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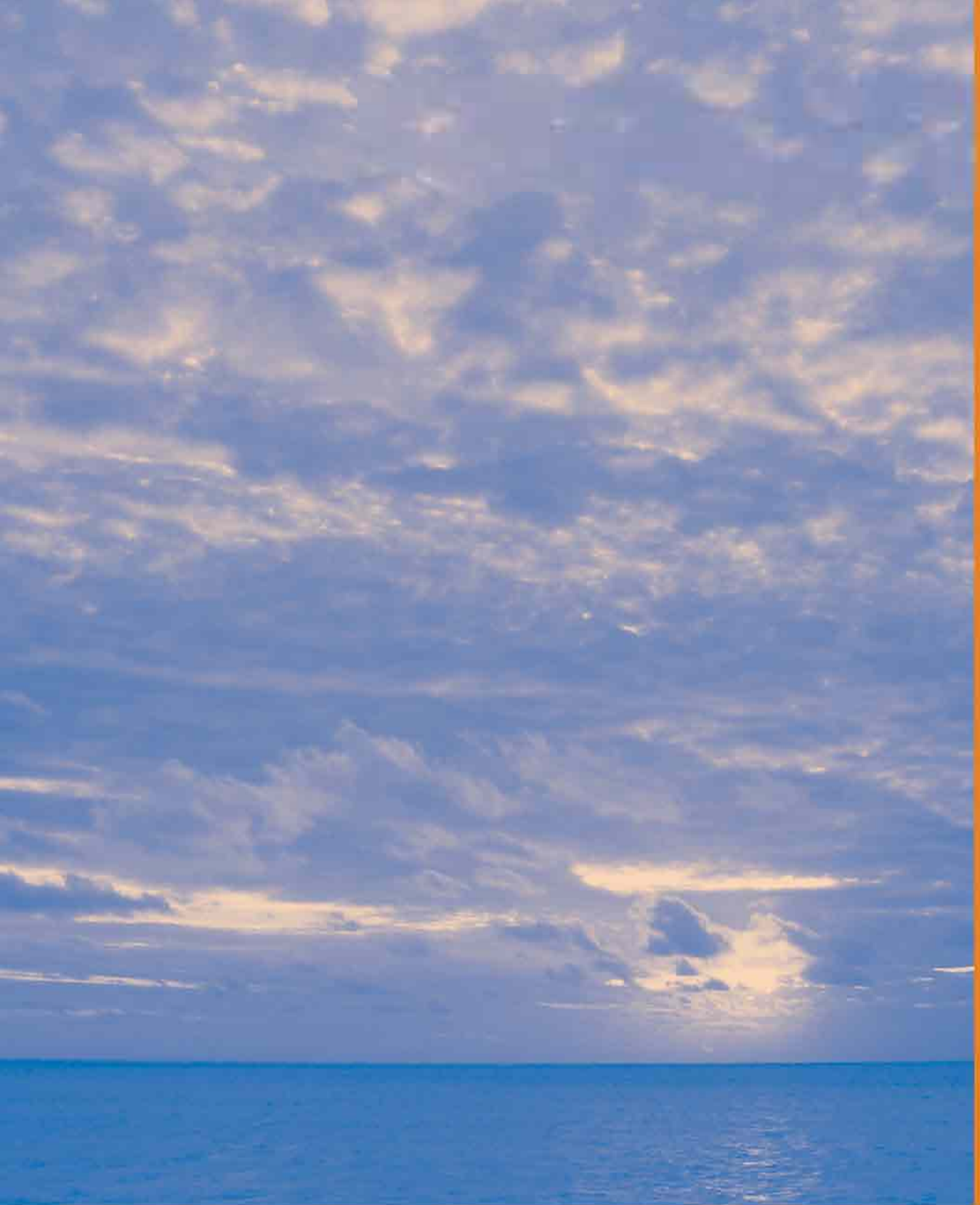
# Managing Climate Risk

*Integrating Adaptation into  
World Bank Group Operations*



World Bank Group  
Global Environment Facility Program





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**Global Environment Facility Program**



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# Abbreviations and acronyms

AfDB	African Development Bank
ADB	Asian Development Bank
BNPP	Bank Netherlands Partnership Program
CARICOM	Caribbean Community
CAS	Country assistance strategy
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CEA	Country environmental assessment
CONCORD	Climate Change Organizing the Science for the American Cordillera
CPACC	Caribbean Planning for Adaptation to Climate Change
DFID	Department for International Development [U.K.]
GDP	Gross domestic product
GEF	Global Environment Facility
GIIF	Global Index Insurance Facility
GTZ	Deutsche Gesellschaft für Technische [German Agency for Technical Cooperation]
IEG	Independent Evaluation Group [World Bank]
IMF	International Monetary Fund
INAP	Integrated National Adaptation Plan [Colombia]
IPCC	Intergovernmental Panel on Climate Change
KAP	Kiribati Adaptation Program
MACC	Mainstreaming Adaptation to Climate Change [Caribbean]
MDG	Millennium Development Goal
NGO	Nongovernmental organization
NOAA	National Oceanic and Atmospheric Administration [U.S.]
ODA	Official development assistance
OECD	Organisation for Economic Co-operation and Development
OECS	Organization of Eastern Caribbean States
PHRD	Japan Policy and Human Resources Development Fund
PRSP	Poverty Reduction Strategy Paper
SEA	Strategic environmental assessment
SPACC	Special Program on Adaptation to Climate Change [Caribbean]
TFESSD	Trust Fund for Environmentally and Socially Sustainable Development
UNFCCC	United Nations Framework Convention on Climate Change

All dollar amounts are U.S. dollars unless otherwise indicated.





# Executive Summary

Climate change is already taking place, and further changes are inevitable. Developing countries, and particularly the poorest people in these countries, are most at risk. The impacts result not only from gradual changes in temperature and sea level but also, in particular, from increased climate variability and extremes, including more intense floods, droughts, and storms. These changes are already having major impacts on the economic performance of developing countries and on the lives and livelihoods of millions of poor people around the world.

Climate change thus directly affects the World Bank Group's mission of eradicating poverty. It also puts at risk many projects in a wide range of sectors, including infrastructure, agriculture, human health, water resources, and environment. The risks include physical threats to the investments, potential underperformance, and the possibility that projects will indirectly contribute to rising vulnerability by, for example, triggering investment and settlement in high-risk areas. The way to address these concerns is not to separate climate change adaptation from other priorities but to integrate comprehensive climate risk management into development planning, programs, and projects.

