



CLOSING THE GAPS



Commission on Climate Change and Development

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Closing the Gaps:

Disaster risk reduction and adaptation to climate change in developing countries

**Report of the
Commission on Climate Change and Development**

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Climate for Change

The Declaration of the Commission on Climate Change and Development

Sustainable development is possible but at risk. The planet's crises – rapid climate change, degraded ecosystems, scarcities of food, water, and energy – will outlast the serious economic downturn that now absorbs the attention of global leaders and affects people worldwide. Some crises can be reversed, but the damage to climate and ecosystems that contain and support all life may be beyond repair and contribute negatively to economic prosperity. It is imperative that all countries adapt to this reality. We are all in this together.

The way that nations respond to the global recession can provide the basis for a new path of development that begins to ease the planet's interlocked emergencies.

The international community seems less concerned about the failing climate system than about failing financial institutions. It hesitates to speak of millions for adaptation to climate change, but mobilizes billions for the financial crisis. Faced with a global crisis, nations risk turning inward, focusing on narrow concerns, which would be a historic mistake.

Yet the climate upon which human civilization is based is changing faster than imagined 20 years ago – or even 2 years ago. The change is accelerating and will affect future economic growth and deepen the economic gaps.

We must respond by mitigation – decreasing greenhouse gas emissions, creating low-carbon paths of development for every nation, paths of development that are both a right and a necessity.

But past emissions are already causing rapid change; so we must adapt to climate change – for present and future generations. Adaptation actions can spur development and the achievement of the Millennium Development Goals. The crises affect all, but they hit the poorest and most vulnerable hardest. The climate crisis is already claiming its victims.

Climate change also presents humankind with a historic opportunity to make development more sustainable, encompassing a low-carbon economy and addressing the risks posed by climate change. It offers an opportunity to create trust and cooperation to better manage all crises, to fashion a market built on

ecological truths as well as economic data, to redefine the way we measure growth and prosperity. It provides an opportunity for developing renewable energy for growth, providing the vulnerable with resources for adaptive capacity, and reducing the risk of disaster. The responses to climate change provide an opportunity to address the inherent inequity in the climate process and to create equity within nations, among nations, and between generations.

This Commission has focused primarily on adaptation as an important element of human development. We recognized the capacity of many peoples and families to use their knowledge and deep experience to adapt effectively, given appropriate signals and support. Our focus is on empowering the poorest people and countries to improve their ability to cope with an uncertain future – to reduce the negative effects and exploit the positive ones. Adaptation is also crucial because millions of lives and livelihoods are at stake and because countries and regions that fail to adapt will contribute to global insecurity through, for example, the spread of disease, conflicts over resources, and a degradation of the economic system.

Seventeen years ago the world agreed on the necessity for the rich to aid the poor in adapting and made it a treaty obligation in the UN Framework Convention on Climate Change (UNFCCC). The evidence today is stronger, the moral case unequivocal, and the political importance compelling. There can be no global agreement without adaptation assistance, and because of the nature of climate impacts, there will be much less global security without it. The world will be a worse place for all if we do not meet this treaty obligation.

Adaptation is about forms of development in which the capacity to manage risk determines progress. Thus adaptation is much more than climate-proofing development efforts and official development assistance (ODA). It requires action, additional funding, and deep cooperation between rich and poor nations and between rich and poor people within nations. It requires sustainable development: meeting the needs of the present in ways that do not compromise the ability of future generations to meet their needs.

RESPONSIBILITIES, COMMITMENTS, AND LEADERSHIP

A trust gap has opened between industrial and developing countries, stalling essential common action. It is rooted in a failure to fully acknowledge the polluter pays principle in climate negotiations and political dialogue. It results both

from decades of unfulfilled commitments in development and trade and from fears that developing countries with rapidly increasing emissions are not doing enough to curb them. The trust gap can be bridged when commitments by industrial countries are met. Developing nations, for their part, need to ensure transparent management of funds and the empowerment of their communities.

The causes and effects of climate change lie thousands of miles and centuries apart. Science has spoken: we now need the political will to act. In particular, strong and capable leadership is needed to overcome the current trust impasse and help us all live up to our responsibilities to current and future generations. This leadership will require an acknowledgement of urgency, a willingness to accept scientific truth, a long-term perspective, and collective actions.

SUSTAINABLE DEVELOPMENT

Ultimately, we need sustainable development, including a rapid move toward a low-carbon global economy. New green growth investment opportunities are necessary to respond to the urgent and growing needs for climate change adaptation.

Development that can be sustained in a world changed by climate must be enabled by building the adaptive capacity of people and defining appropriate technical adaptive measures. Adaptive capacity results from reduced poverty and human development. Adaptive measures require the institutional infrastructure that development brings. Action must be fast, scaled, focused, and integrated across sectoral divides:

- ▶ **Speed:** Wasting no time – climate change is happening faster than science predicted.
- ▶ **Scale:** With growing numbers of people in danger, responses must match the scale of change.
- ▶ **Focus:** Managing risks, building the resilience of the poorest, and enhancing the ecosystem functions upon which they depend.
- ▶ **Integration:** Uniting environment, development, and climate change, and managing synergies between mitigation and adaptation.

GOVERNANCE

The creation of adaptive capacity requires that international funds move efficiently to address impacts that are local. Participatory democracy, functioning institutions, and transparency are needed at all levels for effective adaptation. People at risk need democratic and political space so that they can inform themselves and articulate their views and concerns. They need markets that work for them so that they can trade and build their assets. This means that accountable and responsible government is more important than ever.

Adaptation is best managed through policy coherence and through coordination and cooperation among governments, civil society, and the private sector. The principle of subsidiarity should apply when dealing with adaptation. Impacts are local and contextual. The bulk of responsibility will fall on local and national governments, supported by international actions for appropriate capacities and resources.

Social protection – particularly the direct and predictable transfers of resources to the poor – must become a standard feature when building the adaptive capacity of the most vulnerable households and individuals. It will include effective disaster risk reduction for the most vulnerable.

Women and men have traditionally played different roles in economic activity and natural resources management. Women and men should have equal rights, making full use of their different capacities; where they are affected differently, attention must be given to the needs of the most vulnerable.

INSTITUTIONS

The adaptive capacity of people and communities is mediated through institutions. Disseminating information, building knowledge, articulating needs, ensuring accountability, exchanging goods and services, and transferring resources: all these are needed for adaptation and all are guided by and happen through institutions. In an uncertain world, adaptation cannot be effective without effective and accountable organizations and institutions.

Families, neighborhoods, and communities and their local institutions must have effective links with national, regional, and international institutions, which help set the frameworks and provide many of the means in which and by which they adapt.

Twenty-first century challenges require twenty-first century institutions. Today's organizations must be able to manage public goods, bringing in the private sector. They must be stakeholder-driven, efficiently moving resources from global to local levels. They must be problem solvers, valuing ecosystems in dealing with climate change.

In the short term, we can use existing institutions for the deployment of financial resources and modify these institutions to better manage knowledge and services. In the longer term, as funding increases and agendas expand, new institutions might be needed. Application of the subsidiarity principle, mentioned above, will help distinguish among local, national, regional, and international responsibilities.

Local level

Local institutions know their communities and should have the main responsibility for identifying the poor and vulnerable and supporting them in building safe rural and urban settlements. These institutions should ensure that dissemination of climate information reaches the poorest and most vulnerable through appropriate extension services.

National level

Adaptation requires mechanisms cutting across governments' sectoral forms of organization. National policy coordination for adaptation, disaster risk reduction, poverty alleviation, and human development should be led from the highest political and organizational level. Climate change is far too big a challenge for any single ministry because it requires coordination among multiple sectors. Our report offers encouraging examples. All national sectors must be involved in climate actions.

All governments have a responsibility to protect their poorest and most vulnerable citizens. Climate consequences will affect growing numbers of vulnerable people. Therefore governments need to be ready with the appropriate social safety nets. In developing countries, external technical support is needed to strengthen institutions responsible for such systems, and national and international organizations should cooperate in this effort.

Communities in fragile states present challenges. International organizations and bilateral donors have a special responsibility to support and channel resources to them via traditional and informal organizations.

In terms of climate change, national governments have to deal with multiple assistance agencies, all of which are trying to prove to their constituencies that they are taking effective action. Responding to climate change makes the principles embedded in the Paris Declaration on Aid Effectiveness and the Accra Agenda for Action – ownership, alignment, use of country systems, division of labor – therefore even more relevant.

Governments should provide an enabling policy framework covering management, planning, and service delivery functions for adaptation that facilitate and support local governments and other actors' efforts. They should ensure that devolved administrative responsibilities are matched by resources and technical capacity.

Governments need to invest more in climate and meteorological information, biophysical monitoring, and early warning, integrating such data in their planning.

Regional level

In many cases, regional coordination will provide the best opportunities for dealing with these issues. Regional organizations should identify added value, analyze lessons learned, and ensure the provision of information on experiences and ongoing activities.

There is a need to address climate change at the level of river basins and agro-ecological zones, making regional agencies more important. These should become more innovative in helping countries produce regional climate information and knowledge, design common early warning systems for extreme weather conditions, manage shared water resources, control regional infectious diseases, and develop and create various agricultural and ecosystem management systems.

International level

The international arena provides great opportunities for major actions such as carbon markets and technology transfer. Yet given that adaptation is based mainly on local actions, international organizations must become more adept at reaching the local level directly and through national governments and regional organizations.

Adaptation and mitigation both require an improved knowledge network, with much greater investment in generating, disseminating, and exchanging know-

ledge. It is particularly important to build scientific knowledge and capacity for climate change research in low-income countries. The Intergovernmental Panel on Climate Change (IPCC) should continue its four-yearly reports but should focus also on the rapid turnaround and dissemination of peer-reviewed research findings, especially to low-income countries. The World Meteorological Organization should be equipped to service these new requests of the IPCC.

The IPCC should engage more actively with other existing institutions (such as the UN Environment Programme, the World Bank, UN specialized agencies, academia, civil society, and think tanks) to ensure that climate change knowledge and information reach users in a timely way, particularly in low-income countries.

The UNFCCC secretariat should focus on intergovernmental debate and policy setting, not on regulatory, financial, or operational functions. Regulatory services, the scaling up of carbon trading, and the provision of global corporate guidance (as distinct from political guidance) could be entrusted to a new regulatory institution that would also effectively provide the least developed countries with access to the carbon markets.

The knowledge gap for adaptation is vast, but a growing knowledge network is being developed. The UN should provide a focal point for UN-related climate change knowledge, “delivering as one” within developing countries, providing advice on issues from water and crop management to insurance and disaster risk reduction.

The United Nations, international organizations (including civil society), and governments should work together to quickly and drastically scale up national, regional, and international systems for disaster response and preparedness. The new system should have a standby financial mechanism that would be triggered automatically by a major event, assuring rapid response. It should facilitate recovery through a focus on vulnerability reduction; promote risk transfer, including social transfers and insurance products; and invest in staff with the creativity and capacity to handle surprises. It should strengthen national and regional capacities.

UN agencies are not effectively coordinating their responses to climate change. Governments should support the efforts of the UN Secretary-General (SG) to strengthen coordination among UN agencies, funds, and programs. We urge

the SG to continue to keep climate change issues at the top of government and governance agendas, encouraging and maintaining political will. The SG should bring in stakeholders and set priorities throughout the UN system.

The Commission recognizes the leadership of the SG and urges the SG to convene, in cooperation with international financial institutions, an independent high-level task force to articulate a vision for development that achieves the multiple goals of mitigation, adaptation, and meeting human needs. High on its agenda should be the connections between the different global crises and the adequacy of global public policy and global governance in dealing with them simultaneously.

FINANCE

Resources are essential, but getting adaptation right is not only about money. Adopting a new approach to development and fixing our institutions will provide the kind of incentives needed for more adaptive actions. The transition to a low-carbon green economy can support the global recovery by creating new jobs across a wide range of industries, but it will also secure ecosystem services on which the world depends, especially the adaptive capacity of the poorest. In this context, Reducing Emissions from Deforestation and Degradation offers a promising mechanism for simultaneously delivering mitigation, adaptation, and economic benefits while sustaining vital ecosystem services.

Money is needed now, and more will be needed in the future to help developing countries adapt. The estimated price tag for this is probably higher than what is currently spent on ODA, but that is still uncertain. Hence we need a step-by-step approach that will allow us to invest as our knowledge and understanding of climate change impacts and adaptation needs improve.

Three main issues must be managed to get adaptation financing right: mobilization of resources, management of resources, and allocation of resources.

First, mobilization of resources. The Commission urges donors to honor their ODA commitments. This would improve the adaptive capacity of countries. ODA should be used now for urgent needs and to kick-start other forms of finance. In the long run, resources for adaptation will be a blend of ODA and non-ODA resources. The latter should meet the following criteria: additionality, adequacy, predictability, and political feasibility.

By additional, we mean additional to the commitment of paying 0.7% of gross national income as ODA. The concept of additionality applies to the raising of funds but does not prescribe how the extra funds must be spent. The Commission emphasizes the importance of transparency in funding and therefore urges the Development Assistance Committee of the Organisation for Economic Co-operation and Development to suggest an appropriate marker for adaptation finance that donors will use when reporting their financial contributions. This will allow the tracking of additional resources for adaptation.

Second, management of resources. The Commission finds the proliferation of funds for adaptation problematic; it creates a coherence problem and puts pressure on the management capacity of developing countries. No further vertical funds should be created for adaptation.

Existing funding mechanisms should be effective, efficient, well coordinated, and accessible for actors at different levels. They should meet the following criteria: transparent and balanced governance; accountability of industrial and developing countries; demand-driven, with involvement of recipients during identification, definition, and implementation of programs; management devolved to the lowest level of effective governance; and independent evaluation and oversight.

Third, allocation of resources. This should take into account climate change vulnerability and in the early stage should make use of existing channels to implement high-priority items in National Adaptation Programs of Action, as identified by countries. The aim should be to integrate adaptation activities into the normal planning and budgeting processes of countries.

A TWO-STEP APPROACH

Because the creation of new mechanisms might delay essential action, we recommend a two-step approach to mobilizing “new and additional” funds for adaptation in developing countries. This stepwise approach aims to narrow the trust gap between industrial and developing countries. It provides immediate help to the poorest people as progress is made toward a long-term approach to adaptation funding within the context of a new agreement on climate change.

As a first step, we urge donor countries to mobilize \$1–2 billion (although not at the expense of current ODA-financed programs) to assist the vulnerable, low-income countries (especially in Africa) and selected small island states (below

a certain gross domestic product), which are already suffering from climate impacts. The second step is an effective mechanism for funding adaptation that would be created through climate negotiations.

ODA and other public funds are unlikely to provide the full resources required to finance adaptation efforts of all developing countries in the long term. There is a wide range of estimates of the needs.

The main messages of our report are that adaptation will be possible and cost-effective, that costs will rise for decades or centuries, and that costs will accelerate with continuing failure to mitigate.

Although more work is required to better estimate these needs, there are promising options proposed to raise funds. Some could bring between \$5 billion and \$15 billion additional funds a year – which is in the lower range of estimated needs.

We urge governments to adopt the mechanisms that provide additional and predictable resources and are politically feasible, equitable in terms of all donors and recipients, and respectful of the principle of common but differentiated responsibility.

A BETTER CHANCE

During the course of its work, the Commission on Climate Change and Development has met governments and citizens struggling with the effects of climate change in Bolivia, Cambodia, and Mali. We offer this declaration and its recommendations as a contribution to the sustainable development path that climate change requires. We offer it for the consideration of political leaders at the Copenhagen climate meeting and beyond.

All governments have responsibilities toward their most vulnerable citizens. All resources mobilized to mitigate and adapt to climate change must ensure their rights, their voice, their security.

In 20 years the next generation will not judge us by the precise arrangements we make to reduce the emissions that cause global warming and help the victims of climate change, but rather by whether these arrangements proved effective. If we fail, their lives will be worse and will be more limited. If we succeed, we will have provided them at least a better chance.

Preface

For many years negotiations and debates on climate change have focused on the need to reduce emissions of greenhouse gases. We assumed that successful mitigation would help us avoid the harmful effects of increasing temperatures. But mitigation has yet to begin at the required scale and space. People around the globe observe changes to their environment with profound consequences. The rainy season cannot be trusted to last long enough to recharge dry wells and restore soil moisture. Returning migratory birds no longer signal the right time for putting seeds in the ground. And violent storms and rains occur when and where they are least expected. Those with little margin to maintain a decent life for themselves and their children, relying directly on what ecosystems provide, are most affected.

In September 2007, Swedish Prime Minister Fredrik Reinfeldt therefore informed the Secretary-General of the United Nations of his government's initiative to launch an international commission on climate change and development. Its focus would be threefold: how to design and support adaptation to climate change, how to reduce the increasing risk of weather-related disasters, and how to strengthen the resilience of the poorest and most vulnerable communities and countries.

Much has changed since that day in New York. In December 2007 climate negotiators agreed on a Bali Action Plan, where adaptation is one of the pillars of the continued negotiation process. Scientists report that climate change is happening more rapidly than had been predicted. And the climate crisis is not alone. Food, energy and water scarcities, ecosystem degradation, and a global economic downturn are taking their simultaneous toll, especially on the poorest.

The Commission on Climate Change and Development decided to build its case from the ground up. Through our meetings with citizens and governments in Bolivia, Cambodia, and Mali, we sought to gain an understanding of the threats poor people face, how they can build their adaptive capacity, and what is needed in the form of institutions and resources to provide the most effective support and the best outcomes.

For this to happen, a number of gaps must be bridged. There is a trust gap between rich and poor countries, gaps between institutions, and a resource gap. These are addressed in individual chapters of our report.

Taking adaptation actions today is a requirement for sustainable development tomorrow. Early action is needed to reduce future costs and irreversible ecological damage. We, the Commission, are convinced that the different crises can only be resolved in unison. Assigning the right value to the climate and ecosystems, ensuring that no system is used beyond its capacity, and creating political space for dialogue and action – these are steps needed to deal with our multiple threats. The Commission is united in its belief that the climate crisis gives us both obligations and opportunities. It is in this spirit we offer our report.

Gunilla Carlsson

Swedish Minister for International Development Cooperation
Chairperson, Commission on Climate Change and Development

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Executive Summary

The international Commission on Climate Change and Development was launched in late 2007 by the Swedish government. Chaired by Swedish Minister for International Development Cooperation Gunilla Carlsson, the Commission has 13 members from countries in all regions. They represent international and regional organizations as well as science, civil society, and the private sector.

The Commission examined adaptation to climate change and its links with development and disaster risk reduction and was asked to issue policy recommendations on how the resilience of vulnerable communities and countries can be strengthened through official development assistance (ODA), on appropriate institutional and financial architecture, and on the mobilization of new financial resources.

In Chapter 1 we argue that the only solution to climate change is a rapid move toward a low-carbon global economy. This must be done urgently, efficiently, and with great determination, so that adaptation remains possible.

The poor are overwhelmingly the present and future victims of climate change. Its impacts are mixed with and overlap the impacts of other syndromes such as rising food prices, the financial crisis, energy shortages, ecosystem degradation due to other human causes, and demographic changes. These must be managed in a highly coordinated manner.

The poor need adaptive capacity, which consists mainly of assets, health, education, and governance. Thus in poor countries adaptation is inseparable from development, where the capacity to manage risk determines progress. Adaptation is much more than climate-proofing development efforts and ODA. It requires action, additional funding, and deep cooperation between rich and poor nations and between rich and poor people within nations. It requires sustainable development: meeting the needs of the present in ways that do not compromise the ability of future generations to meet their needs.

Development must quickly reach rapidly growing numbers of people, focus on reducing vulnerability, and integrate adaptation, mitigation, and human development goals.

Chapter 2 examines the ethics of climate change, mitigation, and adaptation, including the trust gap between industrial and developing nations. In the UN Framework Convention on Climate Change of 1992, wealthy nations pledged to help poorer nations adapt to climate hardships created for them by others. Unless this pledge is honored, the poorer countries will not agree to a post-2012 global framework on climate change. Yet climate ethics are complex, as causes and effects are separated by thousands of miles and by generations. The issue of basic fairness developed in this chapter informs much of the rest of this report.

Chapter 3 focuses on the human dimension of climate change. While the effects of climate change may be vast, their brunt will be borne locally by individuals, families, villages, and neighborhoods. Discussions of climate change must be turned upside down, switching from a global to a local focus. National governments must set frameworks to ensure that adaptation measures and disaster risk reduction reach all, including the most vulnerable. Historically, bad governance and a failure to respond to local needs have hindered development efforts. Those problems will frustrate adaptation if not managed. Moving toward participatory democracy is essential.

Adaptation discussions tend to focus on big weather-related catastrophes. Yet adaptation to smaller, unreported events is at least as important. First, the increase in smaller floods, landslides, and so on is increasing poverty through the accumulated effects. Second, households and societies that are more resilient to small shocks are less vulnerable to big ones.

Adaptation strategies must increase the adaptive capacities of people, businesses, and ecosystems. Some development agencies and national governments are successfully using social transfers – regular and predictable grants to poor households – as a way to improve access to services and address the underlying causes of inequalities in well-being. They need to be expanded and scaled up as vulnerability increases.

Adaptation is shaped by institutions at the local, national, and international levels; adaptive capacity at the local scale depends on developing capacity for adaptation at wider scales. The private sector is a key resource in adaptation. Three main institutional ingredients are necessary to improve people's adaptive capacity: targeted capacity development, inclusive governance, and ownership.

Chapter 4 addresses the governance gap. It shows that despite the strong interdependence between economy, environment, and development, governments continue to try to manage issues in silos as if they were separate one from another. Climate change, one of the greatest threats to human civilization, has been placed in what is often the weakest governance silo: environment.

Local institutions know their communities and should have the main responsibility for identifying the poor and vulnerable and supporting them in building safe rural and urban settlements. These institutions should ensure that dissemination of climate information reaches the poorest and most vulnerable through appropriate extension services.

National policy coordination for adaptation, disaster risk reduction, poverty alleviation, and human development should be led from the highest political and organizational level. Climate consequences will affect growing numbers of vulnerable people. Therefore governments need to be ready with the appropriate social safety nets.

The need to address climate change at the level of river basins and agro-ecological zones makes regional agencies more important. These should become more innovative in helping countries produce regional climate information and knowledge, design common early warning systems for extreme weather conditions, manage shared water resources, control regional infectious diseases, and develop and create various agricultural and ecosystem management systems.

The international arena provides great opportunities for major actions such as carbon markets and technology transfer. Yet given that adaptation is based mainly on local actions, international organizations must become more adept at reaching the local level directly and through national governments and regional organizations. The commission offers a number of ways that they can do so.

Chapter 5 deals with the mechanisms for financing adaptation. Acknowledging the difficulties of counting the costs of adaptation at any given time, it argues that costs will only increase as society continues to delay serious efforts on mitigation. The report calls for new and additional resources for financing adaptation. It calls for greater coordination of financing mechanisms and monitoring of resources at the global and national levels.

Mobilization of resources is key. Honoring ODA commitments improves the adaptive capacity of countries and would provide funds to help kick-start urgent

adaptation measures. In the long run, resources for adaptation will be a blend of ODA and non-ODA resources. The latter should meet the following criteria: additionality, adequacy, predictability, and political feasibility.

The proliferation of funds for adaptation is problematic; it creates a coherence problem and puts pressure on the management capacity of developing countries. No further vertical funds should be created for adaptation. Existing funding mechanisms should be effective, efficient, well coordinated, and accessible for actors at different levels. A step-wise approach for mobilizing financial resources is envisaged.

Allocation should take into account climate change vulnerability and in the early stage should make use of existing channels to implement high-priority items in National Adaptation Programs of Action, as identified by countries. The aim should be to integrate adaptation activities into the normal planning and budgeting processes of countries.

Nine appendixes cover the issues of food security; water; natural resources, forests, and trees; health; energy access, climate, and development; risk and insurance; migration; cities and: disaster risk reduction;

- ▶ Food security depends on more than how much food is grown; it depends on people's access to markets (including for labor), the stability of supply, and quality. All are affected by climate change and must be managed.
- ▶ Water is mainly an issue of political power, especially for the poor. Efficient management is also crucial, particularly for the use of rainwater.
- ▶ Natural resources management depends on land tenure and user rights. Good management, especially of forests, can have both mitigation and adaptation results.
- ▶ Energy is necessary for development, and energy access issues must be part of mitigation and adaptation strategies.
- ▶ Health will be affected by changing disease patterns, requiring more emphasis on prevention and improved sanitation.
- ▶ Insurance approaches must evolve toward new forms of transferring and sharing risks more effectively targeting the poor and based on climate change models.

- ▶ Cities, especially the mega-cities of poor nations, require problem-solving partnerships between local governments and residents of informal communities for innovative urban land use.
- ▶ Migration should be recognized as an adaptive strategy, to be managed and facilitated rather than restricted.
- ▶ Disaster risk reduction strategies should focus on underlying risk rather than response and on the safety of human settlements.

1. Adaptation: The Context for Change

*Development and climate change are the central problems of the 21st Century.
If the world fails on either, it will fail on both. Climate change undermines development.
No deal on climate change which stalls development will succeed.”*

LORD NICHOLAS STERN

The international Commission on Climate Change and Development was launched in late 2007 by the Swedish government. Chaired by Swedish Minister for International Development Cooperation Gunilla Carlsson, the Commission has 13 members from countries in all regions. They represent international and regional organizations as well as science, civil society, and the private sector.

