



Poverty and Climate Change

Reducing the Vulnerability of the Poor through Adaptation

prepared by:

- African Development Bank
- Asian Development Bank
- Department for International Development, United Kingdom
- Directorate-General for Development, European Commission
- Federal Ministry for Economic Cooperation and Development, Germany
- Ministry of Foreign Affairs - Development Cooperation, The Netherlands
- Organization for Economic Cooperation and Development
- United Nations Development Programme
- United Nations Environment Programme
- The World Bank







Contents

List of Boxes, Figures, Tables, Acronyms and Abbreviations	IV
Foreword	V
Acknowledgements	VI
Executive Summary	IX
Poverty Reduction – the Challenge of the 21st Century	IX
Climate Change is Happening and Will Increasingly Affect the Poor	IX
Adaptation is Necessary	X
Strengthening Adaptation Efforts	XI
Next Steps	XII
Part 1: Climate Change and the Poor	1
1.1 Climate Change is a Reality	1
1.2 Developing Countries Will Be Particularly Affected	5
1.3 Adaptation is a Necessity	5
1.4 Existing Vulnerability to Climate Variability	5
1.5 Already Stressed Coping Capacities	6
1.6 Climate Change Compounding Existing Risks and Vulnerabilities	7
1.7 Implications for Poverty Eradication	11
Part 2: Adaptation Lessons from Past Experience	15
2.1 Addressing Vulnerability in the Context of Sustainable Livelihoods	15
2.2 Equitable Growth and Adaptation to Climate Change	19
2.3 Improving Governance to Mainstream Climate Issues in Poverty Reduction	24
Part 3: The Way Forward	29
3.1 Mainstream Adaptation into Sustainable Development	29
3.2 Continue and Strengthen Assessment and Information Gathering	31
3.3 Engagement with the UNFCCC Process	31
3.4 Ensure Synergies with Other Multilateral Environmental Agreements	32
3.5 External Funding	33
Notes	35
Glossary	37
References	39



List of Boxes

Box 1	Climate Change Impacts on Malaria	9
Box 2	Impacts of Climate Change on Small Island States: The Pacific	10
Box 3	Drought and Livelihoods in the Sahel	16
Box 4	Need for Social Capital Building to Cope with Climate Impacts	16
Box 5	Mangrove Planting in Vietnam	17
Box 6	Climate Information for Southern African Farmers	18
Box 7	Traditional Forecasting in the Andes	19
Box 8	Economic Planning for Disasters in Honduras	21
Box 9	Mexico's Experience in Funding Natural Disaster Relief	24
Box 10	Public Accountability for Flood Protection in Bangladesh	24
Box 11	Reducing the Vulnerability of Women to Cyclones in Bangladesh	25
Box 12	Kiribati's Mainstreaming in National Planning Processes	26
Box 13	Mozambique's Action Plan for Poverty Reduction	27

List of Figures

Figure 1	Variations in the Earth's Surface Temperature, 1000–2100	1
Figure 2	Maize Production in Selected South African Countries versus Niño 3 Data	20
Figure 3	Potential Impacts of Temperature Increases on Tea Growing in Kenya	28

List of Tables

Table 1	Impacts of Climate Change, Vulnerability, and Adaptive Capacity	3
Table 2	Potential Impacts of Climate Change on the Millennium Development Goals	12

Acronyms and Abbreviations

GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
LDCs	Least developed countries
LEG	Least Developed Countries Expert Group
MDGs	Millennium Development Goals
NAPA	National Adaptation Programme of Action
PRS	Poverty Reduction Strategies
PRSP	Poverty Reduction Strategy Paper
RCOF	Regional Climate Outlook Forum
UNFCCC	United Nations Framework Convention on Climate Change
VARG	Vulnerability and Adaptation Resource Group



Foreword

Climate change is a serious risk to poverty reduction and threatens to undo decades of development efforts. As the Johannesburg Declaration on Sustainable Development states, “the adverse effects of climate change are already evident, natural disasters are more frequent and more devastating and developing countries more vulnerable.” While climate change is a global phenomenon, its negative impacts are more severely felt by poor people and poor countries. They are more vulnerable because of their high dependence on natural resources, and their limited capacity to cope with climate variability and extremes.

Experience suggests that the best way to address climate change impacts on the poor is by integrating adaptation responses into development planning. This is fundamental to achieve the Millennium Development Goals, including the over-arching goal of halving extreme poverty by 2015, and sustaining progress beyond 2015.

The objective of this document is to contribute to a global dialogue on how to mainstream and integrate adaptation to climate change into poverty reduction efforts. We hope this will move the discussion further towards action.

While this joint paper focuses on adaptation to climate change in relation to poverty, we understand that adaptation has to go hand in hand with mitigation of climate change by limiting greenhouse gases in the atmosphere. We also reaffirm that industrialized countries should take the lead in combating climate change and its adverse effects.

We share a commitment to assisting and working with poor people, partner governments, civil societies, and the private sector in coping with the vulnerability of the poor to climate change. We resolve to ensure that our own institutions support this commitment.

Agnes van Ardenne-van der Hoeven
Minister for Development Cooperation
The Netherlands

Hilary Benn
DFID Minister of State
United Kingdom

Mark Malloch Brown
Administrator
United Nations Development Programme

Tadao Chino
President
Asian Development Bank

Donald J. Johnston
Secretary-General
Organisation for Economic
Co-operation and Development

Omar Kabbaj
President,
African Development Bank Group

Poul Nielson
Commissioner for Development
and Humanitarian Aid
Chief Executive Officer for
EuropeAid Co-Operation Office
European Commission

Klaus Töpfer
Executive Director
United Nations Environment
Programme

Heidmarie Wiczorek-Zeul
Minister
Federal Ministry for Economic Co-operation
and Development, Germany

Shengman Zhang
Managing Director
The World Bank



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Executive Summary

Poverty Reduction – the Challenge of the 21st Century

Despite international efforts, poverty has become more widespread in many countries in the last decade, making poverty reduction the core challenge for development in the 21st century. In the Millennium Declaration, 189 nations have resolved to halve extreme poverty by 2015 and all agencies involved in this paper are committed to contribute to this aim. However, climate change is a serious risk to poverty reduction and threatens to undo decades of development efforts.