While there is a great need to heighten awareness of climate risk in Bank work, a large body of experience on climate risk management is already available, in analytical work, in country dialogues, and in a growing number of investment projects. This operational experience highlights the general ingredients for successful integration of climate risk management into the mainstream development agenda: getting the right sectoral departments and senior policy makers involved; incorporating risk management into economic planning; engaging a wide range of nongovernmental actors (businesses, nongovernmental organizations, communities, and so on); giving attention to regulatory issues; and choosing strategies that will pay off immediately under current climate conditions.

There are several ways in which the World Bank Group can continue helping its clients better manage climate risks to poverty reduction and sustainable development:

- Integrating climate risk management into the project cycle, by adopting early risk identification (for instance by applying a quick and simple risk-screening tool) and following up throughout the design process if necessary.
- Integrating climate risk management into country and sector dialogues, especially in countries and sectors that are particularly vulnerable.

- Enhancing internal support for and coordination of climate risk management by, for example, expanding analytical work and capacity for cross-support by the Global Climate Change Team and the Hazard Management Unit of the World Bank and by actively developing climate risk management activities within regional departments.
- Supporting the establishment of proper financing mechanisms for adaptation, using, for example, the Investment Framework for Clean Energy and Development. New funding mechanisms created under the United Nations Framework Convention on Climate Change (UNFCCC) and being made operational by the Global Environment Facility (GEF), as well as the Kyoto Protocol, should be used to leverage maximum adaptation results within the Bank's broad range of development activities and investments.

By enhancing climate risk management, the World Bank Group will be able to address the growing risks from climate change and, at the same time, make current development investments more resilient to climate variability and extreme weather events. In that way, climate risk management will not only guard the Bank's investments in a changing climate but will also improve the impact of development efforts right now.

# I · Introduction

In recent years the development community has become increasingly concerned about the adverse effects of climate change on poverty reduction and sustainable development. Science has shown that climate change is already occurring and is bound to continue, even under the most optimistic emissions scenarios. Developing countries, and particularly the poorest people in these countries, are most vulnerable.

This concern has prompted the United Nations Framework Convention on Climate Change (UNFCCC) to give more attention to adaptation and to establish funding channels to support developing countries in reducing their risk. The Global Environment Facility (GEF) has already activated the Least Developed Countries Fund and the Special Climate Change Fund and has established a Strategic Priority on Climate Change in its regular GEF Trust Fund.

But adaptation is not just a matter for the UNFCCC or the GEF. It will affect a significant portion of development investments and is best treated as part of integral climate risk management. In such a climate risk management approach, the threats and opportunities arising from existing and future climate variability, including those deriving from climate change, are assessed and, where necessary, incorporated into the design of projects and plans. Such risk management is nothing new: risks of currency fluctuations or changing market conditions are commonly integrated into World Bank Group operations.

Climate risk management focuses on better management of climate variability in all relevant sectors. The starting point is to determine vulnerability to the current climate conditions, including variability and weather extremes. The next step is to assess how vulnerabilities might change as a result of climate change or in the context of other changes such as population growth and shifting trade patterns. In this way, climate risk management focuses on the pressing issues of the here and now while factoring in projected changes. Since many developing countries are only partly adapted to current climate conditions, climate risk management is of immediate relevance and benefit.

Climate risk management cannot be tackled as a stand-alone issue; it must be integrated into the mainstream development agenda. Many development agencies and investment banks are considering how best to incorporate such concerns into their assistance to developing countries, partly using the new funding opportunities to achieve the broader goal of risk management in regular operations.

This paper takes stock of a number of early experiences in adaptation to climate change and highlights key elements of how the World Bank Group can continue to help its clients better manage the risks to poverty reduction and sustainable development posed by climate change.

The next chapter briefly describes the main concerns about climate change and its impacts on development. Chapter 3 discusses how climate risk management can be integrated into development planning and projects. Chapter 4 reviews a number of experiences with climate risk management in Bank-GEF operations, and chapter 5 outlines steps to be taken in the near and medium term.

## 2 • Climate change, economic development, and poverty reduction

Climate change is no longer an issue for the distant future. During the past century the global climate warmed by about 0.7°C because of human activities, with accompanying changes in rainfall patterns, extreme weather events, and sea levels, and another 1.4°C–5.8°C temperature rise is projected in the next hundred years. The impacts of higher temperatures, more variable precipitation, more extreme weather events, and sea level rise are already being felt and will continue to intensify. Although aggressive mitigation of greenhouse gas emissions is crucial if dramatic long-term changes are to be averted, most of the changes projected for the coming decades can no longer be avoided.

### Severe impacts, particularly for the poor

The consequences of such changes include decreased water availability and water quality in many arid and semiarid regions; an increased risk of floods and droughts in many regions; reduction in water regulation in mountain habitats; decreases in reliability of hydropower and biomass production in some regions; increased incidence of vector- and waterborne diseases such as malaria, dengue, and cholera; increased heat stress mortality; threats to nutrition in developing countries; increased damages and deaths caused by extreme weather events; decreased agricultural productivity with almost any warming in the tropics and subtropics; adverse impacts on fisheries; and adverse effects on many ecological systems (see box 1).

Developing countries, and particularly the poorest people in these countries, are most vulnerable to such changes (see box 2). Their economies depend heavily on agriculture, forestry, fisheries, a reliable water supply, and other natural resources. They also have limited human capacity and limited access to technology and capital to invest in risk reduction.

The increasing risk of weather extremes comes against a backdrop of rising losses from natural disasters and increasing numbers of people affected. In constant dollars, disaster costs in the 1990s, at \$652 billion in material losses, were more than 15 times higher than in the 1950s. In addition, the number of people affected

#### BOX 1

#### Key development sectors directly affected by climate change

- Human health
- Water supply and sanitation
- Energy
- Transport
- Industry, mining, and construction
- Trade and tourism
- Agriculture, forestry, and fisheries
- Environmental protection
- Disaster management

Source: See, for example, van Aalst and Agrawala (2005).

## BOX 2

### Climate change and Africa

Africa will be extremely hard hit by climate change. Sub-Saharan African economies are particularly vulnerable because of their high reliance on agriculture: approximately 25 percent of GDP and 70 percent of the workforce is in the rural sector (DFID 2004).



Many parts of the continent regularly fail to cope with current climate variability. Droughts, floods, and other extremes have large economic and humanitarian consequences. For instance, the costs of the 1997–98 floods and the 1999–2000 droughts in Kenya represented at least 11, 16, and 16 percent of the country's GDP for the three consecutive years over which they occurred (Mogaka and others 2004). More generally, there is a very high correlation between rainfall variability and GDP performance.