The Commission examined adaptation to climate change and its links with development and disaster risk reduction and was asked to issue policy recommendations on how the resilience of vulnerable communities and countries can be strengthened through official development assistance (ODA), on appropriate institutional and financial architecture, and on the mobilization of new financial resources.¹

The Commission's first message is that the only response to climate change is a rapid move toward a low-carbon global economy. This must be done urgently, efficiently, and with great determination.

Yet mitigation – efforts to decrease the amounts of greenhouse gases (GHGs) released into the atmosphere – has yet to begin at the required scale and pace. In fact, GHG emissions have increased steadily since the UN Framework Convention on Climate Change (UNFCCC) was adopted in 1992. Thus anthropogenic emissions are already changing the climate and, due to their long residence in the upper atmosphere, will continue to do so for many decades if not centuries to come. Civilization will have to adapt to these changes.

Policy makers and scientists have all been slow to focus on adaptation, largely because mitigation got much of their

attention. In fact, many environmentalists feared that any focus on adaptation would take attention away from the urgent need to mitigate. That has changed.

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) noted that even if global society does succeed in reducing emissions, some climate change impacts are now unavoidable (see Box, p. 2.) and solutions must be found to adjust to them.

As a result, the 2007 Bali Action Plan called for strong and extremely ambitious steps on adaptation, giving priority to urgent and immediate needs of vulnerable developing countries, including the full range of risk reduction measures.

A stronger sense of urgency

Since the IPCC's Fourth Assessment Report, a number of scientists and scientific organizations have published papers suggesting that climate change is happening much faster than the panel suggested. The 2009 meeting of the American Association for the Advancement of Science heard how carbon emissions have been growing at 3.5% per year since 2000, up sharply from 0.9% per year in the 1990s.

The European Union has set a goal of not allowing the temperature increase to exceed 2° Celsius. Staying under that target would imply emission cuts of at least 80% by 2050. Many scientists argue that an increase of 2° is too high and call for more drastic cuts in emissions. Positive feedback mechanisms such as a reduced albedo and the thawing of the permafrost are likely to accelerate climate change, and the planet appears to be moving toward dangerous tipping points.

Evidence is also growing that the absorptive capacity of carbon sinks such as oceans and terrestrial ecosystems is diminishing. Deforestation, soil erosion, overfishing, and bad management of freshwater resources have further re-

¹ See Appendix 10 for the Commission's full terms of reference.

Different impacts for different regions

In Africa, the situation is quickly becoming more serious: analysts project that by 2020, between 75 million and 250 million people will be exposed to increased water stress due to climate change, and in some countries yields from rainfed agriculture could be reduced by up to 50%.

In Asia, by the 2050s freshwater availability in Central, South, East, and Southeast Asia, particularly in large river basins, is projected to decrease, and diarrheal diseases associated with floods and droughts are expected to increase in East, South, and Southeast Asia.

In Latin America, productivity of some important crops is projected to decrease and livestock productivity to decline, with adverse consequences for food security. Changes in precipitation patterns and the disappearance of glaciers in the Andes are projected to significantly affect water availability for human consumption, agriculture, and energy generation.

In small island states, sea-level rise is expected to threaten vital infrastructure, settlements, and facilities that support the livelihood of island communities. By mid-century, climate change is expected to reduce water resources in many small islands in the Caribbean and Pacific to the point where they become insufficient to meet demand during low-rainfall periods.

Source: Intergovernmental Panel on Climate Change, *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment* (Geneva: 2007).

duced the capacity of Earth's systems to respond to future shocks.²

In March 2009 in Copenhagen, 2,500 researchers from some 80 countries presented their most recent findings. Their main message, according to conference organizers, was that:

Recent observations confirm that, given high rates of observed emissions, the worst-case IPCC scenario trajectories (or even worse) are being realized. For many key parameters, the climate system is already moving beyond the patterns of natural variability within which our society and economy have developed and thrived. These parameters include global mean surface temperature, sea-level rise, ocean and ice sheet dynamics, ocean acidification, and extreme climatic events. There is a significant risk that many

of the trends will accelerate, leading to an increasing risk of abrupt or irreversible climatic shifts.³

Interconnected crises

The impacts of climate change are mixed with and overlap the impacts of other syndromes such as rising food prices, the financial crisis, energy shortages, ecosystem degradation due to other human causes, and demographic changes.

The lack of atmospheric space to safely dispose of GHG emissions is one of several linked scarcities now affecting society. Others include scarcities of affordable petroleum-based products, affordable food, and fresh water.⁴ Climate change is accelerated by the use of carbon-based energy and the alteration of forests to farmland; it changes the availability of fresh water. Agriculture needs a predictable climate, water, energy sources, and fertilizer, much of which is petroleum-based. It is not clear how long these scarcities will persist or how they will continue to affect one another.

These strong connections mean that the scarcities must be managed in a highly coordinated manner. The next-generation technologies, protective investments, and shifts in policies needed to correct economic and financial imbalances can also serve the collective purpose of protecting our common environment from overexploitation. Failure on one will be failure on both.

Focus on the poor

All nations and all people must adapt to climate change. This truth is demonstrated by the heat waves of 2003 in Europe and North America and by Hurricane Katrina in 2005 and other hurricanes affecting US cities. Although single events can rarely be attributed to climate change, they do show that it is the poor, even in wealthy countries, who are most affected by extreme weather events.

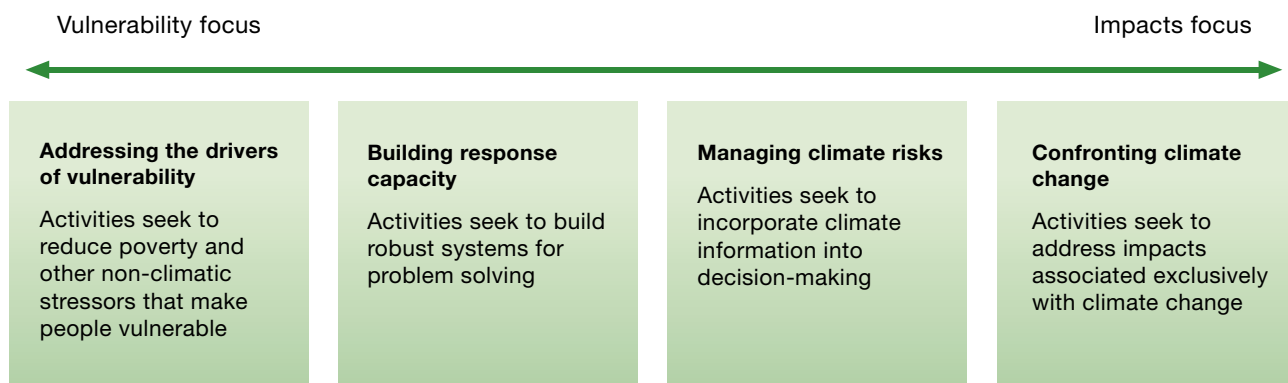
² Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Synthesis* (Washington, DC: Island Press, 2005).

³ "Key Messages from the Congress," International Scientific Congress – Climate Change: Global Risks, Challenges & Decisions, University of Copenhagen, 10–12 March 2009.

⁴ See, e.g., A. Evans, "Multilateralism for an Age of Scarcity. Building International Capacity for Energy, Food and Climate Security," Working Paper (New York: Center for International Cooperation, New York University, July 2008).

Continuum of adaptation activities

Figure 1.



Source: R. J. T. Klein and Å. Persson, "Financing Adaptation to Climate Change: Issues and Priorities" (Brussels: Centre for European Policy Studies, 2008).

This report focuses on adaptation to climate change by poor countries and by poor people in those countries:

- ▶ Because climate change threatens poverty reduction and the achievement of the Millennium Development Goals,
- ▶ Because poor people in poor countries depend directly on endangered ecosystems and their services for their well-being,
- ▶ Because poor people in poor countries lack the resources to adequately defend themselves or to adapt rapidly to changing circumstances, and
- ▶ Because their voices are not sufficiently heard in international discussions, particularly in climate change negotiations.

Adaptation and development

What is adaptation? The UNFCCC provides a clear answer: “Adaptation is a process through which societies make themselves better **able to cope** with an uncertain future. Adapting to climate change entails taking the right **measures** to reduce the negative effects of climate change (or exploit the positive ones) by making the appropriate adjustments and changes” [emphasis added].⁵

Adaptation is about building adaptive capacity and carrying out appropriate adaptive measures. Adaptive measures seek to address climate change impacts by, for example, a new seawall, crop insurance schemes, research on heat- and

drought-tolerant crop varieties, agricultural diversification, vaccines, upgraded drainage systems, enhanced water use efficiency, enlarged reservoirs, or revised building codes. Building adaptive capacity aims to address the multiple drivers of vulnerability, including poverty. Between building adaptive capacity and instituting adaptive measures, there exists a continuum of adaptation activities. (See Figure 1.)⁶

Adaptive capacity increases with human development. It can be summarized under four simple headings – wealth, health, education, and governance:

- Wealth, or access to assets, provides the buffers and backup that take people through crises and enable them to recover. Assets may be financial or material, directly accessible or through insurance, and come from the social networks of family and kin or through government

⁵ UN Framework Convention on Climate Change (UNFCCC), *Climate Change: Impacts, Vulnerabilities and Adaptation in Developing Countries* (Bonn: 2007), p. 12.

6 R. J. T. Klein and Å. Persson, "Financing Adaptation to Climate Change: Issues and Priorities" (Brussels: Centre for European Policy Studies, 2008), adapted from H. McGray, A. Hammill, and R. Bradley, with E. L. Schipper and J. Parry, *Weathering the Storm: Options for Framing Adaptation and Development* (Washington, DC: World Resources Institute, 2007).

social protection schemes for those with few means of their own.

- Health safeguards the productive capacity of the individual and the integrity of families. This comes through clean water and effective sanitation, safe childbirth, and food of the right kind and amount so that children grow to their full potential.
- Education gives people access to information, knowledge of their options, and the ability to make informed choices.
- Governance, or rather the fullness of the institutional environment, provides the means through which people, working with others, have access to resources, articulate needs, and exercise their rights.

Understanding adaptation in this way tells us that adaptive action must be highly context-specific. In countries and communities where human development indicators are low, priority must be given to strengthening the adaptive capacity of people and institutions. If capacity is already there, through assets, insurance, a healthy and well-educated population, and formal and informal institutions that mediate support and through which needs can be analyzed and articulated, then action will naturally emphasize climate-specific measures – that is, measures that would not have been necessary if climate change were not happening.

This report looks at the adaptive capacity of people, firms, and ecosystems and discusses their interactions, complementarities, and competition. It also looks at adaptive capacity across scales – local, national, international – and how interfaces among these scales facilitate or stand in the way of adaptation.

Adaptation to climate change is about forms of development in which the capacity to manage risk determines progress. Thus adaptation is much more than climate-proofing development efforts and official development assistance. The Commission finds that it requires action, additional funding, and deep cooperation between rich and poor nations and between rich and poor people within nations. It requires sustainable development: meeting the needs of the present in ways that do not compromise the ability of future generations to meet their needs.

A new development path

The development path under climate change will involve rethinking and reformulation on four levels: speed, scale, focus, and integration.

- **Speed:** Wasting no time – climate change is happening faster than science predicted. The IPCC prediction that in Africa between 75 million and 250 million people will be exposed to increased water stress by 2020 allows for little more than a decade of development.
- **Scale:** Development must decrease the vulnerability of all of the planet's poorest, and especially the “bottom billion.” Growing numbers of people are in danger; responses must match the scale of this change.
- **Focus:** Development should be centered on managing risks, building the resilience of the poorest, and enhancing the ecosystem functions upon which they depend. This requires new focus and emphases in all sectors, including food security, with special attention to poor people's access to markets; water, with special attention to equity of access and the efficient use of rainwater; natural resources management, with special attention to land tenure and user rights of the poor; energy, with special attention to a decentralized mix of renewable and low-carbon options for the poor; migration, with special attention to policies that benefit the most vulnerable regions and minimize transaction costs on remittances; and disaster risk reduction, with special attention to the most vulnerable groups and settlements and to rehabilitated infrastructure that contributes to reduced risk. (See appendixes for further discussion of these issues.)
- **Integration:** Adaptation, mitigation, and human development goals are closely interrelated. (See Box, p. 5) Mitigation measures such as afforestation, reforestation, and avoided deforestation are also effective adaptation, as they improve economic and ecosystem resilience. The current approach, which tries to deal with them separately, will not only be ineffective, it will be counterproductive. The concept of sustainable development united the two concerns of environment and development; our new development path unites environment, development, and climate change (adaptation and mitigation).

Structure of the report

Our report is structured around four main parts following this chapter. Chapter 2 examines the ethics of climate change, mitigation, and adaptation, including the trust gap between industrial and developing nations. Wealthy nations pledged in the UN Framework on Climate Change of 1992 to help poorer nations adapt to climate hardships created for them by others. Unless this pledge is honored, those countries will not agree to a global framework on climate change. Yet climate ethics are complex, as causes and effects are separated by thousands of miles and by generations. The issue of basic fairness developed in this chapter informs much of the rest of this report.

Chapter 3 focuses on the human dimension of climate change. While the effects of climate change may be vast, their brunt will be borne locally by individuals, families, villages, and neighborhoods. Discussions of climate change must be turned upside down, switching from a global to a local focus. National governments must set frameworks to ensure that adaptation measures and disaster risk reduction reach all, including the most vulnerable. Historically, bad governance and a failure to respond to local needs have hindered development efforts. Those problems will frustrate adaptation if not managed. Moving toward participatory democracy is essential.

Chapter 4 addresses the governance gap. It shows that despite the strong interdependence between economy, environment, and development, governments continue to try to manage issues in silos as if they were separate one from another. Recognizing the limitations of individual actions, the report calls for an enlightened, prudent, yet proactive global public policy.

Chapter 5 deals with the mechanisms for financing adaptation. Acknowledging the difficulties of counting the costs of adaptation at any given time, it argues that they will only rise as society continues to delay serious efforts on mitigation. The report calls for new and additional resources for financing adaptation but also recognizes the importance of official development assistance to kick-start urgent adaptation efforts. A step-wise approach for mobilizing financial resources is envisaged. It calls for greater coordination of financing mechanisms and monitoring of resources at global and national levels.

The appendixes cover the issues of food security; water;

Synergies between mitigation and adaptation

Mitigation and adaptation can be mutually reinforcing. Increasing the storage of carbon and avoiding its release from forests and soils can have multiple benefits. The Reducing Emissions from Deforestation and Forest Degradation program offers a promising mechanism for simultaneously delivering mitigation, adaptation, and economic benefits while sustaining vital ecosystem services. The basic principle is that countries and those that own and manage forests would be paid to protect and increase the public goods they provide. Similar ideas with regard to carbon sinks in soils are under discussion.

Such measures could be combined with adaptation efforts and produce synergies. Maintaining or increasing forest coverage, avoiding tillage of highly organic soils, or integrating bio-char may lead to improvements in water retention and soil productivity, ultimately promoting the resilience of ecosystems and of the communities that depend on them. Mitigation would go hand in hand with adaptation. A high value would be assigned to the sustainable management of natural resources and potentially also promote the implementation of the conventions on biodiversity and desertification.

But there are also conflicts. Ample experience tells us that without secure rights and proper governance arrangements, the poor and landless risk being forced out when the value of forests and land increases. New opportunities will enrich some while others lose out. If safeguards against such risks are not put in place, new climate policy may further marginalize the poor and vulnerable.

natural resources, forests, and trees; health; energy access, climate, and development; risk and insurance; migration; cities; disaster risk reduction; and the Commission's terms of reference and biographies of the Commissioners.

United States

For nearly eight years, Mike Miller, director of supportive housing for UNITY of Greater New Orleans, has worked with the city's homeless population. The burly, bearded Miller reckons that demand for his services has increased 60% since floods caused by Hurricane Katrina broke through badly built dikes in 2005.

According to a US government survey, slightly more than one-third of all New Orleans buildings – houses, churches, medical centers, and so on – are considered officially vacant.

In early 2009, Miller is visiting James Kelly, 61, and Deborah Williams, 54, who have set up barebones house-keeping on the second floor of an abandoned house in a neighborhood of abandoned buildings, like many neighborhoods in the city. In a back room are a battered bureau, a flimsy din-

ing table, and a neatly made bed. The owner of the building is letting the pair live there in hopes of discouraging arson. It took Kelly and Williams three weeks to clear their living space of post-Katrina debris and lay plywood over rotting wood floors. There is still a large hole in the ceiling and the walls are stained with water and mildew, but Williams sweeps the floor daily. A nearby church provides them with water, and Kelly receives a monthly \$600 disability check that pays for food.

"It's actually insanity to live in a place like this," he says. "But it's better than the street, where you can get raped or killed."

UNITY's Miller also knows that abandoned buildings can be havens for drug dealers, drug users, and prostitutes.



PHOTO: VINCENT LAFORET

So he restricts his searches of vacant buildings to daylight hours, looking for signs of habitation, like bedrolls, clothes, or prescription vials. He says that 9 out of every 10 buildings he searches show signs of people living in them.

Kelly and Williams are just two of what Miller estimates may be as many as 10,000 people living in these abandoned structures, a large portion of them, like Kelly and Williams, senior citizens.

In New Orleans, lax construction codes had allowed houses to be built below likely flood levels, and slow-moving bureaucracy and begrudging federal aid have restricted many homeowners from either reclaiming or selling their properties.

For renters, the situation is even worse. The Louisiana Recovery Authority has reported that more than 82,000 rental units were badly damaged or destroyed by Hurricane Katrina, more than 44,000 of those in the greater New Orleans region. It reports that rental rates in metropolitan New Orleans have risen 52% since the hurricane, although coming down from a post-disaster spike caused by landlords looking to cash in on strong demand and very limited supply.

City officials decided just before Christmas 2007 to tear down nearly 5,000 public housing units to make way for privately built housing that promised to supply a small percentage of below-market-rate housing at some time in the future. This decision was formally criticized in a UN report that decried “the disparate impact that this natural disaster continues to have on low-income African-American residents, many of whom continue to be displaced more than two years after the hurricane.”

The lack of affordable housing hurts the most vulnerable, but it also contributes to maintaining a shortage of inexpensive labor and creates a drain on social services provided by both governmental and non-governmental organizations.

UNITY has obtained more than 3,000 federally sponsored vouchers that low-income residents can use to help pay rent. But demand exceeds supply, and attention to the problem is generally lacking, except in extreme circum-

stances, like the formation of two homeless encampments close to public thoroughfares that UNITY helped to clear in the summer of 2007. Says Miller, “We play clean-up for the whole broken system.”

A short time after his visit to James Kelly and Deborah Williams, Miller was able to obtain for Williams an apartment specifically designed for her particular medical condition. Meanwhile, Kelly lives alone in the vacant building the two had shared, waiting for his own chance to move into a real home for the first time in 10 years.

“This is just surviving,” Kelly says. “This isn’t living. All I know is things are supposed to be better than this. We’re all trying to make the best out of a bad situation, but this just ain’t no way for people to live.”

2. The Trust Gap

Climate change is a perfect moral storm. One consequence of this is that, even if the difficult ethical questions could be answered, we might still find it difficult to act. For the storm makes us extremely vulnerable to moral corruption.

PROFESSOR STEPHEN GARDINER⁷

While climate change raises many scientific, technical, and economic issues, it is often described as primarily an issue of political will. Yet this shortcuts the fact that most nations are democracies, and thus political will must depend on the value citizens place on defending the vulnerable and those who have had little to do with causing the problem, including future generations.

The IPCC wrote in its 2007 report that determining what constitutes dangerous anthropogenic interference with the climate system “involves value judgments. Science can support informed decisions on this issue.”⁸ Thus coping with climate change, both mitigation and adaptation, becomes primarily an ethical issue.

The simplest ethical argument runs along the following lines: the stronger and richer peoples and nations have been putting GHGs into the atmosphere; this approach to development helped them get stronger and richer; their actions are harming – and will cause greater and greater harm to – the weaker and the poorer, who have had very little to do with causing the problem; the rich should take a lead in cleaning up what they have done and should take steps to protect the weak as well as future generations, who are blameless.

Many argue the ethical stance quite vehemently, noting that all of the world’s major religions and ethical systems posit a duty of the stronger to help the weaker, especially when it is the actions of the stronger that are inadvertently harming the weaker.

Other commentators maintain that such “finger pointing” arguments simply do not work in political negotiations and are in fact an impediment to those discussions. A focus on the vulnerable without apportioning responsibility might be more helpful.

Though the ethical argument appears at first glance

fairly straightforward, the quest for fairness in allocating rights to emit GHGs has achieved little success. Suggestions range from all people being entitled to an equal share of the atmospheric commons, to a “polluter pays” approach that has countries paying for pollution they have generated, to a position accepting a state’s current rates of pollution – a sort of “squatter’s rights” approach. Some approaches focus on the productivity of the carbon generated and others on guaranteeing each nation at least a “subsistence level” of GHG emissions.

The polluter pays principle

A number of these approaches, and the negotiating stances of the wealthier countries, tend to ignore a widely agreed principle that has been the basis of much international and national environmental law for at least the last quarter-century. The polluter pays principle (PPP) requires that the costs of pollution be borne by those who cause it.

The principle first appeared internationally in the 1972 *Recommendation by the OECD [Organisation for Economic Co-operation and Development] Council on Guiding Principles Concerning International Economic Aspects of Environmental Policies*, which said: “The principle to be used for allocating costs of pollution prevention and control measures to encourage rational use of scarce environmental resources and to avoid distortions in international trade and investment is the so-called Polluter-Pays Principle.”

⁷ S. Gardiner, “A Perfect Moral Storm: Climate Change, Intergenerational Ethics and the Problem of Corruption,” *Environmental Values* 15 (2006), pp. 397–413.

⁸ Intergovernmental Panel on Climate Change, *Climate Change 2007: Synthesis Report. Summary for Policymakers* (Geneva: 2007), p. 18.

It added that the principle “means that the polluter should bear the expenses of carrying out the above-mentioned measures decided by public authorities to ensure that the environment is in an acceptable state.”

The PPP helps to internalize environmental externalities of economic activities so that the prices of goods and services fully reflect the costs of production. Four different aspects of the principle have been described: economically, it promotes efficiency; legally, it promotes justice; it promotes harmonization of international environmental policies; it defines how to allocate costs within a state.⁹

The principle has evolved into something called the extended or strong PPP, as the OECD in the late 1980s included in the PPP costs related to accidental pollution, which would presumably cover GHG emissions.

The PPP was reaffirmed in the 1992 Rio Declaration and is mentioned in *Agenda 21* and the World Summit on Sustainable Development’s Johannesburg Plan of Implementation. It has become one of the fundamental principles of international environmental law, and it is explicitly mentioned or implicitly referred to in a number of multilateral environmental agreements.

The trust gap

The apparent willingness of wealthier countries to dismiss during the climate change negotiations a principle that they and their organizations have insisted on for years is one of several reasons that there is a “trust gap” between rich and poor countries that makes climate and many other negotiations so difficult.

One reason for this gap is that industrial nations have often committed to increasing their official development assistance, but few have done as promised. Since 1970, leaders of most industrial countries have agreed many times that aid-giving nations should provide resources equal to 0.7% of their gross national income (GNI).

Promises of more aid were made in Monterrey, Mexico, in 2002, when leaders pledged to increase aid to help countries meet the Millennium Development Goals. The 0.7% commitment has been repeated more than 50 times, but most industrial countries are still far from honoring their promises.

In fact, the 22 main aid-giving countries gave \$119.8 billion in aid in 2008, the highest figure ever. But this only

represents 0.3% of OECD members’ combined GNI – well below the percentage target.¹⁰

Another breach of trust has occurred in the area of trade. In November 2001, World Trade Organization member nations agreed in Doha to a new round of trade negotiations that would benefit poor countries, allowing them a better chance to trade their way out of poverty. In early 2009, these talks remained stalled, largely due to disagreements between some industrial nations and rapidly developing ones.

Mistrust does not flow in only one direction. Northern nations tend to worry that the South wants a free ride on mitigation, while getting considerable help with adaptation. They see rapidly developing economies such as China and India as able and needing to do more. They denounce the view, common in developing countries, that the North caused climate change, so the North should sharply cut its own GHG emissions, leaving the South to develop along a carbon-intensive path until it is much richer.

Recent work has shown that the notion that developing nations can remain carbon-intensive cannot withstand empirical scrutiny and is, in fact, dangerous for the South itself. The South’s cumulative carbon emissions are already large enough to jeopardize climatic stability and its own future growth, regardless of Northern emissions. By implication, a fossil-fueled South will undermine its own development long before it reaches Northern income levels. (See Figure 2, p. 10.) Sustainable development will therefore require a shift toward clean energy in the South, beginning immediately, as well as rapid reduction of Northern emissions.¹¹

Those who do not trust one another to keep to commitments can rarely negotiate successfully, especially on something as complex as a post-Kyoto climate framework.

