

## Chapter 4

# **Mainstreaming and Financing of Adaptation to Climate Change**

# Mainstreaming and Financing of Adaptation to Climate Change

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## 4.1 Introduction

This chapter builds on our earlier report (Srinivasan 2006), in which we examined the status of international discussions on adaptation to climate change and relevance of various proposals to strengthen the focus on adaptation in the design of the post-2012 climate regime. Based on that analysis, we reported that options for mainstreaming adaptation concerns into development planning and financing of adaptation deserve the highest attention by international climate negotiators and national policymakers in Asia. Here, we examine these issues in detail based on a series of meetings held in 2007.

In February 2007, we organised an expert consultation in Japan on the progress and challenges for mainstreaming adaptation concerns focusing on the two most climate-sensitive sectors in Asia – agriculture and water resources. In stakeholder consultations held in New Delhi (August 2007) and Beijing (September 2007), representatives from both developing and developed countries exchanged views on financing and mainstreaming of adaptation, especially in the context of post-2012 climate regime. In addition, a questionnaire (Appendix C) was posted on the web to ascertain views on priorities and challenges for adaptation.

### 4.1.1 Adaptation – a daunting challenge in Asia

Our consultations from 2005 to 2007 confirmed that adaptation to climate change received limited attention in national environmental policy in Asia, despite high vulnerability and low adaptive capacity of human populations and ecosystems in Asia. Such low priority is partly due to the preoccupation of policymakers in the region with other priorities such as poverty alleviation, sanitation, education and equitable social development. Further, most donors and development agencies are still in the early stages of understanding ways to address adaptation.

For many countries in Asia, adaptation is not an option but a necessity. There is overwhelming evidence that the severity and frequency of weather-related disasters are impacting development in Asia and that climate change is projected to exacerbate such impacts. Further delay in action poses considerable risk in meeting the Millennium Development Goals (MDG) in the region. The Fourth Assessment Report of the IPCC published in 2007 emphasised that the projected impacts would be serious in several sectors in Asia, including agriculture, water, health, and coastal and marine ecosystems (Table 4.1). For instance, sea level rise is expected to threaten the Ganges/Brahmaputra delta and the Mekong delta and displace more than 1 million people in each delta by 2050. Such a large scale displacement of people is not a simple challenge to deal with, and most nations in the region have not yet considered such possibilities in development planning. Likewise, the potential adverse impacts of climate change on onset of monsoons and water flows in major rivers in next 20 to 30 years have not been considered by water resource planners. Recently, the Consultative Group on International Agricultural Research (CGIAR) cited new research that shows climate change could slash

*Despite high vulnerability and low adaptive capacity of human populations and ecosystems in Asia, adaptation to climate change received limited attention in national environmental policy in Asia.*

wheat production by as much as 50% by 2050 - a decrease that could put as many as 200 million people at greater risk of hunger (CGIAR 2007). Indeed climate change poses an additional burden on food security and water availability, especially in areas where agriculture and water resources are already under stress due to adverse meteorological conditions and demand pressures from society. There are similar adverse impacts in other sectors such as energy (power generation capacity and consumption patterns), tourism, forestry (forest fires) and industry. Mainstreaming of adaptation concerns into sectoral planning is, therefore, an immediate priority for Asia.

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**Table 4.1 Key projected impacts of climate change in Asia**

Sector	Projected impacts
Agriculture/ Forestry	<ul style="list-style-type: none"> <li>Increased risk of hunger in South Asia due to 30% decline in cereal yields (266 million Asians may face hunger by 2080)</li> <li>Increase in agricultural water demand by 6-10% or more for every 1°C rise in temperature</li> <li>Decline in net productivity of grasslands and milk yield</li> </ul>
Water	<ul style="list-style-type: none"> <li>Decline in water availability from ~1820 m<sup>3</sup>/yr to ~1140 m<sup>3</sup>/yr in India by 2050; May adversely affect &gt;1 billion people.</li> <li>Decline in annual flow of Mekong river by 16 to 24% by 2050</li> <li>Disappearance of Tibetan Plateau glaciers of &lt;4km length with 3°C rise</li> <li>Shrinkage of area of glaciers by 80% over Tibetan plateau from 500,000 km<sup>2</sup> in 1995 to 100,000 km<sup>2</sup> by the 2030s.</li> <li>Deterioration of water quality due to salt water intrusion</li> <li>Decline in fish larvae abundance in coastal waters</li> </ul>
Health	<ul style="list-style-type: none"> <li>Exacerbation of Cholera in South Asia due to increase in water temperature</li> <li>Increased endemic morbidity and mortality due to diarrhoea all over Asia due to floods and droughts</li> <li>Increase in infectious diseases for livestock</li> </ul>
Coastal/Marine ecosystems	<ul style="list-style-type: none"> <li>Loss of 2500 km<sup>2</sup> mangroves in Asia with 1 m sea level rise;</li> <li>Flooding of Red (5000 km<sup>2</sup>) &amp; Mekong (15-20,000 km<sup>2</sup>) River deltas</li> <li>About 2.6-18.8 million people along the coasts of Southeast Asia may be at risk of flood by 2100</li> <li>Large scale inundation and recession of flat sandy beaches affecting tourism</li> <li>Loss of ~30% of Asia's coral reefs in next 30 years</li> </ul>

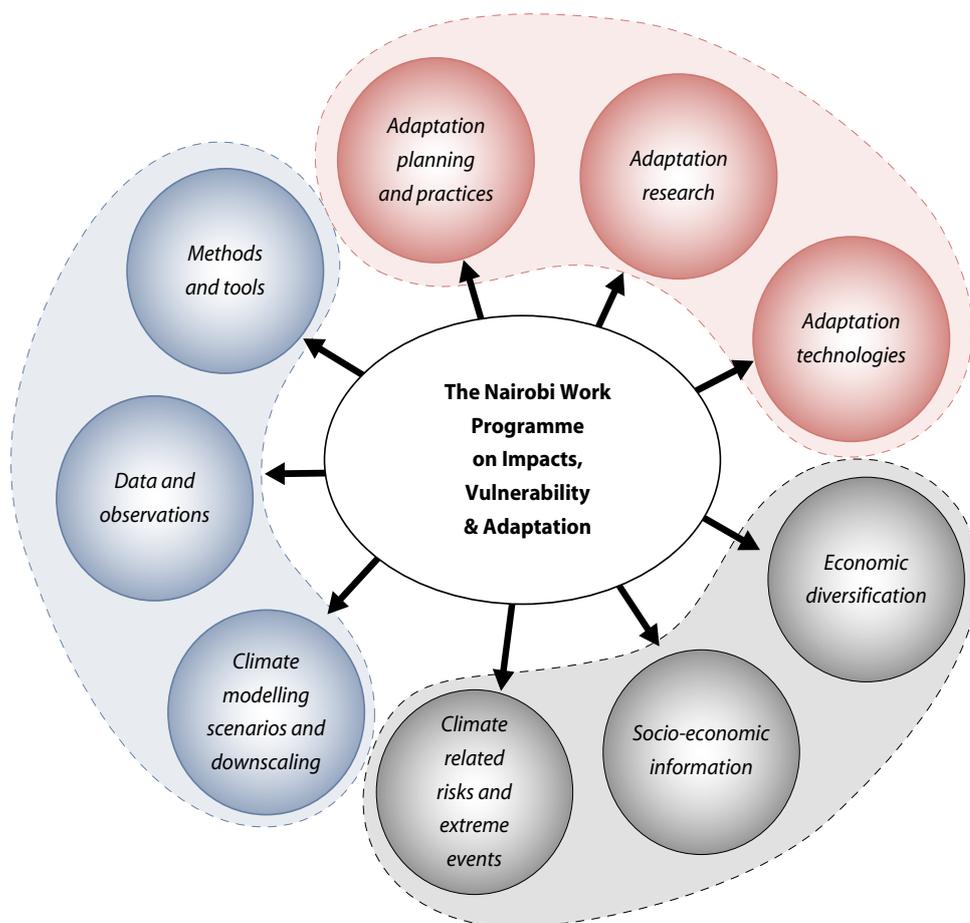
Source: IPCC 2007

At the international level too, adaptation received less attention than mitigation. In 2005, however, COP11 of the UNFCCC adopted a decision (Decision 2/CP.11) to initiate a five-year programme of work of the Subsidiary Body for Scientific and Technological Advice (SBSTA) on impacts, vulnerability and adaptation of climate change with two aims: (a) to assist all Parties, in particular developing countries, including the least developed countries (LDCs) and small island developing states (SIDS), to improve their understanding and assessment of impacts, vulnerability and adaptation, and (b) to make informed decisions on practical adaptation actions and measures to respond to climate change on a sound, scientific, technical and socio-economic basis, taking into account current and future climate change and variability (UNFCCC 2005). The programme was renamed the "Nairobi Work Programme on Impacts, Vulnerability and Adaptation (NWP)" in 2006. The NWP covers nine areas (Figure 4.1) but actions initiated under this programme have been limited to date in Asia.