This paper focuses on the impacts of climate change on poverty reduction efforts in the context of sustaining progress towards the Millennium Development Goals and beyond. It discusses ways of mainstreaming and integrating adaptation to climate change into poverty reduction and sustainable development efforts.

The chief messages emerging from this paper are:

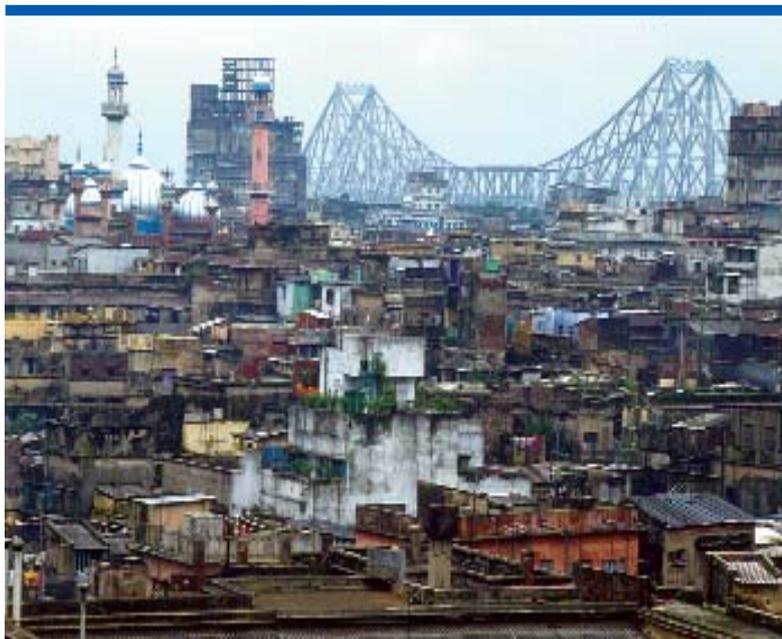
- Climate change is happening and will increasingly affect the poor.
- Adaptation is necessary and there is a need to integrate responses to climate change and adaptation measures into strategies for poverty reduction to ensure sustainable development.

This decision to focus on adaptation is deliberate and is taken with the understanding that adaptation cannot replace mitigation efforts. The magnitude and rate of climate change will strongly depend on efforts to reduce greenhouse gas (GHG) concentrations in the atmosphere. The higher the concentrations of GHGs, the higher the likelihood of irreversible and grave damage to human and biological systems. Therefore, adaptation is only one part of the solution. Mitigation of climate change by limiting greenhouse gas concentrations in the atmosphere is the indispensable other part.

Climate Change is Happening and Will Increasingly Affect the Poor

Today, it is widely agreed by the scientific community that climate change is already a reality. The Intergovernmental Panel on Climate Change (IPCC) has concluded that human activities are altering our climate system and will continue to do so. Over the past century, surface temperatures have increased and associated impacts on physical and biological systems are increasingly being observed. Science tells us that climate change will bring about gradual changes, such as sea level rise, and shifts of climatic zones due to increased temperatures and changes in precipitation patterns. Also, climate change is very likely to increase the frequency and magnitude of extreme weather events such as droughts, floods, and storms. While there is uncertainty in the projections with regard to the exact magnitude, rate, and regional patterns of climate change, its consequences will change the fate of many generations to come and particularly impact on the poor if no appropriate measures are taken.

The impacts of climate change, and the vulnerability of poor communities to climate change, vary greatly, but generally, climate change is superimposed on existing vulnerabilities. Climate change will further reduce access to drinking water, negatively affect the health of poor people, and will pose a real threat to food security in many countries in Africa, Asia, and Latin America. In some areas where livelihood choices are limited, decreasing crop yields threaten famines, or where loss of landmass in coastal areas is anticipated, migration might be the only solution. The macroeconomic costs of the impacts of climate change are highly uncertain, but very likely have the potential to threaten development in many countries.



Therefore, the task ahead is to increase the adaptive capacity of affected poor communities and countries.

Part 1 of this document examines how climate change is likely to affect the existing vulnerability of poor people to climate related impacts. According to the Third Assessment Report of the IPCC, developing countries are expected to suffer the most from the negative impacts of climate change. This is due to the economic importance of climate-sensitive sectors (for example, agriculture and fisheries) for these countries, and to their limited human, institutional, and financial capacity to anticipate and respond to the direct and indirect effects of climate change. In general, the vulnerability is highest for least developed countries in the

tropical and subtropical areas. Hence, the countries with the fewest resources are likely to bear the greatest burden of climate change in terms of loss of life and relative effect on investment and the economy.

Many sectors providing basic livelihood services to the poor in developing countries are not able to cope even with today's climate variability and stresses. Over 96% of disaster-related deaths in recent years have taken place in developing countries. Often, extreme weather events set back the development process for decades. With fishing grounds depleting, and droughts, floods, and storms destroying entire annual harvests in affected areas, the El Niño phenomenon serves as a prime example of how climatic variability already affects vulnerable countries and people today. In many developing countries, climate change already increases stresses from climate variability and extremes and will do so increasingly in the future.

Adaptation is Necessary

In the view of the participating agencies, adaptation to climate change is a priority for ensuring the long-term effectiveness of our investment in poverty eradication and sustainable development.

Part 2 examines lessons learned in reducing poverty while strengthening the capacity of those living in poverty to adapt to climate change. The findings support a conclusion of the IPCC that adaptation measures, if pursued in the sustainable development framework, can diminish the damage from future climate change and climate variability.

Through the decisions of the United Nations Framework Convention on Climate Change (UNFCCC), work has been initiated to develop the adaptive capacity of poor people and the poorer countries (Least Developed Countries) to cope with the impacts of climate change. Yet, a stronger focus must be placed on poverty reduction and sustainable development. We believe that the development and environment community must ensure that adaptation is not treated as a standalone issue, but in the context of poverty reduction and the Millennium Development Goals (MDGs).

Many examples show that addressing poverty implies also preparing for climate variability and extremes. While climate change is only one of the many factors influencing poverty, immediate action should be taken to adapt to climate change impacts. We argue that many possible interventions have already been identified, and prompt action can be taken today.

