



## Part 2: Adaptation Lessons from Past Experience

Adaptation is successful if it reduces the vulnerability of poor countries and poor people to existing climate variability, while also building in the potential to anticipate and react to further changes in climate in the future. The evidence from past experience suggests that this is best achieved through mainstreaming and integrating climate responses into development and poverty eradication processes, rather than by identifying and treating them separately.

In this document, *mainstreaming* is used to describe the consideration of climate issues in decision making processes such as planning and budgeting. *Integration* is used when specific adaptation measures are added to design and implementation strategies. Thus, integration occurs in instances where adaptation is deemed to be a priority in order to effectively achieve development goals.

The rationale for integrating adaptation in development strategies and practices is underlined by the fact that many of the interventions required to increase resilience to climatic changes generally benefit development objectives. Adaptation requires the development of human capital, strengthening of institutional systems, and sound management of public finances and natural resources (Adger et al. 2003). Such processes build the resilience of countries, communities, and households to all shocks and stresses, including climate variability and change, and are good development practice in themselves.

Mainstreaming climate issues into national development policies ensures consistency between the needs of adaptation and poverty eradication. Separation of the two runs the risk of adaptation policies inadvertently conflicting with development and poverty policies, or conversely, development policies inadvertently increasing vulnerability to climatic factors. Accordingly, this issue is critical to the successful eradication of poverty and needs to be placed at the core of national development processes.

The experiences described in this section show how climate issues can be successfully addressed in the

context of development. They have been organized under:

- Addressing vulnerability in the context of sustainable livelihoods.
- Equitable growth and adaptation to climate change.
- Improving governance to mainstream climate issues in poverty reduction.

In practice, overlaps and synergies will occur between actions in these areas. Promoting such synergies is critical and demonstrates how diverse stakeholders, including governments, civil society, and poor people themselves, must share in the task of adapting to climate change (Conde and Lonsdale 2003).

### 2.1 Addressing Vulnerability in the Context of Sustainable Livelihoods

Although poor people have limited income, they have assets and capabilities that can be strengthened to reduce their vulnerability to climate change. These assets or “capital” can be grouped into social capital, natural capital, physical capital, human capital, and financial capital (DFID 2002). Adaptation policies should focus on providing stable conditions and support for making the livelihood assets of the poor more resilient to climate change through resource accessibility and the reforming of policies, institutions, and processes. It is important to ensure that sectoral and other policies do not undermine, but rather reinforce, the opportunities of the poor to access resources, build assets, and diversify their economic activities to increase their adaptive capacity to climate change.

#### Social Capital and Climate Change

Traditional systems for adapting to climate variability include a range of livelihood strategies, from individual to collective savings mechanisms and migration. Social networks play a fundamental role for the poor by providing safety nets as an immediate response in adverse times. In addition, informal “solidarity” networks may be constituted or strengthened after climate-related disasters occur. In the past, interventions from outside have often undermined rather than supported the efforts of informal networks. Instead, these networks

should be recognized for the important role they play in environmental management in the face of adversity.

Box 3 indicates insights from some of the ways that people in the Sahel – one of the most climate-sensitive areas of the world – have responded to droughts in the past. These approaches are typical of the way subsistence farmers in many parts of the world have coped in the face of severe shocks to livelihoods. The lessons from the example indicate the need to build upon existing social capital to enhance coping mechanisms of poor people to adapt to climate change.

**Box 3**  
**Drought and Livelihoods in the Sahel**

Livelihoods in the Sahel suffered heavily during and after the 1968–73 and the 1984 droughts. Adaptation strategies of rural people in Niger provide valuable insights:

- Diversification away from agricultural production is a common response to unpredictable harvests.
- Networks of affinity and trust pull households and individuals together, although minor conflicts – some dating back to pre-colonial relations – may pull them apart.
- The local agrarian system is dynamic and responds to individualistic and well adapted livelihood decisions, as well as to environmental disturbances.
- Access to resources is maintained by switching between capital assets, despite the existence of poverty at certain times and for certain people.
- Migrants tend to leave the community to look for work but usually return.

Source: Batterbury and Warren 1999; Thébaud 1998.

Many traditional risk-sharing mechanisms based on social capital, such as asset pooling and kinship networks, may not work well for climate risks because climate risks often affect all households at the same time. This is different from other shocks such as impacts on households from illness, loss of employment, or death of the main income earner, because everyone who might be a potential source

of help also faces the same hardship. Additionally, traditional coping strategies may be ineffective because of the possibility of climate change increasing the range of climate variability. Consequently, fluctuations that are, or will be, experienced as a result of climate change may exceed the range around which these traditional strategies are built. This may be further hampered by changes in social norms and structures, which no longer allow for the application of traditional coping strategies (Box 4).

**Box 4**  
**Need for Social Capital Building to Cope with Climate Impacts**

In 2000, Kenya experienced its worst drought in 40 years. Effects were severe for pastoralists because ancient coping mechanisms had broken down, either because land had been sold or because of barriers erected by the relatively affluent farmers, ranchers, industry, and city residents. Some traditional drought responses, such as raiding of neighboring cattle and killing wildlife, have become illegal and are no longer an option. As societal norms affect traditional behavior, strategies may no longer be valid and there is the need to support the vulnerable population in identifying new strategies that enable them to deal with adverse climate and adjust to new socioeconomic conditions.

Source: UNEP 2002.

**Management of Natural Capital**

Degradation of natural resources and increasing water stress enhance the vulnerability of many rural communities to climate change. Adapting to climate change therefore needs to increase the resilience of natural systems and their productivity in order to support the livelihoods of the poor. There are, however, many examples of how policies have undermined this and led to maladaptation. For example, the strategic development plan for the Senegal River Basin, shared by three countries, emphasized building dams to provide irrigation for rice crops in response to water stresses. The irrigated areas had to be subsequently abandoned due to salinization. A modeling study showed that an



alternative strategy for the basin of irrigated agro-forestry would have had beneficial impacts for the catchment area, microclimate and the agricultural productivity of the poor (Venema et al. 1997).

Inappropriate natural resource management can exacerbate the vulnerability to climate extremes as illustrated by the impacts of Hurricane Mitch in Central America, which were intensified because of deforestation and degradation of wetlands. Forests and wetlands act as buffer systems, diminishing surface run-off in the case of intense rains in addition to providing livelihoods to local communities. The interaction between land-use practices and climatic impacts is also well illustrated in the Yangtze Basin in China where deforestation increased flooding and erosion, which led to the destruction of lives and livelihoods.

However, there are also a growing number of examples of improvements in the use and management of natural resources, which have enhanced the resilience of ecosystems and had positive effects on the livelihoods of poor people. In China, a very high proportion of the land is subject to severe land degradation. In these areas, the government has recently undertaken integrated ecosystems management. At the household level, eco-farming integrates renewable energy use such as solar power, vineyard cultivation, and legume planting for fixing sand and providing forage (ADB 1999). In Vietnam, mangrove planting led to improved resilience of the local population to climatic extremes and provided livelihood opportunities (Box 5).

#### Box 5

#### Mangrove Planting in Vietnam

The Vietnam Red Cross (VNRC) has supported local communities in the northern coastal provinces in planting 12,000 hectare of mangrove trees to break the 1.5-meter waves typically associated with tropical typhoons and to act as buffer to 110 kilometer of sea dyke. While the program has cost US\$1.1 million, the benefits have already proved far greater. Costs of dyke maintenance have been reduced by US\$7.3 million each year. Furthermore, Typhoon Wukong in October 2000 claimed no lives inland, caused no damage to the dyke and only minimal damage to possessions and property. The mangrove planting has also created livelihood opportunities for the 7,750 families involved in the replanting and protection effort and who are harvesting shellfish among the mangroves.

Source: IFRC-RCS 2002.