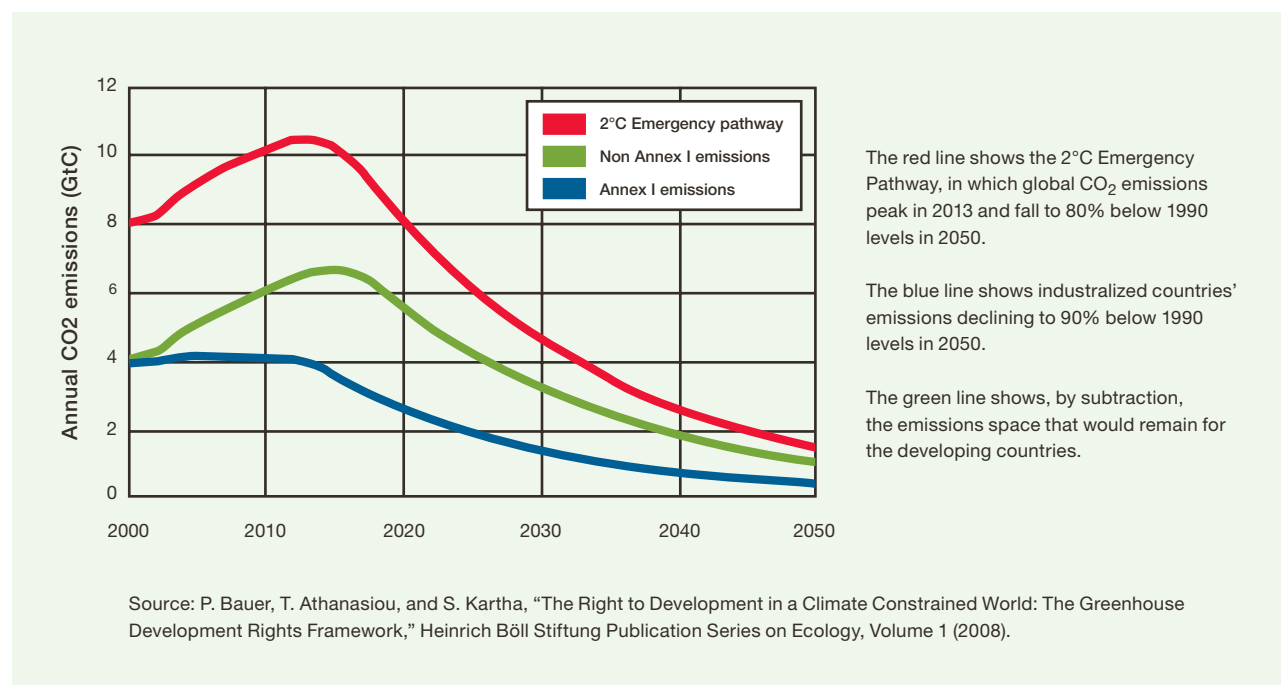
⁹ H. C. Bugge, “The Principles of Polluter Pays in Economics and Law,” in E. Eide and R. van der Bergh, eds., *Law and Economics of the Environment* (Oslo: Juridisk Forlag, 1996).

¹⁰ Organisation for Economic Co-operation and Development (OECD), “Development Aid at Its Highest Level Ever in 2008,” press release (Paris: 30 March 2009).

¹¹ D. Wheeler and K. Ummel, “Another Inconvenient Truth: A Carbon-Intensive South Faces Environmental Disaster, No Matter What the North Does,” Working Paper 134 (Washington, DC: Center for Global Development, December 2007).

The South's dilemma

Figure 2.



Industrial and developing nations must work quickly and effectively to close the trust gap. Such an effort among the richer nations would include keeping past promises on increased ODA, providing efficient aid for developing countries' adaptation to climate change, and identifying and investing in synergies between mitigation and adaptation in developing countries – especially in land use, natural resources, and forestry management. Developing nations on their side need to ensure transparent management of funds and a willingness to commit to goals and targets, based on their current capacity.

The values gap

The ethics of climate change are incredibly complex, with causes and effects being both thousands of miles and centuries apart. Any successful treaty must in some way establish a form of intergenerational equity in terms of carbon use.

Yet today's leaders are in a difficult position. The GHGs affecting this generation were emitted previously. The GHGs emitted today will affect not this generation but

future ones. Thus it could be argued that it is not in this generation's interest to mitigate. GHG emissions will bring much more good than harm to those alive and making economic and political decisions today.¹²

But all future generations will be in exactly the same situation as this one, facing the same hard truths. It has been argued that this conundrum is so difficult that it pushes political leaders into stressing uncertainties and claiming progress in negotiations when there is little to none.

Thus success in mitigating climate change and helping the poor adapt to its effects will require that leaders and the people who vote for them make sacrifices for future generations. Yet there is much evidence that generational equity is not a widely held value.

While "future generations" remain an abstract population, the present adult generation has one very real future

¹² Gardiner, op. cit. note 7.

generation under its care: children. Society in general does not live up to its responsibilities for children well. Almost 10 million children under age five die each year – more than 26,000 a day – nearly all in developing countries and mostly of common illnesses preventable by cheap interventions such as vaccines, sugar/salt solutions, and insecticide-treated mosquito nets.¹³

Given that governments have allowed this to continue year after year, it is hard to imagine sacrifice for future generations we cannot see and know. The literature on ethics and climate change also suggests – almost always implicitly – that heroically strong and capable leadership will be required to overcome the climate challenge, leadership of the sort that led to the founding of the United Nations or the European Union. And as the next chapter makes clear, in terms of adaptation much of that strong leadership must be local.

Given the complexity of the climate change challenge and the lack of motivation for any single generation to decrease emissions, serious mitigation may not occur until the planet runs short of carbon-based energy. This possibility puts even more pressure on the adaptation side of the equation.

¹³ www.unicef.org.

Samoa



PHOTO: RICCARDO SPILLA

He was a huge, weathered New Zealander who had lived in Samoa 15 years and did not want to give his name because he sometimes had problems with the authorities. He ran a sports fishing boat, and there were occasional issues about his clients catching something they should not or his putting over the side something he should not.

Asked if he had noticed climate change, he exclaimed: “My god! It has been horrible for the past four years – completely unpredictable. Storms when they are not expected. Big seas when there are no storms, crazy currents. I can hardly make a living.”

Told there was a climate change conference involving all South Pacific nations in progress in Samoa and even a course to teach journalists how to write about it, he responded: “Bloody environmental propagandists!”

One Samoan taxi driver said that he had not seen any sign of climate change and did not even believe in it. He lives in the central hills of the main island. Another taxi driver said climate change was trying to kill him and his family and every year recently he had to build back part of his house. He lives on the beach.

Response to climate change is mixed in the South Pacific, even though the region, with its isolated nations of tiny, low-lying atolls, is often billed as the global front line of climate adaptation. Spreading the word is hard over the vast distances; many people experience climate change daily but have not heard of it.

The region’s governments are working at both ends of the climate political spectrum. They have devised a Pacific Islands Framework for Action on Climate Change 2006 – 2015; they are active and aggressive in global climate negotiations, and they are trying to get information on climate change throughout the Pacific.

Much governance in the island nations takes place at village level, and there are strong traditions of self-organization along the lines of church, women’s, youth, and fishers’ groups. International nongovernmental organizations (NGOs) like WWF and the International Federation of Red Cross and Red Crescent Societies are also focusing on climate change.

For example, Tuvalu is a nation of nine islands stretching over 1,000 kilometers from north to south but with only 26 square kilometers of land mass. It has 11,000 inhabitants (4,000 of whom live in the capital), a population density greater than Japan’s, and no land higher than 4.5 meters above sea level. It is at risk of rising seas, cyclones, tsunamis, house fires, drought, and flooding due to high tides and storm surges.

The Tuvalu Red Cross is connecting outer islands with satellite phones, spreading courses in sea survival skills throughout the islands, and developing information material – difficult because the Tuvaluan language is not standard throughout the islands. It is also involving youth groups in the effort, seeing them as powerful agents of change.

3. The Focus Gap: The Human Dimension¹⁴

All politics is local.

ATTRIBUTED TO “TIP” O’NEILL,
LONGTIME SPEAKER OF THE US HOUSE OF REPRESENTATIVES

So much discussion of climate change is from the global perspective: sea-level rise, temperature increase, negotiations, and policies. Even discussions of adaptation focus on global costs and large-scale modeling. Although they may be extensive and severe, the effects of climate change will be felt locally, however: by individuals, families, villages, and neighborhoods.

The Commission finds that most adaptation will also happen at the local level, in ways that are usually unnoticed, uncoordinated, and unaided by national governments or international agencies.

The diversity of climate change effects and of how individuals, households, businesses, governments, and civil society deal with them are best understood through analysis of their local circumstances. Even so, what determines vulnerability, impact, and capacity to respond is usually embedded in broader social, cultural, political, and economic structures. But only if we focus on the local dimensions of adaptation can we tell whether human vulnerability is being reduced.

This chapter starts with people and the complex mix of climate and other risks they face. Learning from past experience with development cooperation, this chapter shows that effective climate change adaptation requires integrating risk analysis in development, supporting social protection, and promoting locally owned capacity development processes.

Unpacking climate risks

Poor people manage a complex mix of changes and risks on a daily basis. Food and energy insecurity, scarcity of fresh water, changing markets for crops, and labor are on their daily agenda. Climate change just adds an extra layer of risk. (See Box.)

How climate change risks are tangled up with other risks

Climate change plays a role in declining food security, though there is controversy over its importance in the extraordinary rise in food prices in 2008. The fact that poor people have less to eat is rarely due to declining national food stocks but is usually due to changes in local and global markets and their inability to afford available food. Old assumptions about the poor being “peasants” or “subsistence” farmers must be replaced with an awareness of how urbanization, market integration, multifunctional rural livelihoods, and other factors affect food-climate connections.

Climate change affects ecosystems and the ways in which people manage them and use their services, but shifts in land use patterns also affect ecosystems. Ecosystem services – such as purification of air and water, erosion control, and food production – are fundamental for human well-being. They support livelihoods and are the foundation for food security, health, and economic development. Ecosystems can also mitigate the impacts of natural hazards such as landslides and hurricanes and provide an important asset in the aftermath of a disaster.

Climate change creates new health risks such as increased mortality due to heat waves, increased malaria and diarrheal disease occurrence, malnutrition due to local food insecurity, and injuries due to violent weather. Most of these risks can affect entire communities, but individual health risks tend to affect the poor disproportionately and to have long-term effects on their well-being and ability to accumulate assets. Poor workers may be disabled by excessive heat or affected by re-emerging infectious diseases such as yellow fever and dengue.

Source: See Appendixes for more details and references.

¹⁴ This chapter builds on a 2009 background paper to the Commission by I. Christoplos, S. Anderson, M. Arnold, V. Galaz, M. Hedger, R. Klein, and K. Le Goulven, “The Human Dimension of Climate Adaptation: Local and Institutional Issues”, available at www.ccdcommission.org. The paper was edited for the purposes of the Commission’s report.

Risk literature distinguishes between general categories of risk to describe its frequency and intensity and how it is distributed among individuals and groups. It differentiates in particular between idiosyncratic shocks, which are those that affect the individual or household (e.g., death, injury, or unemployment), and covariate shocks, those that affect localities or nations (e.g., epidemics, disasters, or war). Climate change affects all of these risk categories by:

- ▶ Increasing idiosyncratic risk (e.g., increased mortality due to heat waves, increased malaria and diarrheal disease occurrence, increased small-scale hazard events);
- ▶ Increasing covariate risk (e.g., increasing frequency of large-scale disasters); and
- ▶ Making idiosyncratic risk covariate (e.g., increasing severity of disasters or small, localized hazard events becoming larger disasters).

But because climate change is not a linear process, it also brings something new and different to the existing risk landscape: gradual changes may build up until some tipping point is reached. Glaciers melt gradually, and then suddenly are no more.

Moreover, climate change brings surprises, having at least three dimensions: the event in itself may be unexpected, the speed of change may be unexpected, and the geographical scale of change may be unexpected.

Adaptation discussions tend to focus on increasing levels of dramatic covariate risk expressed as weather-related catastrophes. The Commission stresses the obvious need to “harmonize” disaster risk management and climate change adaptation and to develop the capacities of national and local governments in these areas. There is learning on adaptation in the disaster risk management community that should inform current policy formation related to climate change.

However, adaptation to idiosyncratic risks is at least as important, for two main reasons. First, the increase in smaller idiosyncratic risks is having a larger impact on poverty. The accumulated impacts of small and medium-size disasters equal or exceed those of large disasters. These events are recurrent, and their impacts are felt locally. Small disease outbreaks, local flash floods, and land degradation are usually invisible to the media and often to policy makers as well. Repeated disaster shocks have cumulative effects, as when drought reoccurs with such frequency that people

have no time to recover between events, leading to deepening poverty and chronic food insecurity. Also, exposure to one type of risk can increase vulnerability to other risk factors, such as when crop failure leads to malnutrition, which increases the risk of common illnesses. Over the past few years, the number of smaller disaster events that do not trigger international disaster response but that are responded to locally or nationally has increased. (See Box, p. 16, and Figure 3, p. 15.) Thus the most important capacities for addressing idiosyncratic risk are within societies and local organizations.

Second, the Commission has noticed that households and societies that are more resilient to idiosyncratic shocks are less vulnerable to covariate shocks. Different risks can compound one another and increase a household’s overall risk level. However, developing capacity for community resilience and self-reliance bolsters capacity to manage covariate risk.

Adaptation must provide space for surprises, for unexpected change in the form of novel or re-emerging epidemics, invasive species, unforeseen and rapid negative ecosystem changes, and other occurrences.

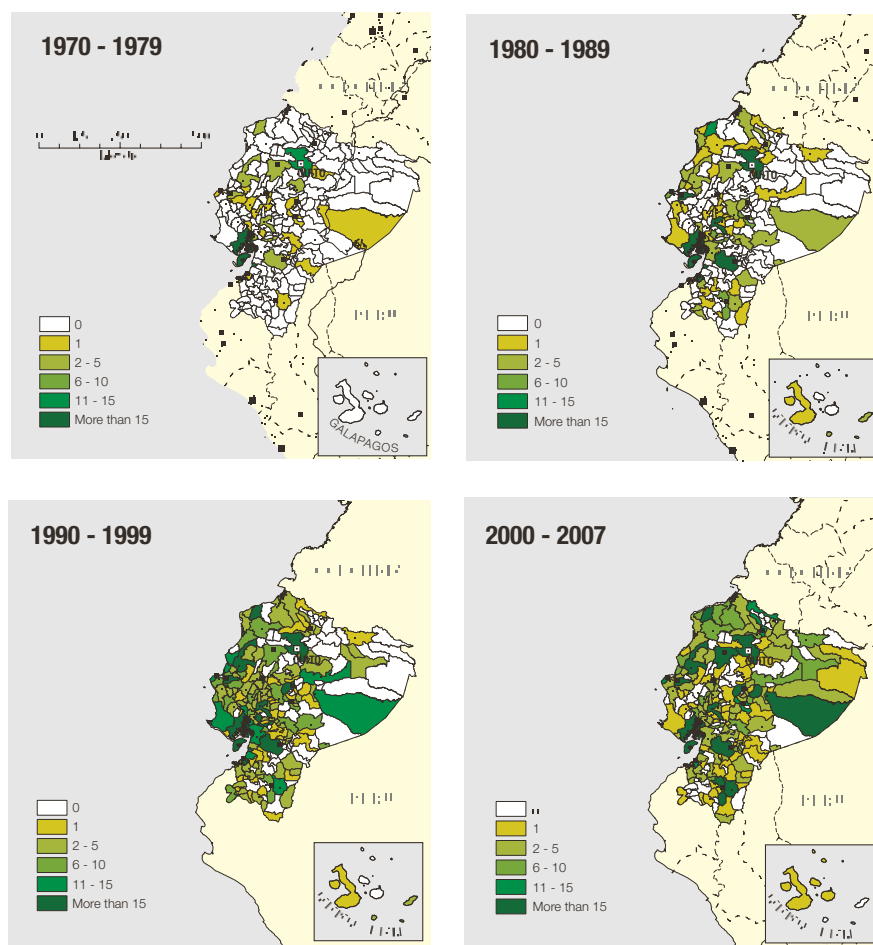
Compartmentalized structures create a double problem. Development actors tend to ignore both sudden and gradual onset catastrophes, as they see them as interruptions to development rather than indications that it is time to consider the risks inherent in development itself. Countries that experience recurrent drought often fail to coordinate relief and development efforts, creating parallel structures to address emergency needs that contribute little to addressing the underlying causes of vulnerability to drought.¹⁵

Humanitarian actors, on the other hand, tend to focus on disasters, forgetting idiosyncratic risks. And both development and humanitarian actors have demonstrated their inability to come to terms with surprises. They need to come to grips with this.

¹⁵ ProVention Consortium and ALNAP, “Slow-Onset Disasters: Drought and Food and Livelihoods Insecurity,” Briefing Paper, 2008.

Disasters in Ecuador

Figure 3.



The weather related disasters in Ecuador resulting in less than 50 deaths or 500 houses destroyed during 1970-2007.

Source: 2009 Global Assessment Report on Disaster Risk Reduction, United Nations International Strategy for Disaster Reduction (Geneva: 2009).

We know which areas are prone to droughts, hurricanes, and certain diseases; we can make surprises less surprising and more manageable and we can better control the conditions that cause them. Investments in knowledge management can bring together information often dispersed in different organizations. This will help local societies decide what they perceive to be an acceptable level of risk. Otherwise, repeated surprising events will challenge local and national adaptive capacity, escalating social tensions and hindering human development.

Climate change thus makes evident the need to recognize the risk inherent in development. The Commission believes that it is not about “mainstreaming risk” into development, but rather recognizing that a successful development process manages risk. It is about unpacking that risk, making it visible and transparent, and ensuring that households and societies have sufficient information to take decisions on how much risk they will accept and how they will manage it.

What is happening to global disaster risk?

The *2009 Global Assessment Report (GAR)* – a biennial report on governments' progress in implementing the disaster reduction policy framework established in Kobe, Japan, in 2005 – gives cause for great concern.

Mortality risk is highly concentrated in a few large events. Just 23 of the 8,866 registered disaster events that killed 2.3 million people between 1970 and 2008 caused 78% of the deaths. But under the surface of these mega-disasters, a different picture emerges. The frequency of small disasters has increased steadily since the early 1990s in what seems to be a global trend. They are closely linked to the expansion of cities and slums and the expansion of farmland into less populated areas. Each event may result in only a few casualties and damaged homes, but they are increasing in frequency, with more people exposed, and primarily take their toll among the poor. Some 92% of these local events are weather-related – floods, storms, and landslides. Places where climate change will result in more and heavier rains and where there is no infrastructure to deal with more surface runoff are now even more in the danger zone.

Disaster risk is not being reduced, according to the GAR. Although many governments report progress in establishing new institutions and legal frameworks and raising awareness, the drivers of vulnerability and risk are unrelenting. Key drivers include weak urban governance, fragile rural livelihoods, declining ecosystems, and the absence of social protection. The GAR forcefully explains how disaster risk reduction and poverty alleviation must go hand in hand.

Source: *2009 Global Assessment Report on Disaster Risk Reduction, United Nations International Strategy for Disaster Reduction* (Geneva: 2009).

Unpacking adaptive capacity

To manage risks requires appropriate adaptive capacity. As laid out in Chapter 1, this report acknowledges the convergence of adaptive capacity with human development. In this chapter we take the analysis one step further to look at the adaptive capacity of businesses and ecosystems and their interactions, complementarities, and competition with people's adaptive capacity.

Markets for adaptation goods and services

The components of adaptive capacity – assets, health, knowledge, and governance – are as relevant for businesses as for people. To adapt effectively and efficiently, businesses need

sufficient assets and capital to invest in adaptive behavior. They need a predictable investment climate with solid regulations and transparent institutions, as well as cash flows and market intelligence. They need access to information on how climate change impacts and social and ecological change will affect their trading. Businesses need to be in markets that allow adaptive behavior to be easily planned and executed. Fundación PROFIN in Bolivia illustrates how private actors – in this case, small farms – can benefit from a process that allows adaptive responses to an increasing likelihood of extreme weather events. (See Box, p. 17.)

Businesses must adapt to and try to exert some control over customers, suppliers, lenders, and regulators, as well as to the various climate change effects. They must adapt to and exert some control over markets, while the markets themselves operate within the sphere of higher scales of influences and regulations and depend on these for their adaptive capacity.

The Commission recognizes that much adaptation takes place in the private sector – choices, investments, and actions taken by individuals, households, and businesses. To the extent that businesses trade relevant goods and services to individuals and households, there is an adaptation market. Access is determined largely by price mechanisms, but state interventions can help break down problems of market segmentation and inaccessibility for the poor.

Perhaps the most obvious adaptation-relevant commodity is information about climate variability and change. People and businesses will invest in getting access to information to help reduce the unpredictability of climate events and trends. Governments can and do provide such information. Similarly, expertise on adaptation options and resources can be marketed to improve the way people adapt. Hard technology will find a market when people perceive adaptation as a necessary or advantageous avenue.

Adaptation can also be facilitated by a range of other goods and services supplied by the private sector, such as banking systems, agricultural risk insurance, and drip irrigation.

However, the products most useful for adaptation by the poor are often not provided in forms they can afford or obtain. This differential access to insurance, credit, and technologies accentuates the “adaptation gap” between the poor and the better off. In some cases products are widely avail-

able but need to be tailored to the specific needs and limited means of the poor. This could mean a major redesign of both the products and their markets. In other cases, new products to support the poorest may need to be developed.

Adaptation through ecosystem protection

Ecological systems do not respond to change in a smooth fashion. Tipping points occur when the cumulative effects of both slow and fast environmental changes and disturbances reach thresholds that result in dramatic and often rapid negative changes in ecological systems. Small events such as droughts, floods, or pest outbreaks might trigger ecological changes that are difficult or even impossible to reverse. This phenomenon has been observed in ecosystems such as coral reefs, fresh water, coastal seas, forests, savannah, and grasslands. Accumulated stresses may lead to catastrophic shifts like the loss of coral reefs and the services they bring. Fast-onset surprises, such as invasive species and emerging infectious diseases, could become more common.

Climate change is likely to change ecosystems that have co-evolved with the previous climate. If these changes bring rapid losses of ecosystem services, human adaptation options shrink.

The Commission stresses that people can be helped to protect and improve their local ecosystems in ways that also support their livelihoods and adaptive capacities.

Highlighting the role of ecosystems in adaptation suggests a number of possible win-win options. These are related to increasing the flow of ecosystems services and helping disadvantaged groups deal with future impacts of climate change. These strategies can lead to risk reduction and can also contribute to attempts to promote a transition to sustainable poverty alleviation in rural communities. In Tigray province in northern Ethiopia, for example, collaboration between local farmers and experts on a farming-with-nature project – using compost to increase yields, selecting a diversity of wild plant species to decrease the need for fertilizers, making trench bunds to hold water and reduce soil erosion – led to higher yields and groundwater levels while increasing household income and livelihood opportunities for women.¹⁶

The “win-win” relationship between investments in ecosystem services and improved livelihoods of the poor

Fondo de Mitigación del Riesgo Agrícola Bolivia

Fundación PROFIN has developed an innovative, index-based insurance scheme being piloted in four provinces in Bolivia. It combines incentives for risk reduction and a flexible, people-centered index mechanism. In this scheme, the trigger is based on the production levels of reference farming plots in areas that are geographically similar in terms of temperature, precipitation, humidity, and type of soil.

Farmers identified as good practitioners by their peers farm the reference plots. The scheme is based on the fact that these farmers have established reputations within their communities for their skills and knowledge and that the yields on their plots can serve as reliable indicators of whether production levels have been adversely affected by environmental factors (thus triggering an insurance payout) or by other factors within a farmer’s control. This reduces the moral hazard in the scheme, and the reference farmers also serve as technical assistance agents to promote ideas for increasing yields and reducing disaster risks and impacts.

The system encourages other farmers to match the reference farmers in implementing efforts to reduce the effects of drought, excess rains, hailstorms, and frost, because those farmers run the risk that their own plots will be significantly affected while the reference farmers’ plots will be less affected.

Source: Fondo de Mitigación del Riesgo Agrícola, at www.fundacion-profin.org/fmra.html.

should, however, not be assumed to be cheap, quick, easy, or inevitable. The better-off can capture the benefits of these efforts, and in some cases the outcomes have not lived up to expectations.¹⁷

Coping strategies can also create “lose-lose” situations. Those in poverty and vulnerable to climate change, perhaps unable to grow their traditional crops, may be forced to overharvest ecosystems for food, fiber, and fuelwood, accelerating ecosystem degradation and the sort of qualita-

¹⁶ J. Lundberg and F. Moberg, *Ecological in Ethiopia – Farming with Nature Increases Profitability and Reduces Vulnerability* (Stockholm: Swedish Society for Nature Conservation, 2008).

¹⁷ H. Munk Ravnborg, M. Gervin Damsgaard and K. Raben, *Payments for Ecosystem Services – Issues and Pro-poor Opportunities for Development Assistance*, Danish Institute for International Studies (Copenhagen: 2007).

tive ecosystem change that will leave them worse off. In addition, the indirect impacts of climate change can lead to acts that rapidly undermine the resource base of local communities. Examples include extraction of nonrenewable fossil groundwater, rapid land use change as a result of investments in biofuels, or increased fishing pressure as a response to changing market prices.

Efforts to conserve ecosystems and to adapt to climate change often involve trade-offs, as highlighted by research at the World Resources Institute.¹⁸ Managing those trade-offs and effectively using adaptation strategies to realize both livelihood and ecosystem objectives remain difficult challenges, requiring an understanding of factors that undermine resilience – such as biodiversity loss and habitat fragmentation – and a range of management and governance issues. Social sources of resilience – diverse and effective institutions, social capital, ecological understanding – are all critical assets in dealing with crisis.

Adaptation through social protection

Social protection refers to a broad set of policies and programs to reduce poverty and vulnerability by diminishing people's exposure to risks, encouraging effective labor markets, and building people's capacity to protect themselves against hazards and loss of income. Some development agencies and national governments now see social transfers – direct and predictable transfers of resources to the poor – as a way to improve access to services and address the underlying causes of inequalities in well-being.