Besides direct damages and the accompanying humanitarian crises, climate variability has another, hidden cost. The widespread expectation that unmitigated disasters will recur leads to risk-averse behavior and creates disincentives for investment, seriously affecting economywide performance and hence growth, even in years of good climatic conditions (Gray and Sadoff 2004).

Climate change is projected to increase the number of droughts and floods. Coupled with sea level rise, this will affect food security, the productivity of commercial agriculture, commodity exports, health, and energy. Hundreds of millions more people will suffer from the increased risk of floods. Crop production will be seriously affected, with yields falling in most parts of Africa. Diseases such as malaria may become more widespread. People will lose their livelihoods, and communities and countries will suffer economically (see, e.g., DFID 2004).



Photo 1: The environmental downside of coastal development.

by disasters has grown dramatically. Some of these increases can be explained by population growth and the fact that more assets are at risk, but they also reflect maladaptation—an increasing exposure to extreme events as a result of investments and settlement in hazardous locations. Sadly, instead of improving our capacity to withstand the extremes of a changing climate, many development efforts may well be contributing to a rise in vulnerability.

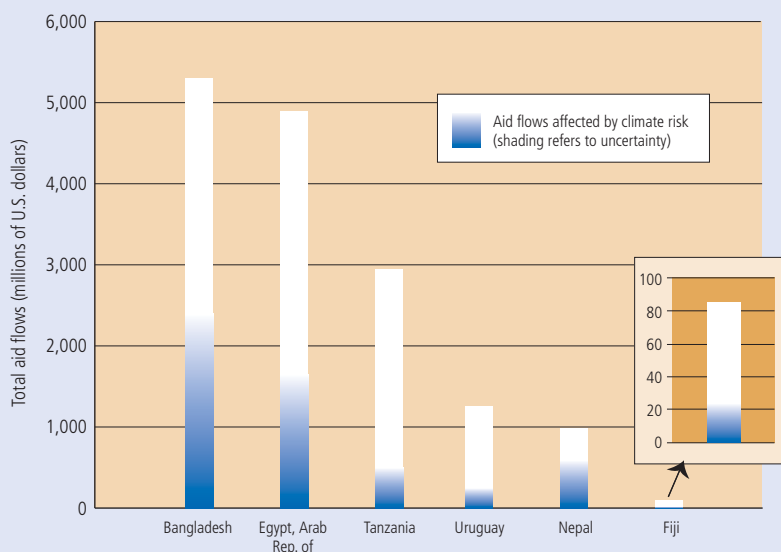
## Climate change and the World Bank Group's mission of eradicating poverty

Climate change will hamper the achievement of many of the United Nations Millennium Development Goals (MDGs), including those on poverty eradication (MDG1), child mortality (MDG2), combating HIV/AIDS, malaria, and other diseases (MDG6), and environmental sustainability (MDG7). Several studies have suggested that in the absence of adaptation, the annual costs of climate change impacts in exposed developing countries could range from several percent to tens of percent of gross domestic product (GDP) in exposed developing countries (World Bank 2006a). Much of this damage would come not gradually and incrementally through the years but in the form of severe economic shocks. In addition, the impacts of climate change will exacerbate existing social and environmental problems and lead to migration within and across national borders. Climate change is clearly not just an environmental issue but one with severe socioeconomic implications, particularly in developing countries.

### Effects of climate change on development investments

Climate change has severe implications for development investments, including the World Bank Group's assistance to its client countries. An assessment of six developing countries (OECD 2005) showed that a significant share of development investment (official development assistance and concessional lending) could be at risk from climate change (see figure 1). A rough estimate is that about a quarter of the World Bank Group's portfolio is subject to a significant degree of climate risk (World Bank 2006a).

**Figure 1. Development aid flows affected by climate risk, 1998–2000**



Source: OECD 2005.

Note: The definition of uncertainly depends on the sectoral classification used in the assessment.





## 3 • Climate change as a risk management issue

Worryingly, the rising risks of climate change and their implications for development (outlined in box 3) are seldom explicitly addressed in World Bank Group operations. Currently, climate risks are discussed in project design documents for only about 2 percent of projects (World Bank 2006a). The six-country review of development assistance by the Organisation for Economic Co-operation and Development (OECD) cited in chapter 2 found that few plans, programs, or projects by donor agencies, development banks, or the national governments studied took account of climate risks (van Aalst and Agrawala 2005). An earlier study of World Bank Group projects (Burton and van Aalst 1999) and an assessment of projects by the German Agency for Technical Cooperation (Klein 2001) came to similar conclusions. It is possible that climate risks are partially addressed during project implementation. There is, however, clearly a need to provide stronger incentives and tools for better due diligence regarding climate risks in project design.

In fact, these studies also showed that besides lack of attention to the risks associated with a changing climate, many strategies, programs, and projects also failed to take into account the risks of natural hazards under current climate conditions. Even as the Bank Group, donors, and developing country governments are making substantial investments to foster economic development and poverty alleviation, their efforts are frequently diluted or even erased by the effects of natural disasters. Some of the damages from these natural hazards are unavoidable, as it is neither feasible and nor economical to strive for protection against all risks, but many damages and casualties simply result from poor planning. Even worse, the well-intended rapid reconstruction efforts after a disaster often recreate the same vulnerabilities that allowed the hazard to cause such havoc in the first place.

This illustrates the large overlap between the challenge facing climate change adaptation and that facing disaster risk reduction. As the World Bank Group's Independent Evaluation Group (IEG) put it in 2006, "Countries affected by disaster, as well as the donors that try to help them, including the Bank, have generally treated disasters as interruptions in development rather than as a risk that is integral to development." Hazards

### BOX 3

#### Climate risks facing development investments

- Direct threats to investments (e.g., effect of extreme weather events on infrastructure)
- Underperformance of investments (e.g., irrigation investments that fail to pay off when rainfall decreases)
- Maladaptation, as when economic development triggers settlement in vulnerable areas or taxes the resilience of natural resources

In addition, there is the risk of forgoing opportunities that may arise from climate change and could be captured if factored into plans and projects.

become disasters as a result of the day-to-day development decisions that are responsible for the high levels of vulnerability. Most of the hazards facing developing countries are recurrent, rather than one-off events, and they should be treated as risks to development rather than as acts of God. Although disaster management covers many hazards, such as earthquakes and volcanoes, that are not related to climate, and climate change adaptation must also address gradual changes in average conditions, there is clearly a strong overlap between both agendas. The impacts of climate change on increased droughts and floods, stronger hurricanes, and sudden outburst floods from glacial lakes, to name a few consequences, clearly represent higher levels of disaster risk.