#### Physical Capital

Policy making and planning has often neglected the needs of the poor, while they are the most vulnerable to climate-related shocks and stresses. Development strategies based only on discussion with politically powerful groups can lead to large-scale infrastructure and technological solutions that undermine or are inappropriate for poor households. Furthermore, infrastructure design is often solely based on past climatic records and may therefore not or only insufficiently account for changes in regional climatic conditions such as more intense and frequent extreme weather events. By assuming no change, development policies can lead to maladaptation enhancing the vulnerability of a region and its population.

It may be necessary to assist poor people in making their physical capital more climate resilient through the use of appropriate infrastructure and technology. For example, in September 2000, a serious flood in the Mekong delta killed over 300 people and affected more than 500,000 houses. Afterwards, the Vietnam Red Cross helped to install flexible flood and typhoon resistant houses that can be easily restored after a disaster hits. They are

a successful adaptation strategy with direct benefits for the livelihoods of the poor. Except for steel frames and a platform that allows the house to be quickly raised if water rises, all materials are cheap and locally available and the house looks similar to traditional houses.

### Human Capital

Climate change presents many complex risks to different groups and sectors over different timeframes and localities. Adaptation is likely to be successful if people are informed about climate change, how it affects them, and options for doing something about it. Successful climate change interventions are dependent on high-quality accessible information to allow effective decision making. As the impacts of climate change are difficult to predict accurately, adaptation activities need to be flexible and responsive to new information, and robust to withstand a wide range of plausible futures. The use of risk management and coping thresholds is an area of applied adaptation research of growing importance (Jones and Boer 2003; Jones and Mearns 2003).

Agricultural climate information is now used to advise farmers about their choice of crops and methods of cultivation, which in turn has provided major benefits in terms of increased yields and preventing food shortages. Similarly, better information and early warning systems for farmers can reduce vulnerability to inter-annual climate variations and enable responses to be proactive rather than reactive (Box 6).



### Box 6

#### Climate Information for Southern African Farmers

A recent review of the international initiative on Regional Climate Outlook Forums (RCOFs) has found many benefits in helping the poor to cope. RCOFs were first initiated in 1996 and gained momentum as a regional response to the major El Niño of 1998. RCOFs are rapidly becoming the main regional mechanism for providing seasonal climate forecasts to policymakers and for disseminating climate information to users, including farmers.

The forums bring together climate scientists, operational forecasters and end-users. Climate outlook guidance is agreed and the implications for climate-sensitive sectors are discussed. The guidance is presented in terms of probabilities of rainfall being in the ranges of previous dry or wet years. The forums have helped to develop links and mutual understanding between meteorologists and end-users of seasonal forecasts and have stimulated the development of national seasonal predictive capacity in Africa. They have also raised awareness of the issues of inter-annual climate variability and climate change and provided an impetus for adaptation activities.

Source: Hulme 1996; WMO et al. 2000.

Climate information can generate substantial benefits in other areas as well, including water management, planning and delivery of health services, and improved warning for extreme weather events.

As the poor already have a lot of knowledge about how to cope with climate variability, adaptation activities should take account of this knowledge, where benefits are proven. Incorporating local knowledge into policy actions may help governments to accommodate specific needs of poor people and ensure that strategies are taken up by local communities.

Box 7 illustrates the use of folklore by Andean communities, which anticipate the abundance of rain during the growing season by the brightness of the stars and adjust their crop planting strategies accordingly.

**Box 7****Traditional Forecasting in the Andes**

Indigenous farmers in some communities of the high Andes of Peru and Bolivia observe the Pleiades star constellation to gain insights into the possible weather several months into the future. They observe the overall brightness, the size, the date of first appearance, and the position of the brightest star in the cluster. If the stars appear clear in the pre-dawn sky, early abundant rains and a rich potato crop is anticipated. If the stars appear dim, a smaller harvest is expected due to late and reduced rainfall. The farmers adjust their planting practices accordingly to minimize the negative impact of these anticipated weather conditions.

Scientists have found that the visibility of the constellation, which also determines the time of its first appearance in the sky, might be related to the presence of wispy cirrus clouds high in the atmosphere, and that these are associated with the warm phase of El Niño. Andean farmers have in effect been forecasting El Niño for at least 400 years, and are able to adjust their planting schedule if poor or later rains are expected.

Source: Orlove et al. 2000.

In Southern Africa numerous adaptation techniques are used by poorer farmers to deal with anticipated drought. These include water and soil management techniques, resistant crop varieties, and food production methods. However, these techniques are often known only locally, or to certain ethnic groups.

It is necessary to further the understanding of how such traditional knowledge is, and can be, utilized by communities, and also how climate change will impact on the reliability of such practices in the future.

### Financial Capital – Promoting Safety-Net Mechanisms

While the poor have limited financial assets, there are ways for them to mobilize their own savings

and reduce financial risk. The micro-finance industry has grown considerably in the past twenty years, with micro-insurance a relatively recent addition (World Bank 2000). While micro-insurance faces the standard challenges inherent in all insurance schemes, it has to deal with additional issues arising from catering to poor households that already represent high insurance risks.

One way to overcome these difficulties is by the use of informal networks of trust that exist within well established groups. Wodaabe herders in Niger have informal systems for managing risks, such as the *habbamae*. These provide loans to replace reproductive stock lost to natural events. The *habbamae* stocking system is illustrative of community-level institutional arrangements that, with minimal additional support, can be used to reduce income-related risks and strengthen the capacity to cope.

A number of countries are now developing more formal schemes; for example Morocco plans to offer sunflower and cereal grain farmers insurance that would pay out when rainfall is below certain thresholds during critical growing periods (Mosley 2000; Skees et al. 1999; Hees et al. 2002). (See also page 20).

## 2.2 Equitable Growth and Adaptation to Climate Change

Economic growth is important for generating livelihood opportunities for poor people, allowing them to move out of poverty (see Bardhan 1996; Dollar and Kray 2000; Ravallion 2000). It can contribute to the ability of governments to provide important services, such as health and education, which are key to achieving the Millennium Development Goals. The extent, pattern, and distribution of growth in a country is the outcome of the interaction between its initial conditions, its institutions, its policy choices, the external shocks or stimuli it receives, and chance. However, economic growth by itself is not a sufficient condition for poverty eradication. The pattern or "quality" of economic growth is as important to eradicating poverty as the absolute level of that growth. Growth benefits the poor most when it occurs in areas of the economy that provide opportunities for increased employment and higher returns for poor people's assets.

Climatic variability affects short-term economic growth in many countries. Droughts or floods

severely disrupt economies and it can take years before the impact of such shocks fade and economies can return to their previous growth paths. Moreover, ongoing climate change will further increase the vulnerability of poor people, particularly for economies that are heavily dependent upon natural resources (for example water) and related climate sensitive economic sectors (such as agriculture, forestry, and fisheries). Figure 2 shows the impact of El Niño related events on the agricultural productivity of Malawi, Zimbabwe and Zambia, which also has considerable ramifications for their GDP. As climate change is expected to exacerbate climatic extremes associated with El Niño years, this underlines the need to address climate related vulnerability in the context of development strategies.

Climate change can depress the economy by affecting the sources of growth. The exact nature and scale will depend on a number of factors including:

- Quality of economic growth and distribution of its benefits.
- Structure of the economy.
- Ability of the government to finance important social services such as education and health.
- Longer-term implications of disruption to existing growth paths through, for example damage to infrastructure.