One problem is that social transfer policies tend to ignore the long-term risks associated with climate change. Also, much of the current social protection agenda is designed and financed by external actors – bilateral and multilateral donors, international NGOs, academics, and consultants – and not enough by domestic constituencies, national governments, local civil society, and citizens.¹⁹

Despite these flaws, a review of impacts of social transfer schemes in Mexico, Brazil, and Ethiopia found that state-managed social transfer programs do improve the adaptive capacity of the poor.²⁰ Social transfers are used to scale up access to and demand for equitable health and education services. New aid flows for poverty reduction and adaptation should use this channel to support the poor.

However, social transfers require significant amounts of

additional revenue, and the transfers must be long-term and predictable. Incremental approaches to introducing and then scaling up social transfer programs have proved the most effective.

The Commission stresses that governments and donors need to assure policy coherence between social transfer programs, wider service sector initiatives, and climate adaptation plans within and among sectors (health, education, social welfare, agriculture). Managing social transfers to improve climate adaptive capacity will require institutional strengthening that may necessitate a parallel technical assistance program.

From adaptive capacity to capacity development

Adaptation does not happen in a vacuum. It is shaped by institutions at local, national, and international levels. Adaptive capacity at the local scale depends on the capacity for planned adaptation at wider scales.

Three main institutional ingredients are necessary to improve people's adaptive capacity: capacity development, inclusive governance, and ownership.

Capacity development

Many countries, provinces, districts, and municipalities facing the most serious adaptation challenges have meager capacity and poor governance and thus need help with capacity development.

This goes well beyond the technical cooperation and training approaches that have been associated with “capacity building” in the past. The stock of human capital and the supply of general and technical skills are important. However, a country's ability to use skilled personnel to good effect depends on the incentives generated by organizations

¹⁸ McGray, Hammill, and Bradley, op. cit. note 6.

¹⁹ M. Davies, J. Leavy, T. Mitchell, and T. Tanner, “Social Protection and Climate Change Adaptation,” Policy brief prepared by Institute for Development Studies for the Commission on Climate Change and Development, 2008.

²⁰ T. Geoghegan, J. Ayers, and S. Anderson, “An Assessment of Channels to Support Climate Adaptation by the Poorest,” Working Paper (London: International Institute for Environment and Development, forthcoming).

and the overall environment. It is an endogenous process that cannot be imported from the outside.²¹

Evidence has shown that public, private, and civil society organizations will never become sustainable or responsive to their members, staff, or clients if they are created solely to implement a project. Stand-alone training projects and indeed projects in general have had little discernable or sustainable impact on capacity development. Disaster management in particular has been locked into short-term projects, not least due to the boom-bust cycles that are inherent in the humanitarian funding approaches upon which they rely.

The Paris Declaration on Aid Effectiveness was in part a response to top-down “capacity building” efforts of the past, being an attempt to move away from trying to transfer the “right answers” to instead stressing that a nationally and locally owned capacity development process must be at the core of any sustainable change effort. This lesson has not been reflected in most recommendations for climate change adaptation.

Inclusive governance

The uncertainties of climate change make ongoing access to information crucial. Democracy relies on people having the information and resources they need to make their own informed decisions.

A main tool of adaptation is inclusive governance, especially as it can help reduce vulnerability through efforts to alleviate poverty. Vulnerability reduction depends on capacities to provide leadership, engage actively as part of civil society, get access to services (especially those related to information, technology, and capital), and mobilize a dynamic business environment that creates opportunities to pursue less risk-prone livelihoods.

National policies and commitments to reducing vulnerability are important, but they cannot simply be transferred to the local level.

As a result of decentralization, local government is being overwhelmed by massive responsibilities. The Commission saw this firsthand in field visits in countries as different as Bolivia, Cambodia, and Mali. The responsibilities of local governments are rising without increases in human or financial resources. Efforts to decentralize responsibilities for adaptation need to reflect inevitable human resource

gaps, lags in organizational and institutional reform, and unfulfilled promises of financial devolution.

The principle of subsidiarity is essential, in that local actors and local governance are the most important basis for action informed by existing conditions. At the same time, factors related to covariate risk mean that local government (particularly poorer municipalities and districts) have had little chance of managing these risks or obtaining resources to develop their capacities.

Aid can help overcome some of these obstacles and has been effective in producing risk maps, initiating participatory planning, and building basic human resources. The greater challenge is in creating effective links between national climate change efforts and the municipalities, districts, and provinces that must move from words to actions. The Commission believes that this challenge must be met.

In many countries there are capacity and communication gaps between those holding the financial resources and managing the international networks at ministerial levels and the local government actors who lack the skills, awareness, and time to explore ways to get these resources. Financial pipelines become blocked where lean environmental ministries cannot even send their staff out of the capitals and where rural municipal authorities are too busy with other tasks to figure out how to respond to climate change. One obvious way to overcome this is to involve the ministries and public authorities that have a greater local presence (e.g., those dealing with water, energy, spatial planning, and agriculture) in adaptation efforts.

Adaptation efforts must therefore be based on the opportunities and constraints facing local governments and their relations with line ministries. The need for a deeper understanding of how climate change adaptation could be better managed through decentralized structures suggests new priorities for research, evaluation, and public administration reform.

Civil society organizations are helping set the rules for climate change adaptation, acting as a watchdog to see that the rules are enforced and also mobilizing populations to

²¹ Development Assistance Committee (DAC), “The Challenge of Capacity Development: Working Towards Good Practice,” DAC Guidelines and Reference Series (Paris: OECD, 2006).

act accordingly. Some organizations are taking on significant roles in service provision, helping to fill the gaps where local government and business are weak or absent. Local-national-global networks of civil society organizations can help address the gaps between national and local governments by creating multistakeholder platforms for debate about how to manage climate risks.

The Commission finds that business is an engine for development by providing jobs, tax revenues, and technology; it is the biggest investor in areas such as technology transfer, and it is businesses, not governments, that usually own the technology. Business makes many of the most important decisions that affect how risk is managed. Private sector investments constitute up to 86% of investment and financial flows and are thus a critical point of leverage for reducing climate and disaster risks.²²

Firms' adaptation efforts have often focused on climate-proofing their factories, stores, and field operations. When a farmer chooses a different seed variety or when a shopkeeper installs a stronger roof, these private sector actors are also investing in their own risk reduction. Larger companies have been focusing more on adaptation and risk reduction as they realize that they cannot succeed in societies that are failing due to lack of adaptation. Corporate social responsibility is a growing channel for working with local neighborhoods or even entire nations to help manage water resources, mobility, and communications.

For all these reasons, the Commission believes that it is critical to engage the private sector as a stakeholder and key resource in adaptation. The business community must be present in forums for planning and decision making for proactive risk management. However, the question must always be asked, Whose risk are we talking about, and who is benefiting? A number of proposals have been put forth that incorporate public-private partnerships and the provision of micro-insurance and other forms of risk financing in support of adaptation. The challenge is to find schemes that are relevant for the poor and that they can get and afford, be the approaches market-based or public. So far, micro-insurance has mainly been in the form of small-scale pilot schemes. To contribute to the adaptive strategies of the poor, micro-insurance needs to be scaled up, flexible, pay quickly to cover losses, and include incentives for investments in risk reduction.

Ownership

Good governance for adaptation is ultimately manifested in the ownership of policy objectives. In recent years the drive for ownership in an aid context has been promoted through efforts to implement the Paris Declaration on Aid Effectiveness by aligning aid with national strategies and harmonizing donor approaches.

This ownership relies on coherence among formal regulatory frameworks, central investment strategies (and, indeed, among international and donor agencies), and local plans and processes. As mentioned earlier, the task of bridging the local-national divide must not be underestimated. There are well-justified fears that the emerging climate change adaptation agenda is a top-down effort that will reduce the space available for local actors to determine their own strategies and control their own futures. The struggle to react to climate change as a "crisis" diminishes opportunities for local people to take ownership of their own climate change agenda and integrate it into their own development strategies.

There is a disconnect between short political cycles and the need for investments in long-term risk reduction. The search for short-term political gain is rarely conducive to appropriate adaptive policy action. If vulnerable people are going to benefit from investments in climate change, it will be because their political institutions help them toward better protection from risk than they have today.

The Commission reiterates that ownership is a precondition for long-term sustainability, but it is not a guarantee. Bringing together ownership and sustainability may be more complicated than it seems. The design of National Adaptation Programs of Action (NAPAs) by least-developed countries illustrates this. NAPAs are nationally owned, but they are rarely integrated into national planning and budgetary processes. They have not received significant levels of financing because they are seen as exemplifying the kind of "projectization" that the Paris Declaration seeks to eliminate and replace with programmatic approaches. Fur-

²² UN Framework Convention on Climate Change (UNFCCC). *Investment and Financial Flows to Address Climate Change: An Update, Technical Paper* (Geneva: 2008).

thermore, the little funding they have received has largely been outside of the mainstream aid process, which also contributes to limited integration. (See Box on NAPAs in Chapter 5.)

This leads to a conundrum. The NAPAs and many other small adaptation and disaster risk reduction initiatives, particularly those promoted by civil society, are a first step toward local learning about how to manage climate change. They can create concrete, on-the-ground examples of actions to address what is widely seen as a rather abstract set of hazards. Ultimately, the NAPAs are more about capacity development than they are about furthering adaptation.

Without this first step, there will be great difficulties in taking a far larger second step, since the modest levels of ownership that they represent will be extinguished. Support for initiatives such as the NAPAs must then be situated within a much more comprehensive dialogue on adaptation. This means that although these “pilot projects” may not actually be scaled up, they should be used as capacity development exercises and as a platform for establishing a broad dialogue about what climate change adaptation implies.

The climate agenda must be aligned with the Paris Declaration, and action must respect and promote adaptive capacity through subnational actors. Harmonization and alignment processes have sometimes disenfranchised the civil society actors who must be part of sustainable development.

The development community tends to see their climate change colleagues as being too focused on macro-level technical models to relate to on-the-ground realities. If those implementing climate change initiatives are to be held accountable for the quality and effectiveness of their work, and if they are to learn about impacts, they must devise and use monitoring and evaluation techniques on a much larger scale than thus far.

Climate change initiatives frequently include mechanisms for monitoring whether people are managing the environment in prescribed ways. Adaptation requires more of a learning approach, combined with systems by which affected populations can begin to hold their political leadership (and aid donors) to account for whether vulnerability has been reduced. Three principles should guide monitoring and evaluation of adaptation efforts: impartiality/independence, credibility, and usefulness.²³

- **Impartiality/independence** is needed to ensure that assessment is free from vested interests and bias. The desire to support urgent and decisive action and to justify increased investments in climate change activities has meant that independent judgment has at times been lacking.
- **Credibility** will emerge from increased independence and field-level analysis of the results of new investments, approaches, and policy changes. Theories of change are not enough. Credibility is an outcome of providing verifiable and reliable evidence of the results of adaptation efforts.
- **Usefulness** can only be achieved by identifying forms of information that are relevant to the target group. Creating a more constructive dialogue will require understanding how decisions are made at different scales and designing monitoring and evaluation instruments that relate to these specific processes.

²³ OECD-DAC Network on Development Evaluation, “Evaluating Development Cooperation: Summary of Key Norms and Standards” (Paris: 2008).

Mali

A score of elders sat on mats under an awning; older women stood in the background; children ran around and young women pounded corn (maize) in big wooden mortars. There were virtually no young men left in the village of Bougoula, 40 kilometers outside of Bamako, Mali's capital.

Out of a clan of 110, 60 had left the village to find jobs: some in Bamako, some in the cotton and rice-growing parts of the country, some in more prosperous African states to the west, and some in Europe.

One young man – a rare sight in the area – standing in his millet field, said: “The old weather signs are gone. We used to plant when the storks came from Europe. We knew it would rain soon after. Or when that tree blossomed. Now we cannot tell. We get advice from the meteorological office over the radio, but it is not always right.”

There has been less rain in Bougoula. Its small river ran year-round in the 1970s but now is dry for some three months every year. And there is more heat, so when it does

rain the ground does not stay moist as long as it used to, adding to the uncertainty of farming.

The extremes of climate change are the weather-related disasters at one end and the slow rise in temperatures and sea level at the other. But in the middle is the greatly increased unpredictability that makes farming – and many other human activities – so much more difficult.

“We cannot farm. We try to grow cotton to pay for fertilizer, but we get into debt buying fertilizer, and we lose our dignity in debt,” said Tiéni Synayoko, the head of another clan. “We are trying everything: to diversify into other cash crops, to garden during the dry season with irrigation, to compost.”

There is a lively Wednesday market in Bougoula, but the city folks from Bamako come out in big trucks and have huge bargaining power because the villagers have no transport to manage the treacherous dirt roads, and most of their produce will spoil if not sold quickly.



PHOTO: BRUNO FERTI

Bougoula, like many villages in Mali and in the developing world, is having responsibilities devolved to it by the central government, so it must run its schools and health clinics and manage water resources and environmental protection. But funds are not being decentralized as fast as responsibilities. Many of the local people are poor and exempt from taxes, so there is only a tiny local tax base.

The Sinsibere Cooperative (mainly women) makes quality shea butter and soap for sale, harvests and stores peanuts in hopes of better prices, tills collective fields, and participates in microcredit schemes. The profits go to the members but also to help pay for the village school.

The main outside organization reaching the people of Bougoula is the Malian NGO Mali-Folkecenter, which helps with environmental protection, provision of clean energy services, drinking water supply, technology transfer and the training of local technicians, and the delivery of enterprise development services for rural companies.

The Commission met with representatives from UN organizations such as the UN Development Programme, national aid bodies such as the Swedish International Development Cooperation Agency, and regional bodies such as the Permanent Inter-State Committee for Drought Control in the Sahel. The representatives were proud of their ability to meet among themselves and to meet regularly with the government but also frustrated at their inability to accomplish much in the ways of practical help due to their own and the national government's scarcity of resources.

In Bougoula, Synayoko sits in the small hut that is his blacksmith shop. He spent six years in Libya working and sending money home. He has a brother in Spain, one in Côte d'Ivoire, and one in western Mali.

"I used to be a full-time blacksmith, making and repairing all the farming tools for the village. Now with fewer men here and less farming, I have to farm myself, to eat, and I barter; there is no money."

Bougoula is already suffering the water shortages and declining yields that the IPCC predicts for much of Africa in 2020, and these are degrading the entire village economy.

4. Governance Gaps

A new generation of governance is required that not only satisfies the interest of the parts – nations – but also meets the legitimacy of every citizen's interest that the whole of the Earth system and the economy work with a high degree of stability, efficiency, predictability and security.

THE TÄLLBERG PROVOCATION²⁴

Climate change aside, governance approaches and institutions need reform.

In today's world, markets, money, knowledge, communications, ambitions, and microbes are global. Yet global governance structures remain based on approaches devised by the few victors of World War Two, when it was possible and perhaps even desirable for a few powerful nations and economies to run the globe. Such an arrangement is no longer desirable or even possible. Reforming global governance is a necessity to deal with the issues of our time but also to restore trust between the rich and the poor so that they can better share management of the planet they share.²⁵

At the time we write our report, we are on the cusp of a broader understanding than ever before of the importance of global public policy. The financial crisis has offered lessons about the importance of the interplay between the public and private sectors, including an efficient and well-functioning regulatory and enabling framework for the private sector, and about the need for prudent yet proactive international cooperation. We also better understand the need for reconfiguration and major shifts in the way we manage our planet – whether that involves its economy, its energy, its food security, its ecology, or the connections among these.²⁶

Climate change makes the need for reform more urgent. Mitigation will require unparalleled international cooperation – cooperation that sets standards and rules that reach into the daily lives of billions. Adaptation will require new forms of coordinated cooperation between rich and poor nations but also forms of governance that reach seamlessly up and down among local, national, regional, and international levels to accelerate resilient development.

International, regional, national, and local institutions all

help to organize and coordinate adaption at the local level. Chapter 3 looked at the need to focus on the local level and organize adaptation from the bottom up. This chapter focuses on how institutional architecture must be organized to best serve local needs and best make the connections needed. The functions of institutions include:

- ▶ Financing (mobilization, transfer, allocation, disbursement);
- ▶ Policy and strategy formulation (including roles and responsibilities of national and local governments);
- ▶ Knowledge and information management (including exchange of information and experience, monitoring, dissemination of research findings, assessment of trends over time, advocacy);
- ▶ Manifesting accountability and embodying norms; and
- ▶ Implementation (getting the adaptation actions done).

Examples exist of systems that stretch across these interfaces; all are flawed but all suggest ways forward. (See Box, p. 25.)

The application of the subsidiarity principle, mentioned in Chapter 3, will help distinguish between local, national, regional, and international responsibilities.

²⁴ B. Ekman, J. Rockström, and A. Wijkman, *Grasping the Climate Crisis. A Provocation from the Tällberg Foundation* (Stockholm: Tällberg Foundation, 2008).

²⁵ International Task Force on Global Public Goods, *Meeting Global Challenges: International Cooperation in the National Interest*, Final Report (Stockholm: 2006.)

²⁶ L.-G. Engfeldt, *From Stockholm to Johannesburg and Beyond – The Evolution of the International System for Sustainable Development Governance and its Implications* (Stockholm: Svensk Information, 2009).

Managing interfaces between local, national, and international levels

Responding to earlier criticism that global programs hurt national and local capacities by imposing heavy transaction costs on existing structures, The Global Fund to Fight AIDS, Tuberculosis and Malaria has stretched from the international level down into villages, helping to reform national and regional health systems and, while doing so, to integrate its work into national health plans and Poverty Reduction Plans.

The international network of the Consultative Group on International Agricultural Research works on various crops to develop new varieties, while combinations of governments, farmers' organizations, and NGO efforts get these seeds and training to remote farmers. Many systems of agricultural extension in various parts of the world have degraded over the years and must be revived to produce and disseminate crop varieties, agricultural inputs, and advice suitable for new climate conditions. In many cases, effective adaptation will involve strengthening institutions that already exist.

The Red Cross and Red Crescent, in its various forms, is a movement reaching from the local to the global level and is working effectively on the Pacific island atolls and elsewhere to improve village resilience in the face of the effects of climate change.

The private sector and markets also offer examples. The UK-based company Vodafone has been developing mobile phone systems in East Africa that allow people to make various transactions over their telephones, greatly lowering the transaction costs of microfinance and increasing family and individual resilience.

Local level

The previous chapter emphasized the need to adapt at the family, village, and city level. In the developing world, resources and capacity are often in short supply at the local level, so such adaptation will require assistance from higher institutional levels.

Yet in the small nations of the South Pacific, there is a long tradition of strong governance at the village and clan level, supported by church, women's, and youth groups and other forms of NGOs. The national governments and international organizations such as the Red Cross and Red Cres-

cent Societies and WWF are working to use these groups to disseminate lessons on such things as marine safety as well as hardware such as satellite radios. Governments and NGOs are also working together to develop Internet portals providing region-wide information on climate change. In this region, there is a more obvious connection between the issues of disaster risk reduction and adaptation.

Cities highlight the need for effective local governance. (See Appendix 8.) They have received much less attention than rural areas in adaptation literature and practice, but – particularly in the developing world – they contain growing numbers of vulnerable people. Many live in informal settlements – slums or shantytowns that may have been developed outside city plans or that ignore such building codes that may exist. These have been developed on whatever ground was available: dangerous, near seashores, in river basins and their floodplains, on steep hillsides prone to landslides.

City governments often ignore such settlements because they are, from their point of view, outside the law. And while informal settlements may have strong internal governance, they cannot be expected to adapt effectively to climate change until they can fit effectively in with the adaptive planning of the rest of the city.

National governments and international organizations have often found it hard to aid and cooperate with even legitimate city governments – something they will have to do if adaptation is to succeed. Partnerships between formal and informal, public and private actors should be supported for effective adaptation in villages and cities. (See Box, p. 26.) This is in line with the call for inclusive democracy made in Chapter 3.

The call for inclusive and participatory democracy is nothing new. The Brundtland Report noted in 1987 that sustainable development cannot happen without effective participatory democracy. And in the 1992 Rio Declaration on Environment and Development, 178 governments pledged to open environmental decision making to public input and examination.

While adaptation goes far beyond environmental decision making, it requires the same rights of public access to information, to public participation in decision making, and to justice. In many countries, laws guaranteeing such rights have been passed, but often action on such laws,

Partnerships for urban governance

The 2009 *Global Assessment Report on Disaster Risk Reduction* provides many examples of successful partnerships among civil society groups, companies, and city governments that have facilitated urban development in a resilient way. In India, the Ahmedabad Municipal Corporation partnered with a textile company, an NGO, and a slum community to improve basic infrastructure and provide water and sanitation to households. The project was one of the many activities financed through the issuance of municipal bonds. In Namibia, the government teamed up with the Shack Dwellers Federation of Namibia (an organization of savings groups formed mostly by low-income women) and overturned conventional approaches to urban land use and infrastructure standards, making housing sites more affordable to low-income households.

After Hurricane Katrina savaged the city of New Orleans, the US Congress funded a Community and Regional Resilience Initiative, originally tested in three vulnerable cities, that brings together all government agencies with responsibilities for managing disasters, before and after, to plan and implement measures to increase resilience. The program goes beyond government bodies to include businesses and civil society organizations. It is a low-tech approach that could be replicated in other countries, rich or poor.

Source: 2009 *Global Assessment Report on Disaster Risk Reduction*, *United Nations International Strategy for Disaster Reduction* (Geneva: 2009).

both by governments and the civil society organizations meant to make use of them, lags behind.

Citizens groups must put pressure on governments to make sure that the necessary access laws are in place and that governments cooperate with the public in setting policy. Then those groups themselves must participate.

Local institutions know their communities and should have the main responsibility for identifying the poor and vulnerable and supporting them in building safe rural and urban settlements. These institutions should ensure that dissemination of climate information reaches the poorest and most vulnerable through appropriate extension services.

The issue of access to information, decision making, and justice is one that unites the various levels, from local to national to international.

National level

“Governments’ general response to the speed and scale of global changes has been a reluctance to recognize sufficiently the need to change themselves,” the Brundtland Commission wrote more than 20 years ago.

Adaptation covers virtually all elements of national government activity: finance, planning, agriculture, water management, health, safety, disasters, infrastructure, food security, and so on. Effective action requires coordination between these sectors, something that will only be achieved if all areas of government dealing with adaptation are led and coordinated from the highest political and organizational level. This is true for industrial as well as developing countries.

Developing-country governments in particular need to blend and coordinate development, environment, poverty reduction, and disaster risk reduction activities, such as the national platforms for disaster reduction initiated through the Hyogo Framework for Action; the institutions and efforts of the Rio Conventions on Climate Change, Biodiversity, and Desertification; and the national efforts aligned to all of these, such as the NAPAs.

Yet governments cannot be both the implementers of action and the judges of the success of that action. Therefore the monitoring, evaluation, and reporting on implementation activities should be transparent and involve civil society organizations, using the access rights described earlier.

The Commission believes that national governments must strive to overcome the policy incoherence that exists both nationally and internationally by systematically promoting mutually reinforcing policy actions across government departments and agencies, creating synergies to help achieve defined objectives.

In that national governments govern and fund international organizations, national policy incoherence encourages international policy incoherence. Thus, assuring a coherent national view would help ensure more coordinated views and actions at the global level. Efforts in this direction are evident in some donor countries’ development strategies. They consist mainly of establishing an interministerial/interagency process to screen policies and decisions on any specific issue, with a lead agency in charge of delivering concrete and coordinated policy results.

Examples include the creation of Interministerial Commissions on Sustainable Development and International Development in France and in the United Kingdom and the Policy Coordination Committees in the United States. Other initiatives include Sweden's Policy for Global Development, which integrates all Swedish policy areas into one coherent and all-encompassing country policy for global development.

As for adaptation strategies, we note in Chapter 5 that the least developed countries (LDCs) may have developed their NAPAs under one ministry (usually environmental) and their Poverty Reduction Strategy Papers under another (often financial or planning), while various ministries coordinated other related strategies, such as that for meeting the Millennium Development Goals.

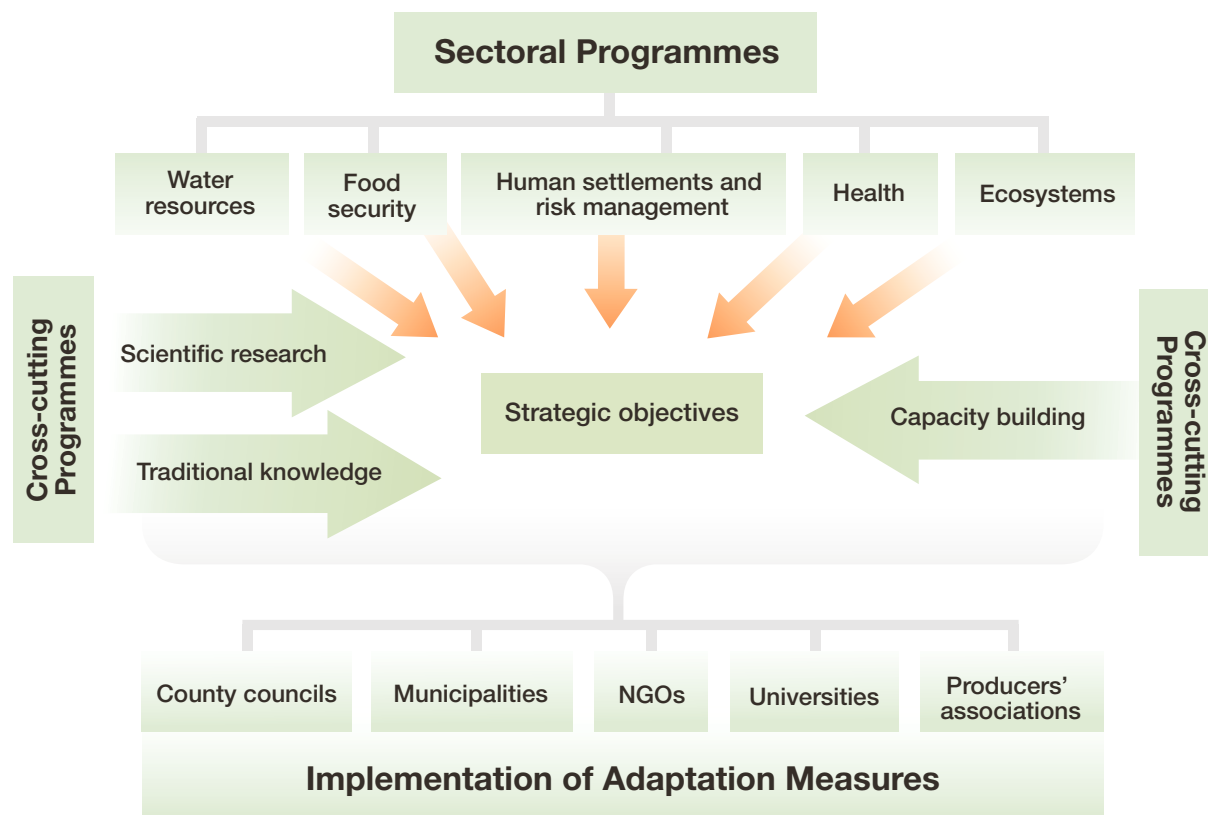
These nations will need to rapidly coordinate action among these plans and strategies, creating a coherence that should save resources over time. This will involve going beyond issue and policy silos to coordinate linked activities and goals.