*Design and implementation of adaptation policies are more challenging than those of GHG mitigation for several reasons.*

It should be noted that design and implementation of adaptation policies are more challenging than those of Greenhouse Gas (GHG) mitigation for several reasons. First, mitigation policies are largely similar and have precedents to follow in terms of improving energy efficiency, promoting renewable energy, transforming transportation modes and fuels, etc. However, adaptation policies are largely unique and site-specific, hence they require more local adjustments. Second, mitigation is relatively limited in focus involving mainly energy-related sectors. Adaptation, on the other hand,

**Figure 4.1 Nine components of the Nairobi Work Programme**



***Adaptation has a much broader focus involving nearly all sectors of the economy, hence more sectoral integration and greater authority would be necessary for implementation of adaptation policies.***

has a much broader focus involving nearly all sectors of the economy, hence more sectoral integration and greater authority would be necessary for implementation of adaptation policies. Third, the prospects for failure with adaptation policies are high as implementation of such policies involves several stakeholders and broad mandates, including national development planning and implementation. In contrast, prospects for the success of mitigation policies are high. Finally, since the entry into force of the UNFCCC in 1994, much progress in mitigation policies was evident in both developing and developed countries. On the other hand, due to limited attention to adaptation for a long time, progress in adaptation policy design and implementation was limited even in developed countries. It is worth noting, however, policies to address climate variability, not climate change, have been in place in many countries and can be a good foundation for policies on adaptation to climate change.

## **4.2 Mainstreaming Adaptation Concerns into Development Planning in Asia**

The need for mainstreaming adaptation strategies into national development plans has been long recognised in the UNFCCC. Borrowing the UNFCCC Article 2 language, Ian Tellum of the Netherlands Climate Change Studies Assistance Programme defined “mainstreaming adaptation” as “the process of bringing adjustments in ecological, social or economic systems into the common current of thought in society in response to expected climate impacts, to ensure that food production is not threatened and to

enable economic development to proceed in a sustainable manner” (Tellum 2003). In simple terms, mainstreaming is understood as integrating adaptation policies and measures in ongoing development planning and sectoral decision making. However, such integration cannot be a one time event as adaptation is a dynamic and multi-dimensional process (Hay et al. 2004).

There are many benefits of mainstreaming adaptation concerns into development planning and assistance. Mainstreaming ensures that current projects are no longer at risk from climate change and do not contribute to aggravating the vulnerability of local communities. It also ensures that future projects are consciously aimed at reducing vulnerability and enhancing adaptive capacity towards a climate-resilient development. For example, a water management policy which integrates adaptation concerns would ideally ensure water rights to groups exposed to water scarcity during drought. Mainstreaming thus entails making more efficient and effective use of financial and human resources rather than designing, implementing and managing adaptation policy separately from ongoing activities, and it is aimed to ensure the long-term sustainability of investments as well as to reduce the sensitivity of development activities to both today’s and tomorrow’s climate (Klein 2002, Huq et al. 2003, Agrawala et al. 2005). Effective mainstreaming would avoid any mal-adaptations and ensure consistency between the needs of poverty eradication and adaptation to climate change.

Since climate change has already evolved from merely an environmental issue to a developmental issue (especially because the adverse impacts of climate change can nullify the developmental progress), several policy researchers and development practitioners in Asia have argued for mainstreaming adaptation into development planning and sectoral decision making. The link between adaptation and development becomes particularly relevant in mainstreaming adaptation concerns into official development assistance (ODA).

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#### **4.2.1 Modalities for mainstreaming**

Participating stakeholders discussed various entry points for mainstreaming adaptation concerns into development planning and suggested that policymakers could incorporate adaptation concerns and their linkages with development initially in national communications to the UNFCCC, national adaptation programmes of action (NAPAs), national adaptation policy frameworks, poverty reduction strategy papers (PRSPs), national environmental action plans (NEAPs), MDG achievement plans, national agricultural policy documents, national water policy documents, etc. However, mere incorporation of adaptation concerns into such documents is in itself inadequate. Effective mainstreaming cannot be complete until suitable strategies in light of current and future impacts of climate change in a given sector are designed and implemented on the ground. The development of a national strategy that duly considers (a) local and sub-national adaptation needs, (b) current developmental policies and programmes, (c) stakeholder concerns and (d) technological solutions based on local experiences could be the first step toward mainstreaming adaptation concerns into development planning.

Integration of adaptation concerns can be done at various levels (local, sub-national, national, regional and international) using different approaches. Top-down approaches for mainstreaming include, for example, expanded irrigation systems and development of

drought-resistant crop varieties, while bottom-up approaches may include community-based water harvesting or allocation systems decided at the local level. Likewise, mainstreaming can be done at the policy level (e.g. national land use systems and integrated water management policies that fully consider current and future impacts of climate change) or at the operational level (e.g. location and design of bridges, reservoirs and hydropower facilities). Both traditional and modern approaches can be employed for mainstreaming. In a traditional approach, if an area is likely to experience more intense rainfall events due to climate change, water managers may change the drainage systems by replacing old small pipes with bigger pipes. In a modern approach, however, a mainstreamed adaptation strategy includes measures that address the underlying sources of vulnerability to climate change, particularly at the local level.

Some participants stated that mainstreaming adaptation concerns at the community level should pay attention to four areas, namely assessment, planning, implementation, and dissemination. In terms of implementation, collaboration with local extension services was considered important. The need for community-based monitoring and evaluation, and the importance of participation and transparency in the process was also regarded as important.

#### **4.2.2 Progress on mainstreaming in Asia**

*All national communications in Asia submitted to date mainly focus on GHG inventories and mitigation, with very limited attention to adaptation policies and measures.*

All national communications in Asia submitted to date mainly focus on GHG inventories and mitigation, with very limited attention to adaptation policies and measures (Srinivasan 2006). The limited focus on adaptation in China's and India's initial national communications, for example, was attributed to limited availability of relevant data and limitations of models in assessing sectoral impacts at the sub-national level. Such low attention to adaptation due to limitation of data and methodological capability was not only in developing Asia but also in developed countries (Gagnon-Lebrun and Agrawala 2006). For example, in Japan's 314-page 4<sup>th</sup> national communication, only half a page was devoted to adaptation policies. Likewise, Singapore, which is a relatively well-developed nation in economic terms but one of the most vulnerable to impacts of sea level rise, mentioned adaptation concerns in only one line out of its 75-page national communication. In some Asian Least Developed Countries (LDCs) such as Bangladesh, however, NAPA process seems to have served as a catalyst in mainstreaming adaptation concerns at least in planning stages. Several Asian countries plan to expand the coverage on impacts and adaptation assessments in their second national communications to the UNFCCC.

Insofar as mainstreaming adaptation concerns into development assistance is concerned, the OECD development and environment ministers recently made a declaration to integrate adaptation into development cooperation both within OECD and its partner countries (OECD 2006). Development agencies such as the World Bank, Asian Development Bank (ADB) and bilateral cooperation agencies such as Japan International Cooperation Agency (JICA), Department for International Development (DFID), Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) and others have begun to mainstream adaptation in their operations but progress is far from adequate (Klein et al. 2007). For example, JICA's efforts in mainstreaming climate concerns in various sectors through its ODA included reviewing conventional assistance and listing past projects which had adaptation benefits but were not implemented as "adaptation projects." In

2003, ADB published a report on mainstreaming adaptation concerns in ADB operations (ADB 2003), but the extent to which ADB investments in the region were climate-proofed through such guidelines remains unclear. Based on a survey of 26 bilateral and 10 multilateral donor agencies, Gigli and Agrawala (2007) concluded that international donors made significant progress in recognizing the importance of climate risks in their development co-operation policies, but translating such concerns into operational practices remains a difficult challenge.

Assessment of the progress on mainstreaming adaptation concerns in agriculture and water sectors in developing Asia, as part of the expert consultation held in February 2007, showed that several national agricultural policy documents of Asian countries referred to the need for considering climate variability but did not consider the long-term climate change explicitly. Indeed, the 18-country dialogue on water and climate conducted in 2003 revealed that water managers showed little enthusiasm for factoring long-term climate predictions into their calculations (Water and Climate 2003). Similarly, an analysis of water policy frameworks of four Annex I (Canada, Finland, UK and USA) and four non-Annex I (Argentina, India, Mexico and Zimbabwe) countries in 2006 showed that most of the frameworks did not incorporate climate change adaptation explicitly, although policy frameworks of Annex I countries were considered to provide a strong foundation for adaptation planning while those of non-Annex I were considered less mature, with weaker institutions and less capacity to provide a basis for adaptation (Levina 2006, Levina and Adams 2006).

The assessment of progress on mainstreaming adaptation in agriculture and water sectors of Bangladesh, China, India and the Philippines confirmed that much more needs to be done to integrate adaptation concerns into sectoral development planning. In Bangladesh, efforts to integrate adaptation concerns into agricultural research were evident but not in extension (Huq et al. 2003). In the water resource sector, managers committed to incorporate adaptation into existing plans but it remains to be seen if such commitments would necessarily lead to implementation on the ground. In China, the impacts of climate change were well-studied and several water conservation measures were developed. However, future climate change impacts are not yet integrated into sectoral development plans in both sectors. Further, information on priorities for adaptation in different regions was lacking. It is encouraging to note, however, some cross-sectoral studies on adaptation in various sub-regions of China are being planned recently.