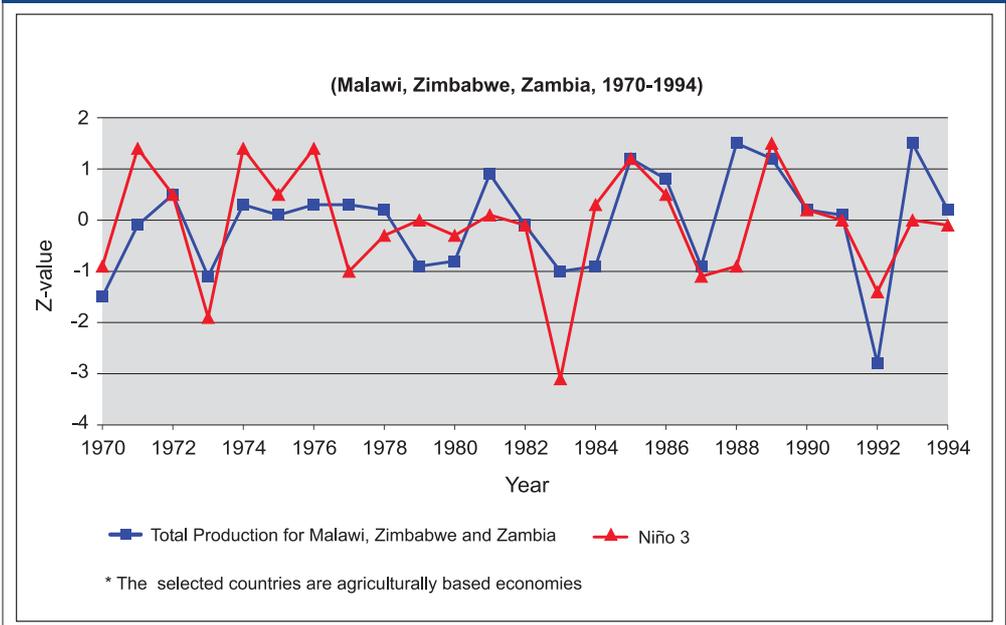
- Success of adaptation efforts implemented in response to the anticipated or experienced change.

Given the centrality of growth to poverty eradication, there is a need for measures aimed at minimizing climate's negative impacts on a country's growth strategy. Experience suggests that in adopting such an approach there is scope for the following interventions.

### Mainstreaming Climate Issues into Economic Planning and the Budget Process

While climatic change is just one out of several possible external events to which economies and societies are exposed, appropriate adaptation responses may be critical to maintain growth prospects. Governments can attempt to increase the resilience of their growth strategies through implementing effective adaptation policies to both short-term and long-term impacts of climate on their economies. This is best achieved by adopting flexible economic policies based on an understanding of climatic risks and risk management. Accordingly, climate issues should be mainstreamed into national economic planning and budgetary processes, both to ensure macroeconomic stability and to ensure budgetary allocations for activities that minimize climate risk.

**Figure 2**  
**Maize Production in Selected South African Countries\* versus Niño 3 Data**  
 Source: Dilley et al. 1997



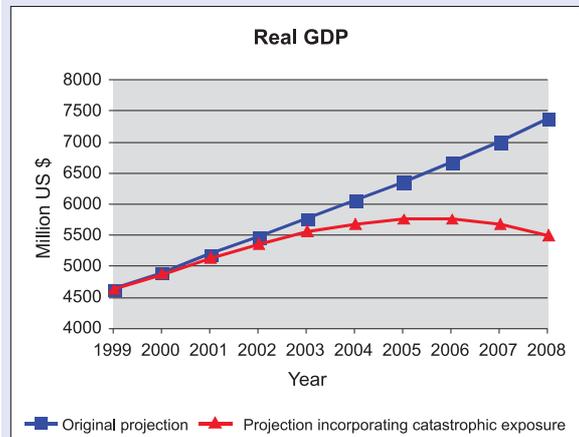
The budget is a key process in any country for identifying and funding development priorities. Given their growing importance within the development process, climate adaptation activities should be integrated in the budget framework. This will ensure that climate change interventions are properly funded over the long term, integrated into relevant sectoral priorities, and balanced against other competing priorities.

In addition, economic management, particularly in the face of extreme events, requires improved means to manage the consequences of shocks through effective inclusion of contingencies for climatic variability within budget planning processes. For instance, as Box 8 illustrates, integration of disaster management as a component of macroeconomic projections, including public expenditure planning, allows the exploration of more effective financial options at the country and international level.

### Box 8

#### Economic Planning for Disasters in Honduras

An exercise to model the macroeconomic impacts of disasters in Honduras developed a framework to analyze the economic impacts of disasters and policies to reduce them. Initially, the country estimated annual expected losses of US\$64 million per year (0.49 percent of capital stock) due to natural catastrophes.



Subsequently, the macroeconomic impacts of direct losses were estimated, as shown in the graph. Honduras considered cases in which access to post-disaster financing may be limited. The figure demonstrates that if foreign reserves are only accessible after the catastrophe, the event could result in stagnant GDP over the following eight years. The first trajectory, marked with boxes, represents projections for expected annual growth rates of between 5 and 6 percent. The second growth trajectory, marked with triangles, incorporates the effects of catastrophic exposure assuming the country cannot obtain sufficient foreign reserves or external funds to finance post-disaster losses. This new growth trajectory demonstrates that catastrophe exposure has the potential to impede future growth of the Honduran economy.

Source: Freeman et al. 2001.

### **Increasing the Resilience of Infrastructure and Investments**

Estimates indicate that 50 to 75 percent of economic losses from Hurricane Mitch resulted from inadequate design and location of infrastructure, such as housing, roads, bridges, and industry (Charveriat 2000). However, despite growing awareness, there is currently no formal mechanism for assessing the impacts of climate events and conditions on infrastructure and development activities.

Although precise information from climate change projections about the probability of different climate events is limited, it is important to simulate how a range of events would impact on the outcome of a development activity; in many cases it could potentially entail a re-examination of the activity. Until now, the application of vulnerability assessment information in project appraisals has been extremely limited. Cost-benefit analysis needs to highlight the impact of various scenarios on the poorest and to incorporate, to the extent possible, an evaluation of environmental externalities (Dixon et al. 1988, 1994). Initially, such evaluation may focus on infrastructure projects that tend to have a long economic life, such as dams, roads, bridges, and electricity power supply and distribution systems.

There are also many examples of the need for improved climate-related codes and standards for infrastructure design, to ensure a decrease in the vulnerability of the poor. For example, the increasing variability in precipitation may need larger reservoirs, and more frequent storms may necessitate redesign of coastal infrastructure to withstand storms and storm surges. Examples of regulatory tools include land-use planning, water-basin management, and implementation of storm-resistant building codes. In many cases, these regulatory interventions exist but have limited impact and do not pay adequate attention to the communities that may be adversely impacted. It is therefore important that vulnerability assessments and climate-related codes and standards are integrated into the design and maintenance of infrastructure.

### **Improving Management Systems and Technology**

Growth and development in areas dependent upon natural resources are often particularly climate sensitive and current patterns of resource use and management may need to be changed in order to promote climate resilience.

For example, many developing countries have a persistent and systemic water crisis in terms of both water stress and water scarcity. With projected changes in climate, water stress and the frequency and magnitudes of droughts are both likely to be exacerbated in many arid and semi-arid countries in Africa and the Middle East (IPCC 2001b). Therefore, managing the demand for water through policy instruments, including a sound regulatory environment and an incentive-based system – covering resource rights and pollution permits – would be a key to reducing vulnerability.

Many crops, such as rice, are already at the limit of their temperature tolerance, and increases in mean temperature and climate variability in the tropical countries could result in more years with lower yields (IPCC 2001b). However, agricultural management models that promote dryland agriculture could increase the resilience of agricultural systems and the development of drought-resistant species could enhance the ability to cope with reduced water availability. Consequently, more effective adaptation can be achieved through improved resource management systems and use of available technology.

### **Spreading Risk – Enhancing the Financial Resilience of the Poor**

New capacities, technical support, and policy instruments are required that will allow the incorporation of risk management into economic and sectoral planning instruments and improve access by the poor to insurance and other safety-net mechanisms. A number of initiatives are currently being developed in order to find a more innovative approach to structuring risk sharing, so that insurance markets can better absorb catastrophe losses and provide affordable insurance for poor people and governments. This also includes the establishment of public-private or national-international partnerships. For instance, formal sector international insurers are being sought to reinsure the portfolios of institutions like the Grameen Bank in Bangladesh.