Our combined experience suggests that the best way to address climate change impacts on the poor is by integrating adaptation measures into sustainable development and poverty reduction strategies. Only such a comprehensive approach, which provides options for poor people to reduce their vulnerability to current and future risks, will contribute towards achieving the MDGs and ensure that sustainable progress is made beyond 2015.

Strengthening Adaptation Efforts

Many adaptation mechanisms will be strengthened by making progress in areas such as good governance, human resources, institutional structures, public finance, and natural resource management. Such progress builds the resilience of countries, communities, and households to all types of shocks, including climate change impacts. Strategies to cope with current climate variability provide a good starting point for addressing adaptation needs in the context of poverty reduction. Learning from experience will help to prevent the underachievement of sustainable development efforts and avoid maladaptation.

Progress will require:

Improved governance, including an active civil society and open, transparent, and accountable policy and decision making processes, which can have a critical bearing on the way in which policies and institutions respond to the impact of climatic factors on the poor.

First steps towards mainstreaming climate issues into all national, sub-national, and sectoral planning processes, such as Poverty Reduction Strategies (PRS) or national strategies for sustainable development.

Encouraging a ministry with a broad mandate, such as planning or finance, to be fully involved in mainstreaming adaptation, especially in countries where major climate impacts are expected.

Combining approaches at the government and institutional level with bottom-up approaches rooted in regional, national, and local knowledge.

Empowerment of communities so that they can participate in assessments and feed in their knowledge to provide useful climate-poverty information. They will also need full access to climate relevant information systems.

Vulnerability assessments that fully address the different shades and causes of poverty.

Access to good quality information about the impacts of climate change. This is key for effective poverty reduction strategies. Early warning systems and information distribution systems help to anticipate and prevent disasters.

Integration of impacts into macroeconomic projections. The rate and pattern of economic growth is a critical element of poverty eradication, and climatic factors can have a powerful bearing on both. Integration will prevent climate change diverting limited resources into disaster relief and recovery activities and away from long-term development priorities. The national budget process should be the key process to identify climate change risks and to incorporate risk management so as to provide sufficient flexibility in the face of uncertainty.

Increasing the resilience of livelihoods and infrastructure as a key component of an effective poverty reduction strategy. Similarly, effective adaptation strategies should build upon, and sustain, existing livelihoods and thus take into account existing knowledge and coping strategies of the poor. Traditional risk sharing mechanisms, such as asset pooling and kinship, could be complemented by micro-insurance approaches, and infrastructure design and investment, both for private and public use, should take into account the potential impacts of climate change.

Next Steps

Part 3 makes specific recommendations for action in the areas of:

- Development agency and donor activities.
- Governments in developing countries.
- Strengthening information and assessments.
- Engagement of the UNFCCC process.
- Ensuring synergies with other multilateral agreements.
- Funding adaptation.

Development and environment agencies need to ensure that their efforts support the mainstreaming of climate issues into general sustainable development. This requires a sector-wide examination of existing programs as well as: a close look at existing disaster reduction and preparedness programs to make maximum use of their ability to assess and reduce current vulnerabilities; the development of tools and methodologies for planning in the face of risk; training and awareness raising of senior management and staff; and the improvement of institutional processes to address the vulnerability of the poor in development programs. Furthermore, checks must be built in to avoid any development activity that undermines the capacity of the poor to cope with climate variability and change.

The UN Conventions on Climate, Biodiversity, and Desertification all provide opportunities for sustainable development and implementation of measures should be integrated in poverty reduction strategies. However, many developing countries 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, for example, maximizing synergies in reporting and other requirements and by integrating implementation measures into general development strategies.

Reducing the vulnerability of those most at risk from the impacts of climate change and the process of mainstreaming adaptation into poverty reduction will require, in many cases, substantial external financial resources. These resources would need to be provided through a number of channels, which would include: bilateral, multilateral, and non-governmental development assistance; the new funds created by the UNFCCC; and the Global Environment Facility (GEF) as the financial mechanism of the UNFCCC.

Development assistance should aim to reorient current practices and remove barriers to “no regrets” adaptation interventions through the integration of climate risk management in development programs. This would also help to mainstream adaptation in national development planning and budgetary processes. Additional resources are required to assess and address climate risks in projects supported by development assistance, where climate-safe development implies extra costs over and above business-as-usual. Funding by the GEF and the new climate change funds further supports interventions that help to prepare for climate change adaptation, and help demonstrate adaptation interventions. The nature and scope of this latter support is dependent on the evolving guidance from the UNFCCC, but we do have to act now.



PART 1: Climate Change and the Poor

Currently over 1 billion people – two thirds of them women – live in extreme poverty on less than US\$1 a day. This figure rises to 2.8 billion if a standard of US\$2 a day is used (OECD 2001).

Climate change will compound existing poverty. Its adverse impacts will be most striking in the developing nations because of their geographical and climatic conditions, their high dependence on natural resources, and their limited capacity to adapt to a changing climate. Within these countries, the poorest, who have the least resources and the least capacity to adapt, are the most vulnerable (IPCC 2001a). Projected changes in the incidence, frequency, intensity, and duration of climate extremes (for example, heat waves, heavy precipitation, and drought), as well as more gradual changes in the average climate, will notably threaten their livelihoods – further increasing inequities between the developing and developed worlds. Climate change is therefore a serious threat to poverty eradication. However, current development strategies tend to overlook climate change risks.

An approach that uses both mitigation and adaptation is needed. Current commitments to mitigate climate change by limiting the emissions of greenhouse gases (GHGs) will not, even if implemented, stabilize the atmospheric concentrations of these gases¹. Developing adaptive capacity to minimize the damage to livelihoods from climate change is a necessary strategy to complement climate change mitigation efforts.