It is instructive that countries with the most experience of weather-related disasters, and a keen understanding of their vulnerabilities to them, are striving most systematically for adaptation policy coherence. Bangladesh, Bolivia, and Tunisia are some of the first movers toward increased coherence. (See Box, p. 28, and Figure 4.) They also illustrate the fact that when national adaptation plans are set up with national funding hubs or trust funds, the need for effective coordination becomes even greater.

All governments have a responsibility to protect their

Structure of the national mechanism of adaptation to climate change

Figure 4.



Source: Ministry for the Environment and Water, Bolivia

National initiatives for better adaptation policy coherence

Bangladesh, which has suffered a succession of cyclones, storms, and floods, has developed a national action plan uniting the areas of agriculture, health, livelihoods, disasters management, environment, and development – including 50 subsectors of those areas. A trust fund has also been established to receive and allocate funding between sectors.

Bolivia developed a National Mechanism for Climate Change Adaptation covering five sectoral programs (water resources, food security, health, human settlement and risk management, and ecosystems) and three cross-sectoral programs (scientific research, capacity building and education, and anthropologic aspects and traditional knowledge). This mechanism is based on preliminary vulnerability assessments with different climate change scenarios, participatory consultations, and evaluation of adaptation needs. It is incorporated into the 2006–2010 National Development Plan.

After four years of severe droughts (1999–2002), Tunisia gathered national and regional climate data, studied the potential effects of climate change on the nation, reoriented away from short-term crisis management to a long-term adaptation strategy, and established an intersectoral climate council that brought together the ministries of agriculture, environment, and cooperation. It is setting up an information system on agriculture, water, environment, tourism, and health.

poorest and most vulnerable citizens. Climate consequences will affect growing numbers of vulnerable people. Therefore governments need to be ready with the appropriate social safety nets. In developing countries, external technical support is needed to strengthen institutions responsible for such systems, and national and international organizations should cooperate in this effort.

Leadership for coordinating and improving governance will be hardest to find in fragile states and areas where formal institutions are weak or non-existent, and there must be increased support for building and strengthening governance in these areas. International organizations and bilateral donors have a special responsibility to support and channel resources to communities via traditional and informal organizations.

In terms of climate change, national governments must deal with multiple assistance agencies, all of which are trying to prove to their constituencies that they are taking effective action. Responding to climate change makes the

principles embedded in the Paris Declaration on Aid Effectiveness and the Accra Agenda for Action – ownership, alignment, use of country systems, division of labor – even more relevant.

National governments also have the responsibility to provide the institutional environment that makes adaptation possible for people at the local level.

As described in previous chapters, adaptation varies with varying conditions: different for desert nations than for island nations, different for the rich than for the poor. But a set of principles can be defined for adaptation efforts in terms of management, planning, and service delivery.²⁷ This effort is not meant to prescribe action but to identify a set of fundamental functions that countries need to perform to adapt effectively. With agreement on the capacities needed to perform key adaptation functions, governments and organizations at all levels can discuss and plan adaptive strategies using the same vocabulary and checklist. This is not so much governance as a tool for governance. This should also improve communication on adaptation among the various levels, from the local to the international.

Some areas where more investment is needed in every country are climate and meteorological information, biophysical monitoring, and early warning. Countries should also integrate such data in their national planning.

Regional level

Coordination at the regional level is probably the most appropriate step toward international cooperation in that countries usually feel a greater ownership of and loyalty toward regional organizations. The case for regional coordination is strongest for producing and managing regional public goods issues.

There is a need to address climate change at the level of river basins and agro-ecological zones, making regional agencies more important. These should become more innovative in helping countries produce regional climate information and knowledge, design common early warning systems for extreme weather conditions, manage shared

²⁷ H. McGray et al., “The Bellagio Framework” (Washington, DC: World Resources Institute, forthcoming).

water resources, control regional infectious diseases, and develop and create various agricultural and ecosystem management systems.

A number of regional organizations are beginning to play or are capable of playing important roles in adaptation (see Box); the goal is to encourage them to improve their adaptation abilities.

Regional organizations can also play an important role in building and sharing experience and capacity. It is also at the regional level that many South-South partnerships share best practices in terms of adaptation. Regional organizations should identify added value, analyze lessons learned, and ensure the provision of information on experiences and ongoing activities.

Efforts must be made to encourage regional organizations to play dynamic and effective roles in helping their regions adapt to climate change. The European Union (EU) Commission is developing a white paper on climate change adaptation that proposes a regional workplan. Policy priorities are identified on the basis of three principles: the principle of subsidiarity, the principle of solidarity between member states, and a focus on sectors that are integrated at the EU level through the common market and common policies.

International level

In many instances, the international system has proved successful in making life better for all by reducing the number of internal wars, lifting millions out of poverty, eradicating important diseases such as smallpox, preventing further depletion of the ozone layer, and designing international standards for telecommunication, aviation, and so on.

But this same system has long needed serious reform, and it needs it without any consideration of climate change. Multilateral bureaucracies are often huge, inefficient, and slow to react and change. Mandates overlap and compete with one another. Cooperation and coordination between multilateral organizations is often lumbering and ineffective. The multilateral system consists of a proliferation of organizations, funds, and agreements; decision making within it is highly compartmentalized; it focuses on concerns about legitimacy, accountability, and results; and interactions between different levels of governance leave much to be desired. The uncoordinated international system reflects national policy inconsistencies and the contradictory ways

Regional organizations and adaptation

The International Centre for Integrated Mountain Development serves the eight countries of the Hindu Kush–Himalayas, providing them with a center for knowledge on adaptation, particularly local adaptation. Ice covers 17% of the high Himalayas and inner mountain ranges of South Asia, and snow and glacier melt are the source of the 10 largest rivers in Asia, whose basins are home to 1.3 billion people. As these glaciers melt and disappear, floods will give way to water shortages, and both will challenge agriculture and livelihoods throughout the region.

The Mekong River Commission, formed in 1995 by an agreement between the governments of Cambodia, Laos, Thailand, and Viet Nam, has been slow to get into adaptation to climate change, but it is well positioned to do so.

The Pacific Island Countries and Territories (PICTs) contain much land that is low-lying, narrow atolls – in some cases, accounting for the entire territory of the PICT. Their people make their livings largely off natural resources: fishing, farming, forestry, tourism. They are the countries most vulnerable to climate change and most in need of developing adaptation measures.

The PICTs have created the Pacific Islands Framework for Action on Climate Change (2006–2015). They held their first Pacific Islands Climate Change Roundtable in 2005 and their second in 2008 (on a basketball court in Samoa), and they plan to make it an annual event. These bring together not only government officials from the region but also civil society organizations working on climate change and the important donor governments of Australia, New Zealand, Japan, and the United States. The focuses for adaptation are food security and agriculture, health, coastal areas, and infrastructure and water resources. The main effort at the Samoa roundtable was to develop a single Internet portal that could provide virtually all the information available about climate change and adaptation in the region.

that governments exercise their roles internationally.

“The challenges are both interdependent and integrated, requiring comprehensive approaches and popular participation. Yet most of the institutions facing these challenges tend to be independent, fragmented, working to relatively narrow mandates with closed decision processes,” noted the Brundtland Report.

Climate change, which is global, cross-cutting, and happening faster than expected, throws these faults into sharp relief. It will require institutions to be global in vision, cross-cutting in agenda setting, and nimble and responsive.

Many multilateral institutions suffer from chronic underfunding, which prevents them from carrying out their mandates. This is particularly true of institutions dealing with so-called environmental issues, which are more often the environmental effects of economic, social, and political issues. In some cases this reflects free-rider issues. In others it reflects divergent country interests. But in many cases it reflects distrust about the effectiveness and accountability of management, in part because of the lack of independent evaluation capacity and other concerns about governance.

Adaptation to climate change is an odd issue in that it tends to be the responsibility of the weaker institutional sectors: environment, development, and disaster risk reduction. These include environmental agencies and ministries, most of which tend to be underfunded and overshadowed by the bodies responsible for such activities as agriculture, finance, infrastructure, manufacturing, and transport – the sources of so much environmental degradation.

Adaptation is also a concern of international development organizations such as the UN Development Programme and the World Bank, which have a tough challenge reaching the poorest and marginalized. The national official development assistance agencies and ministries also act on the international adaptation stage, many bilaterally. However, they are not always focusing on the development of the most vulnerable. The reasons may range from domestic, geopolitical, and commercial considerations to the fact that governments of the recipient nations may not always favor those most in need.

This cascade of priorities demonstrates why development assistance has struggled to be effective in assisting development and why national aid agencies have found it so difficult to cooperate and coordinate activities, which effective adaptation actions will require. This historic ineffectiveness is why the *Paris Declaration on Aid Effectiveness: Ownership, Harmonization, Alignment, Results and Mutual Accountability* of 2005 was necessary. The ministers and heads of multilateral and bilateral development institutions who signed it resolved “to take far-reaching and monitorable actions to reform the ways we deliver and manage aid.” In a conference to follow up the Paris Declaration in Accra in 2008, an action plan for implementation was unanimously endorsed.

Humanitarian assistance institutions also have their

weaknesses. Donor behavior has in the past been dysfunctional, irrational, and sometimes arrogant.²⁸ Some crises have received more resources than seemed to be required, while others, particularly those that linger year after year, received a pittance. In some crises donors and international agencies competed for operational space, while in others they were very few and far between – if found at all. This sort of analysis led humanitarian donors to initiate reform, which resulted in the Good Humanitarian Donorship initiative, including the establishment of a peer-review mechanism under the OECD Development Assistance Committee. Further steps have then been taken in a UN-led humanitarian reform process.

So adaptation is not getting enough attention on the world stage, and the attention it is getting is from three sectors that have been historically challenged to be effective. Yet work is being done to enhance coordination of the international scene. (See Box, p. 31.)

But many governance initiatives seem to respond to a crisis in a reactive manner and with little or no delivery of concrete changes. The recent food and financial crises exemplify this. They have pushed governments to take a step beyond merely calling for reform. Governments have gathered urgently to discuss how to best respond to the crises collectively. This is commendable, but it must be followed up by action. Must the world wait for the next crisis to start acting? Or will governments now decide to be truly proactive?

The Commission believes that governments should act now to design an international system that will enable current and future generations to deal with crises, including the climate change crisis. Twenty-first century challenges require twenty-first century institutions. Today’s organizations must be able to manage public goods, bringing in the private sector. They must be stakeholder-driven, efficiently moving resources from global to local levels. They must be problem solvers, valuing ecosystems when dealing with climate change.

²⁸ J. Schaar, “The Birth of the Good Humanitarian Donorship Initiative,” in Development Assistance Research Associates, *The Humanitarian Response Index 2007* (Madrid: 2008).

The Commission believes that in the short term, we can use and modify existing institutions to better manage knowledge and services for climate change adaptation. In the longer term, as funding increases and agendas expand, new institutions might be needed.

The international arena provides great opportunities for major actions such as carbon markets and technology transfer. Carbon markets offer a potential for developing countries to receive additional finance and technology to help them achieve low carbon growth. To date, LDCs have not been able to gain access to carbon markets to any great degree. A long-term and ambitious post-Kyoto target of emissions reductions will be required, and this will need to be complemented by a scaled-up, professional, and politically independent regulatory system that provides confidence to investor and recipient country alike.

As far as adaptation is concerned, and given that it is based mainly on local actions, international organizations must become more adept at reaching the local level directly and through national governments and regional organizations.

Adaptation and mitigation both require an improved knowledge network, with much greater investment in generating, disseminating, and exchanging knowledge. The Commission believes that it is particularly important to build scientific knowledge and capacity for climate change research in low-income countries. The Intergovernmental Panel on Climate Change should continue its four-yearly reports but should focus also on the rapid turnaround and dissemination of peer-reviewed research findings, especially to low-income countries. The World Meteorological Organization should be equipped to service these new requests of the IPCC.

The IPCC should engage more actively with other existing institutions (such as UNEP, the World Bank, UN specialized agencies, academia, civil society, and think tanks) to ensure that climate change knowledge and information reach users in a timely way, particularly in low-income countries.

The UNFCCC secretariat should focus on intergovernmental debate and policy setting, not on regulatory, financial, or operational functions. As carbon markets could expand exponentially, it is timely to consider separating the roles of providing services for the convention and performing regulatory functions. Regulatory services, the scaling

UN system-wide coherence

Following the 2005 World Summit, the UN Secretary-General (SG) put together a High Level Panel on United Nations System-wide Coherence in the areas of development, humanitarian assistance, and the environment. Its final report made recommendations for decreasing fragmentation in the UN system and delivering on the Millennium Development Goals. These called for multiyear funding (providing predictability), a pilot program of One United Nations at the country level, an independent task force to clarify roles and responsibilities within the UN system, the appointment of a development coordinator to ensure performance and accountability in UN development activities, and the establishment of a Sustainable Development Board to report to ECOSOC.

On the issues of environment, the panel recommended that international environmental governance be strengthened and that an independent assessment be undertaken, that the UN Environment Programme (UNEP) be upgraded and given real authority, that the Global Environment Facility (GEF) receive more support and be strengthened, and that the United Nations cooperate more on thematic partnerships.

Source: High-level Panel on United Nations System-wide Coherence in the area of development, humanitarian assistance and the environment, *Delivering as One* (New York: United Nations, 2006).

up of carbon trading, and the provision of global corporate guidance (as distinct from political guidance) could be entrusted to a new regulatory institution that would also effectively provide LDCs with access to carbon markets.

The knowledge gap for adaptation is vast, but a growing knowledge network is being developed. The UN should provide a focal point for UN-related climate change knowledge, “delivering as one” within developing countries, providing advice on issues from water and crop management to insurance and disaster risk reduction.

The United Nations, international organizations (including civil society), and governments should work together to quickly and drastically scale up the national, regional, and international systems for disaster response and preparedness. The new system should have a standby financial mechanism that would be triggered automatically by a major event, assuring rapid response. It should facilitate recovery through a focus on vulnerability reduction; promote risk transfer, including social transfers and insurance

products; and invest in staff with the creativity and capacity to handle surprises. It should strengthen national and regional capacities.

UN agencies are not effectively coordinating their responses to climate change. Governments should support the efforts of the UN Secretary-General to strengthen coordination among UN agencies, funds, and programs. We urge the SG to continue to keep climate change issues at the top of government and governance agendas, encouraging and maintaining political will. The SG should bring in stakeholders and set priorities throughout the UN system.

The Commission recognizes the leadership of the SG and urges the SG to convene, in cooperation with international financial institutions, an independent high-level task force to articulate a vision for development that achieves the multiple goals of mitigation, adaptation, and meeting human needs. High on its agenda should be the connections between the different global crises and the adequacy of global public policy and global governance in dealing with them simultaneously.

Cambodia

Simso Pahna is not typical of the people around him in the remote village of Thlok in Cambodia's Kampong Chhnang province. He had some education in Russia and then spent six years as a Cambodian army journalist after the Pol Pot era. Yet despite this sophisticated background, he elected to return to Thlok, one of four villages in the Chronouk Commune.

The commune is just south of Lake Tonle Sap, which for much of the year covers about 2,700 square kilometers. During the rains, the Mekong River, which joins the Tonle Sap River, carries so much water that it causes the latter to reverse its flow and increase the area of the lake to 16,000 square kilometers and its depth from one to nine meters, flooding nearby fields and forests.

The flooded area is full of nutrients for fish, and the lake becomes one of the most productive inland fisheries in the world, providing 60% of the protein for a nation that survives mainly on rice and fish paste. The sediment in the floodplain provides nutrients for the rice crop planted when the floods recede, and the ground has traditionally remained damp.

Pahna says: "I fish, mainly to eat. I have only one child but I have set up a little house for 14 orphans, and they must eat. I sell some of the fish for gas for an irrigation pump so I can grow dry-season rice."

He sees changes in the local climate: "The last two or three years have been very hot. So the land dries up quickly when the rainy season stops, which is why I need to irrigate. Wells fail, and springs dry up."

The fishing is getting harder, too, but this may have little to do with climate change: "The government is giving more areas over to commercial fishing companies. They are using electricity, explosives, nets with very small meshes catching too many small fish," he explains. Catches by ordinary people have declined by 40% over the last few years, while the cost of fish has increased by 70%. Pahna is a "key fisherman" for the NGO Fisheries Action Coalition Team (FACT), with which he is setting up a fish conservation area.

Much of the village migrates 8 kilometers nearer the



PHOTO: STR

lake in the dry season to fish and plant dry-season rice, but yields of both are falling. So Pahna is part of a communal effort to get the government to build a dike near the village that would trap water in the wet season that could be released slowly for rice farming and might even recharge the local groundwater and the wells and springs it supports.

The appeal for project funding has gone off to a government that has drawn up a National Adaptation Program of Action containing 39 “no regrets” projects, many of which are similar to the one being proposed by the Chronouk Commune. Only one of the projects – not one given highest priority by the government – has found an interested donor.

A Ministry of Environment official advised the Commission that the NAPA would remain largely a theoretical exercise without donor funding. Yet adaptation is not on donor agendas. There are many other different plans – poverty, Millennium Development Goals, donor-country strategies – but none mentions adaptation, according to the official. Donor interest is mainly in potential Clean Development Mechanism (CDM) projects that are about emissions (offsetting industrial-world emissions), and donors fund development activities on a project-by-project basis.

An official for the Council for the Development of Cambodia, responsible for national aid coordination, wondered

how development resources could be effectively coordinated when there were 19 technical working groups and 2,000 bilateral aid projects, a figure that leaves out the roughly 1,000 projects managed by NGOs. “Under the leadership of the Ministry of the Environment, all ministries and agencies are required to integrate priority activities,” the Commission was told, but in Cambodia, as in other countries, the environment ministry has little power over other ministries.

In Chronouk Commune, Pahna said that during the hotter dry seasons the cattle, pigs, and chickens get sick and die. The people develop diarrhea, get rheumatism and heart palpitations, and are exhausted no matter how light the work. Asked about coping strategies, Pahna smiled and said, “We eat less.” It is hard to plant food substitutes like vegetables because of the quick drying of the soil and the lack of water.

Pahna, 48, knows about climate change and its effects and even does environmental cartoons for FACT. He introduced the Commission to a 44-year-old woman named Kui Bo, who has nine children and a husband crippled by warfare. They have no land; her husband sells noodles and she farms rice on some of her sister’s land. Asked about the climate she said, “Oh, I see no change – but it is much hotter.” She said she did not have time to think about such things.

5. Financing Gaps

The developed country Parties and other developed Parties included in Annex II shall also assist the developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects.

UN FRAMEWORK CONVENTION ON CLIMATE CHANGE

Resources are essential, but getting adaptation right is not only about money. As demonstrated in previous chapters, implementing a new approach to development and fixing our institutions will provide the kind of incentives needed for more adaptive actions. The transition to a low-carbon global economy can help support the global recovery by creating new jobs across a wide range of industries, but it will also secure ecosystem services on which the world depends, especially the poorest.

Money is needed now, and more will be needed in the future to help developing countries adapt. Official development assistance must reflect climate change realities. But funding for adaptation must go far beyond ODA. A first, confidence-building step would be for all donors to honor their ODA commitments of 0.7% of GNI. But more will be needed under different terms than “traditional ODA.”

Four main issues need to be managed to get adaptation financing right: costs of adaptation, mobilization of resources, management of resources, and allocation of resources.

Costs of adaptation

The Commission did not attempt to come up with a new cost number for adaptation needs. The argument developed in this section is based on existing estimates, which vary widely. The Commission emphasizes this uncertainty and the need for more work to refine estimates,²⁹ while agreeing that costs will be high and much beyond present ODA levels. Moreover, based on the methodological limitations of existing costing exercises, the Commission cautions against basing policy on available estimates as if they were final numbers. A way forward might be for countries to develop their own national “Stern reports.”³⁰

The variation in estimates is due to the uncertainty of

climate impacts at national and subnational levels and the difficulty of undertaking cost-benefit analyses for low-probability but catastrophic damage events. It is also due to what is captured under “adaptive actions.” As we emphasized earlier, adaptation actions range broadly, from investments in human development in order to build resilience to very specific interventions that would not have been necessary without climate change.

Hence, adaptation financing must cut across many different sectors, such as health, agriculture, and infrastructure. And this financing will involve many types of actors: households, governments, and businesses at different levels and within different time frames. Such a span makes it challenging to assess the costs of adaptation. It also makes it complex to find appropriate financing mechanisms for identified actions.

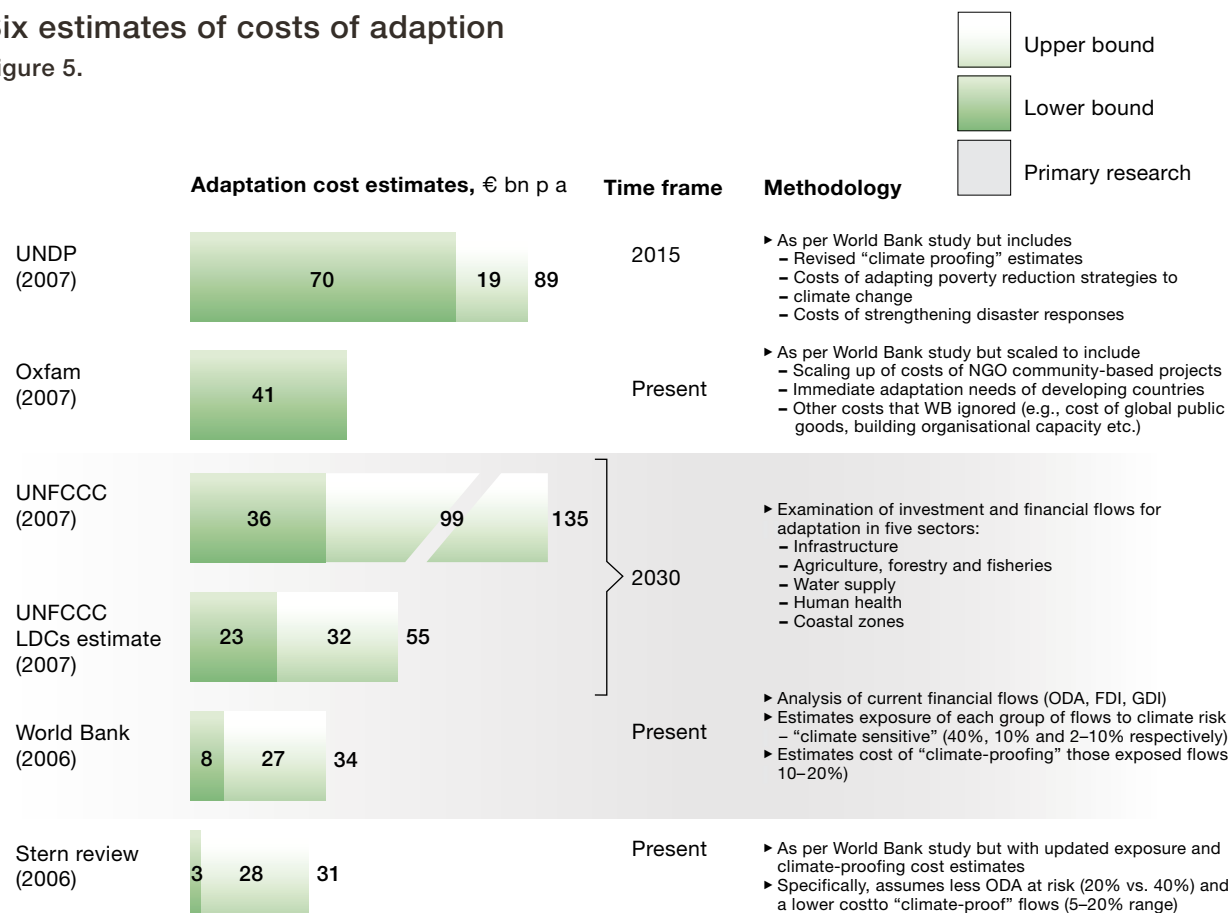
Estimates of adaptation costs have tended to focus on the costs of adaptive measures – the “concrete” – rather than the costs of immaterial but crucial activities to build adaptive capacity, such as access to assets, education, a supporting institutional environment, and enabling policies, standards, and regulations, the costs of which are all hard to quantify but which can be highly cost-effective. (See Chapter 3 for a discussion of adaptive capacity.) Even the studies of the concrete elements of the various sectors most affected by climate change are incomplete. Much work has been done in examining coastal zones and agri-

²⁹ One important initiative in this regard is the study on the economics of adaptation conducted by the World Bank and supported by the governments of the United Kingdom, the Netherlands, and Switzerland.