In the absence of insurance markets, households try to cope with weather risks by: (a) self-insuring through asset accumulation, savings, and access to credit; (b) income diversification; and (c) informal insurance arrangements. In most poor countries and for most poor households, credit and savings markets are imperfect and asset accumulation



is never enough in times of a crisis. Diversification to other activities is difficult because households lack skills, information, and capital to do something else. Many households adopt low-risk and low-yield production patterns to ensure a minimum income. These production patterns come at the expense of perhaps much riskier, but higher-return, production that could create income growth and the build-up of capital. Finally, informal insurance arrangements at the local community level often break down when faced with disasters that are geographically widespread, such as severe weather events, catastrophic droughts, and floods, because all households suffer at the same time.

Traditional insurance markets dealing with weather related risks have a very low penetration in developing countries, although there is a clear need to establish systems to provide for insurance coverage in cases of catastrophic weather events. However, because of the geographically widespread nature of many weather events, a large number of people will make claims at the same time and thus local insurance companies could face huge losses.

At the macro level, several governments in developing countries have some ad hoc emergency assistance programs that fund post-disaster relief efforts. Because of the ad hoc nature of these government programs, it is not possible to find international reinsurance and thus governments tend to self-insure through budgetary allocation. Such self-insured programs could run out of funds if a catastrophic event occurs. Some governments in poorer countries rely on donors to provide funds in case of disasters but donor funds can be too little or too late.

Recent developments in global financial and insurance/reinsurance markets are making it increasingly feasible to spread weather risks across countries. New financial and insurance instruments, such as catastrophe bonds and weather insurance contracts, offer innovative ways of packaging the risks assumed by local insurers and governments. For example, catastrophe bonds issued against rainfall events in developing countries could be appealing to international investment bankers because their risk would be uncorrelated with the risks of most other financial investments. Similarly, several international insurers and weather risk companies

would like to diversify their weather related risk portfolio by including weather risks in developing countries. Market mechanisms for risk management do not always develop on their own, because they have historically interfered with local institutions and the large international markets. Governments and bilateral/multilateral financial institutions can help establish and support the development of sustainable structures (Box 9).

An important challenge to developing weather insurance of this kind is the availability of reliable and verifiable data on weather patterns. Furthermore, weather stations with appropriate hardware systems need to be put in place to ensure reliable readings on insured events. However, weather events can also vary spatially, so the existence of microclimates and localized disasters needs to be taken into account. In some cases, weather events show a trend, for example a negative rainfall trend, signifying higher probability for droughts—this can pose a challenge in designing a drought insurance program. Hence, while insurance schemes can help to spread the risk of climate impacts, their limitations need to be carefully considered, particularly because climate change may cause changes in climate variability and the occurrence of extreme events in a region, and past experiences may not apply to the future.



**Box 9**  
**Mexico's Experience in Funding Natural Disaster Relief**

In Mexico, in 1996, the government established a Fund for Natural Disasters (FONDEN) for post-disaster financing for reconstruction of public infrastructure and compensation to low-income producers for crop and livestock losses arising from natural disasters. FONDEN targets the beneficiaries and has limits to amounts it disburses per beneficiary. The intention is not to compete with private insurance. FONDEN payments are triggered only when droughts, frost, or other weather perils affect most people in a region — that is, FONDEN pays out against catastrophic systemic events. In addition, more recently, FONDEN has started to adopt objective rules for declaring catastrophic events. For example, FONDEN rules that livestock owners are eligible for drought payouts when cumulative rainfall is below either 50% of its historical average or historical minimum for two consecutive months. Similarly, frost is declared when temperatures fall below a certain level depending on the crop. Using parametric rules for triggering payments removes an ad hoc dimension in the declaration of catastrophes and reduces the political interference in FONDEN's operations. The government of Mexico is currently looking into the feasibility of obtaining financial reinsurance for FONDEN to cover its exposure from weather risks affecting the agricultural sector.

In addition, providing catastrophic insurance coverage has encouraged the formation of mutual insurance funds amongst farmer organizations. These farmer organizations are called fondos de aseguramiento (known as fondos), formed to provide mutual crop insurance to their members. The fondos collect premiums, creating reserves to pay indemnities and cover operational costs. However, in the event of catastrophic weather events the collected premiums and reserves are not sufficient to cover the losses. This is because a catastrophe affects all farmers at the same time and the

mutual insurance needs to make payments to all of them at the same time. Research by the World Bank identified drought, excess humidity, and frost as the main weather perils that represent catastrophic risks for the fondos. These risks depend on the geographic location of the fondos, so each one is exposed to mainly one or two weather risks.

Source: World Bank 2000; Skees et al. 2001.

**2.3 Improving Governance to Mainstream Climate Issues in Poverty Reduction**

Public institutions, including both political systems and civil service institutions, are key to determining and implementing effective decisions. Climate change—which brings new and unknown risks, difficult choices, and potential sudden shocks—reinforces the need for responsive and accountable institutions. This is illustrated in an example on constructing and maintaining flood control systems in Bangladesh (Box 10), which demonstrates that good governance must underpin effective adaptation strategies. By making public institutions responsive, participative, and accountable to those they serve, decision making process and implementation activities can be robust enough to deal with the challenge of climate change.

**Box 10**  
**Public Accountability for Flood Protection in Bangladesh**

Flooding is a fact of life in Bangladesh, with one third of cultivated land flooded in a normal monsoon year. People in the Haor Basin have learned to cope, as the floodplains are some of the most productive fisheries in the country and the region has a food surplus providing up to 10 percent of national grain supplies. But the food system is fragile; 80 percent of people are sharecroppers or landless laborers and a powerful elite control land and fishing rights. While expected floods can be managed, flash floods can cause severe damage to homes and crops.



To prevent this, the Water Development Board constructed over 800 kilometers of embankments with responsibility for maintenance shared between government and residents. In 2002, after complaints by residents about lack of repairs to embankments, construction mismanagement, lack of monitoring, and corruption, a flash flood hit just before the main harvest. It destroyed a third of all infrastructure and 20 percent of the crop, leaving 1.4 million people in the Haor Basin facing food shortages. In response to visits to the area by activists and government officials, relief was provided and steps taken to prevent a similar outcome in the future. The Minister for Water Resources has agreed to stamp out corruption in construction and some senior Water Board officials have been removed while a judicial inquiry is underway.

The State Minister for Disaster Management has announced that, for the first time in 20 years, elected officials will be involved in embankment construction and maintenance. However, since local government remains weak, a local civil society group, HUNO, is working with the local government and Water Board to develop a citizen-based monitoring system.

Sources: Sashankar 2002; DFID 2002.

### The Role of Civil Society in Climate Change Policies and Programs

For climate adaptation to be effective, empowering civil society to participate in the assessment process, including identifying and implementing adaptation activities, is especially important (see Box 11). However, in order to enhance their participation, it is important to ensure that they have access to information, analysis, and knowledge about the impact of climate change on their lives. Vulnerability assessments and adaptation measures are more likely to be realistic and effective if they have input from those who will be affected by climate change and who are best placed to manage the relevant risks. At the same time, adaptation reflects a continuing learning process, and community participation in the assessment process could itself enable the community to initiate adaptation measures.

#### Box 11

### Reducing the Vulnerability of Women to Cyclones in Bangladesh

The community-based cyclone preparedness program in Bangladesh has found that where women were not involved in village-level disaster preparedness committees, responsible for maintaining cyclone shelters and transmitting warnings, they made up the highest proportion of cyclone victims. In Cox's Bazaar in east Bangladesh, where women are now fully involved in disaster preparedness and support activities (education, reproductive health, self-help groups, and small and medium enterprises), there has been a huge reduction in the numbers of women killed or affected.