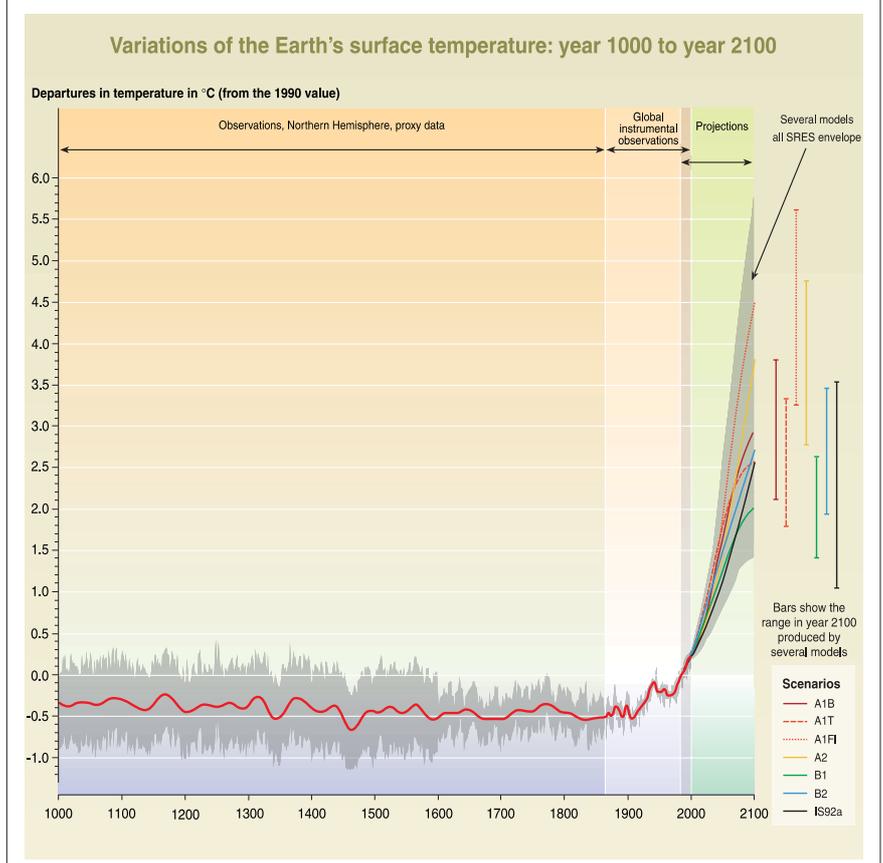
Climate change adaptation – all those responses to climatic conditions that reduce vulnerability – is therefore an integral and urgent part of overall poverty reduction strategies. Adaptation should not be approached as a separate activity, isolated from other environmental and socioeconomic concerns that also impact on the development opportunities of the poor. A compre-

hensive approach is needed that takes into account potential synergistic and antagonistic effects between local and global environmental changes as well as socioeconomic factors.

1.1 Climate Change is a Reality

Today, it is widely agreed by the scientific community that climate change is already a reality. The rate and duration of warming observed during the twentieth century are unprecedented in the past thousand years. Increases in maximum temperatures, numbers of hot days, and the heat index have been observed over nearly all lands during the second half of the twentieth century. Collective evidence suggests that the observed warming over the past fifty years can be mostly attributed to human activities. The warming trend in the global average

Figure 1
Variations in the Earth's Surface Temperature, 1000–2100.
Source: IPCC 2001 a.



surface temperature is expected to continue, with increases projected to be in the range of 1.4 to 5.8 °C by 2100 in comparison to 1990 (IPCC 2001a).

There is increasing observational evidence that regional changes in climate have contributed to various changes in physical and biological systems in many parts of the world (IPCC 2001a; 2001b). These include the shrinkage of glaciers, thawing of permafrost, changes in rainfall frequency and intensity, shifts in the growing season, early flowering of trees and emergence of insects, and shifts in the distribution ranges of plants and animals in response to changes in climatic conditions.

On the regional level, climate change is superimposed on the existing climatic conditions and manifests itself through:

- Changes in average climatic conditions. For example, some regions may become drier or wetter on average (IPCC 2001a).
- Changes in climate variability. For example, rainfall events may become more erratic in some regions.
- Changes in the frequency and magnitude of extreme events (IPCC 2001a; 2001b).
- Changes in sea levels, which are projected to rise by between 0.09 and 0.88 meters by 2100 relative to 1990 (IPCC 2001a).



Table 1
Impacts of Climate Change, Vulnerability, and Adaptive Capacity
 Source: Adapted from IPCC 2001 b.

Region	Likely Regional Impacts of Climate Change	Vulnerability and Adaptive Capacity
Africa	<p>Increase in droughts, floods, and other extreme events would add to stress on water resources, food security, human health, and infrastructure, constraining development.</p> <p>Changes in rainfall and intensified land use would exacerbate the desertification process (particularly in the Western Sahel and Northern and Southern Africa).</p> <p>Grain yields are projected to decrease, diminishing food security, particularly in small food-importing countries.</p> <p>Sea level rise would affect coastal settlements, flooding and coastal erosion, especially along the eastern Southern African coast.</p> <p>Major rivers are highly sensitive to climate variations and may experience decreases in run-off and water availability, affecting agriculture and hydropower systems, which may increase cross-boundary tensions.</p> <p>Increase in frequency of some extreme events in some places.</p>	<p>Adaptive capacity is low due to low GDP per capita, widespread poverty (the number of poor grew over the 1990s), inequitable land distribution, and low education levels. There is also an absence of social safety nets, in particular after harvest failures.</p> <p>Individual coping strategies for desertification are already strained, leading to deepening poverty. Dependence on rain-fed agriculture is high.</p> <p>More than one quarter of the population lives within 100 kilometers of the coast and most of Africa's largest cities are along coasts vulnerable to sea level rise, coastal erosion, and extreme events.</p> <p>Climate change has to be recognized as a major concern with respect to food security, water resources, natural resources productivity and biodiversity, human health, desertification, and coastal zones.</p> <p>Adaptive capacity will depend on the degree of civil order, political openness, and sound economic management.</p>
Asia	<p>Extreme events have increased in temperate Asia, including floods, droughts, forest fires, and tropical cyclones.</p> <p>Thermal and water stress, flood, drought, sea level rise, and tropical cyclones would diminish food security in countries of arid, tropical, and temperate Asia.</p> <p>Agriculture would expand and increase in productivity in northern areas.</p> <p>Reduced soil moisture in the summer may increase land degradation and desertification.</p> <p>Sea level rise and an increase in intensity of tropical cyclones would displace tens of millions of people in low-lying coastal areas of temperate and tropical Asia.</p>	<p>Adaptive capacity varies between countries depending on social structure, culture, economic capacity, and level of environmental degradation.</p> <p>Areas of concern include water and agriculture sectors, water resources, food security, biodiversity conservation and natural resource management, coastal zone management, and infrastructure.</p> <p>Capacity is increasing in some parts of Asia, for example the success of early warning systems for extreme weather events in Bangladesh, but is still constrained due to poor resource bases, inequalities in income, weak institutions, and limited technology.</p>