In India too, the national agricultural policy contained many references to measures such as enhancing drought and salinity resistance in crops to cope with droughts and sea level intrusion respectively, and water conservation measures such as rainwater harvesting. However, there was no explicit reference to climate change adaptation. Likewise, the national water policy, which was formulated in 1987 and revised in 2002, contained many references to water use efficiency and integrated watershed management. However, no explicit references to adaptation were available. Further, the legal provisions on water were dispersed across various acts and there was no explicit legal framework for water extraction rights or water trading (Sharma 2006, Sharma and McCornick 2006). An expert committee on climate change impacts was established in India in 2007, however, to identify necessary adaptation measures and provide guidelines for mainstreaming adaptation concerns in development planning in target areas. In addition, as part of the

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second national communications, integrated inter-sectoral adaptation assessments are planned to be conducted in several climate hotspots.

In the Philippines, many water conservation and flood prevention efforts were taken at both the national and local levels. However, climate change was not the primary motive for such measures. A few measures considered historical climate but they are not necessarily suitable for coping with future impacts of climate change.

#### **4.2.3 Barriers to mainstreaming**

Participants at our consultations and respondents to the questionnaire identified many barriers to mainstreaming adaptation concerns in Asia including information (communication and coordination) barriers, institutional barriers, stakeholder participation-related barriers and the lack of suitable incentives and resources. Some of the barriers, such as lack of clarity in adaptation policy guidance and lack of incentives and adequate resources, are applicable to the entire region. Others, such as inadequate institutional structures, are applicable to specific countries or sub-regions. Some Chinese participants, for example, listed barriers such as establishing effective partnerships with local agencies, designing acceptable approaches that are in line with China's sustainability goals and national development plans, applying participatory integrated approaches and developing acceptable monitoring and verification protocols for use within a Chinese context. In Indonesia too, the barriers related to institutions, incentives and instruments were considered significant in mainstreaming adaptation concerns in agriculture and forestry sectors (Herawati et al. 2006).

Among the various information-related barriers, the lack of awareness among sectoral policymakers about adverse economic implications of specific impacts of climate change at the local level was considered the biggest bottleneck. Nearly 43% of respondents to our questionnaire identified it as a significant barrier. The mismatch between the temporal and spatial scales of projections of climate change and information needs of various sectors was considered the second biggest barrier (25% respondents). Participants pointed out that very few climate models can predict rainfall patterns in many Asian ecosystems with certainty or on timescales relevant to decision-making. The dearth of policy-relevant climate information was especially severe in mountain ecosystems of South Asia, SIDS in the Pacific, and coastal ecosystems of Southeast Asia, which are among the most vulnerable to impacts of climate change.

Insofar as institutional barriers are concerned, inadequate human and institutional capacities to integrate information on adaptation into sectoral planning, and weak coordination among agencies responsible for development planning were identified as the most important barriers. In many Asian countries, the environment ministries, which are usually the focal points on climate change issues, have limited leverage over agriculture and water management agencies and their policies. The parallel evolution of policies in different sectors without a holistic view of the vulnerabilities and impacts also slowed progress in integrating adaptation concerns.

The over-reliance of both national planners and development assistance agencies on structural and technological options which are inflexible and often insensitive to the local contexts and are technologically and financially demanding was also considered a

*The establishment of a cohesive institutional framework for implementing adaptation strategies was considered a main challenge in many Asian countries.*

*Inadequate human and institutional capacities to integrate information on adaptation into sectoral planning, and weak coordination among agencies responsible for development planning were identified as the most important barriers.*

major barrier. An assessment of adaptation priorities using an analytic hierarchy process (AHP) method in Heihe river basin of northwest China, for example, confirmed that the feasibility of adopting technical and engineering adaptation practices was relatively low due to difficulties in obtaining financial support. On the contrary, water conserving practices such as adjustments in cropping patterns and cultivation methods were more feasible because of their relatively small capital requirements (Yin et al. 2008).

Inefficient regulatory frameworks, insufficient means to consider interests of local stakeholders, institutional fragmentation and resulting communication barriers, and the lack of policy coherence and consistency between adaptation and development goals are other major barriers. In Bangladesh, for example, the ADB-supported Sunderbans' restoration project was originally aimed at improving adaptive capacity of the region but some components of the project in fact led to an increased vulnerability of local populations (Aslam, H., personal communication).

The lack of suitable incentives for individuals and organisations to realise effective mainstreaming was considered especially serious in Asian LDCs, where many national meteorological services do not have adequate incentives and are not mandated to provide agriculture and water sectors with the full range of services they need. In LDCs and SIDS, the so called "mainstreaming fatigue" was considered a barrier as there was a lack of adequate recognition of challenges in mainstreaming.

*Practical demonstrations on promising mainstreaming options, capacity strengthening and streamlining of financial mechanisms are crucial to make further progress.*

#### **4.2.4 Potential countermeasures**

Participants suggested that practical demonstrations of promising mainstreaming options, capacity strengthening and streamlining financial mechanisms are crucial to make further progress. Some respondents to the questionnaire pointed out that discussions on mainstreaming were so far mainly confined to elaborating pure theoretical and conceptual approaches rather than practical demonstrations. The Kiribati National Adaptation programme supported by the World Bank (Bettencourt et al. 2005) could be a good model for mainstreaming adaptation concerns at the national level for several countries, especially SIDS, and other developing countries where administrative mechanisms are not complex (Exhibit 1). Likewise, the initiative of China's Ministry of Science and Technology to develop a national adaptation policy framework, which sets out roles and responsibilities for different levels of governments as well as the private sector in order to streamline responsibilities among different institutions, can be a good model to emulate in other countries. The preparation of a NAPA type document in all Asian countries may also help in determining adaptation priorities and suitable means to mainstream such concerns in development planning.

In many critical ecosystems in Asia, detailed vulnerability and adaptation assessments have not been completed due to data limitations. Building support for such assessments through strengthening institutional frameworks and human capacities was considered a first step to move forward. Participants suggested that information on the current and future impacts of climate change and associated adaptation measures (both content and manner of delivery) should be customised to fit local conditions and needs of the decision makers, and discussed in the developmental context rather than the environmental context (IDS 2006). Framing adaptation issues in the context of policy making, and raising awareness of local impacts and coping strategies were considered

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the most important to support mainstreaming efforts at the national level by a significant number of respondents to the questionnaire (41% each).

**Exhibit 1 Five steps in mainstreaming of adaptation into national development planning – A case study from Kiribati**

Step 1: National consultations on vulnerability and adaptation including social assessment of perceived climate changes in priority sectors
Step 2: Prioritisation of hazards & adaptations at the local and island level
Step 3: Ranking adaptations (managerial, infrastructure & policy) A – Urgent adaptations which can be done by communities B – Urgent adaptations for which communities need assistance from the national government C – Adaptations that are less important/urgent D – Adaptations that are not yet needed
Step 4: Allocating responsibilities of B type actions to national agencies and assessing the changes necessary <ul style="list-style-type: none"> <li>• Changes to national policies and strategies</li> <li>• Changes to laws and regulations or enforcement</li> <li>• Formal engineering and construction works</li> <li>• Informal engineering and construction works by households and communities</li> <li>• Extension and information to countries, provinces &amp; communities</li> </ul>
Step 5: Matching adaptation priorities with operational plans of different agencies

Source: Bettencourt et al. 2005

*Generating easily accessible and timely climate risk information based on good interpretation and communicating the economic case for various adaptation options are crucial to achieve effective mainstreaming and climate-resilient development.*

The importance of creating an effective knowledge management system, comprising case study databases, toolkits (e.g. Community-based Risk Screening Tool - Adaptation and Livelihoods (CRYSTAL)), socio-economic information and appropriate policy options, to raise awareness of the local impacts and coping strategies among politicians and high level policymakers at various levels was emphasised (Klein et al. 2007). Participants stressed the need for generating easily accessible and timely climate risk information based on good interpretation and for improving the relevance of scientific outputs to decision-making through improving (a) communications between scientists and policymakers and (b) information delivery methods. Nearly 56% of respondents to the questionnaire suggested that communicating the economic case for various adaptation options was the most important. Many participants stressed the need for capacity building and information sharing at all levels, particularly at the local community level. Indeed, the relative success of mainstreaming environmental concerns in Sri Lanka's Poverty Reduction Strategy Paper (PRSP), including those related to climate change, was attributed to effective involvement of informed communities in the implementation of the poverty reduction strategies (IDS 2006).

Some participants stressed that policy harmonisation, inter-agency collaboration, and stakeholder involvement are crucial to achieve effective mainstreaming and climate-resilient development. For effective communication and coordination, participants called for bridging information gaps between different stakeholders, linking the science community to the policy community and clarifying the roles of each agency in mainstreaming efforts. Participants stressed that both vertical links (central government ministries – provinces – districts and local institutions) and horizontal links (all relevant ministries besides the ministry of environment) should be promoted. Nearly 53% of respondents to the questionnaire suggested that fostering institutional linkages and coordination at the national level was the most important element for effective mainstreaming of adaptation concerns.