Source: IFRC-RCS 2002.

Engaging broader civil society, including community groups, religious organizations, trade unions, professional associations, the media, and public interest organizations, is also important. Such groups can be instrumental in raising awareness of climate change impacts, in supporting poor people as they engage in adaptation activities, in providing valuable knowledge, and in monitoring governmental performance and holding government to account in its efforts to cope with climate change. Consequently, civil society, and particularly the poor, must be empowered to participate in the assessment process and in identifying adaptation activities.

### Monitoring and Assessment of Poverty and Climate Change

Understanding how climate change is increasing the vulnerability of the poor through its impact on their livelihoods, health, and economic opportunities is crucial to effective policy responses.

Improved use of climate information will require strengthening existing institutions and processes to develop effective procedures for information collection and dissemination. This will include, and in turn contribute to, the development of trust and motivation among end-users. As well as the need to ensure that climatic information is focused on the needs of the poor, there are two kinds of challenges: the first involves situations where informa-

tion exists, but is poorly coordinated and often not used, and the second involves situations in which relevant information is lacking. Generally, vulnerability assessments for current climate variability are more widely available, while assessments for future climate variability are much fewer – although growing in number.

The considerable body of information about current climate variability includes the growing number of vulnerability assessments at all spatial scales (UNEP 2001; Downing and Patwardhan 2003), but despite this progress vulnerability assessments are still limited in number for poor countries. Vulnerability maps account for climate-induced risks to crop production, water, health, and so on. The World Food Programme has its own vulnerability-mapping unit and non-governmental organizations like the Save the Children Fund also have their own assessments. The challenge is to increase the effectiveness of the information by coordinating data gathering efforts to avoid duplication and to ensure that the data really are being used to inform and influence decisions and action. There are many cases demonstrating that the real problem is not lack of vulnerability assessments or early warning – but the lack of prompt action on such early warnings.

However, sometimes the problem is a lack of relevant and reliable poverty-climate information. In particular, action is needed to improve short-term impact information and to ensure that it is used. To date, many climate change vulnerability, impact, and adaptation assessments have focused on the medium to long term (year 2050 or even 2100). This timeframe does not coincide with the scope of decision making by politicians and governments, who are guided by short-term political cycles and annual budgets. Shorter-term probabilistic climate outlooks, from the seasonal to 3–10 year time scale, could therefore be useful for the development of rapid, but preliminary, assessments. This focus on the short run will help to make the assessments more useful for reducing poverty now. Nevertheless, it is important to recognize and also improve the long-term projections in climate trends to ensure that no measures are taken now that lead to maladaptation in the long run.

Development of possible socioeconomic scenarios for the future has proven problematic due to the large uncertainties associated with projecting likely

development paths. Guidelines for the design of socioeconomic scenarios are now developed (UNDP 2001), and some countries – like China and India – are using them as part of their assessments. The development of diverse scenarios based on the integration of climate change and poverty data – including, but not limited to, Poverty Reduction Strategy Papers (PRSPs) – can inform the design of more effective adaptation strategies and planning options.

In conclusion, effective and transparent institutions must be in place to ensure that high quality information reflecting the needs of the poor is produced in a participative manner, made accessible, and acted upon. This is key to effective decision making.

### Coordination of Adaptation by Government

Vulnerability assessments and the identification of cross-sectoral dimensions of climate change have led some countries – which usually are already vulnerable to today's climate – to assign the general responsibility of climate change management to a ministry with a broad mandate. In Kiribati, for example, the national adaptation program is managed by the Ministry of Finance, which helps to ensure a coordinated response and that other policies do not inadvertently increase the vulnerability to climate change (Box 12).

#### Box 12 Kiribati's Mainstreaming in National Planning Processes

**Kiribati is one of the most vulnerable countries in the world to the effects of climate change, climate variability, and sea level rise. Most of the land in Tarawa, Kiribati's largest and most populous island, is less than 3 meters above sea level, with an average width of only 450 meters. The islands are exposed to storm surges and to droughts, particularly during La Niña events. Many adaptation measures that address immediate risks are the same as those recommended for adapting to climate change.**

**The government of Kiribati is moving to a two-phase Adaptation Program, which would address mainstreaming adaptation in their national development framework. The**



Program is overseen by an Adaptation Working Group, chaired by the Secretary to the Cabinet, and managed by the Ministry of Finance and Economic Planning. All other concerned Ministries are represented on the Adaptation Working Group, along with fully committed senior-level staff. The Preparation Phase (scheduled to last two years) will involve a process of national consultations between key government ministries, the private sector, non-governmental organizations, and civil society to agree on a national vision for adaptation, along with broad benchmark indicators that would be incorporated into national economic planning. The Implementation Phase (three to four years) would start once adaptation benchmarks are agreed and ideally be supported by incremental grant financing from donors for top-up of public expenditures against agreed adaptation benchmarks.

Source: Bettencourt 2002.

### Mainstreaming Adaptation into Planning Processes

All countries have some process to identify and implement key priorities at national, subnational, and sectoral levels. At the national level, this may be a long-term development plan, a Poverty Reduction Strategy (PRS), a five-year planning process, or a national strategy for sustainable development (OECD 2001). Mozambique's Action Plan for Poverty Reduction represents an example of how responses to climate risks can be integrated into national development strategies (Box 13).

The prioritization of development interventions normally occurs in the Office of the President or Prime Minister, in Planning Agencies, or in Ministries of Finance. The process varies from country to country and, in large countries, often from province to province. The priority-setting process typically involves technical analyses as well as participatory inputs by various stakeholders. The design of adaptation activities will be context specific, based on the country's specific development planning process and the particular analytical and participatory methodologies used.

#### Box 13

### Mozambique's Action Plan for Poverty Reduction

Mozambique is particularly vulnerable to natural disasters, which impact heavily on the poor. The floods it experienced in 2000 and 2001 had far-reaching social and economic consequences for the poor and the country's economic growth. The impact of natural disasters on the poor is recognized in Mozambique's Action Plan for the Reduction of Absolute Poverty 2001–2005, in which reducing vulnerability to natural disasters is one of the key action areas. The Action Plan states:

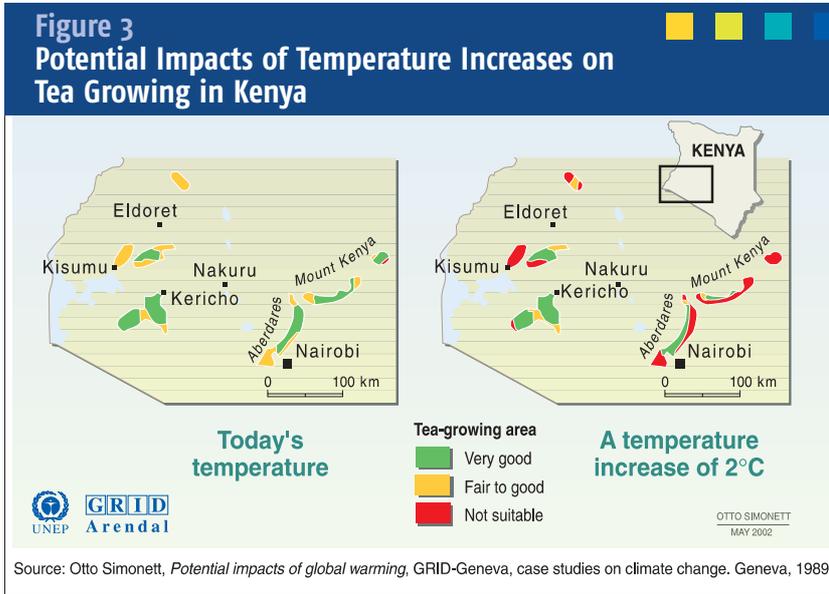
Natural disasters are a risk factor, which affect the pace of economic growth, and destroy assets of the poorest segments of the population in affected areas, reducing them to a state of dependency, at least temporarily, on donations. Natural disasters affect the living conditions of affected populations, and constitute an obstacle to a definitive break with certain degrees and patterns of poverty. Therefore, measures aimed at managing these risks are of the utmost importance.