Region	Likely Regional Impacts of Climate Change	Vulnerability and Adaptive Capacity
Latin America	<p>Loss and retreat of glaciers would adversely impact runoff and water supply in areas where snowmelt is an important water resource.</p> <p>Floods and droughts would increase in frequency, and lead to poorer water quality in some areas.</p> <p>Increases in the intensity of tropical cyclones would change the risks to life, property, and ecosystems from heavy rain, flooding, storm surges, and wind damages.</p> <p>Coastal human settlements, productive activities, infrastructure, and mangrove ecosystems would be negatively affected by sea level rise.</p>	<p>Some social indicators have improved over the 1990s including adult literacy, life expectancy, and access to safe water.</p> <p>However, other factors such as high infant mortality, low secondary school enrolment, and high-income inequality contribute to limiting adaptive capacity.</p> <p>Areas of particular concern are agriculture, fisheries, water resource management, infrastructure, and health.</p>
Small Island States	<p>The projected sea level rise of 5 millimeters per year for the next 100 years would cause enhanced soil erosion, loss of land, poverty, displacement of people, increased risk from storm surges, reduced resilience of coastal ecosystems, saltwater intrusion into freshwater resources, and high resource costs to respond to and adapt to changes.</p> <p>Coral reefs would be negatively affected by bleaching and by reduced calcification rates due to higher CO₂ levels; mangrove, sea grass bed, and other coastal ecosystems and the associated biodiversity would be adversely affected by rising temperatures and accelerated sea level rise.</p>	<p>Adaptive capacity of human systems is generally low in small island states, and vulnerability high; small island states are likely to be among the countries most seriously impacted by climate change.</p> <p>Areas of concern are food security, water resources, agriculture, biodiversity and coastal management, and tourism.</p> <p>Islands with very limited water supplies are highly vulnerable to the impacts of climate change on the water balance.</p> <p>Declines in coastal ecosystems would negatively impact reef fish and threaten reef fisheries, those who earn their livelihoods from reef fisheries, and those who rely on the fisheries as a significant food source.</p> <p>Limited arable land and soil salinization make agriculture of small islands, both for domestic food production and cash crop exports, highly vulnerable to climate change.</p> <p>Tourism, an important source of income and foreign exchange for many islands, would face severe disruption from climate change and sea level rise.</p>

1.2 Developing Countries Will Be Particularly Affected

The impacts of climate change vary across geographical regions (IPCC 2001b). (See Table 1).

Some of the anticipated impacts of climate change are positive (see IPCC 2001b). For example, water-scarce regions such as parts of Southeast Asia may benefit from increased water availability. However, developing countries are likely to suffer most from the negative impacts of climate change (IPCC 2001b). This is due to the economic importance of climate-sensitive sectors (for example, agriculture and fisheries) for these countries, and to their limited human, institutional, and financial capacity to anticipate and respond to the direct and indirect effects of climate change. In general, the vulnerability is highest for least developed countries (LDCs) in the tropical and subtropical areas. Hence, the countries with the fewest resources are likely to bear the greatest burden of climate change in terms of loss of life and relative effect on investment and the economy (IPCC 2001b).

1.3 Adaptation is a Necessity

The extent and scope of regional climate change impacts depend on the degree of mitigation. While the urgency and scale of adaptation efforts required will be lower if aggressive mitigation is undertaken early on, some degree of adaptation is inevitable².

Reductions in emissions of greenhouse gases would delay and reduce damages caused by climate change (IPCC 2001c). Essentially, the lower the future stabilization level of atmospheric greenhouse gas concentration, the less would be the likely damage³. The UNFCCC states that: "the parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof." (Article 3.1 of the UNFCCC).

Even if greenhouse gas emissions were curbed immediately, the global average temperature would still con-

tinue to rise due to the slow response of the Earth's atmosphere system to past emissions. This suggests that any future levels of greenhouse gas concentration, once stabilized, will be above current levels.

1.4 Existing Vulnerability to Climate Variability

'Three years ago it was a very bad year. The flood washed away all of our crops, and there was a lot of hunger around here, to the point that many people actually died of hunger,' Benin 1994.

(Narayan et al. 2000)

Climate change is a very emotional subject for the Philippines because the issue is viewed not only as causing additional economic burdens, but as a critical factor that would determine its survival as a nation. Many of its people are in coastal areas and at risk from the impacts of extreme climatic events, sea level rise and degradation of marine ecosystems. The effects of climate change on agriculture, forestry and water resources will further encumber a country already reeling from a host of socio-economic and environmental problems.

(Philippines 1999)

Recent catastrophes ... have shown that the poor are much more likely to be adversely affected than the non-poor. Because of the inadequate construction, poor people's dwellings are particularly vulnerable; and when affected have insufficient savings to address the emergencies.

(Nicaragua 2001)



Before addressing climate change adaptation in the context of development, it is important to recognize that today's climate already influences economic opportunities and development prospects. Poor countries and people tend to be particularly vulnerable to deviations from average climatic conditions and climatic extremes (OFDA/CRED; UNDP 2003b).

Climate and climate variability are therefore important elements of the complex web of factors influencing people's livelihoods. When comparing data on natural hazards in developing and developed countries, the loss of life and the number of people affected tend to be considerably larger in developing country regions for natural disasters of comparable magnitude. Damages in relation to GDP are usually also higher.

Bangladesh is a prime example of a country that is particularly vulnerable to today's climate. With a low-lying coastline, high population density, and an economy highly dependent on agriculture, the lives and livelihoods of people are threatened by frequent cyclones and the associated effects, such as saltwater intrusion, that render agricultural lands unproductive. Between 1974 and 1998, the country experienced seven major floods (Matin 1998). In 1998, about 68 percent of the country's geographical area was flooded, affecting more than 30 million people and causing 918 fatalities (Choudhury 1998). Economic losses were estimated at US\$3.3 billion, equivalent to 8 percent of the country's GDP (Choudhury et al. 1999).