The need for improved coordination among sectoral data providers to enhance harmonisation and consistency of data was also suggested. In order to improve

technical capacity for mainstreaming in the region, a region-wide adaptation facility may be established by ADB or other regional organisations. In this connection, the role of research institutions is especially important in improving decision making (under uncertainty), particularly in sensitive sectors such as agriculture and water. Other suggestions to improve institutional aspects of mainstreaming include the following:

- (a) Managing adaptation plans by a ministry or agency with a high level of leverage so that institutional linkages and coordination can be fostered
- (b) Encouraging the private sector to mainstream adaptation concerns in various operations
- (c) Ensuring a coherent approach to mainstreaming through regular and broader engagement of stakeholders at various levels
- (d) Building “boundary institutions” which can help to bring information on implications of climate change for sectoral planning and decision making

In order to promote mainstreaming, participants suggested that national meteorological services in Asian countries should be strengthened and reoriented to provide policy-relevant information regarding adaptation and sustainable development. In addition, legal provisions to mainstream adaptation concerns into management choices could be promoted. For example, standard environmental impact assessments (EIA) often consider the impacts of the potential project on the environment. In the future, the EIA should include a section to discuss how current and future impacts of climate change can affect the sustainability of the project itself. At the national level, a high level committee to look into climate proofing of various domestic investments can also be a good way to mainstream climate change concerns into infrastructure planning.

Donor agencies could facilitate adaptation mainstreaming by screening their project portfolio for potential mal-adaptations, and by creating an effective enabling environment for mainstreaming through (a) development of operational guidelines, (b) provision of additional support for monitoring and evaluation of mainstreaming approaches, and (c) enhancing the technical skills for mainstreaming at sectoral level. A study based on DFID aid portfolio in Bangladesh found that vulnerability assessments at the local level are crucial to facilitate mainstreaming adaptation in ODA (Tanner et al. 2007). Among respondents to our questionnaire, nearly 41% noted that developed countries should take a lead in supporting mainstreaming efforts through both reorienting ODA and providing technical skills. Likewise, a significant number of respondents (38%) stressed the need for regional and international capacity building initiatives on mainstreaming.

The UNFCCC and other international organisations can play a catalytic role in exchange of experiences, and in facilitating the development of region-wide and sector-wide approaches for mainstreaming. A majority of participants to the questionnaire (59%) noted that the future climate regime discussions could help mainstreaming efforts by focusing on (a) guidance to development agencies to preferentially support mainstreaming, (b) guidance to policymakers on inter-agency coordination and mainstreaming at national level, and (c) capacity building on mainstreaming options in critical sectors.

***National meteorological services in Asian countries should be strengthened and reoriented to provide policy-relevant information regarding adaptation.***

***The UNFCCC and other international organisations can play a catalytic role in exchange of experiences, and in facilitating the development of region-wide and sector-wide approaches for mainstreaming.***

***Widening the base of adaptation funds, capacity building for prioritisation of adaptation actions and research support for adaptation assessments were the three most important priorities.***

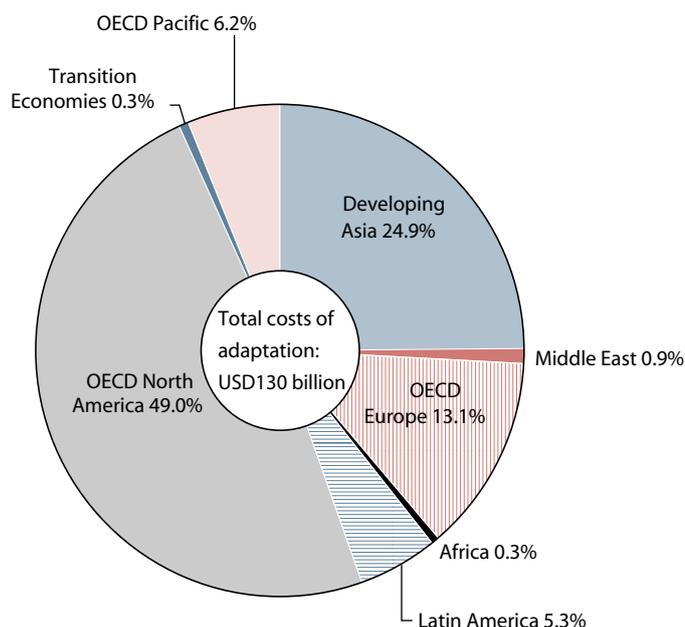
### 4.3 Adaptation Financing

Adaptation funding has become a major topic in international climate negotiations. The majority of respondents to our questionnaire confirmed that widening the base of adaptation funds, capacity building for prioritisation of adaptation actions and research support for adaptation assessments were the three most important priorities. Furthermore, it was repeatedly pointed out in our consultations that progress in discussions on mitigation targets would be nearly impossible without progress in other areas including adaptation. Finding appropriate means to fund adaptation efforts, therefore, is an important challenge for the global community to encourage effective participation of developing countries in the future climate regime. As climate change proceeds, the costs of impacts and the demand for adaptation funds by developing countries are bound to increase.

The costs of impacts of climate change are difficult to estimate, as there are both direct and hidden costs. Most often, hidden costs are rarely computed. The direct costs for example, include loss in crop production due to altered precipitation patterns; loss in forest production due to increased risks of forest fires; damage to infrastructure due to increased frequency and intensity of extreme events; evacuation costs due to storms, cyclones and landslides; heat-related hospitalisations; cost of upgrades to the drinking and wastewater infrastructures from sea level rise; drops in tourism revenue and industrial production, etc. Hidden costs may include the replacement value of infrastructure; costs of re-routing traffic, workdays and productivity lost; costs of provision of temporary shelter and supplies; potential relocation and retraining costs; costs on insurance, banking and investment; threats to national security, etc. Both direct and hidden costs often vary under different national circumstances, hence it is only possible to get very rough estimates.

The cost of climate change impacts was estimated at 5-20% of global GDP annually in the absence of adaptation (Stern 2006). The World Bank estimated that up to 10% of domestic and foreign direct investment (FDI) flows in developing countries, and up to 40% of ODA and concessionary finance might be at risk from climate-related damages (World Bank 2006). Therefore, cost-effective and timely adaptation strategies that are fully compatible with development objectives are crucial, otherwise communities and countries will be forced to implement reactive unplanned adaptations, which will prove much more costly. For example, infrastructure investments, which have long lifetimes of over 25 or 50 years, are particularly at risk if projected impacts of climate change are not taken into account in project design. The Stern Review estimated that additional costs of adapting infrastructure and buildings may amount to 1-10% of the total costs invested in construction in OECD countries, which could range anywhere from USD 15 to 150 billion annually (Stern 2006). Considering the fact that much of the infrastructure built to date did not consider impacts of climate change in its design, and that new infrastructure necessary to support development in Asia is enormous, the total costs "climate proofing" would obviously be large. The regional breakdown of projected adaptation costs in 2030 shows that a quarter of global costs of adaptation will fall on developing Asia (UNFCCC 2007, Figure 4.2).

**Figure 4.2 Regional breakdown of projected adaptation costs in 2030**



Source: UNFCCC 2007

Adaptation, however, should not be seen merely as an additional cost as it may bring new jobs and markets for innovative products (e.g. climate-proofing materials) and services (e.g. insurance options). The IPCC (2007) reported several examples where the benefits of adaptation often exceed the costs by several orders of magnitude. For example, the benefits of adaptation to climate change in the Pearl River Delta in China were estimated to be as high as USD 5 billion while the costs were estimated to be about USD 400 million (Hay and Mimura 2005).

As discussed in our earlier report (Srinivasan 2006 p. 82-84), financing adaptation to climate change is an enormous challenge because of the significant gaps between the estimated costs and the limited funds available through the current climate regime. Table 4.2 summarises the costs of impacts and adaptation estimated by various agencies. It shows that the annual costs of adaptation run into several billions of dollars per year. On the other hand, Table 4.3 shows the limited availability of funds under four categories – Least Developed Countries Fund (LDC Fund), Special Climate Change Fund (SCCF), Special Priority on Adaptation (SPA) Fund of the Global Environmental Facility (GEF), and Adaptation Fund. Both the LDC fund and SCCF are based on voluntary contributions from a few developed countries. The LDC fund is mainly to support preparation of NAPAs and implementation of priority actions identified in NAPAs. Several LDCs in the Asia-Pacific region submitted NAPAs with estimated costs of implementing priority adaptation actions (Table 4.4). As of May 2007, six projects were approved under the SCCF adaptation programme with a grant of about USD 25.17 million and with expected co-financing of USD 92.67 million. The SPA approved 10 pilot and demonstration adaptation projects with core SPA funds of USD 25 million and co-financing of USD 62.81 million (Levina 2007). An additional USD 5 million was allocated under the SPA to support community-based adaptation projects in 10 countries including Bangladesh, Samoa and Viet Nam. It is important to note that SPA funds were meant to be fully allocated during the period from 2004 to 2007 but some funds remain unspent.

