to the global economic turbulence. The Asian Development Bank recently predicted that Southeast Asian GDP growth is likely to fall from 4.3% in 2008 to 0.7% in 2009 (ADB 2009). This could result in tens of millions of people in poverty, who would otherwise be lifted out, and would make the achievement of the MDGs more challenging.

The economic downturn could make the task of combating climate change more difficult. Government development priorities could be diverted to tackling short-term

macroeconomic stabilisation problems and away from addressing longer term climate change and other environmental issues. Policies and public resources to cope with the economic recession may be considered more urgent, with climate change initiatives postponed. With credit tightening, private investment in adaptation and mitigation may not be forthcoming.

This does not have to be the case. Recognising the urgency of tackling both the global economic crisis and the planetary climate crisis, the UN Environment Programme (UNEP) has proposed a "Global Green New Deal". It calls for developed countries to use "green" investment measures (improving energy efficiency, expanding clean energy options, and developing sustainable transport) equivalent to 1% of GDP in the next two years, as a fiscal stimulus. The Deal also calls for developing countries to invest in clean water and sanitation for the poor and to develop well-targeted safety net programs. The Deal is already being backed by many governments.

A number of countries, developed and developing, have included specific "green measures" in their proposed or announced fiscal stimulus packages. Leaders of the G20 at the 2009 London Summit agreed to make the best possible use of investment funded by fiscal stimulus programs toward the goal of building a resilient, sustainable, and green recovery, and to make the transition toward clean, innovative, resource-efficient, low-carbon technologies and infrastructure. Green development plans are already on the agenda in many countries in the region, such as the People's Republic of China, Japan, and Republic of Korea.

In Southeast Asia, fiscal stimulus is also being used by many countries, including Indonesia, Philippines, Singapore, and Thailand, to support domestic demand through tax cuts, investment in infrastructure, and increasing spending on social programs. There may be scope for building into such stimulus packages "green investment" programs that combine adaptation and mitigation measures with efforts to shore up the economy, create jobs, and reduce poverty. The present crisis offers an opportunity to start a transition toward a climate-resilient and low-carbon economy in Southeast Asia. ■

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The full report from Asian Development Bank can be found on their website:
http://www.adb.org/documents/books/economics-climate-change-sea/default.asp