The Action Plan goes on to recommend that action be taken to strengthen the national capacity to respond to natural disaster by raising the standard of the national early warning system.

Source: Mozambique 2001.

In addition to national level planning, experience suggests that climate adaptation also needs to be followed through to local level planning and implementation to be effective. With increasing decentralization, local governments are often key to effective implementation of any policy in developing countries. Adaptation strategies will require fusing government- and institution-level approaches with bottom-up approaches rooted in regional, national, and local knowledge (Niang-Diop and Bosch 2003).

Finally, key climate-sensitive sectors, such as agriculture and infrastructure, also need to integrate



climate adaptation activities. For example, in Kenya, the total area suitable for growing tea may be dramatically reduced with a temperature increase of 2°C in comparison to 1990 (Figure 3). Only higher-elevation areas would remain appropriate for tea growing; other areas would become too hot to grow tea. This work demonstrates the potential dangers of not taking climate change into account in strategic sectoral planning. Mainstreaming climate issues into broader planning activities would lead policymakers at least to consider the impacts on export earnings and may encourage diversification into more climate-resilient food

crops in vulnerable areas. Whatever form the priority-setting process takes, it should consider relevant climate change adaptation activities.

As this section has demonstrated, for adaptation to be effective, development of adaptive capacity to climate variability and change should be mainstreamed into national support for poverty reduction and sustainable development. The task ahead for the development community is to increase adaptive capacities and help to implement specific actions for addressing climate change impacts.

## Part 3: The Way Forward

This document has argued that climate change impacts severely threaten development efforts and opportunities across the developing world. Through the United Nations Framework Convention on Climate Change (UNFCCC)<sup>5</sup>, efforts have been initiated to develop and increase the adaptive capacity of poor people and the poorer countries to the impacts of climate change. The UNFCCC decisions accept that sustainable development must be the framework for adaptation activities and that both immediate and long-term responses to the adverse impacts of climate change are needed.

Many of these responses are “no regrets” measures, which, if implemented, strengthen the overall sustainable development process. No-regrets policies and measures would generate net social benefits whether or not there is human-induced climate change (IPCC 2001b). While in principle no-regrets measures are beneficial to the economy and their realization may in some cases require no or little additional funding, considerable transaction costs may be involved in other cases. The challenge is to fine-tune policies and practices by removing barriers that currently constrain the adoption of no-regrets adaptation responses. Depending on the rate and magnitude of climate change, further specific adaptation measures may become necessary and require additional funding. It is important to recall that the need for, and therefore also the cost of, adaptation is ultimately tied to mitigation efforts.

Below are the areas of action for all stakeholders, given an understanding that the main objective is to mainstream and integrate adaptation responses into sustainable development processes and activities.

### 3.1 Mainstream Adaptation into Sustainable Development

#### Development Agencies and Donors

Support for general poverty reduction and sustainable development lies at the core of development agencies’ programs. Given the gravity of climate issues and their potential impact on achieving the Millennium Development Goals by 2015 and sus-



taining progress beyond 2015, development agencies need to give more consideration to climate change in their work.

International development agencies should take the lead in internalizing climate issues in all their work by ensuring robustness of poverty reduction programs to climate change. This would require development of tools and methodologies, training and awareness raising of senior management and staff, and the possible modification of their own institutional processes to ensure that climate vulnerability is addressed with due diligence<sup>6</sup>.

Over recent years, several countries and regions have developed vulnerability and adaptation assessments, as well as practical policy proposals and strategic implementation plans to address climate change. This knowledge needs to be integrated into development support so as to manage climate vulnerability along with other non-climate risks in project design and implementation. Three windows of opportunity are available to enable this integration.

First, there is an immediate opportunity to analyze projects and practices that show how the translation of adaptation planning and assessment into project design will provide real benefits. This can

ultimately facilitate the mainstreaming of climate change issues into national policy and sustainable development planning.

Second is the opportunity to start implementing adaptation activities where sufficient information is available. Such activities need to be of immediate concern to the livelihoods of poor people, such as water resources management, land management, health, agriculture, infrastructure development, fragile ecosystems, and integrated coastal zone management. There is also a need for climate change related disaster prevention and preparedness to be more proactive and development-oriented. At the same time, development efforts should fully incorporate disaster prevention and preparedness.

Third is the opportunity to implement the priority adaptation activities identified by the UNFCCC<sup>7</sup>,

especially in cooperation with its financial mechanism, the Global Environment Facility (GEF). In this context, collaboration between the Development and Environment Ministries of OECD countries would help to harmonize adaptation within the development cooperation framework and within the UNFCCC focus (OECD 2002).

### Governments in Developing Countries

The efforts of development agencies to address climate change should support and complement those of developing-country governments in mainstreaming climate issues in national development frameworks, sectoral planning and budgeting processes, and in integrating adaptation measures in the implementation of development projects.

In the context of regional, national, and local needs and sustainable development imperatives, adaptation interventions often form only a subset of many desirable interventions. Interventions to address climate-induced increased vulnerability compete with interventions to address other important issues such as indebtedness, HIV/AIDS, increasing urban poverty, macroeconomic instability, and increasing inequality. Consequently, following assessments of vulnerability and adaptation options, adaptation interventions, where necessary, would need to be prioritized in the context of other development interventions. The assessment and prioritization processes would necessarily require engagement between civil society, the government, and the private sector.

In order to internalize the identified priorities, it is necessary to enable institutional processes to anticipate climate-related vulnerability. This emphasizes the importance of the budget process. Even if the development priorities are ultimately funded in some countries through development assistance, this expenditure should be included within the budget framework to ensure proper planning and financial management and the correct prioritization amongst competing demands for resources within the country itself. This will ensure that they are properly funded over the long term, that they are integrated into relevant sectoral priorities, and that they can be balanced against other competing priorities.

The pervasive nature of interventions required across the economy to address climate-related vulnerability suggests that in some cases a Ministry



with a broad mandate, for example the Ministry of Finance or Planning, is most appropriate to coordinate adaptation interventions. In other cases, where vulnerability increases are largely confined to a single sector (for example water or agriculture), strengthening the sectoral Ministry may be the key institutional intervention.

### 3.2 Continue and Strengthen Assessment and Information Gathering

Internalizing climate vulnerability into the development process, both within the development agencies as well as within country governments, will require assessments of current and future climate vulnerability. Within a development project, such assessments should include both a participatory analysis of the vulnerability of the community, ecosystem, and socioeconomic sector that the project addresses, and an assessment of the effects of the project on the vulnerability of the community, ecosystem, and socioeconomic sector.

This document has argued the importance of both the geographic specificity of increased vulnerability and of local, sometimes informal, knowledge to deal with climate variability. This highlights the importance of capturing local knowledge, reviewing and assessing its applicability, and its dissemination amongst other communities and relevant agencies.

Assessment related activities should build on the significant work already undertaken by many countries to prepare vulnerability assessments in the framework of the preparation of National Communications to the UNFCCC. Best practice examples are the National Communications of Mongolia, Ethiopia, Maldives, Yemen (Mongolia 2001; Ethiopia 2001; Maldives 2001; Yemen 2001), and the regional assessments developed by the Pacific and the Caribbean Small Island States. Typically, these documents have been developed from the perspective of the livelihood approach, giving emphasis of the impact of climate change on people's lives, instead of solely focusing on physical and natural changes.