*Adaptation should not be seen merely as an additional cost as it may bring new economic opportunities including jobs and markets for innovative products (e.g. climate-proofing materials) and services (e.g. insurance options).*

*An additional USD 5 million was allocated under the SPA to support community-based adaptation projects in 10 countries including Bangladesh, Samoa and Viet Nam.*

**Table 4.2 (a) Estimates of costs of climate impacts**

Estimates (US\$ billion/year)	Remarks	Reference
160-330	Current global losses	UNFCCC (2007)
850-1,350	Global losses in 2030 (1.0-1.5% of world GDP)	UNFCCC (2007)
40	Costs in developing countries • 0.5% of developing country GDP • Could range a few billion to US\$ 100 billion	World Bank (2006)
0.5-1.5% of world GDP	• Based on a 2 °C increase in global mean temperature • A 4 °C increase in global mean temperature could cause 1-6% loss of world GDP	Stern Review (2006)

**Table 4.2 (b) Estimates of costs of adaptation**

Estimates (US\$ billion/year)	Remarks	Reference
>50	Total costs in developing countries • US\$ 7.5 billion/year by scaling up NGO community-based initiatives • US\$ 8-33 billion/year by scaling up urgent and immediate adaptation needs described in NAPAs • Other hidden costs (no estimates provided)	Oxfam International (2007)
49-171	Global costs in 2030	UNFCCC (2007)
28-67	Costs in non-Annex I parties in 2030 • US\$ 7 billion for agriculture, forestry and fisheries sector • US\$ 9 billion for water supply sector • US\$ 5 billion associated with human health • US\$ 5 billion in coastal zones • US\$ 2-41 billion related to infrastructure	
50-170	Additional investment in 2030	Smith (2007)
1.9-32.4	In developing Asia in 2030	UNFCCC (2007)
50-100		FT (2007)
100		Christian Aid (2007)
9-41	Total costs for "climate proofing" investments in developing countries • US\$ 4-8 billion to climate-proof ODA and concessionary finance • US\$ 2-3 billion to climate-proof FDI • US\$ 3-30 billion to climate-proof Gross Domestic Investment	World Bank (2006)
15-150	Costs of making new infrastructure and building resilient to climate change in OECD	Stern Review (2006)

**Table 4.3 Funds available for supporting adaptation efforts under the current climate regime as of April 2007**

Name of the fund	Total funds mobilised (USD in million)	Unpaid contributions and pledges (USD in million)	Cumulative funds collected (USD in million)
1. Special Climate Change Fund (SCCF)	62.1	9.1	53.0
2. Least Developed Countries Fund (LDC Fund)	115.8	53.6	62.2
3. Strategic Priority on Adaptation* (SPA; from GEF Trust Funds)	50.0	-	50.0
4. Adaptation Fund (2% proceeds from CDM)	450 by 2012 (best estimate)		

\* Co-financing for adaptation projects supported through SPA was USD 68.27 million.

**Table 4.4 Costs of priority activities of adaptation, compiled from NAPAs of selected LDCs in Asia**

Country	Adaptation measure	Cost (million USD)
Bangladesh	Construction of flood shelter, and information and assistance centre to cope with enhanced recurrent floods in major floodplains	5.00
	Enhancing resilience of urban infrastructure and industries to impacts of climate change	2.00
	Promoting adaptation to coastal crop agriculture to combat increased salinity	6.50
	Adaptation to fisheries in areas prone to enhanced flooding in North East and Central Region through adaptive and diversified fish culture practices	4.50
Bhutan	Landslide management and flood prevention	0.89
	Weather forecasting system to serve farmers and agriculture	0.42
	Flood protection of downstream industrial & agricultural area	0.45
	Rainwater harvesting	0.90
Cambodia	Rehabilitation of upper Mekong and provincial waterways to reduce risks caused by floods, improve fishery resources, supply sufficient water for irrigation and domestic uses	30.00
	Vegetation planning for flood and windstorm protection	4.00
	Development and improvement of community irrigation systems	45.00
	Community mangrove restoration and sustainable use of natural resources	1.00
Samoa	Reforestation, rehabilitation and community forestry fire prevention project	0.42
	Climate early warning system project to implement effective early warning systems and emergency response measures to climate and extreme events	4.50
	Implement coastal infrastructure management plans for highly vulnerable districts project	0.45
	Sustainable tourism that take into account climate change and climate variability	0.25
Tuvalu	Increasing resilience of coastal areas and settlement to climate change	1.90
	Increasing subsistence pit-grown pulaka productivity through introduction of a salt-tolerant pulaka species	2.20
	Adaptation to frequent water shortages through increasing household water capacity, water collection accessories and water conservation techniques	2.70

Source: UNFCCC 2007

The Adaptation Fund, which is primarily through a 2% share of the proceeds on CDM transactions, has yet to become operational, although an agreement on management of the fund was reached at the COP/MOP3 held in Bali, Indonesia in December 2007. The decision to establish an independent Adaptation Fund Board – with members selected by and under the direct authority of the COP/MOP – may be significant for at least two reasons. First, developing countries would be given direct access to the Fund, without having to go through ‘implementing agencies’ such as the World Bank, UNDP, or UNEP. Second, the Adaptation Fund Board will be a new operating entity to be based at UNFCCC in Bonn, and it would be independent of the GEF. However, the GEF Secretariat would provide secretarial services while the World Bank would serve as a trustee during the first three years. The management of the fund will be reviewed every three years.

The lack of clarity on the scope of adaptation, the complexity of procedures to access available funds as well as the limited experience of countries in implementing cost-

*The decision to establish an independent Adaptation Fund Board – with members selected by and under the direct authority of the COP/MOP – may be significant for at least two reasons.*

***It is now widely agreed that international climate regime alone cannot raise sufficient funds for adaptation and that other mechanisms outside the regime should be explored.***

***The mechanisms and allocation principles for adaptation financing should be fair, equitable, politically feasible, and have a potential to raise sufficient amount of funds that would meet adaptation needs of developing countries.***

effective adaptation strategies pose additional challenges. It is now widely agreed, however, that international climate regime alone cannot raise sufficient funds for adaptation and that other mechanisms outside the regime, including bilateral and multilateral development assistance, insurance and risk transfer instruments, loans and grants by international financial institutions, should be explored while ensuring synergies with these mechanisms as much as possible.

The need to explore synergies between adaptation, disaster risk management and development was consistently discussed during our consultations, although some participants pointed out that putting too much emphasis on synergies might exclude more promising adaptation options. Many projects supported by ODA are considered to reduce vulnerability and enhance adaptive capacity. It should be noted, however, that most of such projects do not explicitly consider impacts of climate change in their design and implementation.

International financial institutions have begun to allocate additional funds for adaptation recently. For example, following directions from the G8 Gleneagles Process, the World Bank recently launched the Clean Energy Investment Framework (CEIF), with adaptation as one of its three pillars. The CEIF is expected to generate up to an additional USD 12 billion annually from the private sector and official agencies. Nearly 40 projects in 30 countries are in progress and it is expected that grant funding for adaptation projects would increase from USD 5 million in 2006-2007 to USD 60 million in 2008-2009. In addition, about USD 550 million is expected to be leveraged through International Bank for Reconstruction and Development (IBRD), International Development Association (IDA) and other funding (World Bank 2007). A new "Environmental Transformation Fund" to which nearly 800 million GBP was committed to date would also support adaptation efforts partly but the mechanisms for allocating this money are not yet designed (Radcliffe, D., personal communication). In Asia, ADB has also begun the Clean Energy Program under which it expects to support some adaptation initiatives.

A few other initiatives such as the Global Index Reinsurance Facility (GIRIF) of the International Finance Corporation, the Global Facility for Disaster Reduction and Recovery (GFDRR) of the World Bank, and the International Strategy for Disaster Reduction Asia & Pacific (ISDR-AP) may also be utilised to fund adaptation efforts indirectly. It is important, therefore, to develop synergies between financial instruments available through the UNFCCC and the Kyoto protocol, and those available under non-UNFCCC mechanisms. Initiatives to proactively involve the business sector, especially the insurance sector, in adaptation at both the international and national levels are also necessary.

#### ***4.3.1 Burden sharing principles for adaptation financing***

Burden sharing principles are the most important considerations in designing an adaptation financing mechanism. Our earlier assessment suggested that most of the proposals were based on historical responsibility or the "polluter pays principle" and the ability to pay. Stakeholders at our consultations stressed that the financing mechanisms and allocation principles (basic rules of financial obligations for adaptation) should be fair, equitable, politically feasible, and have the potential to raise sufficient amount of funds that would meet adaptation needs of developing countries. In our stakeholder consultations, we used the above criteria to assess four allocation principles: adaptation

beneficiaries pay principle, emitters pay principle, ability to pay principle, and climate-change winners pay principle (Farber 2007).

#### **4.3.1.1 Adaptation beneficiaries pay principle**

Under this principle, beneficiaries of adaptation policies and measures bear the costs. Indeed this is the basic rule that governs the trading of private goods. In daily life, an individual pays for goods because he/she is the beneficiary of the services that the goods provide. The principle is also justified in the case of public goods if they have natures usually attributed to private goods. Examples include public transportation, education, health services and parks, among others. Although adaptation projects have a public goods nature, the benefits of such projects typically accrue to local residents and therefore can be considered as having private benefits. This could form the basis of using beneficiaries pay principle as a burden sharing rule. However, the principle has serious problems from the point of equity, because the most vulnerable and poor sections of the communities in all nations and poor countries in the world suffer the most from impacts of climate change although they contribute the least to the problem.

In the context of burden sharing, equity can be assessed by historical responsibility and ability to pay (Oxfam International 2007). Table 4.5 lists per capita GDP in 2004 and per capita historical CO<sub>2</sub> emissions over a 12-year period following the adoption of the UNFCCC in 1992 for various countries in Asia. The table shows that most Asian countries are not historically responsible for climate change, as these countries typically have average per capita emissions of less than 1 ton, which are far less than the average emissions of developed countries such as the US, Japan, EU, or even the global average (4.18 tons). Therefore, under the beneficiaries pay principle, the burden tends to fall onto the countries that are not historically responsible for climate change. Similarly, in terms of ability, the developing countries with low per capita GDP in 2004 and are tend to bear a greater burden compared to their ability.