Both the climate change adaptation and the disaster risk reduction constituencies face similar challenges in integrating risk management into various domains of development, as they are seldom considered part of core business by key players in sectoral or national planning. Given the rising climate risks and disaster losses, these constituencies should together make the case that appropriate hazard risk management, including adaptation to climate change, is not a luxury for development planning but is pure due diligence.

For a farmer in Africa affected by a drought, it does not matter whether the adverse conditions are related to greenhouse gases or are part of the natural variability in the climate system. From a development perspective, climate change is only one element in the spectrum of risks facing an investment. Hence, adaptation to climate change should be addressed through a climate risk management approach—that is, an ongoing process that starts with coping strategies for current climate variability, tries to anticipate changes in climate change, and seeks to evolve new coping strategies as necessary (see the discussion in the Introduction).

Such risk management is not new to development investments. The World Bank Group routinely assesses strategic and operational risks to its programs and investments, ranging from political issues to the impact of currency fluctuations on market prices of agricultural products. Climate risks can be taken into account in similar ways, provided that Bank task managers and clients have access to the right information and to tools for interpreting climate risk information in a development planning context.

Given the many linkages between the impacts of climate change and social and economic systems, adaptation cannot be implemented efficiently by itself or as a strictly environmental issue. Instead, it can often be introduced through small changes in project design, based on existing information

and technologies, and through the strengthening and good enforcement and implementation of regulatory frameworks and planning mechanisms.

This climate risk management agenda generally requires awareness raising and institutional development, often informed by simple risk assessment tools and by economic analysis to evaluate and promote risk management options. As part of that broader agenda, better use of climate information—not only historical data and immediate weather forecasts, but also seasonal climate predictions and projections of long-term climate change—can help in better managing climate risks at all time scales, provided that the information is tailored to the end user and is integrated into planning processes.

In order to capture such opportunities, climate risk management must be integrated into development planning and be part of sectoral, national, and regional development planning, engaging the full spectrum of government operations. In addition, it must be integrated into specific investment decisions and implementation plans, starting at the beginning of the project cycle or investment planning process.

If climate risk management is consistently implemented, it will affect many different sectors within the government, including infrastructure, health, natural resources, agriculture, and water management. For effective coordination of climate risk management by government offices, and for systematic exchange of climate risk information, an appropriate coordination mechanism at the national level is needed. Ideally, it should be positioned close to senior policy makers and the economic planning process.

Climate change adaptation is not just a government responsibility. Most of the actual climate risk management is carried out by individuals, communities, and businesses in their day-to-day decisions and regular investments. This reality has implications for creation of an enabling environment for climate change management, which must include capacity building and instruments and tools for a wide variety of actors. Given the important role of people's decisions and behavior for climate change adaptation and for the success of government approaches in this area, it is crucial that adaptation efforts include serious awareness raising to enhance the profile of climate risk management among local actors. And it is also essential that governments listen to such actors to understand their priorities and the barriers to reduction of climate risk that they face.



## 4 • Emerging lessons from World Bank Group operations

In the past, World Bank Group support for adaptation has been limited, on the order of approximately \$50 million over about five years, mainly with GEF co-financing, and has mainly addressed awareness raising, capacity building, and international coordination.<sup>1</sup> Support to client countries has focused on improving understanding of current and future climate conditions and assessing the risks to development (see box 4).

### BOX 4

#### Applying scientific climate information

Better understanding of regional climate trends and projected impacts is essential for the work on adaptation. There is substantial scope for making better use of seasonal forecasting (for example, of wet or dry seasons resulting from El Niño or La Niña phenomena) and to improve early warning systems for extreme weather events. Improvement of capacity for monitoring and analyzing such information is best undertaken in the light of clear demand from end users—for instance in the context of World Bank Group operations that will benefit from enhanced risk management on the basis of such information.

Examples of support for climate information as a tool for achieving better risk management in World Bank Group operations and activities include an arrangement to improve the capacity of the Meteorological Office in Kiribati under the World Bank—GEF Kiribati Adaptation Program; establishment of monitoring systems in the context of an El Niño Emergency Assistance Project in Peru; a partnership with the Meteorological Research Institute of Japan for the utilization of data from the Earth Simulator (a powerful supercomputer complex used for climate simulation); and planned collaborations with the Earth Observation Partnership for the Americas coordinated by the U.S. National Oceanic and Atmospheric Administration (NOAA) and with the Climate Change Organizing the Science for the American Cordillera (CONCORD) glacier research coalition.

The Asian Development Bank (ADB) also has developed relevant experience on the use of climate information in development planning, including infrastructure design (see ADB 2005).

Increasingly, the adaptation experience is now extending to operational activities and is being coupled to the Bank's country dialogue and sector operations (see figure 2). This chapter highlights some emerging lessons from these early experiences with adaptation (see boxes 5 and 6).

<sup>1</sup> An earlier, more extensive, overview of some Bank work on adaptation can be found in Mathur, Burton, and van Aalst (2004).

## BOX 5

### Examples of recent analytical work and capacity building for adaptation

- Climate forecasting for agricultural and livestock production in the Southern Africa Development Community (SADC) countries, in the context of ongoing economic changes influencing vulnerability to both climate variability and change.
- A review of current coping responses adopted by communities facing climatic extremes in Peru.
- An assessment of policy interventions that would promote economically prudent farm-level adaptation in drought-prone districts in Andhra Pradesh State, India.
- An analysis of the impact of drought on the economy of Andhra Pradesh State and appropriate response options, including options under projected climate conditions. A wider study in three states takes this work forward with improved analytical tools for designing flood and drought responses in a variable and changing climate.
- Training in Africa. With support from the World Bank Group and from NOAA's Office of Global Programs, analysts in 11 African countries were trained to model agricultural productivity on the basis of climate scenarios, and assessments were made of farmers' adaptive capacity through household surveys.
- World Bank Institute courses on climate change and disaster risk reduction in several countries in Latin America and Africa.