The impact of climate variability on countries is also well illustrated by the environmental and socioeconomic damages associated with El Niño. El Niño is a natural recurring climatic phenomenon associated with fluctuations in the atmospheric pressure and sea surface temperatures in the tropical Pacific Ocean. It affects the climate on a global scale, with the impacts concentrated in the tropical and subtropical regions. The shift in sea surface temperature is known to affect marine productivity. On land, El Niño is associated with floods and droughts in Latin America, Asia, and Africa, as well as changes in extreme events and the distribution of vector-borne diseases (IPCC 2001b). El Niño has caused loss of life, destroyed livelihoods, and affected national economies. For Ecuador, the overall costs of direct damages to agriculture, livestock and fishing associated with the

1997–98 El Niño constituted 4.7 % of its agricultural GDP. Loss of harvest and rising unemployment of agricultural workers led to an increase in the incidence of poverty by 10 percentage points in the affected municipalities (Vos et al. 1999).

Between 1970 and 1999 about 3.76 billion people were affected by natural disasters in Asia, explained in a large part by Asia's high population density in hazard prone areas. Africa had the second highest number of people affected by natural disasters, largely due to frequent occurrence and the long-term effects of droughts and the importance of the agricultural sector. For the regions of Latin America and the Caribbean, floods had the highest cumulative cost, followed by windstorms, earthquakes, and droughts (Charveriat 2000).

1.5 Already Stressed Coping Capacities

All societies and economies have developed mechanisms to cope with climate extremes and other natural hazards, which they face occasionally. Trade, migration, or precautionary storage of food are examples of strategies to cope with adverse climatic conditions.

This capacity to cope with climate variability and extreme weather events in itself is highly dependent on the level of economic development. In general, livelihood sources of the poor are usually narrower and more climate-sensitive than those of the non-poor. Extreme weather events, which would cause limited damage and few casualties in a developed country, often cause extensive damage and substantial loss of life in a developing country. Poor people are particularly vulnerable to deviations from average climatic conditions such as prolonged drought and to natural disasters such as floods. In periods of stress they may be forced to sell off their physical assets such as land, bicycles, and farming implements, thereby undermining the sustainability of their livelihoods over the longer term.

Among the poor, vulnerability varies, since some groups are more lacking in the financial, social, and political means of securing alternative livelihoods less exposed to risk than others. Women for example may be constrained by social and cultural structures that place them in inferior social positions, limiting their access to income, education, public voice, and survival mechanisms. In addition, the coping capacities of the poor are often

already strained due to a number of trends including HIV/AIDS, increasing population densities, and detrimental forces associated with globalization. Climate change will add to these trends and increase vulnerabilities.

1.6 Climate Change Compounding Existing Risks and Vulnerabilities

Traditional coping mechanisms are backward-looking, based on historical experience and observations. In the face of changing patterns of climate variability, and significant deviations from historical experience, their effectiveness may be significantly reduced. For example, in Tanzania, high rainfall due to the 1998 El Niño was followed by a two-year period of erratic rainfall. This climatic shock caused some of the poorer farmers to give up maize farming and opt instead to sell their labor at farms in other, more productive areas. The resulting dependence on physical working capacity as their sole endowment increased vulnerability, since malnutrition and disease can reduce their capacities for manual labor.

Since the mid-1970s El Niño events have become more frequent, persistent and intense than the opposite cool phase (IPCC 2001a). Whether this is already the result of climate change is the subject of ongoing scientific debate. However, such deviations from normal climatic conditions and previous experience illustrate the additional strain climate change is likely to exert on the poor, if no appropriate adaptation measures are taken. The poor will need to devote more of their already limited resources to coping with adverse climatic conditions.

Climate change may thus force drastic changes to livelihood strategies. Where economic diversification is low, income opportunities and hence options for developing alternative livelihoods in response to climatic changes may be limited. In some cases migration, which is an important coping strategy for poor people, might be the only solution, but will potentially cause social disruption.



The impacts of climate change on the poor will be context-specific, reflecting factors such as geographic location; economic, social, and cultural characteristics; prioritization and concerns of individuals, households, and social groups; as well as institutional and political constraints. The following points illustrate the impacts of climate change on poor people's livelihoods.

Ecosystem Goods and Services

The degree of local environmental degradation will influence the vulnerability of an ecosystem to climate change. Habitat fragmentation is already a leading cause of biodiversity loss and changes in temperature and moisture regimes further limit habitats necessary for the survival of species. Degradation of forested mountain slopes in conjunction with intensified rainfall may increase erosion and loss of fertile soil and affect the quality of watersheds. Climate change is likely to lead to changes in species distribution and abundance, and increase the risk of extinction and loss of biodiversity (IPCC 2001b).

Since some ecosystems are highly sensitive, even small changes can have large effects. Minor increases in water temperature can, for example, damage coral reefs, exacerbating other stresses such as pollution and over-fishing and thereby cause a reduction in fish stocks, jeopardizing fish- and tourism-dependent livelihoods.

Poor people are often directly dependent on goods and services from ecosystems, either as a primary or supplementary source of food, fodder, building materials, and fuel. This makes them highly vulnerable to ecosystem degradation. While local economic and social conditions drive poor people into marginal areas and force them to exploit natural resources to support their livelihoods, climate change further erodes the quality of the natural resource base, thereby reinforcing conditions of poverty.

Changes in ecosystem composition and provision of goods and services may also have wider economic effects. Essential ecosystem services include breaking down wastes and pollutants, purifying water, and maintaining soil fertility. Climate change will alter the quality and functioning of ecosystems, reducing their capacity to perform their role as important life support systems. This will have important impacts on key economic sectors such as agriculture, water supply, and others.

Water

Water scarcity is already a major problem for the world's poor. The number of people impacted by water scarcity is projected to increase from about 1.7 billion people today to around 5 billion people by 2025, independent of climate change (IPCC 2001b). Climate change is projected to further reduce water availability in many water scarce regions, particularly in the subtropics, due to increased frequency of droughts, increased evaporation, and changes in rainfall patterns and run-off.