³⁰ See, for instance, R. Garnaut, *The Garnaut Climate Change Review* (Cambridge, UK: Cambridge University Press, 2008) for Australia.

Six estimates of costs of adaption

Figure 5.



Source: Project Catalyst, *Adaptation to Climate Change: Potential Costs and Choices for a Global Agreement*, Report of the Adaptation Working Group (The ClimateWorks Foundation, 2009).

culture, but studies of the energy sector are limited mostly to North America, while little has been done in the areas of health or tourism.³¹

Six assessments of global adaptation costs were published over 2006–2008. Their estimates vary widely and range from \$3 billion to \$135 billion per year. (See Figure 5.)

According to a 2008 updated UNFCCC paper on investment and financial flows to address climate change, "estimated overall additional investment and financial flows needed for adaptation in 2030 amounted to several tens, and possibly hundreds, of billions of United States dollars, with a significant share needed in developing countries."³² (The UNFCCC adds that while these sums "are significant,

the value of the adverse impacts that these expenditures could avoid may be larger.")

These estimates have also been broken down to differentiate between short-term (2010) and medium-term costs (2030).³³ The short term covers initial investments in global

³¹ S. Agrawala and S. Fankhauser, *Economic Aspects of Adaptation to Climate Change* (Paris: OECD, 2008).

³² UNFCCC, op. cit. note 22.

³³ Project Catalyst, *Adaptation to Climate Change: Potential Costs and Choices for a Global Agreement*, Report of the Adaptation Working Group (The ClimateWorks Foundation, 2009).

public goods (e.g., better information technology and early warning systems), implementation of NAPA priorities, and the establishment of global and regional response schemes (e.g., extreme weather insurance programs).

Medium-term costs would cover further investments in global public goods and in global and regional response schemes but would go beyond NAPAs and finance specific projects to support implementation of broad, strategic, and long-term adaptation planning. Short-term costs are estimated at between \$6 billion and \$11 billion per year and medium-term costs between \$12 billion and \$29 billion per year.

The main messages of this report are that adaptation will be very expensive (even with many cost-effective investments) and that costs will rise for decades or centuries (even if ambitious mitigation regimes were put in place immediately) and will accelerate with continuing failure to mitigate. Since external funds will never be sufficient to cover all costs involved, given their magnitude and the uncertainty that surrounds them, it will be of utmost importance that ways are found to mobilize domestic as well as international resources from all possible sources.

Mobilizing resources

Before looking at how new funds can be raised, it is worth examining the inadequacy of present funds and funding mechanisms. (See Box.)³⁴

Funds destined for adaptation are proliferating but are not providing much extra money. Governments and organizations are pledging far too little and depositing what funds there are in separate and growing numbers of initiatives in separate organizations with different, often complex, rules.

This syndrome threatens to drastically raise transaction costs, which the poorest countries most in need of funding can ill afford. Several of these countries also lack the human capacity to negotiate the difficulties of gaining access to such funds.

As of today there is not much money available compared with the range of costs identified earlier. One reason for this is that the UNFCCC does not have specific targets for donations. In addition, the system of funding is not very predictable. Most mechanisms are funded by voluntary contributions pledged in an ad hoc manner.

Major international funding mechanisms and amounts

The GEF allocated \$50 million in 2003 to a Strategic Priority on Adaptation to pilot adaptation actions in developing countries. By late 2008, that amount had been allocated to 22 projects.

UNFCCC parties established two special funds for adaptation: the Special Climate Change Fund (SCCF) and the Least Developed Countries Fund (LDCF), operated by the GEF. By late 2008, 15 projects had been approved to receive funding from the SCCF, totaling \$67.52 million. The LDCF was established to support the LDC work program, including the preparation and implementation of NAPAs. By late 2008 a number of submitted projects had been approved as being consistent with fund eligibility criteria.

The Adaptation Fund was established to finance adaptation projects and programs in developing countries, primarily from the proceeds of the 2% levy on certified emissions reduction transactions under the CDM. The UNFCCC estimates that it could receive \$80–300 million per year in 2008–12. As of late 2008, it had received funds but made no dispersals.

The World Bank's Pilot Program for Climate Resilience (PPCR) is part of its Climate Investment Funds (CIFs) that are being set up with the regional development banks. The PPCR seeks to mobilize new and additional financing for activities and investments that demonstrate how financial and other incentives can be scaled up to support adaptation. Of the pledged \$6.34 billion, \$240 million has so far been allocated to the PPCR. All funds and programs under the CIFs are of limited duration so as not to prejudice deliberations regarding the future of the climate change regime.

Source: K. Le Goulven, "Financing Mechanisms for Adaptation," Background paper for the Commission on Climate Change and Development, 2008; UNFCCC 2008.

³⁴ There are also a number of national funding efforts, such as the Japanese Cool Earth Partnership and Germany's International Climate Initiative.

Official development assistance

ODA represents a much larger sum of money. In 2007, ODA totaled \$104 billion, and an estimate by OECD suggests that more than 60% of ODA could be considered as relating to adaptation. Obviously, increasing ODA would both provide funds for climate-proofing development assistance and increase funding for adaptation. The appropriate role of ODA in supporting climate adaptation needs to be articulated. Two opposing arguments are summarized here.

Some argue that if climate change adaptation is about development, then financial transfers and institutions with the objective of enhancing development could be used for adaptation. That would be ODA and development agencies. After all, experience gained through decades of development cooperation could inform new efforts to adapt to climate change. And steps taken to harmonize aid flows and align them with national priorities could also guide financial transfers for adaptation. To date, most climate finance from donors is channelled through international and bilateral development agencies. And most of it is ODA-eligible.

Some react strongly against this position. They argue that climate adaptation finance follows a different rationale than ODA: financial transfers for adaptation are compensation – or restitution³⁵ – from rich and polluting countries to poor countries. The parties to the climate convention acknowledged this responsibility by calling for new and additional resources to finance climate adaptation. Thus many see developing a financial architecture for adaptation outside of this framework as violating an international legally binding agreement. An additional concern is the possible diversion of one form of finance for the other objective and the possibility of double-counting resources. Hence developing countries strongly oppose mixing climate finance with ODA.³⁶

One way to bridge these conflicting positions is to increase financial transparency. How can this be done?

First, the Commission postulates that “additional”

³⁵ For a better understanding of this wording, see B. Müller, “International Adaptation Finance: The Need for an Innovative and Strategic Approach,” *IOP Conference Series: Earth and Environmental Science* 6 (2009) 112008.

³⁶ See, for instance, South Centre, “Developed Country Climate Financing Initiatives Weaken the UNFCCC,” Analytical Note (Geneva: 2009).

OECD policy guidance on integrating adaptation to climate change into development cooperation

The OECD has recently developed policy guidance to help integrate adaptation within development processes. Its objectives are to promote understanding of the implications of climate change on development practice and the need to mainstream adaptation in development cooperation agencies and partner countries, to identify appropriate approaches for integrating climate adaptation into development policies, and to identify practical ways for donors to help developing countries reduce their vulnerability.

Integrating adaptation will require an analysis of the governance architecture and the policy cycle to identify entry points where climate change adaptation could be incorporated. At the national level, typical entry points could include various stages in the formulation of national policies, long-term and multiyear development plans, sectoral budgetary allocation, and regulatory processes. *Entry points* would be very different for on-the-ground projects, where adaptation considerations might need to be factored within specific elements of the project cycle.

Central to the OECD policy guidance is the notion of a *climate lens*, which involves examining four key factors: the extent to which a policy, plan, or project could be vulnerable to risks arising from climate variability and change; the extent to which climate change risks have already been taken into consideration; the extent to which the policy, plan, or project could inadvertently lead to increased vulnerability or miss important opportunities arising from climate change; and, for pre-existing policies and plans that are being revised, what amendments might be warranted in order to address climate risks and opportunities.

Source: OECD, *OECD Policy Guidance on Integrating Adaptation to Climate Change into Development Co-operation* (Paris: 2009).

means additional to the commitment of paying 0.7% of GNI as ODA.

Second, the Commission stresses that the concept of additivity applies to raising funds but does not prescribe how the extra funds must be spent. Hence, adaptation action should be integrated into developing countries’ plans and budgets. The rationale is that integration of finance into one planning and budgeting process will provide greater efficiency in funds spent. The Development Assistance Committee (DAC) of OECD is working on guidelines to facilitate this integration. (See Box.)

Third, the Commission emphasizes the importance of transparency in funding and therefore urges OECD-DAC

to suggest an appropriate marker for adaptation finance that donors will use when reporting their financial contributions. This will allow tracking of additional resources for adaptation.

Generating adaptation finance

Options currently being discussed under the UNFCCC for generating more funding can be clustered into three groups:³⁷

- ▶ National budgetary allocations: Proposals have been made to define donation targets that could match estimated costs. Targets would be defined as a percentage of gross domestic product (GDP) or according to a formula based on GHG emissions, population, and GDP.
- ▶ National market-based levies: Proposals include the design of levies on carbon markets (under a cap-and-trade climate policy), on aviation, or on shipping.
- ▶ International market-based levies: The Adaptation Fund created under the Kyoto Protocol and financed by a 2% levy on CDM activities is the main international instrument. Proposals to increase resources include increasing the levy on the CDM or extending the levy on the other flexibility mechanisms defined under the Kyoto Protocol (Joint Implementation and Emission Trading).

Appropriate adaptation funding mechanisms will provide large amounts of additional resources that are adequate for the tasks at hand in tranches over time that could be more predictable.³⁸ Funding mechanisms must be politically feasible and equitable in terms of all donors and recipients (and in terms of the principle of common but differentiated responsibility).³⁹

Many fund mobilization proposals are being floated; two at the forefront are:

- ▶ The Norwegian proposal that a small portion of carbon emission quotas (an assigned amount unit) be withheld from national quota allocation and auctioned by an international institution. The resulting funds could be used for adaptation. The UNFCCC reckons that auctioning 2% of these assets would raise annual funds of \$15–25 billion.
- ▶ The International Air Travel Adaptation Levy could raise \$4–10 billion annually through a flat charge on air travel or airline fuel and is similar to the International Maritime Emission Reduction Scheme for taxing bunker fuel.

The Commission acknowledges that the generation of resources through these mechanisms will take at least as much time as setting up the institutions that support them. Hence, it is important that donor countries quickly honor their ODA commitments and deliver additional public finance for adaptation until other financial instruments become functional.

In addition to setting these instruments, policies should encourage as much private sector funding as possible, such as the use of insurance, foreign direct investment, and standards.

Business has been more involved in mitigation than in adaptation, but this is changing. However, most adaptation by companies focuses on protecting their own infrastructure.

The UNFCCC has suggested that it could be helpful to develop guidelines for businesses on how to integrate climate change concerns into their routine risk assessment and strategic decision making. For example, vulnerability and adaptation assessments could be required as part of environmental impact assessments.

There are many investment opportunities in adaptation activities, specifically in the fields of water resources, agriculture, and environmental services. (See Appendixes 1, 2, and 3.) These include irrigation, fertilizer, water purification, and weather forecasting.

Insurance schemes (see Appendix 6) could not only provide relief during and after disasters but also encourage people to reduce their vulnerability.

³⁷ See M. Bapna and H. McGray, “Financing Adaptation: Opportunities for Innovation and Experimentation,” in L. Brainard, A. Jones, and N. Purvis, eds., *Climate Change and Global Poverty: A Billion Lives in the Balance?* (Washington, DC: The Brookings Institution Press, 2009).

³⁸ The recent financial crisis has taught us that market-based financing instruments are not as predictable as theory might suggest. As of February 2009, the value of certified emissions reductions suffered a drop of 20% from the previous year – meaning fewer resources for the Adaptation Fund.

³⁹ Principles and the following discussion based on Müller, op. cit. note 35.

Management of resources

As with mobilizing funding, many ideas for managing funds have been put forward. “Parties have suggested a need for adaptation funding to be structured and governed under an umbrella financing mechanism of the Convention,” wrote the UNFCCC Secretariat. “Parties have recommended that the financial architecture of a future post-2012 climate agreement facilitates collaboration and synergy between activities under the Convention and related national and international efforts in climate change adaptation. For example, the European Union has proposed a Framework for Action on Adaptation to serve as a guide for the financial mechanism operating within the context of the Convention but also to be considered by bilateral and multilateral organizations in their adaptation and resilience-building activities.”⁴⁰

However, the UNFCCC Secretariat added that while some parties have called for making use of and improving existing institutions, such as the Adaptation Fund or the GEF, in order to avoid a proliferation of institutions, others have suggested creating new institutions. Some parties, including Australia, the European Union, and New Zealand, see an opportunity for the climate change community to take on board many of the lessons learned in the development community and recognized in the Paris Declaration on Aid Effectiveness and the Accra Agenda for Action.

The Group of 77, China, and the Alliance of Small Island States have proposed a Climate Change Fund under the Convention, in accordance with its Article 11 (not the Kyoto Protocol, as at present). It would be run by a board appointed by the Conference of the Parties, with equitable and balanced representation by all parties within a transparent and efficient system of governance.

The Commission finds the proliferation of funds for adaptation problematic; it creates a coherence problem and puts pressure on the management capacity of developing countries. No further vertical funds should be created for adaptation.

The management of any mechanism for funding adaptation should learn from weaknesses of the current aid system, and its functioning should go beyond traditional donor-recipient relationships. In particular, it should be governed through a representative and equitable arrangement, with agreed roles, functions, accountability, and

replenishment mechanisms. On principles in general, the Commission believes that we must always secure transparent and results-based management in any discussion and any outcome.

Existing funding mechanisms should be effective, efficient, well coordinated, and accessible for actors at different levels. They should meet the following criteria:⁴¹

- ▶ **Transparent and balanced governance.** It is important to have a balanced representation of industrial and developing countries.
- ▶ **Demand-driven.** The mechanism for funding adaptation should be demand-driven and enable access to funding by recipient governments and nongovernmental entities at different levels. It should ensure recipients’ involvement during identification, definition, and implementation of programs, rendering it truly demand-driven. Monitoring and auditing functions should build on existing and accepted multilateral mechanisms.
- ▶ **Allocation and disbursement functions.** So as not to slide into micromanagement, the mechanism would facilitate the allocation and disbursement of funds via different agencies for adaptation activities in their various fields of expertise, such as disaster reduction through the Global Facility for Disaster Risk Reduction, relief efforts by the Central Emergency Response Fund, or specific national or regional funding hubs. Allocation and disbursement criteria need to be sufficiently flexible to allow for the wide range of adaptation actions necessary.
- ▶ **National funding hubs.** In view of the principle of subsidiarity, the management of climate adaptation finance should be devolved to the lowest level of effective governance. This means that the international level provides the general policy framework, but allocation decisions are taken at the relevant national or subnational level, within the agreed framework. Given the diversity of national circumstances and the specificity of national adaptation needs, funding hubs could take different formats. They could be national or regional, or they could

⁴⁰ UNFCCC, op. cit. note 22.

⁴¹ This builds on B. Müller and L. Gomez-Echeverri, “Reform of the UNFCCC Financing Mechanism: Architecture and Governance,” Ecpi Policy Brief (2009).

be part of the national budget or established as an off-budget trust fund. This could be relevant if the affected country does not have the fiduciary and other standards necessary for the effective and efficient management of resources.

- **Independent evaluation and oversight.** Independent oversight and evaluation are critical to increase accountability and transparency, ensure support by all parties, and maintain financial flows. The evaluation system should be fully independent from the management of the financing mechanism.

Allocation of resources

How should funds be allocated? So far, the approach by the international funds has been on a project-by-project basis. As the funding grows, micromanagement will be both undesirable and impossible, as will a focus on immediate projects rather than long-term strategies.

Before getting access to funds, each nation should understand its adaptation needs. Thus each country (industrial and developing, but here the focus is on the latter) should elaborate an integrated and strategic approach to adaptation and should mainstream adaptation in development plans, budgets, and – for poor countries – poverty reduction strategies. Focal areas will include but not be limited to water, energy, agriculture, forests, capacity development, and the rapid build-up of knowledge. This is a precursor to seeking adaptation funding.

LDCs have been developing NAPAs, a process established by the UNFCCC when it was negotiating new adaptation funds. The NAPAs provide project-level information on adaptation costs, cover urgent rather than medium- or long-term needs, and are meant to be created through a bottom-up survey process.

The Commission recognizes NAPAs as the point of departure for strategic and long-term adaptation planning for LDCs. (See Box.) The Commission urges industrial countries to quickly provide financial support for the implementation of NAPAs.

As noted in Chapter 4, Bangladesh has established a helpful model of the National Adaptation Strategy and Action Plan, which looks at medium- and long-term needs through strategic planning, intends to consider climate change risks in all development activities, and offers technical and ad-

Do NAPAs matter?

By late 2008, 38 out of 48 LDCs had concluded the NAPA process, identifying a total of 430 urgent projects. Preparing these programs cost nearly \$10 million.

Implementation of the identified projects is estimated at about \$2 billion. Yet to date only one of these “urgent” projects has been funded, partly due to the confusion over funding mechanisms, but also partly a reflection of a historical syndrome whereby poor countries are asked to (and often funded to) carry out studies to identify needs – and receive little funding to meet these needs.

Donors’ reluctance to provide funding partly rests on the fact that they feel that NAPAs are little different from development plans in general. NAPAs have also been criticized for their project approach and their failure to involve major ministries and decision makers in their countries.

Two workshops organized by the World Development Report team in 2008 found that those involved in preparing the NAPAs feel differently. They followed the guidance provided by UN agencies and identified urgent and high-priority adaptation projects to implement. They also feel that NAPAs have been instrumental in increasing awareness of climate change in LDCs and have increased capacity for planning for adaptation.

Source: Adapted from A. Agrawal, “The National Adaptation Programmes of Action,” on Development in a Changing Climate, WDR2010 blog, 2008.

ministrative ways of doing this. Other LDCs are moving toward national adaptation plans that are longer-term. With many countries, the realities of repeated disasters act as a strong incentive to such strategic planning.

In response to this effort by recipient nations, donors should coordinate and agree on the division of labor in providing support in accordance with the Paris Declaration on Aid Effectiveness, and they should also work to increase the absorptive capacities of recipient countries.

Beyond the urgency of NAPA funding, how should adaptation funding be channeled and monitored?

In view of the discussion on the human dimension of climate change and the importance of the local level, the Commission argues that adaptation funding should be ac-

cessible for national as well as local governmental and non-governmental organizations.

There is a fear that prioritization of adaptation funding is now focusing on countries that have developed administrative and management capacity rather than on those without such capacity but where resources are most needed. The Commission calls for strong support for the latter but also for building the necessary capacity to manage funds.

Allocation should take into account climate change vulnerability and in the early stage should make use of existing channels to implement high-priority items in NAPAs, as identified by countries. The aim should be to integrate adaptation activities into the normal planning and budgeting processes of countries. There will still be a need for pilot projects for trial and experimental purposes, but they can be identified within a program context.

The Commission argues that adaptation action ranges from resilience building among the most vulnerable communities in the form of assets, health, education, and so on to highly specific climate-related measures, such as protection against sea-level rise or glacial lake outburst floods.

This poses a dilemma when it comes to monitoring and assessing outcomes of resilience-building investments, whether through mechanisms under the UNFCCC or as bilateral and multilateral ODA. Investments in resilience will have benefits not only with regard to specific climate change impacts. And it will not be possible to attribute resilience only to adaptation funding when resources of different origin become blended in an integrated resource allocation process. Furthermore, resilience is an outcome that may not be easy to measure. And activities that enhance resilience may be different in different contexts.

Still, governments receiving financial resources through convention mechanisms are accountable to convention parties in ensuring that resources are used to achieve intended adaptation outcomes and impacts. And to the extent that ODA is used, donors must make sure that their contributions can be traced and results measured.

If adaptation activities are narrowly defined to satisfy administrative needs of easy tracking and monitoring, building basic resilience may become neglected and instead only specific adaptation measures supported. Practitioners must therefore look at monitoring and evaluation arrangements that use proxy indicators for desired resilience out-

comes and that give meaningful answers as to the effect of individual contributions when attribution is difficult.

The system defined to monitor adaptation investments should be used to learn about and then refine funding practices.

A two-step approach

Because the creation of new mechanisms might delay essential action, the Commission finds that a two-step approach to mobilizing “new and additional” funds for adaptation in developing countries would be appropriate. This stepwise approach aims to narrow the trust gap between industrial and developing countries. It provides immediate help to the poorest people as progress is made toward a long-term approach to adaptation funding within the context of a new agreement on climate change.

As a first step, donor countries should mobilize \$1–2 billion (although not at the expense of current ODA-financed programs) to assist the vulnerable, low-income countries (especially in Africa) and selected small island states (below a certain GDP), which are already suffering from climate impacts. The second step is an effective funding mechanism for adaptation that would be created through climate negotiations.

ODA and other public funds are unlikely to provide the full resources required to finance the adaptation efforts of all developing countries in the long term. There is a wide range of estimates of the needs. Although more work is required to refine these estimates, there are promising options proposed to raise funds. Some could bring between \$5 billion and \$15 billion in additional funds a year – which is in the lower range of estimated needs.

Governments should urgently adopt those mechanisms that provide additional and predictable resources and are politically feasible, equitable in terms of all donors and recipients, and respectful of the principle of common but differentiated responsibilities.

Bolivia



Antonio Mamani has a small farm to the west of La Paz near Lake Titicaca. Both he and the Bolivian capital are struggling to survive the apparent effects of climate change. Bolivia has the lowest GDP per capita in Latin America.

Mamani, 50, has a hectare of potatoes and garden crops, a few cows, and eight children. His potatoes were shriveling in the ground due to too little rain. Weeds were taking over, but if he weeded, all the potatoes would come up with the unwanted plants.

With some 300 potato varieties available on the Altiplano, he and his fellow farmers are seeking those that grow fast to avoid variable weather. But they cannot get access to such varieties.

Some farmers in the Altiplano plains above La Paz are better off than Mamani in that they irrigate, and irrigation

water is plentiful. That is because all the glaciers along the Cordillera Real mountain range near La Paz are melting. These had acted as both reservoirs and dams, holding fresh water in place and releasing it slowly during warmer weather, providing drinking water, irrigation water, and hydropower.

El Alto, a “dormitory” suburb of the capital that is home of over 1 million people, is the fastest-growing city in Bolivia and will face water shortages with the shrinking glaciers. But before that, disastrous meltwater floods could do great damage in the capital, which is encased in a vast canyon.

Warmer weather keeps the glaciers from replenishing, as does the fact that the rains come in the austral summer, when it is generally too warm anyway for it to turn to ice.

The rains will continue, but all of the water infrastructure – drinking, irrigation, hydro – will have to be rebuilt to be in sync with rainfall rather than glacier melt. The government envisions a great many small dams.

One of the most famous of the nearby glaciers was Chacaltaya, which encyclopedias still describe as among South America's highest glaciers (5,421 meters) – 18,000 years old and containing the world's highest ski resort served by a lift. Yet when the Commission visited Chacaltaya in March 2009, there was virtually no glacier, no snow, and only the empty shell of a ski resort, which had been functioning until 10 years ago. Piles of skis, Alpine posters, and a lift motor are all still in place.

As in so many other poor countries, it is neither the gradual climate change nor major disasters that are affecting Bolivia – yet. It is the year-to-year uncertainty and the many small, local disasters too small for the international media. Mamani had five “normal” years, then most crops were wiped out by floods last year and by a local drought in 2009.

Juan Pablo Ramos, vice minister for environment, biodiversity, and climate change, told the Commission that climate change had decreased the nation's GDP by 4% a year over the past two years due to floods, droughts, and – in Bolivia's eastern, Amazonian region – major forest fires.

Climate change is blamed for causing a major reinfestation of the *Aedes aegypti* mosquito, which carries dengue fever, and there was a dengue epidemic in the economically important lowland city of Santa Cruz in March 2009. Mosquitoes were also moving higher up the mountains than ever before, and primary cases of malaria had been found at 3,100 meters above sea level.

The government is trying to factor climate change into all development planning, including the work of the health and education ministers. Ordinary people must be taught about the new threats of dengue and malaria, but so must their doctors, who may never have seen these diseases before.

The government is systematically seeking to build adaptive capacity by, among other measures, tapping the indigenous knowledge of the nation's 36 different ethnic groups. That includes farmers like Mamani, a member of the Aymara people of the high plains.

But Mamani hopes to tap the government for new potato varieties, crop insurance, weather forecasting, early warning systems, garbage collection, and protection from the malarial mosquitoes moving into his area for the first time in living memory.