## BOX 6

### Climate risk management in World Bank Group work: Analysis, country dialogue, and operations

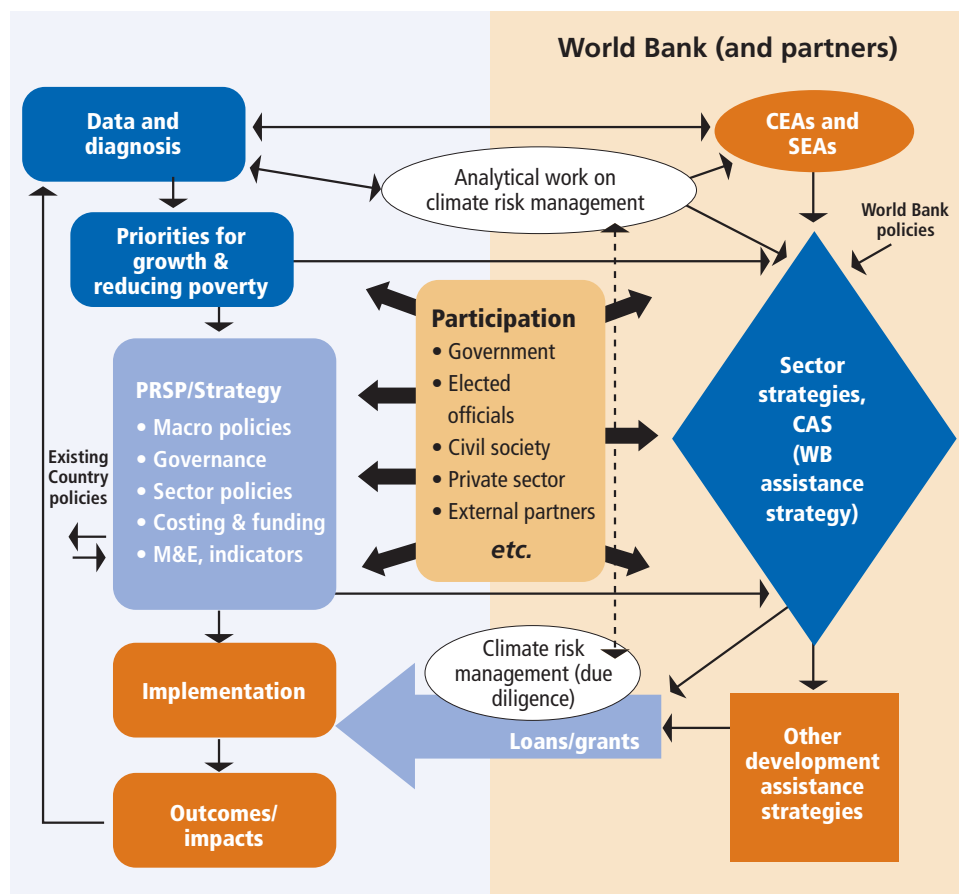
The World Bank Group's work on climate change adaptation rests on three pillars, which are closely related:

- Upstream analytical work
- Integration of climate risk management into the country dialogue
- Integration of climate risk management into projects.

Upstream analytical work, as illustrated in box 5, can help define priorities and convince policy makers in client countries of the relevance of climate risk management. Analytical work can then feed into the country dialogue, the country assistance strategy, and country planning documents such as the Poverty Reduction Strategy Paper (PRSP). Such national dialogues, as well as the analytical work itself, should generate new activities, including loans and grants for climate risk management, usually in the context of other development investments.

Another avenue into improved climate risk management is to start with the existing pipeline of projects in preparation and screen them for climate risk, as a matter of due diligence. Projects that could be strongly affected become natural starting points for the integration of climate risk management into that particular project. In many cases such projects will then identify information gaps and barriers to efficient implementation of climate risk management within the project sector and beyond and can catalyze a broader investment in climate risk management capacity.

**Figure 2. How climate risk management considerations feed into World Bank Group sectoral plans, country strategies, and operations**



Note: CAS, country assistance strategy; CEA, country environmental assessment; M&E, monitoring and evaluation; SEA, strategic environmental assessment.

## Country and regional examples

In the late 1990s vulnerability and adaptation assessments for Africa (Ringius and others 1996) and Bangladesh (World Bank 2000a) put climate change adaptation on the agenda but failed to influence the country dialogue. The Bangladesh study, however, seems to have succeeded in engaging with the water sector, where climate change was taken on board in a new 25-year water sector plan, and in the coastal sector, where study findings were incorporated into the design of a World Bank Group integrated coastal zone management project and into disaster preparedness planning (Huq 2002).

The Pacific Islands region is highly vulnerable to climate change and sea level rise (photo 1). The World Bank’s regional economic report “Cities, Seas, and Storms” (World Bank 2000b) contained groundbreaking economic impact assessments of the potential implications of climate change that



Photo 2: Flood preparedness training, Gujarat, India.



Photo 3: Many island countries consist of small areas of land surrounded by ocean and at risk of sea level rise and extreme weather.



led to a regional dialogue among stakeholders not typically involved in climate change debates. Instead of targeting environment ministries, high-level regional meetings on climate change were held and were attended by ministers and senior officials from ministries of finance and planning, who began to see the need to mainstream climate risk management into their countries' economic planning.<sup>2</sup>

One of the activities that grew out of that regional agenda was the World Bank–GEF Kiribati Adaptation Program (box 7). A three-year preparation phase included intensive consultations, technical assessments, and capacity building in the Ministry of Finance and Economic Planning and in key sectoral ministries to integrate climate risk management into strategic and operational planning. On the basis of these preparatory activities, the program has now entered its second stage, combining actual investments in climate risk reduction in key sectors (water and coastal protection) with continued consultations, mainstreaming, and capacity building.

#### **BOX 7**

### **Mainstreaming climate risk management: The Kiribati Adaptation Program (KAP)**

KAP-II, the pilot investment phase of the Kiribati Adaptation Program (\$6.6 million, including \$1.8 from the GEF Strategic Priority on Adaptation), is the second stage of a long-term program to assist the Central Pacific island nation of Kiribati in managing climate change (see photo 2). The project's development objective is "to develop and demonstrate the systematic diagnosis of climate-related problems and the design of cost-effective adaptation measures, while continuing the integration of climate risk awareness and responsiveness into economic and operational planning."

Initially in the Ministry of Finance and Economic Planning, the program has now moved to the Office of the President, as part of a new National Strategic Risk Management Unit. On the basis of an extensive process of national consultations, as well as scientific and technical assessments, climate risk management has been integrated into national development strategies and ministry operational plans for all relevant sectors. All of the program's investments are tied directly to priorities and activities identified in these key government planning documents.

<sup>2</sup> Key conclusions from these regional dialogues and lessons learned from risk management operations in the region are reflected in Bettencourt and others (2006).



Photo 4: View of Kiribati's low-lying coastline.

The Kiribati Adaptation Program is one example of the international community's efforts to help island countries adapt to climate change.