Precipitation is expected to increase in equatorial, middle, and high latitude regions (IPCC 2001b), which tend to suffer less from water scarcity. As rainfall events are expected to become more intense, the incidence of floods may increase, jeopardizing human settlements and infrastructure.

Increases in temperature and changes in precipitation are projected to accelerate the retreat and loss of glaciers (IPCC 2001a; 2001b). Associated changes in the timing of streamflow will have downstream effects for agriculture. The melting of glaciers has become a serious concern in the Himalayan region, because of the growing risk of glacial lake out-burst floods (UNEP/ICIMOD 2002; Bhutan 2000).

Agriculture and Food Security

Agriculture is the most important sector for most least developed countries as the impact of agricultural growth on poverty reduction tends to exceed the impact of growth in other sectors (ODI 2002). Food security is a function of several interacting factors, including food production as well as food purchasing power. Climate change could worsen the prevalence of hunger through direct negative effects on production and indirect impacts on purchasing powers.

Land degradation, price shocks, and population growth are already a major concern for sustaining agricultural productivity. Changes in temperature, precipitation, and climatic extremes will add to the stress on agricultural resources in many developing country regions and reduce the quality of land areas for agricultural production. This will be particularly serious for areas where droughts and land degradation, including desertification, are already severe. As access to productive land is important for reducing rural poverty, the impacts of climate change on the productivity of land will further constrain efforts to combat rural poverty.

Low-lying coastal communities will have to deal with sea level rise and the impact of climate change on marine resources. Sea level rise may lead to salinization and render agriculture areas unproductive. In areas where fish constitute a significant source of protein for poor people, declining and migration of fish stocks due to climate change and associated changes in the marine environment will further need to



be considered in their impact on the local food security.

The impact of climate change on food supply varies significantly by region. In general, crop yields are projected to decrease in most tropical and subtropical regions due to changes in temperature and rainfall (IPCC 2001b). Consequently, there is a real risk that climate change will worsen food security and exacerbate hunger in some developing-country regions. In the short term, however, the greater impact on food security could come from the projected increases and severity of extreme weather events rather than from gradual changes in the climate (FAO 2002).

The impact of climate change on food security will be a major concern for Africa. In conjunction with the previously discussed changes in water supply, the production losses for Sub-Saharan countries could be substantial as the length of suitable growing periods decreases. Livestock activities and crop yields for many countries in Asia and Latin America are also projected to decrease.

Health

The potential impacts of climate change on human health would increase vulnerability and reduce opportunities by interfering with education and the ability to work. While any attempt at predicting and gauging the impact of climate change on human health is a complicated task, it is likely that climate change will have both direct and indirect adverse effects on human health.

A direct effect is an increase in temperature-related illnesses and deaths. Prolonged intense heat waves coupled with humidity may increase mortality and morbidity rates, particularly among the urban poor and the elderly. Another direct effect will be increased death and injury from extreme weather events such as flooding, landslides, and storms – over 96 percent of disaster-related deaths in recent years have taken place in developing countries (World Bank 2001).

Changes in temperature and rainfall may change the geographic range of vector-borne diseases such as malaria and dengue fever, exposing new populations to these diseases (see Box 1). Young children as well as pregnant women and their unborn children are especially vulnerable to malaria. Malaria contributes to perinatal mortality, low birth weight,



and maternal anemia (WHO 2002). The frequency and severity of malaria epidemics in East Africa already appear to have increased in correspondence with the increased frequency, magnitude, and persistence of the El Niño phenomenon over the past 20 to 30 years (McMichael et al. 1996).

Box 1

Climate Change Impacts on Malaria

Modeling based on IPCC (2001b) scenarios suggests that temperature rise by 2100 could lead to significant increases in potential breeding grounds for malaria in parts of Brazil, Southern Africa, and the Horn of Africa. In a few areas – such as parts of Namibia and the West African Sahel – malaria risk may fall due to excessive heat. In Africa, cities that currently are not at risk of malaria because of their high altitudes, such as Nairobi and Harare, may be newly at risk if the range in which the mosquito can live and breed increases.

Source: Gallup and Sachs 2000.

The net effect of climate change on malaria infections is still uncertain, and the impacts will vary

from region to region. Nevertheless, the close link of the occurrence of malaria and other vector-borne diseases with climatic parameters and the potential changes in the distribution ranges of such diseases warrant responsive health institutions, precautionary action, and monitoring.

Climate change-induced droughts, flooding and other extreme weather events degrade and reduce potable water supplies and increase water-associated diseases such as cholera and diarrhea, particularly in areas with inadequate sanitary infrastructures. Inadequate access to safe drinking water and sanitation, combined with poor hygiene practices, are major causes of ill health and life-threatening disease in developing countries. At present, these diseases already kill an estimated 2.213 million people per year in developing countries, of which about 90 percent are children under the age of five (Prüss et al. 2002). Women are particularly exposed to water-associated diseases through their traditional chores of washing and water collection.

Involuntary Displacement, Migration, and Conflicts

The direct and indirect effects of climate change and their interaction with other vulnerabilities and environmental exposures may lead to mass migrations, as crucial resources become degraded and livelihoods are threatened.

Loss of land mass in coastal areas due to sea level rise is, for example, likely to lead to greater permanent or semi-permanent displacement of populations, which may have considerable economic and political ramifications. Areas most vulnerable to sea level rise lie in the tropics: the west coast of Africa; the north and eastern coast of South America; South and Southeast Asia; and small island states in the Caribbean, Pacific and Indian Oceans (IPCC 2001a). Of the world's 19 mega-cities (those with over 10 million people), 16 are on coastlines and all but 4 are in the developing world. The poor living in Asian mega-cities are particularly at risk, as sea level rise compounds subsidence caused by excessive groundwater extraction in Manila, Bangkok, Shanghai, Dhaka, and Jakarta.

To this should be added the risk for potential conflicts, including social unrest, political instability, and wars over decreasing water or other natural resources and possible mass migration due to, for example, land loss or degradation and extreme

weather events. Such conflicts may have considerable costs both in macroeconomic terms and in human suffering.