Acronyms

CCRIF	Caribbean Catastrophic Risk Insurance Facility
CDM	Clean Development Mechanism
CFA	Comprehensive Framework for Action
CIF	Climate Investment Fund
COPD	chronic obstructive pulmonary disease
CPRC	Chronic Poverty Research Centre
DAC	Development Assistance Committee
DfID	Department for International Development
DRR	disaster risk reduction
EU	European Union
FACT	Fisheries Action Coalition Team
FAO	Food and Agriculture Organization
GAR	Global Assessment Report
GDP	gross domestic product
GEF	Global Environment Facility
GHG	greenhouse gas
GNI	gross national income
HFA	Hyogo Framework for Action
IFPRI	International Food Policy Research Institute
IPCC	Intergovernmental Panel on Climate Change
ISDR	International Strategy for Disaster Reduction
IWRM	integrated water resources management
LDC	least developed country
LDCF	Least Developed Countries Fund
LPG	liquefied petroleum gas
MDG	Millennium Development Goal
NAPA	National Adaptation Program of Action
NGO	nongovernmental organization
NRECA	National Rural Electric Cooperative Association
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
PICTs	Pacific Island countries and territories
PPCR	Pilot Program for Climate Resilience
PPP	polluter pays principle
REDD	Reducing Emissions from Deforestation and Forest Degradation
SCCF	Special Climate Change Fund
SG	Secretary-General
TFD	The Forest Dialogue
UNEP	UN Environment Programme
UNFCCC	UN Framework Convention on Climate Change
WFP	World Food Programme
WHO	World Health Organization

Appendixes

The following appendixes are the result of the Commission's work with a number of different experts and organizations, and in some cases of work done by Commissioners and members of the secretariat. Their different origins have resulted in different styles and approaches. However, each was edited by the Commission, which takes sole responsibility for any errors.

1. FOOD SECURITY⁴²

Ensuring food security in the context of climate change and growing disaster risks is one of the greatest adaptation challenges. It provides a useful illustration of what the upside-down approach means for policy choices.

The issue of food security attracted considerable attention during the late 1980s due to the impacts of droughts in Africa and concerns about the nature of famine. At that time, food availability and consumption were being compromised by many of the factors that may have been early forms of climate change.

Yet at the same time, the focus was shifting away from increasing crop yields to understanding the complex nature of hunger and famines. Researchers such as Nobel laureate Amartya Sen and Alex de Waal pointed out that famine resulted not from a lack of food in a given region but rather from political decisions that led to a lack of "entitlements" by marginalized populations to gain access to the food they need.

Such entitlements could consist of income, access to social protection, or smallholder production. Sen famously showed that food exports always increase from famine-affected areas, largely because poor people cannot afford to buy the food available. So increasing global food supply is not a panacea for avoiding famines. The broader "freedom" to buy food, as influenced by local/national/international policies, markets and trends, was recognized as more important than household or even national production levels.

Partly as an outcome of these new perspectives, during the 1990s the broader concept of *livelihoods* came to largely displace earlier attention to food security. The complex struggles of poor people to survive in increasingly diverse

and complex economies were recognized as a more appropriate starting point in preventing hunger than a narrow food production perspective.

Recent events have swung the pendulum partially back toward food security and increasing yields. Skyrocketing food prices in 2008 emphasized that the bottom line in the livelihoods of the poor is being able to afford enough to eat. Climate change is seen as a major (but not the only) factor in determining whether the livelihoods of the poor are viable in terms of preventing famine.

Food security considerations have four main dimensions: food availability, access to food, stability of supply, and safe and healthy use of food.⁴³ The situation is deteriorating for the chronically poor in all four dimensions, due in part to climate change:

- **Availability** of food is decreasing due to scarcity arising from global population increase, worsening climatic conditions, changing food demands (for meat and dairy rather than grain), and shifts from food to biofuel production.
- **Poor people's access** (entitlements) to food is declining due to worsening terms of trade between wages and food costs.
- **Stability** is threatened due to increasing prevalence of disasters, uncertainty regarding food prices, and national protectionism.
- **Safe and healthy use** of food is deteriorating as the poor switch to more monotonous diets, which lack essential micronutrients, and as hazards such as flooding increase the prevalence of diarrheal diseases and malaria, which in turn affects food use.

⁴² This appendix is based on a 2009 background paper to the Commission by Ian Christoplos, researcher and consultant with Glemming Development Research, "Food Security: A Strategy Interface in the Human Dimension of Climate Change," available at www.ccdcommission.org.

⁴³ M. J. Cohen, C. Tirado, N-L. Aberman, and B. Thompson, *Impact of Climate Change and Bioenergy on Nutrition* (Washington, DC, and Rome: International Food Policy Research Institute (IFPRI) and Food and Agriculture Organization (FAO), 2008).

Markets: the livelihoods and food security link

Despite huge growth in the global economy and significant progress in poverty reduction, food security has deteriorated since 1995. Even before the recent increases in the price of food, increasing yields had not diminished high levels of hunger in much of the world.⁴⁴ This implies a failure in the local, national, and international market institutions that govern food entitlements. Food prices are volatile; 50–80% of the wages of the poor go to purchasing food, but in many cases this is not enough.⁴⁵

Furthermore, a dynamic agricultural economy is a precondition for dynamic rural development, upon which even the landless poor depend for their livelihoods and food security. Particularly in sub-Saharan Africa, climate change will increasingly limit such dynamism over the next few decades. Due to climate change, the window of opportunity to use agriculture as the driving force to overcome rural poverty, and thereby improve food security, is closing fast.⁴⁶

Higher oil prices have made fertilizer and irrigation even more expensive (though they were already unaffordable for most poor farmers).⁴⁷ The rush to take advantage of higher commodity prices has multiplied inflationary pressures on fertilizer, creating an even greater gap between those who can and cannot afford it. Meanwhile, climate change is increasing dependence on more capital-intensive production due to climate variability's effects on traditional rainfed production and other low external input farming.

The shift from food to biofuel production is also affecting food prices. Food security is thus related to energy security, but at national and local levels it has proved difficult to overcome institutional approaches that make food and energy security two entirely separate issues. The inclination to define climate change as an “environmental issue” also tends to put it in a sort of institutional ghetto removed from the institutions managing agriculture, energy, and finance.⁴⁸ Local, national, and international agencies active in environmental issues are often perceived as ignorant about the drivers behind market trends.

The extent to which increasing global food prices have affected local food prices varies enormously,⁴⁹ but one message is clear: food prices are the greatest determinant of whether people can sustain food security.

Most of the chronically poor are landless or near landless, and an increasing proportion live in cities, the latter

being a new focus of attention with regard to food security.⁵⁰

The chronically poor generally rely on day labor (often on the farms of their wealthier neighbors), petty commercial enterprises, and social protection. Food scarcity affects their food security, but mainly indirectly, in the form of higher prices and social conflict. Given that they rely on efficient markets for food and labor, infrastructural investment is one of the most important factors in ensuring food security in the face of climatic variability, since roads allow food to be transported from surplus to deficit areas and reduce the costs of travel to jobs.⁵¹

Poor people in rural areas use a variety of commercial and subsistence production activities to obtain food. Maintaining agro-biodiversity and ecosystem services are not new climate change adaptation tools. Farmers have long understood the importance of planting a range of different varieties and crops to protect themselves against climatic variability. Efforts to maintain biodiversity can prevent land degradation, since planting trees and other perennial crops are ways of dealing with erratic rainfall. Trees can prevent wind damage.

Managing ecosystems and biodiversity – for agriculture and other purposes – can create synergies between climate change adaptation and mitigation measures.

⁴⁴ J. von Braun, “High Food Prices: The What, Who and How of Proposed Policy Actions,” Policy Brief (Washington, DC: IFPRI, May 2008).

⁴⁵ Oxfam, “The Time is Now: How World Leaders Should Respond to the Food Price Crisis,” Oxfam Briefing Note (Oxford: June 2008).

⁴⁶ Chronic Poverty Research Centre (CPRC), *Chronic Poverty Report 2008–2009: Escaping Poverty Traps* (Manchester: 2008).

⁴⁷ A. Evans, *The Feeding of the Nine Billion: Global Food Security for the 21st Century*, A Chatham House Report (London: Chatham House, 2009).

⁴⁸ A. Evans, “Rising Food Prices: Implications for Development,” Chatham House Briefing Paper (London: Chatham House Food Supply Project, April 2008).

⁴⁹ Von Braun, op. cit. note 44.

⁵⁰ Evans, op. cit. note 48.

⁵¹ CPRC, op. cit. note 46.

Social protection as a solution to market failures

Safety nets, in the form of risk transfer products, social protection, or other publicly supported mechanisms, will be required if an acceptable level of food security is to be maintained. These are needed both to stabilize consumption levels and to keep small farmers from having to sell off productive assets such as plows or oxen. Such sales can turn acute food security crises into longer-term, chronic declines in food security and livelihood prospects.⁵²

For many years the solution to market failures leading to acute food insecurity was food aid. In recent years this has been questioned. Cash-based responses are a more flexible and cheaper alternative and can provide positive incentives for local food production since they put money – rather than imported food – into the pockets of the poor.⁵³ Imported food can damage markets for local food.

However, the food crisis and the rapidly diminishing value of cash for food purchases have drawn attention to food aid again. More efforts are now being made to purchase food locally, since there is less pressure to dispose of Northern grain surpluses, and the procurement efforts of an agency like the World Food Programme (WFP) may be able to contribute to smoothing and stimulating demand as well as calming markets.⁵⁴

While food for work, school lunch programs, and similar initiatives are still important in managing chronic food security needs in some countries, the range and scope of these and other social protection programs must increase as part of climate change adaptation. The need for social protection already far outstrips supply and access. Even in countries with relatively well established and organized social protection systems, such as Ethiopia and Bangladesh, only a small minority of the chronically poor has access to social protection.⁵⁵

Reaching the hungry

Food security is a topic that sits poorly within the architecture of international institutions. Coordination among the three UN food-related agencies in Rome has long been poor, with WFP integrated into the humanitarian system and the Food and Agriculture Organization and International Fund for Agricultural Development having a significant degree of independence as “specialized agencies” with a focus on

production rather than consumption. In addition, UNICEF devotes a significant proportion of its work to nutrition. The UN Development Programme and World Health Organization also have food security elements.

The World Bank is by far the largest investor in agriculture and is rapidly expanding its portfolio, but given its orientation toward economic growth, in the past it paid relatively little attention to food security. This may be changing with Bank President Robert Zoellick’s calls for a “new deal for global food policy.” Yet the *World Development Report 2008*, on agriculture and development, makes virtually no mention of links between climate change and food security.

The ambiguities in the links between agriculture and food security objectives may be changing. The UN Secretary-General’s Task Force on the Food Security Crisis and its Comprehensive Framework for Action (CFA) constitute new structures for a joined-up response within and beyond the UN system. If the task force can mobilize the intended broad buy-in from different actors, it could catalyze and coordinate actions that have been fragmented in the past. The CFA is designed to address both policy and operational factors and echoes many of the intentions embodied in the Paris Declaration on Aid Effectiveness. A strong link with the new climate change mitigation and adaptation architecture, which is emerging simultaneously, will be essential.

Coordination challenges are in many respects mirrored at national and local levels, where responsibility for nutrition is usually placed with ministries of health, food with ministries of agriculture, and social protection with ministries of social welfare. Emergency response institutions manage acute food insecurity, but other organizations deal

⁵² C. B. Barrett, B. J. Barnett, M. R. Carter, S. Chantarat, J. W. Hansen, A. G. Mude, D. E. Osgood, J. R. Skees, C. G. Turvey, and M. Neil Ward, “Poverty Traps and Climate Risk: Limitations and Opportunities of Index-Based Risk Financing,” prepared for the Policy Roundtable on Climate Risk, Poverty Traps and Index-Based Financing, International Research Institute for Climate and Society, Columbia University, 19 October 2007.

⁵³ FAO, *The State of Food and Agriculture 2006: Food Aid for Food Security?* (Rome: 2006).

⁵⁴ World Food Programme, *Purchase for Progress: Innovations to Connect Low-income African Farmers to Markets* (Rome: 2008).

⁵⁵ Von Braun, op. cit. note 44.

with chronic insecurity. Food security is too often the responsibility of everyone and no one.

Meanwhile, climate change is mainly the reserve of environmental authorities, with little contact and less influence on any of the institutions dealing with food security. Civil society organizations advocate for action among all these parties, but they can do little to bring them together. Nongovernmental organizations (NGOs) may themselves be struggling with internal conflicts between humanitarian and development divisions.

The 2008 food crisis could act as a wake-up call to bring different organizations together at international, national, and local levels to address the link between food security and climate change. Declarations have been made to this effect and financing is being sought, but as yet it is too early to determine whether a “new” food security agenda is going to be put into place among those who need to act in order to reach the food-insecure and, if so, whether this agenda will reflect the new range of risks stemming from climate change.

What is to be done?

Doing more of the same: Most of the actions required to ensure food security and to promote sustainable livelihoods in the face of climate change are not new. The main task is to better apply what is known about availability, access, supply stability, and use of food within the development agenda in a more coherent manner at local, national, and international levels. Climate change is primarily a multiplier of known risk factors that have in the past rarely received sufficient attention or funding because they have fallen into the gap between relief and development. Climate change adaptation for enhanced food security is above all a matter of addressing this gap.

Doing some things differently: The uncertainty inherent in climatic variability suggests that support to agriculture and livelihoods must provide a menu of options rather than set packages for increasing food production or livelihood support. Territorial development programs and post-disaster agricultural rehabilitation efforts have been important vehicles to promote food security, but they have often been driven by assumptions that played down the extent to which uncertainty about weather and markets is at the core of how chronically poor and vulnerable populations main-

tain their livelihoods. Risk must become a core aspect of how these programs are designed and implemented.

Being more cautious in pursuing some development objectives: The CFA presents a powerful call for renewed attention to agricultural production. However, it is important to ensure that the poor and food-insecure are the ones who benefit from increased production under climate change adaptation programs. A range of services is needed to make the link between greater food production and the entitlements upon which food security depends. The importance of entitlements is understood, but this understanding has not always been applied in the rush to increase overall food supplies. Promotion of a limited range of seed varieties may help some and may increase national food supplies, but it can also increase risk and have a negative impact on agro-biodiversity.

Doing new things: Promotion of agro-ecosystem services does not fall within the standard food production toolbox. There is therefore a need to think out of the box to find ways to recognize and build on the value of the ecosystem services that are provided in new agricultural programs. Similarly, those working with ecosystem services are not always accustomed to reflecting empirically and critically on the wider impacts of their schemes on the nutritional status of affected populations, especially those (such as the landless) who may not be direct beneficiaries of payments for these services.

Doing things that people want: Food-insecure people are the most concerned about having enough to eat. One driving factor in locally owned climate change adaptation is therefore likely to be addressing risks to food security. Awareness of this overarching concern can provide a foundation for a joint dialogue at the interface among national and international actors and local populations about priorities for climate change adaptation.

2. WATER⁵⁶

Water is not only a necessity for life but also a critical input in nearly every type of economic activity, from farming to industry to energy production.

Yet despite its importance, it is often badly managed. It is a set of contradictions in that it is scarce (in some places), cheap (for some), and wasted in large quantities. Given its very unequal distribution across the globe, water management needs to address the specific situation in each region.

The primary use of managed water is agriculture, which takes 70% of water withdrawn from rivers and groundwater and an even higher percentage of consumptive water use. Other uses include manufacturing and power-generating operations (22%) as well as direct use by households and businesses (8%).⁵⁷ Its management is buffeted by demographic changes, economic development, urbanization, changing consumption patterns and diets, changing political priorities, environmental degradation, disasters, conflict, climate change, and demand for biofuels.

Projections simulating the interplay of these stresses are alarming. The Millennium Ecosystem Assessment estimated that up to 25% of global freshwater use exceeds long-term accessible supplies and is maintained only through engineered water transfers or overabstraction of groundwater sources. However, there is little information about the effects of water scarcity on ecosystems and the services they provide. The *2006 Human Development Report* estimated that by 2025 up to 3 billion people will live in water-stressed countries. Today up to one-third of world population is subject to water scarcity, depending on the definition of water scarcity.

Climate change impacts on water resources

Climate change often exacerbates water problems; it can have a multiplier effect on other factors affecting water resources, as when climate change causes desertification in the Sahel, which causes overgrazing in some areas, which then suffer rapid runoff and flooding. The melting of glaciers in the Andes and Himalayas will first cause increased volumes in rivers and flooding and then seriously decreased flows. Climate change effects can be classified according to their impacts on the following:⁵⁸

- Rainfall, runoff, stream flow, groundwater recharge, water availability from changes in annual averages;

- Variability and extremes, floods and droughts, more intense and more frequent storms;
- Temperature – resulting in aridity, increasing evaporation and irrigation water demand, glacier and snow melt, loss of storage, change in water quality;
- Sea level changes – resulting in impacts on estuaries, deltas, and seawater intrusion into groundwater aquifers; and
- Plant water use efficiency from changes in atmospheric carbon dioxide (CO₂) concentration.

These impacts affect mainly the poor in the poorest countries and will continue to do so at an accelerating rate. Hence it is not surprising that water resources management is the second highest priority in the list of urgent and immediate needs identified by least developed countries (LDCs) in the National Communications and National Adaptation Programs of Action prepared in the context of the UN Framework Convention on Climate Change (UNFCCC).

While water management presents many technical and scientific challenges, the social and political are perhaps the most difficult. The main challenge in water resource management is allocation: who gets how much, how and when delivered, and of what quality.

Water is probably the world's most intensely contested natural resource. Even in reasonably water-abundant places, the poor tend to get less than their share – and less than they need – in terms of quantity, quality, and reliability. When resources diminish, the most powerful user groups make sure that their share is not diminished, less powerful groups may have to settle for less, and the poor get the worst deal of all.

The rural poor can be catastrophically affected by reduced availability of irrigation water (or if rainfed agriculture ceases to be viable, by the lack of an irrigation alter-

⁵⁶ We would like to thank Tighe Geoghegan and Holger Hoff for valuable inputs and comments on this section.

⁵⁷ N. Stern, *The Economics of Climate Change* (Cambridge, UK: Cambridge University Press, 2007).

⁵⁸ R. Lenton, “Integrated Water Resources Management and Climate Adaptation,” presented at International Conference on Climate Change Adaptation for Land and Water Management, Copenhagen, 12 November 2008.

native). Reductions in water quantity and quality can have enormous health impacts on the urban poor.

The issue of power has been associated with water since the beginning of civilization, which began with water management. Hegemonial relationships in transboundary rivers lead to unequal and inefficient water sharing and allocations. It will become an increasingly important issue as the effects of climate change increase.

Managing water resources in a changing climate

History can no longer guide future water management, given the severe effects projected under climate change.⁵⁹

Water management has long been addressed as a sectoral issue at the state level through the creation of national water management agencies. Over the past two decades, this approach has been replaced in theory by a more decentralized and participatory approach in which the concept of integrated water resources management (IWRM) is central. The principles of this paradigm were proposed at the 1992 International Conference on Water and the Environment in Dublin and later agreed at the United Nations Conference on Environment and Development in Rio.

The 2002 World Summit on Sustainable Development called for all countries to develop IWRM and water efficiency plans by 2005. To date only about 25% of countries have prepared plans, indicating little political buy-in.⁶⁰

Three main lessons seem to emerge from experience with water sector reforms and IWRM plans (and similar integrated approaches for watershed and coastal zone management).⁶¹

- ▶ Irrespective of climate change consideration, water sectors remain weak in most developing countries.⁶²
- ▶ Focus on national plans and targets should be shifted to focus on processes that link local practices to national and international institutions and policies, an extremely complex undertaking.
- ▶ Engineering solutions – infrastructure for water storage and transfers as well as desalinization – must be conceived to include the maintenance of ecosystem services.

An overriding problem with IWRM has been its failure to robustly incorporate equity and sustainability objectives. Because of the power issues around water and the centrality of water access to the livelihoods of the poor, this is a fundamental flaw in the concept. Privatization and the

introduction of cost-based approaches to water management have had severe impacts on the poor in many parts of the world. As scarcity drives the cost of water up, the consequences grow worse, especially when the needs of the poor (equity) and the environmental services they depend on (sustainability) are not part of the equation and begin to conflict with one another.

IWRM makes great sense as an overall ideal, but its elaboration has revealed its technocratic complexity, which has made it all but impossible to implement in most of the developing world. Even South Africa, committed to IWRM and possessing enormous water management technical capacity, has been overwhelmed by its demands. Thus, few countries have completed IWRM plans, and virtually none has implemented one to a significant degree.

A key priority for sustainable development and effective climate adaptation is increasing equity in water laws and their implementation. Unless that is in place, any efforts to improve the management of water in response to climate change are likely to simply assure that the share going to the most powerful does not change.

Agriculture and coastal zone management are particularly important in managing water resources in light of climate change. Experts concur that faulty policies lie behind most examples of water scarcity in agriculture: low priorities for water policies, inadequate and inadequately targeted investment, insufficient human capacity, ineffective institutions, and poor governance. New and innovative water management thinking would assure enough water to feed

⁵⁹ P. C. D. Milly, J. Betancourt, M. Falkenmark, R. M. Hirsch, Z. W. Kundzewicz, D. P. Lettenmaier, and R. J. Stouffer, "Stationarity Is Dead: Whither Water Management?" *Science*. vol. 319. no. 5863 (2008), pp. 573–74.

⁶⁰ T. Geoghegan, "Managing Water Resources for Pro-poor Growth in a Changing World," DfID Water Resources Policy Background Paper (London: Department for International Development, 2008).

⁶¹ Integrated watershed development and management and integrated coastal zone management are conceptually close to integrated water resources management.

⁶² For example, a severely water-scarce country such as Niger has a water law that only covers water from a drinking water perspective. See G. Björklund, "Freshwater in NAPAs and Climate Adaptation in Freshwater Planning," prepared for the UN Development Programme Water Governance Facility (Stockholm: 2009).

the world now and in the future. However, it should also be recognized that several countries, in particular those located in Central and Western Asia and North Africa, are reaching the threshold of absolute water scarcity so that domestic water resources cannot produce enough food for their populations.⁶³ Climate change in those regions will accelerate this process.

Such new thinking should take climate change into account, recognize and exploit the potential of green water (soil moisture, as opposed to blue water, which refers to lakes, rivers, and aquifers), consider rainwater as the key resource, acknowledge that irrigation will not be the magic bullet solution, and invest in the protection of ecosystem services.

Coastal zones are the areas most vulnerable to sea-level rise triggered by climate change. The direct impacts of sea-level rise include inundation, exacerbation of flooding, beach erosion, and saltwater intrusion into rivers and groundwater aquifers. Adaptive measures in coastal zones include increased height of infrastructure, land use planning, change in livelihoods, and resettlement.

Adaptive water management from local to global level

Water resources management can be seen as the thread that runs up and down different levels from the local to the global.⁶⁴ At the community level, the main issue is how to support localized water resources approaches that are adapting to climate variability and change. Concrete actions would include:⁶⁵

- ▶ Development of rainfed agricultural systems that are easy to operate and maintain locally;
- ▶ Improved management of soil moisture in rainfed areas;
- ▶ Increased investment in water harvesting, small storage, and supplementary irrigation schemes;
- ▶ Small community-based irrigation schemes;
- ▶ Development of water supply to meet the needs of multiple and diverse water users;
- ▶ Improved water access for livestock in arid and semiarid areas; and
- ▶ Other actions such as demand management, conjunctive surface and groundwater management, payments for environmental services, and so on.

At the national level, the main challenge is to provide the enabling environment that supports local actions, and in particular to:⁶⁶

- ▶ Integrate climate variability and climate change in water policy frameworks;
- ▶ Encourage an integrated approach in water management planning that cuts across land, agriculture, and mining sectors, taking into account water productivities as a basis for reallocations;
- ▶ Diversify economies and incomes;
- ▶ Support the decentralization of water resources management (or focus on catchments and river basins);
- ▶ Ensure that climate risk information is available and used to inform water planning strategies; and
- ▶ Empower communities to engage with local and national governments to help meet their water needs.

At the regional level, the focus should be on defining transboundary water management arrangements. By its nature, water resource management is located at the level of the basin or catchment area that rarely corresponds with political or administrative boundaries. About 40% of people live within the basins of international rivers, and about 90% of people live in countries that share these basins. Transboundary water management is costly and resource-intensive but can yield tremendous benefits (e.g., regional peace and stability).

At the international level, the donor community needs to reorient its financial assistance toward supporting countries in water management actions to increase water's contribution to development in the context of risk and change. Key areas include support to development of hydrological monitoring systems and public goods that are unlikely to appeal to commercial investors, such as infrastructure for flood control.⁶⁷ With changing climate, patterns of crop water productivity change, and intra- and interregional virtual water trade may become more relevant.

⁶³ J. Rockström, M. Falkenmark, L. Karlberg, H. Hoff, S. Rost, and D. Gerten, "Future Water Availability for Global Food Production: The Potential of Green Water for Increasing Resilience to Global Change," *Water Resources Research*, 45 (2009).

⁶⁴ Lenton, op. cit. note 58.

⁶⁵ M. Hedger and J. Cacouris, *Separate Streams? Adapting Water Resources Management to Climate Change* (Teddington, UK: Tearfund, 2008).

⁶⁶ Ibid.

⁶⁷ Geoghegan, op. cit. note 60.

3. NATURAL RESOURCES, FORESTS, AND TREES⁶⁸

Ecosystems provide services that support human beings and their complex civilizations, including protecting people and their systems from climate-related disasters.

Mangroves can dampen the effects of storm surges, and wetlands can decrease the impacts of floods and droughts. Coral reefs underpin local shore protection, fisheries, and tourism and are a vital source of food and income in many regions of the developing world.

Ecosystem services include water and air purification, flood and erosion control, generation of fertile soils, detoxification of wastes, regulation of climate, and pollination of crops. Thus they contribute a great deal to national economies, particularly in poor tropical countries, a contribution usually underestimated by governments.