In many ways, the Kiribati Adaptation Program not only addressed the needs of the country itself but also served to develop and test approaches for climate risk management. Although the country and the government are quite small, Kiribati shares the characteristics of many postcolonial governments, including strong sectoral segmentation. The lessons learned concerning cross-sectoral coordination, integration of climate risk management into economic and operational planning, and coupling bottom-up consultations with top-down planning, including regulatory changes, could all be applied in many other countries around the world. The World Bank Group's strong involvement in national economic policy discussions, as well as its role in investment projects in key sectors in many developing countries, provides the sort of presence required for a credible dialogue on mainstreaming climate risk management.

While the Kiribati project is entering its investment stage, the regional work in the Pacific continues, on the basis of the recent policy note “Not If, but When” (Bettencourt and others 2006), which summarizes regional experiences with climate change adaptation and natural hazard risk management and outlines a joint agenda for the region. Further activities are now being initiated in Vanuatu, where a country profile will highlight key issues to be addressed to mainstream climate risk management into national economic planning.

Another initiative in the East Asia and Pacific Region provides an important model for mainstreaming climate risk management: attaching climate risk management investments to regular Bank loans. A climate risk management project in the Philippines, under preparation for the Special Climate Change Fund, would reduce climate risk in the context of several World Bank loans to the Department of Agriculture, the National Irrigation Authority, and the Department of Environment and Natural Resources. These loans amount, in total, to over \$300 million, of which about \$50 million could be affected by climate change. The program will not only enhance climate risk management for these specific investments but will also use them as pilots to enhance overall capacity to systematically utilize climate risk information in planning decisions on all time scales, within these departments and through interagency coordination mechanisms, including the National Disaster Coordinating Council. The context of the regular investment operations provides a clear linkage to the mainstream development agenda. This linkage will help the country better manage climate risks in general and will directly reduce risk to the World Bank’s own investments.

The Latin America region was among the first to start working on adaptation and currently has the largest portfolio of completed, ongoing, and planned adaptation projects. Work on adaptation in that region began in 1997 with the Caribbean Planning for Adaptation to Climate Change (CPACC) project, funded by the GEF, which focused on the vulnerability of the island nations of the Caribbean to the impacts of climate change. This region is highly vulnerable, with potential economic damages in the Caribbean Community (CARICOM) countries, in the absence of adaptation, estimated at between \$1.4 billion and \$9 billion. In a low-climate-change scenario, impacts range from 3.5 percent of GDP in Trinidad and Tobago to 16 percent in Guyana; in a high scenario the total impact averages over 34 percent of GDP, from 22 percent in Trinidad and Tobago to 103 percent in Guyana. The largest category of impacts would be the loss of land, tourism infrastructure, housing, and other buildings, and infrastructure as a consequence of sea level rise, but significant impacts also result from reduced tourism demand, hurricane damage, and effects on agriculture, health, and water resources.

These efforts have grown into a very comprehensive adaptation program; the Mainstreaming Adaptation to Climate Change (MACC) and Special Program on Adaptation to Climate Change (SPACC) projects are now under way (see box 8), and a gradual transition will be made to mainstreaming adaptation into sectoral work and to actual investment in climate risk management in that context. The subsequent programs in the Caribbean demonstrate that a long-term and continuous effort is required to face the growing climate risks.

A key achievement of that sustained effort in the Caribbean was the creation of regional institutional capacity. CPACC established a working network of institutions to coordinate and implement regional efforts in climate change adaptation. It also developed a strong technical base capable of providing leadership in the regional effort on climate change, as well as policy advice and momentum. Although this institutional arrangement delivered on the objectives of CPACC, it was only intended as a transitional step. With support from MACC, a Caribbean Community Climate Change Centre (CCCCC) was created, which now serves as a regional center of excellence in capacity building, technical assistance, and coordination and as a support mechanism to the CARICOM countries in the areas of climate change adaptation and mitigation.

#### **BOX 8**

### **Special Program on Adaptation to Climate Change (SPACC)**

The proposed World Bank–GEF SPACC project will support, in seven sites in the participating countries, the coordination and implementation of pilot adaptation measures that address the expected impacts from sea level rise and changes in rainfall patterns and the effects on ecosystem integrity and water supply, thereby enhancing the resilience of insular ecosystems under threat from climate change. The project will include the following elements:

- Completion of an integrated natural resource management plan, including climate change concerns, for one island and incorporation of the results into the national planning process
- Incorporation of lessons on strengthening key infrastructure into local hazard management plans and building guidelines
- Stabilization of the population of threatened mangrove stands
- Stabilization of the diversity of coral reefs and associated species
- Preservation of ecosystem functioning in two national parks
- Maintenance of the health of coastal ecosystems.

## **BOX 9**

### **Colombia Integrated National Adaptation Project (INAP)**

Both the mountainous inland and the insular areas of Colombia are highly vulnerable to climate change. In the Andean highlands, temperatures have already been rising, and average monthly rainfall has been decreasing significantly. Climate projections indicate that this trend will worsen. Highland ecosystems, including unique fragile moorlands, are significantly affected. At the same time, sea level rise will strongly affect the insular areas of the country, causing saline intrusion into aquifer-based freshwater supplies and biodiversity. Coastal erosion and island movements could, if no action is taken, have severe destabilizing social impacts on these small islands, with their dense populations and lack of interior land on which to relocate (see photo 3).

Another effect of climate change is increased exposure to tropical vector diseases. Both dengue and malaria have recently reemerged as significant public health burdens in Colombia. Mountain populations that have in the past largely escaped these diseases due to the cold weather are likely to experience significantly increased exposure to dengue and malaria, with serious implications for the already stressed health sector.

The World Bank–GEF Integrated National Adaptation Project will support Colombia's efforts to define and implement specific pilot adaptation measures and policy options to meet the anticipated impacts from climate change. Project activities include:

- Maintenance of the hydropower generation ability of the Amoya River watershed
- An enhanced public health program incorporating measures to meet the increased threats from dengue and malaria
- Incorporation of adaptation into regional development plans for the Las Hermosas Massif
- Incorporation of adaptation into regional development plans for the Colombian Caribbean insular areas, including enhanced management of key marine ecosystems and reduced vulnerability in water supply to local communities.





Photo 5: The environmental risks of coastal erosion affect countries such as Colombia (box 9) and the Pacific Island region shown here.

#### **BOX 10**

### **Adaptation and global environmental concerns**

While adaptation to climate change is primarily focused on reducing local risks, in many cases local climate risk management can go hand in hand with global environmental objectives such as biodiversity conservation and carbon sequestration. For instance:

- Work on ecosystem restoration and on climate change adaptation can often be complementary and mutually supportive. Examples include the Colombia Integrated National Adaptation Project and the Kiribati Adaptation Program.
- In some cases there is scope for synergies between work on mitigation (largely carried out with carbon revenues) and adaptation opportunities. The Nariva Project in Trinidad (supported under the Bank's Carbon Fund) is an example.