International support is important to create an enabling environment in developing countries to carry out vulnerability assessments of relevance to their needs and priorities. This could include strengthening infrastructure for data collection and dissemination, capacity building for scientific and

socioeconomic assessments, and for related policy analyses.

Vulnerability assessments and their integration into development policy and implementation is an evolving process. The incorporation of vulnerability assessments requires strengthening human and institutional capacity in national and international development agencies and appropriate civil society organizations to support the information and decision making needs of individuals, and realign institutional practices where appropriate. Recognizing the importance of increased knowledge sharing, some development agencies have created an open network called the Vulnerability and Adaptation Resource Group (VARG) to enhance knowledge sharing<sup>8</sup>.

### 3.3 Engagement with the UNFCCC Process

The UNFCCC has played a valuable role in assisting countries to consider adaptation responses through "enabling activities" to promote capacity building, public and political awareness creation, sustainability of institutional arrangements, sustainability of capacities, and integration of climate change adaptation measures into national development policies. The first round of enabling activities must be seen as a first step, but many of these objectives, in particular the integration of climate change responses into national development policies, are yet to be completed in any country (Amous et al. 2000). In the absence of prior experience, unrealistically high goals were set considering the limited funds and time available. As the first round was undertaken, it became apparent that the methodologies for vulnerability and adaptation assessment need to be further developed to enable the integration of these assessments into development practices.

However, the main reason for the weakness of adaptation activities promoted by the international community has been institutional. The process has been led by the UNFCCC national focal points, which are normally situated within Ministries of Environment, which often have limited links and leverage over other line Ministries. Developing a coherent response to adaptation requires integrating climate change adaptation into the activities of other ministries, such as Finance, Economic Affairs, Planning, and key sectoral line Ministries.

The implementation and effectiveness of the UNFCCC process in addressing global climate change, especially in developing countries, is closely linked to its ability to simultaneously further development and poverty reduction goals. Capacity building to support and facilitate these linkages will enhance the sensitivity of poverty reduction policies to climate issues.

Recently, the UNFCCC has also mandated support for adaptation activities through three Funds (the Least Developed Country Fund, the Special Climate Change Fund, and the Kyoto Protocol Adaptation Fund). The LDC Fund, which is the only Fund of the three that is currently operational, is supporting the Least Developed Countries to prepare National Adaptation Programmes of Action (NAPAs). This is accompanied by the formation of the Least Developed Countries Expert Group (LEG), which is emphasizing the focus on poverty reduction during adaptation planning.

In addition, knowledge generation and dissemination related to climate impacts and vulnerability assessments are essential for making poverty reduction strategies more effective by mainstreaming and integrating climate issues. The IPCC has played a key role in reviewing and synthesizing information about climate change, its impacts, and potential adaptation measures, with a view to informing the UNFCCC negotiations. This knowledge needs to be made more accessible to decision makers, development agencies, and civil society in order to enable them to use it to inform their own work.

Finally, the implementation experience of the development agencies needs to be shared with the UNFCCC process with a view to informing the dialog on opportunities available to integrate adaptation responses in sustainable development. Accordingly, the sharing of analytical tools and project experience should be promoted and inter-agency collaboration should be enhanced.

### **3.4 Ensure Synergies with Other Multilateral Environmental Agreements**

The Rio Conventions reflect the commitment of the international community to protect the global environment, on the basis of common but differentiated responsibilities and respective capabilities. In this context OECD countries have a special responsibility for leadership on sustainable development worldwide, both historically and because

of the influence they exert on the global economy and environment. This responsibility includes helping developing countries to pursue a sustainable development path. In this context it is essential that the linkages between poverty reduction and the global environment are recognized and addressed through appropriate responses (OECD 2002).

This implies that the UNFCCC, the UN Convention on Biological Diversity (UNCBD), the UN Convention to Combat Desertification (UNCCD), and the international agreements on forests are assessed in their local impact on poverty and synergies between conventions are utilized.

Many countries have already taken initiatives to identify prioritized adaptation interventions. In this context, the Least Developed Countries are preparing NAPAs in accordance with UNFCCC guidelines. In addition, prioritized adaptation interventions have also been identified in National Biodiversity Conservation Plans (prepared in response to the Convention on Biological Diversity), the National Action Plans (prepared in response to the Convention to Combat Desertification), and the National Environmental Action Plans.

Currently, many environmental ministries are stretched by the need to service all these international processes, leaving little time for them to engage in domestic implementation and determining national environmental priorities. This conflict can be reduced by maximizing synergies in reporting and other requirements for these international agreements. For a poor person it does not matter from which convention the intervention comes. It is important that these interventions improve welfare and are sustainable. Streamlining national responses to the various global environmental conventions would also help to minimize the diversion of scarce human resources from primary sustainable development activities.

Sustainable interventions that improve economic and social welfare can be ensured by addressing synergies between conventions on the regional and local levels. Impacts of climate change can also affect projects and objectives of the other Conventions. For example, changes in temperature and rainfall regimes are expected to impact on species distribution and the goods and services provided

by ecosystems. Conservation measures aiming at the long-term protection of biodiversity and ecosystems should take such changes into account. Integrating diverse initiatives will help to achieve a strong synergy between the goals of these global environmental conventions and the sustainable development process.

### 3.5 External Funding

Mainstreaming climate issues in development planning would help to ensure that adaptation measures are taken, where this proves to be necessary for achieving sustainable development. As a result, the majority of financial resource needs for adaptation interventions could be part of, and channeled through, national development budgets, with appropriate support from bilateral and multilateral agencies and from non-official development aid sources. Within this context, all countries would use their national processes (long-term development plans, poverty reduction strategy, national strategy for sustainable development, etc.) to identify and implement key priorities. This would ensure the effectiveness of the interventions since they would be matched by a medium-term expenditure framework that would allocate resources (from national and external sources) to these nationally determined adaptation priorities. It would also ensure that adaptation is addressed as a development issue, and not only as a one-dimensional environmental issue.

However, the development of capacity, as well as the implementation of specific measures to cope with the adverse effects of climate change, will in many cases require substantial external resources to reduce the vulnerability and increase the resilience of those most at risk. While all demands for external financial support should result from national planning processes in developing countries, there are three ways to channel external support:

- Through regular development assistance channels; this could be bilateral, multilateral, and/or non-governmental assistance including public-private partnerships.
- Through the GEF in its role as the financial mechanism of the UNFCCC.
- Through the new Funds created by the UNFCCC.

It is crucial that external financial support is available to developing countries as they integrate adaptation in their own sustainable development efforts, especially in interventions for poverty

reduction. This external funding is required to support: vulnerability assessments; identification, prioritization and preparation of adaptation interventions; and the mainstreaming and integration of these interventions in national and sectoral planning and implementation, through the removal of barriers to the adoption of no-regrets interventions. These barriers could include information and knowledge gaps, weak human and institutional capacity, inappropriate policy context, and lack of transactional experience in planning and implementing adaptation measures.

At the same time, external financial support would also be required for implementing specific adaptation measures that address the increased vulnerability of poor people due to the adverse impacts of climate change. The nature and scope of support for these activities from the GEF and the new climate change Funds would depend on the evolving guidance from the UNFCCC.

Finally, it is essential to ensure the rapid availability of external funding for adaptation interventions. This is required to address the many cases in which adequate information on vulnerability, and on its reduction through adaptation measures in sustainable development programs, is already available. There is the need to implement pilot projects as the powerful learning-by-doing experience from these interventions would reinforce the next steps.