In international negotiations, developing countries repeatedly insisted that the costs of adaptation should be borne by developed countries based on historical responsibility and ability to pay. A large number of respondents to the IGES questionnaire also suggested that historical responsibility (determined on the basis of cumulative emissions) and ability to pay should be the basic principles for sharing of adaptation costs. In view of this, burden sharing rules strictly based on the beneficiaries pay principle are unlikely to be institutionalised in the post-2012 climate regime. Nonetheless, it is important to note that some developing countries, which are growing rapidly and contributing GHG emissions, are likely to be held responsible in future for bearing adaptation costs of the other developing countries such as LDCs and SIDS. In general, a more politically controversial task would be to divide countries into two groups, the countries that need to bear the costs of their adaptation and the countries to which other principles will be applied. In Asia, there are a few countries that already have sufficiently high incomes such as Japan, the Republic of Korea, and Singapore to finance their full adaptation costs. As economies grow, other Asian countries are expected to follow suit.

*Adaptation beneficiaries pay principle has serious problems from the point of equity, because the most vulnerable and poor sections of the communities in all nations and poor countries in the world suffer the most from impacts of climate change although they contribute the least to the problem.*

**Table 4.5 CO<sub>2</sub> emissions and GDP of Asian countries in comparison to EU and US**

Country	Average annual per capita CO <sub>2</sub> emissions (ton) over 1992-2003	Per capita GDP (2004, constant 2000 USD)
Bangladesh	0.19	416
Bhutan	0.64	970
Cambodia	0.04	363
China	2.61	1,323
India	0.87	546
Indonesia	1.25	904
Japan	9.42	38,088
Korea, Rep.	8.65	12,762
Lao PDR	1.39	393
Malaysia	4.43	4,296
Mongolia	3.29	464
Nepal	0.09	232
Pakistan	0.62	571
Papua New Guinea	0.43	620
Philippines	0.83	1,101
Singapore	12.45	24,938
Sri Lanka	0.44	960
Thailand	2.64	2,361
Viet Nam	0.53	503
EU (EU25)	8.48	19,621
United States	18.62	36,451

Sources: WRI 2007, World Bank 2007

#### 4.3.1.2 Emitters pay principle

Under this principle, emitters pay the costs of adaptation in proportion to their current emissions or cumulative GHG emissions over a certain period. The emitters pay principle is essentially the same as the polluter pays principle (PPP), which is one of the internationally accepted rules in pollution control. In the context of climate change, “emitters” may include not only countries but also individual firms, industry groups and consumers.

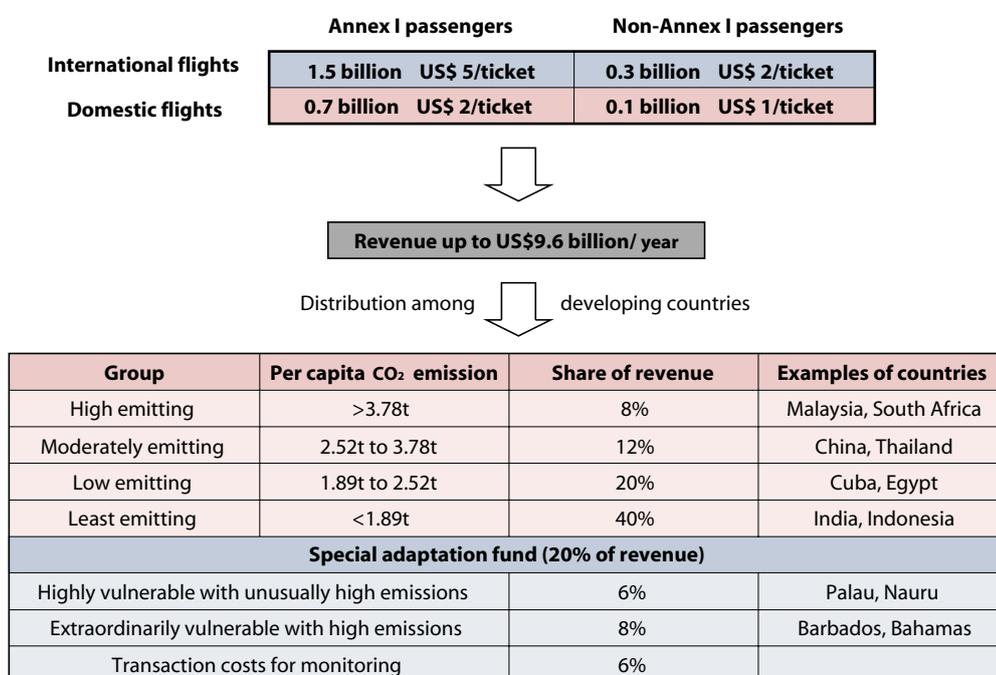
To illustrate the financial feasibility of this principle, the proposal on international aviation levy (Muller and Hepburn 2006) is considered, where emitters are defined as individual air travellers. As there were 800 million international air travels in 2006, the proposal could potentially raise USD 8 billion annually, assuming a ten dollar levy is imposed on each trip (Oxfam International 2007).

In our consultations, a participant from Bangladesh proposed an improved version of the aviation tax, in which all individual polluters are charged but the benefit is given to the most vulnerable. A major feature of this proposal is to differentiate the charges based on fairness considerations – whether passengers are from Annex I or non-Annex I countries, and whether they use international or domestic flights. Based on International Air Transport Association (IATA) passenger volumes, up to USD 9.6 billion per year can be earned through an aviation tax if passengers in Annex I countries pay

*An improved version of aviation tax, in which all individual polluters are charged but the benefit is given to the most vulnerable, was proposed.*

five dollars for international and two dollars for domestic flights, and if passengers in non-Annex I countries pay two dollars for international and one dollar for domestic flights. The amount is significant and is somewhat close to the lower estimate of the needs of adaptation in developing countries. Another feature of the proposal would involve allocating the collected tax to developing countries based on their responsibility (per capita emissions) and vulnerability (the needs of adaptation) (Figure 4.3). The proposal includes the creation of a special adaptation fund with 20% of total income to be allocated to highly vulnerable and extraordinarily vulnerable countries with high per capita emissions. The remaining 80% would be allocated to the other developing countries, which are classified into high-emitting, moderately-emitting, low-emitting, and least-emitting groups. Among these groups, countries with higher per capita emissions receive a smaller fraction of the revenue from the tax.

**Figure 4.3 Adaptation levy from international aviation - A burden sharing proposal made by a participant at the consultation in Delhi**



Zhu et al. (2004) suggested that imposing a carbon tax of one USD per ton of CO<sub>2</sub> could raise up to USD 14 billion annually, even if the tax base is limited to Annex I countries for equity reasons. Nearly 40% of respondents to our questionnaire indicated their support for such an option becoming a legally binding commitment. A participant in our consultations suggested that the imposition of levy of 0.5 USD per barrel of oil consumed in all countries would generate as much as USD 5.5 billion annually, based on current production of about 11 billion barrels per year. TERI's adaptation financing proposal, which includes special compensatory financing (TERI 2005), International Climate Change Task Force proposal (ICCTF 2005), adaptation credits and vouchers (Schellhuber and Cornell 2003) are also based on this principle.

As indicated above, the emitters pay principle has the potential to raise substantial funds while placing a relatively limited burden on individual emitters. In this sense, the principle has high political and economic feasibility. One critical issue with the emitters pay principle is whether "emitters" are defined as countries or individual emitters (such as

*The emitters pay principle has the potential to raise substantial funds while placing a relatively limited burden on individual emitters.*

firms or travellers). If it is on the basis of total emissions from countries, strong opposition may arise from countries with low per capita emissions. In this sense, it is more likely to be politically acceptable if emitters are defined as individuals. Researchers from Princeton University made a similar proposal at a COP 13 side event, in which individuals, not countries, become the basis for burden sharing in mitigation (de Coninck, personal communication).

#### **4.3.1.3 Ability to pay principle**

Under this principle, the burden for adaptation is shared in proportion to the ability to pay, which is typically measured in monetary terms such as GDP or individual income. However, other measures of ability to pay can be used, if appropriate. For example, Oxfam International (2007) used UNDP's Human Development Index (HDI) as a proxy for ability to pay and defined that countries should bear a financial burden only if the value of the HDI is above 0.9. The funds operated by GEF – SCCF, LDC Fund and SPA – may be considered to follow this principle partly, as most of these funds are based on voluntary contributions from developed countries with the ability to pay. However, it should be noted that these funds do not strictly incorporate this principle, as contributions are voluntary in nature. Currently, only 13 and 17 developed countries contribute to the SCCF and LDC funds respectively.

To assess the financial feasibility of this principle, the two-track approach for adaptation funding proposed by Bouwer and Aerts in 2006 was considered. Bower and Aerts recommended that a fixed percentage of GDP for Annex I countries could be utilised for raising adaptation funds. A tax of 0.03% on GDP (which is on average USD 8.6 per person) can raise up to USD 10.9 billion per year (Bouwer and Aerts 2006). The ability to pay principle can thus raise potentially large funds while placing a relatively small burden on individuals. Therefore, the ability to pay principle has high political and economic feasibility.