The Latin America region has also pioneered work on adaptation to glacier retreat in the Central Andes region (photo 4), on adaptation in mountain habitats and the health sector in Colombia (see box 9 and photo 5), on wetlands subsidence and water supply in Mexico, and on hurricane intensification in Central America. Several country assistance strategies in the region, including those for Argentina, Colombia, Mexico, and the countries of the Organization of Eastern Caribbean States (OECS), now specifically mention climate risks. (See box 10, on the wider implications of adaptation projects.)



Photo 6: The retreat of the glaciers—Glacier Yanamarey in the Cordillera Blanca, Central Andes. The photos show the glacier at an altitude of 4,786 meters above sea level. Glacier retreats, which are directly related to rising temperatures, are putting increasing strain on the reliability of water resources downstream in many mountainous areas of the world.





Photo 7: The Paramo las Hermosas, in Colombia is an area where mitigation and adaptation activities are being combined using tools provided by carbon finance and the GEF.

The Rio Amoya Environmental Services Project generates 568 gigawatt-hours per year of renewable energy, and utilizes part of the carbon revenues to adapt to climate change, focusing on resilience of ecosystems and maintaining water supply.

### Risk transfer

One element of climate risk management strategies is to enhance the financial services available for coping with climate risk.<sup>3</sup> Many farmers in the developed world have insurance for crop failure resulting from adverse climatic conditions. Few poor farmers in developing countries have access to such mechanisms, which would allow them to take greater risks and achieve higher overall incomes.

An option being tried in several countries is the use of weather index insurance or weather derivatives. Although these mechanisms can be powerful, they can also become a disincentive for adaptation. They should be used to promote activities consistent with projected climate trends, as well as with market conditions.

An important impediment to the expansion of insurance for poor farmers is the cost of reinsurance to local financial institutions. The World Bank Group has proposed a Global Index Insurance Facility (GIIF)—a risk-taking entity that would originate, intermediate, and underwrite weather, disaster, and commodity price risks in developing countries.

The World Bank Group is also exploring the use of insurance mechanisms to support governments in the aftermath of a natural disaster. The Caribbean Catastrophe Risk Insurance Facility (CCRIF) would allow Caribbean Community (CARICOM) governments to purchase coverage that would provide them with immediate payment after a major hazard event, to help them overcome the typical liquidity crunch following a disaster.

<sup>3</sup> For further discussion of this topic, see, for example, Gurenko (2004); Mechler, Linnerooth-Bayer, and Peppiatt (2005); ProVention/IIASA (2005); World Bank (2005, 2006b); and Churchill, Reinhard, and Qureshi (2006).



## Lessons from experience

The early operational experiences described above highlight several general ingredients for successful climate risk management: getting the right sectoral departments and senior policy makers involved; incorporating risk management into economic planning; engaging nongovernmental actors (businesses, NGOs, communities, and so on); giving attention to regulatory issues; and choosing strategies that will pay off immediately under current climate conditions. Some key lessons follow.

*Climate change needs to be treated as a major economic and social risk to national economies, not just as a long-term environmental problem.*

*Addressing short-term vulnerabilities is the best strategy for preparing for long-term impacts.* From this perspective, adaptation and disaster risk reduction clearly need to be integrated efforts—that is, climate risk management is called for.

*Climate risk management requires high-level coordination, since it cuts across major sectors of the economy.* Climate cannot be dealt with simply as an environmental issue. If climate change adaptation is coordinated by the country's environment department, it is crucial that high-level officials, including representatives of sectoral departments, be involved. Regardless of the coordination mechanism, the role of these departments should not be limited to overseeing or rubber-stamping assessments of climate change impacts and adaptation affecting their sectors; they need to be in charge of the actual implementation of adaptation within their own departments.

*Climate risk management needs to be fully integrated into economic planning and the preparation of sectoral plans and budgets.* Adaptation plans that are delinked from the crucial planning and budget machinery will likely fail to achieve the desired impact.

*Much of the climate risk management effort will have to be undertaken by communities and the private sector.* These actors therefore need to be involved in the planning and implementation of adaptation.

*Adaptation investments need to be informed by a long-term process that links bottom-up consultation with top-down planning and policy.* This approach should allow key implementers (communities, the private sector, and so on) to have a say in government planning and should in turn enable the government to hold these actors accountable for effective implementation (see photo 6).

*Many adaptation investments involve strengthening or enforcing existing regulations and therefore require full buy-in from regulatory agencies.*

*No-regrets strategies and “soft” solutions embedded in more sustainable natural resources management should be pursued where they are available.* Given the remaining uncertainties in climate projections, particularly for extreme weather events and at the local scale, adaptation should primarily look at policy changes to reduce vulnerability and at “soft” technologies rather than site-specific structural protection measures, unless they cost-effectively address current hazards.



Photo 8: Involving all stakeholders. National consultations were held with representatives from all islands during the Kiribati Adaptation Program.

## 5 · Next steps

Climate change is already taking place and will continue over the coming decades. It is a serious factor that needs to be considered in development planning and operations, alongside a multitude of other risks that are routinely factored in.

Climate change will have repercussions on coastal development, water supply, energy, agriculture, and health, among other sectors. A large-scale effort needs to be launched to better understand the anticipated impacts, help strengthen adaptive capacity, and promote adaptation measures. This agenda should be linked to that for disaster risk reduction.

Lessons from early experiences with adaptation in the World Bank Group, including GEF-cofinanced projects, call for a practical approach aimed at mainstreaming adaptation into Bank operations and into the national and sectoral planning of client governments while at the same time building capacity for climate risk management among key stakeholders, including businesses, local governments, NGOs, and local communities.

### Climate risk management in the project cycle

A key objective is to identify climate-sensitive World Bank Group investments early in the project cycle and to support the integration of climate risk management into project design (see, e.g., Burton and van Aalst 2004).

A simple screening tool, as described in box 11, can help task managers decide whether additional work—for example, a full climate risk assessment—is needed. In the short term, this should help identify investments in high-risk areas and sectors, which would be the best places to build experience and capacity, making strategic use of the new adaptation funds. In the longer term, it could become a standard tool for screening new World Bank Group projects for climate risk early in the project cycle.

#### BOX 11

#### Climate risk screening tool

A climate risk screening tool being prepared by the World Bank Global Climate Change Team is aimed at project developers from both donor agencies and recipient countries. It is designed to be a simple means for quickly assessing whether a development project, investment, or activity might be subject to climate risks.