Economy-Wide Effects

Climate change is expected to have effects on the overall economy of poor countries, thus hampering potential for economic growth. In addition, poor adaptation (see glossary) will increase the impacts of extreme events, increasing the costs of rehabilitation and diverting funds from longer-term development purposes.

Current extreme weather events are already taking their toll on developing countries' economies, leading to loss of human and economic capital. Regions where climate change exacerbates climatic extremes and which have limited adaptive capacity will be further constrained in their development prospects due to additional loss of life, private assets, reduced productivity of important economic sectors, and destruction of infrastructure⁴.

This is particularly true for small countries and countries with low economic diversity, where the impact of climatic extremes cannot be well absorbed by economic activity in other regions or sectors (Box 2).

Box 2

Impacts of Climate Change on Small Island States: The Pacific

The Pacific Islands are becoming increasingly vulnerable to extreme weather events as growing urbanization and squatter settlements, degradation of coastal ecosystems, and rapidly developing infrastructure on coastal areas intensify the islands' natural exposure to climate events. In the 1990s alone, the cost of cyclones and typhoons exceeded US\$800 million, while the 1997 drought cost upwards of US\$175 million even before nutrition-related deficiencies were taken into account. During the 1997–98 drought in Fiji US\$18 million in food and water rations had to be distributed.

Source: IPCC 2001b; IFRC-RCS 2002; World Bank 2000.

Even though both people and systems appear to be generally more vulnerable to sudden disruptive changes than gradual ones, long-term climate change can be just as harmful. Changes in average climatic conditions, as well as extremes, and loss of productive areas due to sea level rise, have both been highlighted in their projected impacts on the agricultural sector. Countries where tourism represents a major source of income may be affected by a decrease in revenues due to the effects of both gradual climatic changes and extreme weather events. Such events are likely to alter the attractiveness of certain holiday destinations, for example coral reef mortality is expected to reduce income opportunities for local populations in some regions. All these factors can affect GDP, balance of payments, level of indebtedness, state of public finances, and may divert investments from important development objectives.

1.7 Implications for Poverty Eradication

Part 1 has so far illustrated that even though climate change is a global threat, it is also very much a problem for development, since poorer countries, having the least adaptive capacity and hence the most vulnerable populations, are expected to suffer the greatest adverse effects. This is because many of the world's poor are found in geographically vulnerable places, and live under vulnerable environmental, socioeconomic, institutional, and political conditions.

Climate change provides an additional threat that adds to, interacts with, and can reinforce existing risks, placing additional strains on the livelihoods and coping strategies of the poor. In 2000, leaders of 189 nations agreed on the Millennium Declaration that outlined eight fundamental goals. Climate change challenges the achievement of the



Table 2
Potential Impacts of Climate Change on the Millennium Development Goals

Millennium Development Goals: Climate Change as a Cross-Cutting Issue	
Millennium Development Goal	Examples of Links with Climate Change
Eradicate extreme poverty and hunger (Goal 1)	<ul style="list-style-type: none"> ● Climate change is projected to reduce poor people's livelihood assets, for example, health, access to water, homes, and infrastructure. ● Climate change is expected to alter the path and rate of economic growth due to changes in natural systems and resources, infrastructure, and labor productivity. A reduction in economic growth directly impacts poverty through reduced income opportunities. ● Climate change is projected to alter regional food security. In particular in Africa, food security is expected to worsen.
Health related goals: <ul style="list-style-type: none"> ● Combat major diseases ● Reduce infant mortality ● Improve maternal health (Goals 4, 5 & 6) 	<ul style="list-style-type: none"> ● Direct effects of climate change include increases in heat-related mortality and illness associated with heat waves (which may be balanced by less winter cold-related deaths in some regions). ● Climate change may increase the prevalence of some vector-borne diseases (for example malaria and dengue fever), and vulnerability to water, food, or person-to-person borne diseases (for example cholera and dysentery). ● Children and pregnant women are particularly susceptible to vector and water-borne diseases. Anemia – resulting from malaria – is responsible for a quarter of maternal mortality. ● Climate change will likely result in declining quantity and quality of drinking water, which is a prerequisite for good health, and exacerbate malnutrition – an important source of ill health among children – by reducing natural resource productivity and threatening food security, particularly in Sub-Saharan Africa.
Achieve universal primary education (Goal 2)	<ul style="list-style-type: none"> ● Links to climate change are less direct, but loss of livelihood assets (social, natural, physical, human, and financial capital) may reduce opportunities for full-time education in numerous ways. Natural disasters and drought reduce children's available time (which may be diverted to household tasks), while displacement and migration can reduce access to education opportunities.
Promote gender equality and empower women (Goal 3)	<ul style="list-style-type: none"> ● Climate change is expected to exacerbate current gender inequalities. Depletion of natural resources and decreasing agricultural productivity may place additional burdens on women's health and reduce time available to participate in decision making processes and income generating activities. ● Climate related disasters have been found to impact more severely on female-headed households, particularly where they have fewer assets to start with.
Ensure environmental sustainability (Goal 7)	<ul style="list-style-type: none"> ● Climate change will alter the quality and productivity of natural resources and ecosystems, some of which may be irreversibly damaged, and these changes may also decrease biological diversity and compound existing environmental degradation.
Global partnerships	<ul style="list-style-type: none"> ● Global climate change is a global issue and response requires global cooperation, especially to help developing countries to adapt to the adverse impacts of climate change.



Millennium Development Goals (MDGs) and related national poverty eradication and sustainable development objectives. Unless concrete and urgent steps are undertaken to reduce vulnerability and enhance adaptive capacity of poor people, and unless these actions are integrated in national strategies for poverty eradication and sustainable development, it may be difficult to meet some MDGs by 2015 (Table 2).

Strategies to strengthen capacity to cope with current climate variability and extremes and to adapt to expected future climatic conditions are mutually supportive and will have immediate benefits. They will also help identify and take advantage of the positive impacts of climate change.

There is much experience to date of coping with climate variability and disasters from which useful lessons for adaptation can be drawn. Ensuring that the poor are able to adapt to current and imminent climate variability is the first step. The task ahead for the development community is to enhance the

adaptive capacity of the poor and poor countries and to help to implement specific actions for addressing climate change impacts. With this in mind, Part 2 discusses lessons learned from past experience with coping with climate variability.