#### **4.3.1.4 Climate change winners pay principle**

Climate change winners pay principle implies that the burden of adaptation is shared on the basis of positive impacts of climate change. With moderate warming, for example, countries located at high latitudes such as Russia and much of Scandinavia are likely to benefit positively from climate change due to longer growing seasons and associated higher agricultural yields, lower energy consumption, and reduced mortality during the winter season, among others (IPCC 2007). Climate change winners are usually defined in terms of their geographic locations. However, as Farber (2007) noted, the climate change winners pay principle may not be feasible for the following reasons.

- It is difficult to raise sufficient funds, because only a few countries in high latitudes (e.g. Russia, Canada, and the Scandinavian countries) with relatively small populations are likely to be clear winners from climate change.
- Emissions and climate change benefits are not necessarily directly linked and therefore the principle is not equitable in terms of responsibility.
- The use of geographic location as a basis for taxation may meet strong political opposition from those countries affected by such a rule.

*Climate change winners pay principle implies that the burden of adaptation is shared on the basis of positive impacts of climate change.*

Given such weaknesses, we wish to propose an expansion of the definition as follows: *Climate change winners include any agents who gain from both intended and unintended impacts of climate change.* The burden is shared by all climate change winners according to the benefits they receive. For example, firms and individuals who earn profits from emissions trading, Joint Implementation (JI), CDM and other market mechanisms should be regarded as climate change winners. In this sense, the Adaptation Fund, whose main contributions come from the 2% levy of Certified Emission Reductions (CER) produced from CDM projects, can be regarded as having this principle as a burden sharing rule. The original Brazilian proposal on burden sharing approach (Filho and Miguez 1997), which recommended the use of up to 10% of the Clean Development Fund to finance adaptation, might be considered to use this principle.

To assess the financial feasibility of this principle, we consider the Adaptation Fund. UNFCCC (2006) estimated that by 2012, the total revenue under the fund would be in the range of USD 175 million – 1.05 billion, with the best estimate of USD 450 million. Therefore, a fair assessment might be that this principle can supplement other funding options. However, if such a levy is expanded to other market mechanisms such as JI and emissions trading, or if the levy is increased from the current 2% to 5%, the climate change winners pay principle has the potential to generate necessary funds for adaptation, and the private sector can more effectively be involved in sharing the burden of adaptation. The concept of differentiated levy for CDM projects in China (65% in HFC projects, 30% in N<sub>2</sub>O projects and 2% for the rest) might be interpreted to be modelled along the lines of the “climate change winners pay principle”.

In sum, given the need for raising substantial funds for adaptation, it is imperative to utilize all four principles singly or in combination depending on national circumstances. The beneficiaries pay principle is the fundamental principle that applies to developed countries. There are several proposals based on a combination of the “emitters pay” and “ability to pay” principles. These include the proposal on the creation of specialised funds (Tuvalu 2005), UNFCCC Impact Response Instrument (Muller 2002), and risk management schemes in which industrialised countries are mandated to contribute in proportion to their GHG emissions and GNP (Parry et al. 2005). The determination of an optimum combination of thresholds for both the “emitters pay principle” and “ability to pay principle” is likely to be controversial however. Oxfam International (2007) considered such thresholds by proposing a scheme in which all countries with the HDI above 0.9 (reflecting the principle of the ability to pay [capability]) are required to bear the costs for adaptation, if the average annual CO<sub>2</sub> emissions over a 12-year period since the adoption of UNFCCC in 1992 exceeds 2 tons (reflecting the emitters pay principle [historical responsibility]).

The proposal on Greenhouse Development Rights (Baer et al. 2007) also suggests burden sharing to be determined on the basis of a responsibility capacity indicator. Others (Vattenfall 2006) proposed that countries with per capita incomes less than USD 11,000 should be exempted from mitigation targets and adaptation funds. The combined application of emitters pay principle and ability to pay principle can become more politically acceptable to large emitting countries in the region if a mechanism can be created in which emitters are defined as individuals.

***Climate change winners include any agents who gain from both intended and unintended impacts of climate change.***

***Given the need for raising substantial funds for adaptation, it is imperative to utilize all four principles singly or in combination depending on national circumstances.***

*Proceeds from carbon trading, corporate social responsibility (CSR) payments, and payments for ecosystem services were considered to be the most relevant options for involving the private sector in adaptation.*

*Nearly 56% of respondents to our questionnaire suggested that creation of an international insurance pool would be the most desirable approach.*

Respondents to our questionnaire suggested that mandatory contributions from Annex I countries (38%), a global carbon tax (22%) and an increased levy from CDM (19%) could be the most feasible financing approaches to raise the funds required to meet current and future adaptation needs. Nearly 60% of respondents noted that the vulnerability index of a nation and the vulnerability of communities should be considered the main criteria for sharing the adaptation funds among developing countries. About 85% of respondents to the questionnaire noted that the private sector should be more effectively involved in adaptation financing. Proceeds from carbon trading, corporate social responsibility payments, and payments for ecosystem services were considered to be the most relevant options for involving the private sector in adaptation.

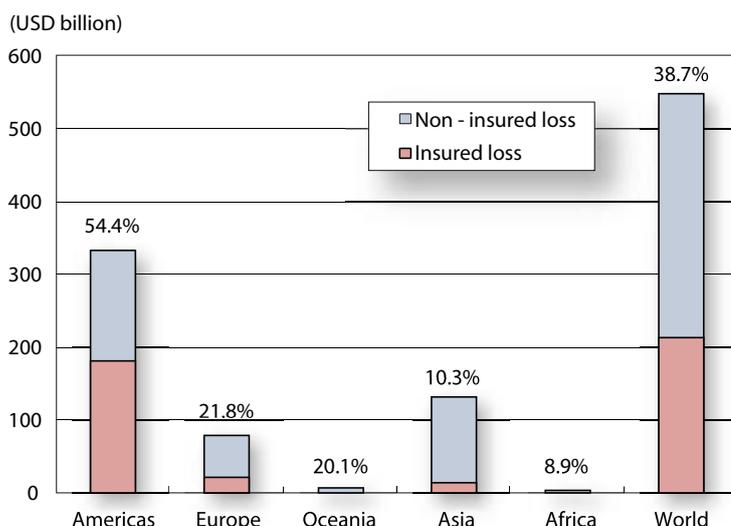
#### **4.3.2 Role of insurance in facilitating adaptation**

Participants at our consultations stressed that insurance should play a key role in facilitating adaptation in the post-2012 climate regime, as it can spread the risks from the adverse consequences of climate change and effectively reduce the vulnerability of local communities. The issue of whether public and/or private funds should be used for insurance received much attention. Some participants suggested that private insurance firms should play a greater role. However, other participants expressed doubts about the roles that the insurance sector can play, citing the public goods nature of adaptation. They stated that public resources should play a larger role in financing adaptation projects. ODA was proposed as a promising option, since significant synergies exist between adaptation activities and ODA-supported initiatives in many countries.

The relative role of public and private sectors would obviously vary depending on the context. For example, in 2000 the Association of British Insurers implied withdrawal of flood insurance from locations at greatest risk and demanded an increased allocation of government expenditures for flood prevention plans (Association of British Insurers 2002). At the international level, an insurance-related public fund against climate damages was first proposed by the Alliance of Small Island States (AOSIS) in 1991. The AOSIS proposed the establishment of an international fund to compensate for damages that small-island and low-lying developing countries incur from sea level rise (Bals et al. 2005). Germanwatch (2005) expanded the AOSIS proposal to include climate damages other than sea level rise and to require developing countries to take disaster prevention measures to be eligible for compensation from the fund. Nearly 56% of respondents to our questionnaire suggested that creation of an international insurance pool would be the most desirable approach, followed by the expansion of micro-insurance to local communities (28%).

Despite considerable potential, climate-related insurance is very limited in developing Asia due to many barriers such as a lack of appropriate information on climate risks (Hoff et al. 2003, IPCC 2007). For example, the insured proportion of disaster losses between 2000 and 2006 was only 10.3% in Asia as compared with 54.4% in the Americas (Figure 4.4). In order to provide appropriate insurance services and determine the level of their premiums, it is crucial to have accurate information on climatic risks at the local level. In addition, the private sector insurers face a great challenge in making their services financially viable, as climate-related catastrophes result in very large losses once such events occur (for example, see Swiss Re 1998). This is particularly true in Asia, where large areas and populations are highly vulnerable to the impacts of climate change.

**Figure 4.4 Insured proportion of disaster costs for 2000-06**



Source: Dlugolecki 2007

In order to overcome the above barriers, an Asia-wide climate insurance scheme may be conceptualized and implemented with the support from regional development banks such as the ADB. First, the scheme should promote vulnerability assessment and future impact analyses in various climate hotspots in Asia, with a particular focus on the risks of catastrophic climate events. Data gathering, modelling and dissemination should be enhanced in cooperation with research institutions in the region. Second, the development of climate-related insurance instruments and services aimed at low-income households (e.g. weather derivatives, crop insurance and micro-insurance) should be enhanced, through both private-private and public-private partnerships. The role of the private insurance sector in industrialised countries such as Japan is especially important, as it has the requisite expertise and experiences. Third, to ensure the viability of private insurance services, a region-wide public fund may be established to compensate for catastrophic losses from climate change in low-income developing countries. The fund can be based on a mixture of voluntary contributions from industrialised countries and mandatory contributions from countries in the region in proportion to their ability to pay, and can be managed by a regional bank such as the ADB. The public fund can create an upper limit on compensation from private insurers when catastrophic climate events occur, and necessary compensation will be paid out from the fund. This will help private insurance firms to avoid incurring large losses due to catastrophic climate events and ensure viable business. The fund will also enable rapid payments to low-income households, who often need international assistance in the event of catastrophic climate events. The above scheme, therefore, will help protect the most vulnerable communities against climate shocks.