The Web-based tool assesses whether projected climate changes might increase or reduce risks arising from climate and provides an explanation of those changes. The tool also points towards resources—relevant projects, technical literature, and experts—that may be helpful to project designers in moving toward the next step in due diligence.

## Climate risk management in country and sector dialogues

Climate risk management could be included in country and sector dialogues, especially in countries and sectors that are particularly vulnerable. Examples from past operations show that climate risk management is only successful if it is fully integrated into the government's regular planning machinery. Where investments are under the direction of powerful sectoral ministries responsible for, say, infrastructure or agriculture, the climate change unit in an environment department or meteorological service is peripheral to the sectoral planning machinery.

World Bank Group operations should take as a starting point the risks to development investments in key sectors, analyzing what is needed to enhance climate risk management in planning and operations across the main departments that are affected. This mainstreaming of climate concerns into national and sectoral policies is crucial for ensuring the sustainability of climate initiatives. The experiences highlighted in chapter 4 provide useful, practical examples.

Climate risk management in projects and at the country level should prominently include the development of enabling frameworks to facilitate adaptive actions by local communities, NGOs, and local governments and by the private sector. Besides provision of appropriate climate risk information, feedback through such frameworks may have implications for government investments and, in particular, for regulations and their enforcement. Improvements in the enabling environment could include encouraging the provision of financial instruments such as insurance and weather derivatives, at all scales from the rural poor to national catastrophe risk schemes. None of these elements will be effective without a well-designed consultative process to engage key stakeholders.

## Internal support and coordination

Analysis and documentation of information and experiences, both within client governments and within the World Bank Group, are crucial for extracting lessons and ensuring that the risk management information that is generated remains readily available to be applied in other operations in that country or sector. This requires systematic thinking about a climate risk management knowledge base. The World Bank Group should further strengthen and expand analytical work and capacity for cross-support on climate risk management, in, for example, the Global Climate Change Team and the Hazard Management Unit. In addition, climate risk management also needs to become more strongly rooted in the regions, through capacity building in key sectoral units in such areas as agriculture and rural development, infrastructure, and environment and through support from regional GEF Coordinators.

## **BOX 12**

### **Funding for World Bank Group adaptation activities**

In past years the GEF has been the primary source of funding for the World Bank Group's adaptation activities. In addition, about \$8 million has been made available through trust funds and from the Bank's budget over the past three years, in particular from the Trust Fund for Environmentally and Socially Sustainable Development (TFESSD), supported by Norway and Finland, the Japan Policy and Human Resources Development Fund (PHRD), and the Bank Netherlands Partnership Program (BNPP).

In the coming years the new adaptation funds established under the UNFCCC and the Kyoto Protocol—the Special Climate Change Fund, the Least Developed Countries Fund, and the Adaptation Fund, as well as the Special Priority on Adaptation within the GEF Trust Fund—are expected to provide an increase in funding for adaptation in developing countries, particularly to reduce the risk to development investments.

The World Bank Group is currently developing an Investment Framework for Clean Energy and Development, which includes a work program for improving understanding of what is needed (technical and institutional analysis, tools, and financial assistance) to better incorporate adaptation into development. Preliminary analyses suggest that financial resources for adaptation will have to be increased significantly over those available or anticipated (World Bank 2006a).

## **Financing for climate change adaptation**

Investments in climate risk management, particularly those related to regulatory changes and institutional capacity building, can be quite cheap. In many cases such investments should provide excellent returns on investment and help protect Bank investments that are already at risk. Nevertheless, adaptation as a whole will be expensive. Developing countries, while contributing relatively little to global emissions, are at the receiving end of the anticipated impacts. A rough estimate suggests that project preparation costs could increase by 5 to 15 percent for the Bank projects that may be at risk from climate change, which are estimated at about 40 percent of the total portfolio. The impacts on investments, through increased costs or significant redirection, are estimated at 1 to 2 percent of the investment portfolio, or about \$200 million to \$400 million per year within the World Bank Group and at least \$1 billion for all official development assistance and concessional lending. The total costs of adaptation for all activities, including government and private investments, in developing countries will be at least an order of magnitude larger. Hence, adaptation will require considerable funding, well beyond what is available today (box 12).

## BOX 13

### Adaptation in the Investment Framework on Clean Energy and Development

In response to the Gleneagles Communiqué on Climate Change, Clean Energy, and Sustainable Development of the Group of Eight industrial nations (Group of Eight 2005), the World Bank Group has been preparing an Investment Framework for Clean Energy and Development. The draft framework, which would complement existing World Bank Group operations, has three elements: clean energy for development, the development of a low-carbon economy, and adaptation to climate change.

The framework anticipates that activities in support of adaptation will grow as clients begin to recognize the development relevance of climate risk management. These activities would then gradually be funded under regular country programs. This recognition, however, has not yet fully emerged and needs to be catalyzed with grants or highly concessional loans. These would promote

- Expansion of analytical work as a basis for action at the national and local levels
- Enhancement of scientific understanding and of tools for assessing the nature of climate risks to development projects (e.g., the Climate Screening Tool)
- Capacity building to enable institutions and communities at risk to cope and adapt
- Support for the implementation of adaptation measures, including investments and piloting of risk management tools such as weather insurance for farmers.

management into the Bank's own investment planning and operations and to assist client countries to do so.

At the same time, climate risk management provides an opportunity. There is strong evidence that the world is poorly adapted even to the current climate, and especially to its extremes. Natural hazards already have severe impacts on development investments and cause humanitarian disasters

The current international resources for adaptation, mainly available through the GEF, should be used to leverage maximum adaptation results within existing development activities and investments. The World Bank Group has an important role to play in ensuring that such results are achieved. But regardless of how effectively they are used, the existing resources for adaptation will also need to be expanded, with substantial additional funding, in order to help developing countries cover the additional costs of protecting their investments in sustainable development and poverty alleviation from the impacts of climate change. The World Bank Group's Investment Framework for Clean Energy and Development, developed in response to the Gleneagles summit of the Group of Eight industrial countries, can play an important role in shaping that discussion within the international community (box 13).

### The way forward

Climate change poses a new challenge to the World Bank Group's great goal—a world free of poverty. Addressing the emerging risks to development involves tradeoffs and will not be cheap. It also requires a special effort to build the internal capacity to integrate climate risk



that particularly affect the poorest of the poor in the most vulnerable places on earth. Addressing climate risk management will not only guard the World Bank Group’s investments but will also improve the impact of development efforts right now.



Photo 9: Coastal infrastructure vulnerable to sea level rise.





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