## Notes

1. Besides, the sea level and ice sheets would continue to respond to warming for many centuries after greenhouse gas concentrations have been stabilized. Climate Change 2001; Statement of the IPCC Chairman at CoP7.
2. Adaptation will, however, not prevent all damages.
3. In the year 2000 the atmospheric concentration of carbon dioxide (CO<sub>2</sub>) was about 370 parts per million (ppm), which represents about a 30 percent increase when compared to pre-industrial levels (IPCC 2001a). A future stabilization level of the CO<sub>2</sub> concentration at, for example, 550 ppm is likely to lead to lower damages than a stabilization at a higher level, say 750 ppm, because the associated climatic changes are likely to exert less pressure on natural and human systems. Over the next 250 years, the projected temperature increase, compared to the 1990 global average, is expected to be 1.9 to 5.1 °C for CO<sub>2</sub> concentration stabilization at 550 ppm, and 2.8 to 7.0 °C at 750 ppm (IPCC 2001a). These projected changes in temperature represent global averages, with the increases being higher over most land areas and lower over ocean surfaces.
4. Besides agriculture, infrastructure plays a crucial role in improving economic conditions in developing countries. According to World Bank estimates 1% increase in the stock of infrastructure translates to a 1% increase in GDP (UNDP 2001).
5. The United Nations Framework Convention on Climate Change (UNFCCC) was adopted at the 1992 Earth Summit in Rio. Its ultimate objective is the, "stabilization of greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a timeframe sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner" (Article 2, UNFCCC).
6. The Conference of the Parties (CoP) is the supreme decision making body of the UNFCCC. It is charged with promoting and reviewing the implementation of the Convention. At the Third CoP in Kyoto, the Parties agreed on a political framework for emissions reduction (the Kyoto Protocol, UNFCCC 1997), while Parties decided on the implementation arrangements for the Kyoto Protocol at the Seventh CoP in Marrakesh. The Marrakesh Accords (UNFCCC 2001), as well as the UNFCCC Declaration at the subsequent Eighth CoP in Delhi emphasized the need to address adaptation, along with mitigation efforts. The Global Environment Facility (GEF) is the financial mechanism of the UNFCCC, and is provided guidance by the CoP on activities eligible for support.
7. UNFCCC Decision 5/CP7 and 6/CP7.
8. Methodologies to assess and manage climate risks and highlight consideration of adaptation interventions from a purely technical to a human development perspective are currently available. (Jones and Boer 2003; Jones and Mearns 2003). The underlying approach emphasizes that adaptation is a process (UNDP 2003a) and needs to be assessed with appropriate indicators under a proper monitoring and evaluation framework for effectiveness (Perez and Yohe 2003).
9. The Vulnerability and Adaptation Resource Group (VARG) is an informal network of bilateral and multilateral agencies that was formed to promote an open discussion of adaptation issues. The mission of VARG is to facilitate the integration of climate change adaptation responses in the development process through the sharing, assessment, synthesis, and dissemination of existing knowledge and experience. The target audience are developing countries, the UNFCCC process, civil society, and development agencies. Participating agencies so far have included: ADB, BMZ, CIDA, DFID, DGIS, EC, GEF, GTZ, OECD, UNDP, UNEP, USAID, USEPA, and the World Bank.





## Glossary

**Adaptation** in natural or human systems is a response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities. In this paper adaptation refers to all those responses to climatic conditions that may be used to reduce vulnerability. Adaptation is a very broad concept and can be used in a variety of ways. Adaptation to the (expected) negative impacts of climate change generally takes place in two ways: anticipatory (before impacts take place) and reactive (as a response to initial impacts). In natural systems adaptation is reactive by definition. In human systems adaptation can be both anticipatory and reactive and can be implemented by public and private actors. Private actors include individuals, households, communities, commercial companies and other actors, such as NGOs. Public actors include government bodies at all levels (Klein 2001; IPCC 2001b).

**Adaptive capacity** can be defined as the ability of people and systems to adjust to climate change, for example, by individual or collective coping strategies for the reduction and mitigation of risks or by changes in practices, processes or structures of systems. Adaptive capacity cannot be easily measured and is not well understood. But it is related to general levels of sustainable development such as political stability (civil conflict, functioning democracy), economic well-being (GDP growth, incidence of poverty), human and social capital (literacy, life expectancy, level of local organization, micro-finance institutions) and climate specific aspects (such as existing disaster prevention and mitigation systems).

**Climate** can be viewed as average weather. It represents the state of the climate system over a given time period and is usually described by the means and variation of variables such as temperature, precipitation, and wind, most commonly associated with weather.

**Climate variability** refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the

climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability)" (IPCC 2001a; 2001b).

**Climate change** refers to any change in climate over time, whether due to natural variability or as a result of human activity. This usage differs from that in the United Nations Framework Convention on Climate Change (UNFCCC), which defines "climate change" as: 'change in climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural variability observed over comparable time periods" (IPCC 2001a; 2001b).

**Disaster** is a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community/society to cope using its own resources (UN/ISDR 2002).

**Disaster risk reduction** represents the systematic development and application of policies, strategies, and practices to minimize vulnerabilities and disaster risks throughout a society, to avoid or to limit adverse impact of hazards, within the broad context of sustainable development (UN/ISDR 2002).

**Integration** is used in this document when specific adaptation measures are added to design and implementation strategies. Thus, integration occurs in instances where adaptation to climate impacts is deemed to be a priority in order to effectively achieve development goals.

**Livelihood** comprises the capabilities, assets (including both material and social resources), and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both



now and in the future, while not undermining the natural resource base (adapted from Chambers and Conway 1992).

**Mainstreaming** in this document is used to describe the consideration of climate issues in decision making processes such as planning and budgeting.

**Mitigation** entails all human interventions that reduce the sources or enhance the sinks of greenhouse gases (adapted from IPCC 2001a; 2001b).

**Official development assistance** is defined as those flows to countries on Part I of the DAC List of Aid Recipients [developing countries] and to multilateral institutions for flows to Part I aid recipients which are:

- i. provided by official agencies, including state and local governments, or by their executive agencies; and
- ii. each transaction of which:
  - a) is administered with the promotion of the economic development and welfare of developing countries as its main objective
  - b) is concessional in character and conveys a grant element of at least 25 percent (calculated at a rate of discount of 10 per cent) (OECD 2000).

**"No regrets"** policies and measures would generate net social benefits whether or not there is human-induced climate change (adapted from IPCC 2001b).

**Poverty** is now widely viewed as encompassing both income and non-income dimensions of deprivation, including lack of income and other material means; lack of access to basic social services such as education, health, and safe water; lack of personal security; and lack of empowerment to participate in the political process and in decisions that influence someone's life. The dynamics of poverty also are better understood, and extreme vulnerability to external shocks is now seen as one of its major features (UNDP 1997).

**Preparedness** includes all activities and measures taken in advance to ensure effective response to the impact of disaster, including the issuance of timely and effective early warnings and the temporary removal of people and property from a threatened location (UN/ISDR 2002).

**Prevention** includes all activities taken to outright avoid the adverse impacts of hazards and related environmental, technological and biological disasters (UN/ISDR 2002).

**Resilience** is the amount of change a system can undergo without changing state (IPCC 2001b).

**Sink** includes any process, activity, or mechanism that removes a greenhouse gas, an aerosol, or a precursor of a greenhouse gas or aerosol from the atmosphere (IPCC 2001a; 2001b).

**Source** includes any process, activity, or mechanism that releases a greenhouse gas, an aerosol, or a precursor of a greenhouse gas or aerosol into the atmosphere (IPCC 2001a; 2001b).

**Sustainable development** is defined as development that meets the needs of the present without compromising the capacity of future generations to meet their own needs.

**Vulnerability** is a more dynamic concept than poverty, since it captures the sense that people move in and out of poverty. The meaning of vulnerability encompasses exposure to risk, hazards, shocks and stress, difficulty in coping with contingencies, and access to assets. In the context of climate change, vulnerability to climate change is used in this report to mean the risk that climate change will cause a decline in the well-being of poor people and poor countries. This means the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. This vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, and its adaptive capacity.



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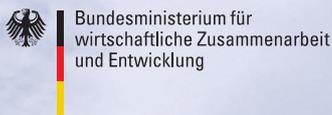
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