The above scheme is in some respects similar to the international regime for compensation from oil pollution damage, and combines regional risk spreading and public-private partnership in the insurance industry. Under the 1992 Civil Liability Convention, every owner of a tanker carrying more than 2,000 tons of oil should purchase insurance to cover potential liability. The Convention also sets an upper limit on the liability of ship owners so that ship owners are exempt from prohibitively high payments. At the same time, the International Oil Pollution Compensation Fund 1992

*An Asia-wide climate insurance scheme may be implemented with the support from regional development banks such as the ADB.*

*The regional fund can be based on a mixture of voluntary contributions from industrialised countries and mandatory contributions from all Asian countries in proportion to their ability to pay, and can be managed by a regional bank such as the ADB.*

(1992 Fund) provides rapid compensation to private agents (such as fishermen) and government agencies, if damages are not fully compensated. The 1992 Fund is financed by mandatory contributions collected from private companies, government authorities, state-owned companies or any other agents in a member state who receive more than 150,000 tons of crude oil and heavy fuel oil in one calendar year. In a nutshell, compulsory purchase of insurance by ship owners forms the basis of the compensation scheme. But it is supplemented by a public fund, so that the fund provides a channel through which victims of oil pollution can receive compensation in a timely manner. The public fund is financed by the agents who benefit from the transaction of oil.

#### 4.4 The Way Forward

Utilising the various opportunities afforded by the international climate regime, several Asian countries have taken many innovative steps to implement the Clean Development Mechanism (CDM). On the other hand, no such comparable actions are evident in adaptation. Furthermore, several Asian countries are characterised by systemic vulnerabilities of very high magnitude. If Asia were to avoid costly, reactive and unplanned adaptations in the future, it is important for the region's policymakers to proactively mainstream adaptation concerns into development planning, and to mobilise adequate resources for "climate proofing" investments. It is important to note that investments, which appear to be cost-effective under current climatic conditions, may become economically and ecologically unsustainable in the future when adverse impacts of climate change become more evident. As many countries in the region are experiencing rapid economic growth, and many plans for building new infrastructure are in preparation, now is the time to act to avoid the risk of mal-adaptation. A few recommendations for achieving such goals are given below.

##### (a) *Creation of incentive schemes for mainstreaming adaptation*

Appropriate incentive schemes should be developed at national, regional and international levels to systematically operationalise mainstreaming adaptation concerns into development planning. Throughout our consultations, participating stakeholders stressed that national strategies so far failed to recognise that a greater degree of local resilience is needed to cope with adverse impacts of climate change. Therefore, Asian policymakers should ensure that the responses to projected impacts are integral to policymaking priorities at all levels and in all sectors. In the Germanwatch proposal for climate-related international insurance fund (2005), eligibility for compensation is tied to disaster reduction efforts at the national level. Similar conditional schemes should be created to promote mainstreaming adaptation concerns into national planning. One possibility is to mandate all developing countries in the region to design national adaptation policy frameworks, along the lines of NAPA initially. In elaborating such frameworks, steps should be taken to ensure that all developmental policies including national budgeting processes in different sectors, bilateral and multilateral development assistance and private sector investments, undergo an adaptation check to determine if they directly or indirectly facilitate or constrain adaptation to current and future impacts of climate change, and to assess if they incorporate measures for adaptation to climate-related impacts. New policies should also incorporate adaptation aspects. The countries that demonstrate proactive efforts to mainstream adaptation concerns should be given preferential access to adaptation fund and other incentives such as reduced national premiums for regional catastrophe insurance facilities.

***If Asia were to avoid costly, reactive and unplanned adaptations in the future, it is important for the region's policymakers to proactively mainstream adaptation concerns into development planning, and to mobilise adequate resources for "climate proofing" of all investments.***

***Appropriate incentive schemes should be developed at national, regional and international levels to systematically operationalize mainstreaming adaptation concerns into development planning.***

Currently, many national policies and measures pose barriers to facilitate adaptation to climate change. For example, even though forests are known to be several times more valuable as flood defences than for logging in floodplains, indiscriminate deforestation is still practiced in many Asian countries as a source of short-term income. Such policies obviously have adverse impacts on future adaptive capacity of ecosystems in a changed climate. Likewise, disaster risk reduction measures that do not account for climate change can lead to mal-adaptation. In Bangladesh, poorly maintained flood defences, which were designed for a certain level of floods, became counterproductive by trapping floodwaters and prolonging floods in 1999.

Regional and international efforts should be directed to develop guidelines for mainstreaming adaptation concerns in different sectors, and identify quantitative or semi-quantitative indicators for measuring the effectiveness of mainstreaming efforts at various levels (mainstreaming metrics). Further, it is important to promote regional cooperation in issues such as the development of early warning and seasonal climate forecasting systems, trans-boundary river basin management, and disease surveillance and monitoring systems through the strengthening of regional networks.

*(b) Mobilisation of “new and additional” financial resources for adaptation*

A growing body of evidence suggests that future impacts of climate change would be serious and adaptation needs would be substantial in Asia. Although additional research on adaptation needs and costs in specific locations is necessary, an urgent multi-pronged integrated regional strategy for adaptation is crucial by linking and scaling up several parallel processes in the fields of disaster management and development. New and additional financial resources for adaptation should be mobilised through (a) establishing a region-wide adaptation facility (b) promoting both North-South and South-South public investments, and (c) increasing the private sector's involvement in adaptation.

In GHG mitigation, and especially in the CDM, Asia overtook other regions such as Central and South America, which initially had more projects. The increase in projects in Asia has been made possible by concerted national and regional efforts including the establishment of a CDM facility at the ADB. Considering that adaptation is going to be a serious challenge, it is time to establish a region-wide adaptation facility, perhaps again at the ADB, with voluntary contributions from developed countries, mandatory contributions of a certain proportion of proceeds from CDM projects brokered by CDM facility at the ADB, and other voluntary contributions from Asian developing countries. This facility can be used to initially support mainstreaming efforts of all Asian countries, besides funding high priority adaptation actions identified by member countries.

The discussion of burden-sharing principles clearly showed that the adaptation challenge cannot be addressed without strong international collaboration. The long-term goal should be to establish a self-sustaining financing mechanism for adaptation in each community, nation and region. However, initial efforts should be directed towards enhanced North-South cooperation. Developed countries should focus on getting greater value for resources invested in developing countries, through appropriate “climate-proofing” of infrastructure investments. In addition, regional and international financial institutions should play a proactive role in raising funds to address trans-boundary impacts such as those from glacier melting.

***All developmental policies including national budgeting processes in different sectors, bilateral and multilateral development assistance and private sector investments, should undergo an adaptation check.***

***The long-term goal should be to establish a self-sustaining financing mechanism for adaptation in each community, nation and region.***

**At the local level, development of flexible, customised credit schemes, and provision of alternative climate-insensitive income generating opportunities are the most urgent priorities.**

At the local level, development of flexible, customised credit schemes, and the provision of alternative climate-insensitive income generating opportunities are most urgent priorities. The increased availability of credit including microfinance (through the Grameen and Proshika schemes) was identified as one of the contributing factors to Bangladesh's increased resilience to flooding over the past decade (ODI 2005). Microfinance can reduce risk to climatic impacts by allowing households to spread income-generating activities throughout the year and to invest in portable assets. Based on successful experiences in countries like Bangladesh, microfinance and microinsurance institutions are gradually becoming common in other Asian countries (e.g. BASIX in India). There is also a considerable potential for instruments such as weather derivatives, weather hedges and catastrophe bonds. A public-private approach facilitated by venture capital funds is likely to succeed in promoting the widespread use of such instruments. Local NGOs have also important roles to play in bringing these products to those who are in need, especially in the rural regions where the penetration of the market is still limited.

*(c) Establishment of a comprehensive region-wide risk-sharing and insurance scheme*

In June 2007, the Caribbean Catastrophe Risk Insurance Facility started its operations to provide client governments with immediate liquidity if hit by an adverse natural event such as a hurricane. Along similar lines, an *Asian Catastrophe Risk Insurance Facility* should be established with a view to (1) create a viable business environment for the private insurance sector, (2) provide rapid monetary assistance after catastrophic climate-related events, and (3) enhance proactive adaptation. Contributions to the Facility should come mainly from the private sector because preventing future disasters will help establish a stable business environment for private firms. A levy on foreign direct investment can also be a possible source of funding. As noted earlier, the levy can be discounted if there was evidence of mainstreaming adaptation concerns into development planning.

Rapid progress in the above three areas is only possible through a more effective regional cooperation in Asia. For such cooperation to be operational, efforts to promote policy convergence, institutional transparency, stakeholder participation and prioritisation of adaptation actions based on political consensus and scientific basis are vital.

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