Many of the changes people have wrought on ecosystems, such as converting forests to croplands, have brought great benefits to society – including enhancing the capacity to adapt to climate change. Yet such changes may have gone too far too fast, as today some two-thirds of all ecosystem services are degraded or unsustainable. If unchecked, this deterioration – also caused by population growth, urbanization, and the global market’s thirst for resources – will substantially diminish the benefits that future generations obtain from ecosystems.

Yet managing and restoring ecosystems and their services can be a powerful tool in both adaptation and mitigation. Some 20% of carbon emissions come from clearing or degrading forests, especially in the tropics. This is roughly as much each year as all the CO₂ emitted by all the fossil energy used in the United States. Keeping forests and other natural ecosystems intact can make the lives of the poor more resilient while decreasing the release of greenhouse gases (GHGs).

Regions facing the greatest challenges in achieving the Millennium Development Goals (MDGs) also face the greatest potential harm related to loss of ecosystem serv-

ices and impacts of climate change. More than 90% of the people exposed to disasters live in the developing world, and more than half of disaster deaths occur in countries with a low Human Development Index. Within communities at risk, some people and social groups are more vulnerable than others.

Many poor and marginalized people, such as farm laborers and fishers, depend directly on ecosystem services for their livelihoods. They may be subsistence farmers; they may fish and sell some of the catch or depend on fish for much of their protein; they may hunt and gather in forests or common lands; they may work for wealthier farmers, and thus floods or droughts would affect their incomes. These people are particularly vulnerable to changes in environmental conditions and factors that may limit their access to resources. If the vulnerability of ecosystems to the impacts of climate change is not reduced, poverty is likely to increase and the likelihood of achieving the MDGs will diminish. This raises the issue of trade-offs between the adaptive capacities of people and ecosystems. However, it is often possible to increase both at once.

Also, living off the resources provided by ecosystems takes certain skills. If climate change, sea-level rise, or ecosystem deterioration force people to migrate, they might lack the specific local knowledge needed for adaptive management of resources in their new locations. Such migrants might be driven to place further stresses on ecosystems through deforestation or overexploitation of water resources, which could result in secondary environmental crises. At the same time their movement would release stress in their region of origin, which could become a new green area (e.g., the Mossi plateau in Burkina Faso or coastal area of Gabon). So migration could reduce burdens on ecosystems in one region and yet increase them in another. (See Migration, Appendix 7.)

Vulnerability complexes

The emergence and recombination of stresses at different temporal, economic, social, and institutional scales cause vulnerability complexes that are the result of interactions between ecosystem change and human activity. Vulnerability complexes threaten human welfare and security in a range of ways; for example:

► In the Lesotho highlands, overgrazing and loss of wet-

⁶⁸ This appendix is based on a 2008 background paper to the Commission by V. Galaz, F. Moberg, T. E. Downing, F. Thomalla, and K. Warner, “Ecosystem under Pressure,” available at www.ccdcommission.org.

lands, climate change, and human displacement are interacting to create feedbacks pushing the human-environment system toward increased vulnerability.

- Loss of forest cover, construction of water systems, urbanization, and demographic change can intersect with climate change to cause diseases spread from animals to humans, such as severe acute respiratory syndrome and the West Nile virus.

Governments and international agencies need systems for monitoring changes in ecosystems – both those caused by climate change and those wrought by land use change and the withdrawal of water. Properly organized, local people can play an important role in this monitoring and reporting and can be an effective early warning system.

Such monitoring would help governments understand potential vulnerability complexes and win-win policy synergies (particularly between ecosystem management and climate adaptation and mitigation).

Especially forests

Appropriate forestry activities in the developing world could play an important role in reducing GHG emissions cost-effectively, especially over the next 10–20 years. A range of estimates indicates that the cost of forest protection in some parts of the world is far less than the cost per ton of more expensive means of reducing CO₂ emissions.

Reducing tropical deforestation would cut GHG emissions, and planting trees sequesters carbon, as growing trees soak up CO₂.

However, if policy makers wait 10–20 years before creating effective incentives for compensating those who protect tropical forests, the forests and the approximately 300 billion tons of carbon they hold will be gone.

Tropical forest nations are unlikely to agree to mandatory caps on emissions in the near future, so a policy mechanism is needed to compensate them for emissions reductions achieved. A promising approach is to give credits for verified emissions reductions against a national baseline, credits that could then be used for compliance in cap-and-trade programs in the European Union (and eventually, perhaps, the United States). This proposal, known as Reducing Emissions from Deforestation and Forest Degradation (REDD), would encourage emissions reductions in tropical forest nations while helping to manage the costs of

compliance in countries that take on economy-wide caps.

At the same time, REDD crediting would help the carbon market to create a powerful incentive for the protection of tropical forests. Over time, this approach could be supplemented with credits for rigorously verified and measured sequestration by afforestation and changes in forest management.

However, there is a danger that if forests are planted and managed only to sequester carbon, they will cease to offer to the poor – and the rest of the planet – the many ecosystem services discussed earlier, many of which are crucial in providing food and shelter.

In many parts of the world, non-timber forest products contribute to varied diets and incomes. Here again, the local, national, and international interfaces inherent in market forces are a major part of the equation.

There are increasing demands for non-timber forest products (particularly from Asian consumers, such as China), and consumers in the West are paying premium prices for “bird-friendly coffee,” timber from sustainably managed forests, and other products that contribute to biodiversity.

While promising, relatively little is known about who wins and who loses from these changing market factors. When a traditional product that has been collected for centuries in the forest becomes a commercial commodity, it can create new livelihoods and shore up existing survival strategies, but it may also reduce local access to traditional foods and may lead to overexploitation of common property resources. Payments for ecosystem services can provide important financial flows to rural areas, but they may also promote less labor-intensive farming systems and fewer jobs. Ethical climate change mitigation efforts must take into account the positive and negative externalities with respect to food and livelihood security as ecosystem services are increasingly commoditized and managed through more-formal systems.

The Forest Dialogue (TFD), a multistakeholder initiative with 250 representatives of business, trade unions, forestry companies, governments, and local and indigenous peoples, argues that treating forests only as “sticks of carbon” will fail, as such treatment does not take into account the human dimensions just discussed. However, if based on sustainable forest management principles, a REDD mecha-

nism could have mitigation, adaptation, and development benefits. Most important of all is to recognize the importance of forest governance and secure tenure.

In October 2008, TFD issued a Statement on Forests and Climate Change, aimed primarily at climate change negotiators, saying “forests have a unique ability to simultaneously reduce greenhouse gas emissions, capture carbon and lessen the vulnerability of people and ecosystems to climate change.”⁶⁹ Their declaration contained six main principles:

- ▶ Ensure that forest-related action for climate change mitigation and adaptation complement and give impetus to sustainable development;
- ▶ Tackle the main drivers of deforestation, which mostly lie outside the forest sector;
- ▶ Recognize and remove barriers to transparent, inclusive, and accountable forest governance;
- ▶ Respect and support local processes that clarify and strengthen tenure, property, and carbon rights;
- ▶ Support balanced approaches to mitigation and adaptation strategies in both forest-rich and forest-poor countries; and
- ▶ Provide substantial additional funding to build the capacity of countries, communities, and forest managers and owners to participate in forest-related climate change mitigation and adaptation initiatives.

TFD said projects and forestry management should aim to curb poverty, strengthen land rights, safeguard indigenous peoples, and improve forest management, and that these should not be a substitute for deep cuts in industrial emissions of greenhouse gases by rich nations.

⁶⁹ The Forest Dialogue, Beyond REDD: *The Role of Forests in Climate Change* (New Haven, CT: 2008).

4. HEALTH⁷⁰

Forceful health adaptation strategies are needed to protect the world's most vulnerable people from the effects of climate change.

Public health planning and decision making need to shift from focusing only on relatively short-term risks to the projected long-term impacts of climate change. It will be increasingly important to address the links between climate and health at different timescales. Already today we need to be better at dealing with climate variability and its related health effects. Improving our capacity to prepare and respond – through using, for example, early warning systems and seasonal forecasts – will put us in a better position to address the challenges that climate change will bring. Long-term climate projections will be increasingly important to ensure that we are prepared for risks changing over time when planning resource allocation, building infrastructure, and ensuring that surveillance systems are able to detect changing patterns of disease.

Health often depends on activities in other sectors. To ensure that the health effects of climate change are not overlooked, the health sector needs to be involved when activities and policies are considered in strategic planning in sectors such as water, agriculture, and disaster management. This includes ensuring the integration of health concerns into such efforts as National Adaptation Programs of Action.

Reducing vulnerabilities and increasing resilience in general will help people cope with the health effects of climate change. This includes strengthening health systems and ensuring adequate water and sanitation facilities for all.

Many needed measures are no-regret options that may contribute to better health even without the threat of climate change. Still, health budgets are finite, and there may be greater benefits to investing in prevention of other health risks. Not all health risks due to climate change will manifest everywhere, and in the interests of prioritization, it is important to conduct location-specific adaptation assessments.

Extreme events

Flooding and storms increase the risk of deaths and non-fatal injuries. Mental health effects such as depression and anxiety after extreme events have been reported and may result in prolonged impairment.⁷¹ Flooding has implica-

tions for other health effects such as the risk of diarrheal disease and outbreaks of vector-borne diseases.

To deal with the health effects of extreme events, the health sector must be engaged in disaster preparedness activities at all levels: international, regional, national, local, and community.

Better use should be made of existing early warning information on all timescales, and new, easily accessible tools must be developed. Early warning systems must be coupled with plans of action – incorporating both disaster management and health expertise. This is an area where national and local governments, humanitarian organizations, and national and regional meteorological institutes should all play a role, down to the community level. Short-term weather forecasts and seasonal forecasts should be used to plan for the coming weeks and the season ahead. This will allow for early action in terms of procurement and pre-positioning of stocks and giving health prevention messages to communities.

Early warning tools should be developed by meteorology services with different end-users in mind, including local humanitarian agencies. Such systems should ideally be developed with the users, with particular attention to developing and packaging the information in a way that truly helps the decision-making process. Specific efforts need to be made to “bridge” the knowledge gap between the weather scientists and the operational humanitarian sector.

It is also important to reduce underlying vulnerabilities through measures such as improving water and sanitation infrastructure, health systems, and building design, as discussed in more detail later in this Appendix.

Direct effects of heat exposure

Climate change is expected to increase average temperatures as well as the number and intensity of heat waves,

⁷⁰ This appendix is based on a 2009 background paper to the Commission by L. Nerlander, health specialist, Red Cross/Red Crescent Climate Centre, “Health and Climate Change,” available at www.ccd-commission.org.

⁷¹ Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2007: Impacts, Adaptation and Vulnerability* (Cambridge, UK: Cambridge University Press, 2007).

which are associated with increases in morbidity and mortality in the short term, especially in populations who are not adapted to extremely hot weather.⁷² Specific risk groups include not only those with respiratory and cardiovascular disorders and the elderly, but also physically and mentally handicapped and other groups not capable of caring for themselves during an extreme event.

The 2003 summer heat wave in Europe showed that even high-income countries are vulnerable to extreme weather events, and although many deaths occurred among the elderly and ill, some of the deaths were associated with occupational exposure to heat. In South Asia, heat waves have been associated with high mortality in rural populations as well as among the elderly and laborers who work outdoors.⁷³

Hot working environments also have non-fatal implications. Heat exposure increases the risk of accidents. Hot working environments may decrease the ability to carry out physical tasks as well as have implications for doing mental tasks. Prolonged heat exposure may lead to heat exhaustion or heatstroke. In addition to the implications for health and well-being, climate change may through exposure of workers to heat stress have important direct effects on productivity.⁷⁴

Early warning systems for heat waves are in operation in many countries, including some in Asia, and these must be coupled with concrete action plans with activities throughout many different sectors. Individuals, the health sector, and care homes as well as civil society organizations must be made aware of what actions need to be taken, so that the protection of the most vulnerable can be safeguarded. Strong networks of information distribution and outreach in communities will play a vital role in implementing such a strategy.

With regards to longer-term planning, the risk of an increased frequency and intensity of heat waves and higher average temperatures should be taken into account during the design of homes and work environments. Urban areas tend to have higher temperatures during hot weather, and this urban heat island effect should be taken into account for future city planning. The adverse effects of occupational exposure to heat waves and high average temperatures may have implications for labor regulations.

Diarrheal diseases

High temperatures, water scarcity, and water abundance resulting from flooding or heavy precipitation are related to diarrheal diseases. After a flood, rates of diarrheal disease, including cholera, may increase, especially in areas where sanitation facilities are poor. Heavy rainfall, even without flooding, may increase rates of diarrheal disease when latrines or sewage systems overflow. Increases in soil run-off may contaminate water sources. With heavy precipitation events expected to become more common, rates of diarrheal diseases may increase, and it is likely that the most vulnerable populations will suffer the greatest burden.

Water scarcity, on the other hand, is also likely to have consequences for public health. A lack of availability of water for personal hygiene and food washing may lead to an increase in diarrheal disease and other diseases associated with poor hygiene. Cholera outbreaks in the Amazon have been linked to low river flows in the dry season, which may be due to pathogen concentration in pools.⁷⁵ A high concentration of pathogens may also overload water treatment plants.⁷⁶

High temperatures are an independent risk factor for increased rates of diarrheal diseases, including salmonella and cholera.⁷⁷ Cholera outbreaks in coastal areas of Bangladesh have been linked with sea surface temperature and an abundance of plankton, which are thought to be an environmental reservoir for the cholera pathogen.⁷⁸

The better the health care sector is at dealing with current climate variability and extremes today, the better prepared it will be for increased variability brought about by climate change.

Ensuring a better baseline level of water and sanitation

⁷² R. S. Kovats and K. L. Ebi, "Heatwaves and Public Health in Europe," *European Journal of Public Health*, vol. 16 (2006), pp. 592–99.

⁷³ IPCC, op. cit. note 71.

⁷⁴ Ibid.

⁷⁵ Ibid.

⁷⁶ Ibid.

⁷⁷ Ibid.

⁷⁸ Ibid.

infrastructure and increasing awareness of the importance of hygiene are measures that are key to reducing a community's vulnerability to extreme weather events and more long-term changes in average water availability or average temperatures. The need to improve sanitation and access to safe water is a target in one of the Millennium Development Goals, and efforts to achieve this must take place at local, national, and international levels. These are clear examples of no-regrets measures.

Planning for gradual changes in average water availability requires many sectors to work together, ensuring that health concerns are represented at the table by water managers and city planners. Plans need to be developed to ensure water availability throughout the year in areas where precipitation is expected to increase in the rainy season and decrease in the dry season. Long-term adaptive investments in infrastructure, in particular the capacity of water treatment plants and water run-off structures in urban environments, are often needed to handle changes in seasonal precipitation patterns and extreme water-related events.

As regards extreme events, the use of early warning systems mentioned earlier could allow the health sectors to pre-position stocks, enabling water purification, and to provide hygiene education to communities at risk. This applies to extremes of rainfall in general as well as to flooding in particular.

Vector-borne diseases

The geographical and temporal distributions as well as the incidence of many vector-borne diseases such as malaria and dengue are sensitive to temperature and rainfall. Replication rates of the vectors or pathogens can be sensitive to temperature. Changes in precipitation patterns can alter the number of breeding sites available or the way people store water, creating breeding sites. Climate factors may not be equally important determinants of disease rates in all regions. There is still considerable uncertainty with regards to how climate change may alter the temporal and spatial patterns of many vector-borne diseases.⁷⁹

The distributions of these diseases are influenced by other factors, such as urbanization, land use, socioeconomic development, population movement, and levels of immunity within the population.⁸⁰

In some areas, drought may reduce the transmission of some mosquito-borne diseases, leading to a reduction

in the proportion of immune people and therefore a larger amount of susceptible people once the drought breaks. After a flood, rates of vector-borne diseases such as malaria can increase as mosquitoes breed in stagnant or slow-moving pools of water. The relationship is complex, however, as floods can also wash away breeding sites. Outbreaks of various rodent-borne diseases, like leptospirosis, are commonly reported in the aftermath of flooding.⁸¹

Adapting to climate change means getting better at vector control, detection, and treatment, paying special attention to the most vulnerable populations. Particular efforts need to be made to improve surveillance systems.

There are few early warning systems for vector-borne diseases in operational use. One example includes southern Africa, where malaria is sensitive to rainfall and where an early warning system puts together seasonal rainfall forecasts with data on population vulnerability and coverage of prevention activities.⁸² An early warning system needs to be coupled with an action plan to be effective.

Even if no early warning system exists, the health sector still needs to be prepared for the distribution of vector-borne diseases to change. These changes may occur in terms of intensity of transmission, geographical distribution, or temporal distribution (i.e., the time of year that transmission takes place).⁸³ In order for health authorities to be aware of these changes, it is crucial that good surveillance systems are in place. To ensure this, a good public health infrastructure with access to primary health care and adequate laboratory facilities and reporting systems are required.⁸⁴

Diagnosis and reporting should be standardized, to be able to use and compare data between different locations

⁷⁹ Ibid.

⁸⁰ Ibid.

⁸¹ Ibid.

⁸² J. DaSilva, B. Garanganga, V. Teveredzi, M. Marx, J. Mason, and J. Connor, "Improving Epidemic Malaria Planning, Preparedness and Response in Southern Africa," *Malaria Journal*, vol. 3 (2004), p. 37.

⁸³ IPCC, op. cit. note 71.

⁸⁴ K. Ebi and I. Burton, "Identifying Practical Adaptation Options: An Approach to Address Climate Change-Related Health Risks," *Environmental Science and Policy* (2008), pp. 359–69.

and over time. Existing surveillance systems should be reviewed in order to identify indicators that could be used for identifying and assessing climate-related health risks and the effectiveness of actions.⁸⁵ Vector surveillance should also be carried out.⁸⁶ Authorities and humanitarian organizations need to know when diseases re-emerge or emerge in new places and when they appear at higher rates or at different times of the year.

Plans must be in place for what to do if patterns are changing, such as alerting health services, starting vector control measures, and providing education and awareness around how to prevent exposure to the vector and when to seek care. Many humanitarian groups and NGOs rely on government data to plan their activities, which means that good surveillance systems will have benefits beyond the state sector.

The above action needs to take place at the national level but to be integrated within regional systems, as exemplified by the European Centre for Disease Control, as well as international systems such as the World Health Organization (WHO). These steps of integration will serve, among other things, to ensure that early warning is given to neighboring countries of emerging outbreaks or diseases that can be spread by international travel. Still, the building blocks of a functioning surveillance system – primary health care, laboratories, and reporting systems – need to be found at the national level. The implementation of the WHO International Health Regulations is expected to improve the situation.⁸⁷

Using the early warning systems for extreme events can also help prepare for any increased risk of vector-borne diseases after flooding or heavy rainfall. Also, here it is important that the health sector works closely with the disaster management sector in planning for and responding to disasters.

Health effects of air quality

The formation of many air pollutants is determined in part by climate factors such as temperature and humidity. In addition, the transport and dispersion of air pollutants away from source regions are strongly affected by weather factors. Climate change may therefore influence pollutant concentrations, which in turn may affect health, as air pollution is related to cardio-respiratory health.

Exposure to high levels of ground-level ozone, for example, which is formed from the exhaust of transport vehicles, can exacerbate respiratory diseases such as chronic obstructive airways disease and asthma, leading to hospital admissions or increased mortality.⁸⁸ The number of forest and bush fires may increase as certain regions face longer periods of extreme dry conditions, and such fires can contribute to air pollution. The direction and magnitude of the effects of climate change on air pollution levels are, however, highly uncertain, and there will be regional variations.⁸⁹

National energy policies and transport policies should take into account the health effects of air pollution, and early warning systems for high levels of air pollution can be implemented. Reducing emissions from transport vehicles is a win-win solution, contributing both to the improvement of health and the reduction of greenhouse gas emissions.

Meningitis

The spatial distribution, intensity of transmission, and seasonality of meningococcal meningitis in the semiarid areas of sub-Saharan Africa have been linked to climatic factors, particularly drought and hot, dry, and dusty conditions, although the causal mechanism is not clear. An early warning system is under development.

Health systems

Adequate health infrastructure with universal access to primary health is crucial to reducing a population's vulnerability to the impacts of changing patterns of diseases due to climate change.

A well-functioning health system not only provides treatment; together with laboratory services and standardized diagnosis and reporting systems, it is a crucial component of

⁸⁵ World Health Organization (WHO), "Climate Change and Health: Report by the Secretariat," EB 124/11 (Geneva: 20 November 2008).

⁸⁶ K. Ebi, "Public Health Responses to the Risks of Climate Variability and Change in the United States," *Journal of Occupational and Environmental Medicine*, vol. 51, no. 1 (2009), pp. 4–12.

⁸⁷ IPCC, op. cit. note 71.

⁸⁸ Ibid.

⁸⁹ Ibid.

a national surveillance system. Health professionals must be better trained to understand the potential impacts of climate change on health. One of the main challenges that health systems face in many developing countries today is that qualified health professionals leave to work abroad.

Improving health systems is another clear no-regrets option for adaptation, and it should include efforts to extend services to the most vulnerable populations. Climate change must also be taken into account when designing health systems, such as, for example, ensuring that health stations are built in areas that are accessible even during floods.⁹⁰

Health effects of adaptation and mitigation

Activities carried out in order to adapt to climate change can in some cases lead to additional health risks.

Examples include the construction of dams for water storage, which may provide breeding sites for disease-transmitting mosquitoes. Irrigation of land currently contributes to the spread of malaria and schistosomiasis. The practice of using wastewater for agricultural irrigation may also become increasingly common in times of water scarcity, leading to increased risks of diarrheal diseases and intestinal worms for populations living in close proximity to irrigated land.⁹¹

These risks highlight the need for an integrated risk assessment during the development of new policies at the national or local level, taking into account the possible health effects and how to reduce these risks. However, it is likely that many such practices will take place informally, so that national regulations may not be as effective.

It is very likely that efforts to reduce emissions of greenhouse gases will have substantial co-benefits for health in terms of reducing pollutants that contribute to cardio-respiratory diseases. Transport policies that promote cycling and walking could reduce both GHG emissions and air pollution and accident risk, while increasing physical activity. Better insulation of houses in cold climates is likely to reduce both energy consumption and cold-related morbidity and mortality.⁹²

There are therefore significant win-win options that can reduce greenhouse gas emissions as well as contribute to better health, and such policies should be favored when choosing strategies.⁹³

Summary

We need to do more of some things we are already doing: focusing on building resilience and strengthening public health systems at all levels while paying particular attention to the most vulnerable in society. Some things need to be done differently, such as developing more user-friendly early warning systems, using information at multiple time-scales, strengthening the health sector's involvement in planning in other sectors, and looking for win-win solutions that benefit health and reduce greenhouse gas emissions. Overall, there needs to be more focus on how to better deal with short-term climate variability, as well as planning how to ensure that systems remain resilient and adaptable to changing risks in the longer term.

Climate change does not create new health hazards. Instead it acts as a multiplier of existing health problems and changes the location of health concerns. Therefore, a cost-effective and prompt way of handling climate change adaptation is to add the climate dimension into existing international or community-based programs and actions. For more long-term adaptive strategies, cross-sectoral approaches are needed.

Finally, further research is needed on the links between climate and health and on projected effects, as well as on the most effective adaptation measures.

⁹⁰ R. Few, M. Ahern, F. Matthies, and S. Kovats, *Floods, Health and Climate Change: A Strategic Review, Working Paper 63* (Norwich, UK: Tyndall Centre of Climate Change Research. 2004).

⁹¹ WHO, "WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater. Wastewater Use in Agriculture. II" (Geneva: 2006).

⁹² C. Campbell-Lendrum and C. Corvalán, "Climate Change and Developing Country Cities: Implications for Environmental Health and Equity," *Journal of Urban Health* vol. 84, 3 Suppl (2007), pp. i109–17.

⁹³ IPCC, op. cit. note 71.

5. ENERGY ACCESS⁹⁴

The transition to a climate-constrained world is happening at a time when a large proportion of the world's population lacks reliable access to modern energy services.

Consequently, the energy transition and climate vulnerability are very closely connected, as the world's poor struggle over a dwindling resource base that is being further degraded by the impacts of climate change. There is a need both to improve energy access and to link this more closely to the climate agenda, the revitalization of rural areas, and the better management of the urban development that has dominated the changing energy landscape of recent decades.

Energy services – the benefits or end-uses of energy (as opposed to energy consumption per se) – have a direct impact on productivity, health, education, and communication. An estimated 2 billion people lack access to modern energy services.⁹⁵ They rely on traditional biomass sources such as wood, agricultural residues, and animal dung to meet their basic energy needs. The use of these traditional fuels in open fires or simple stoves is not only less efficient and more polluting than modern energy options, it is unreliable, not easily controllable, and subject to various supply constraints.

The poor in developing countries therefore pay much more than their counterparts in the rest of the world in terms of health impacts, collection time, and energy quality for the equivalent level of energy services.

Energy is the lifeblood of the modern economy, and no country in modern times has substantially reduced poverty without a massive increase in its use of commercial energy and/or a shift to more-efficient energy sources that provide better energy services. The link extends to the capacity to adapt to climate change, since those countries and regions with lower poverty, greater levels of human development, and greater energy access will have more options and greater adaptive capacity.

However, there is significant variation in energy consumption for different development levels once countries have moved up the energy ladder to modern energy forms instead of traditional biomass. Consequently, although developing countries fall along the sharply upward rising part of the curve, industrial countries are spread all along the flatter part of the curve. In the later stages of a nation's

economic development, reductions in energy demand and a subsequent decoupling between energy consumption and economic growth are achievable. Only a few highly industrialized (and smaller) countries such as Denmark have demonstrated clear evidence of decoupling, achieved through progressive policies to reduce energy consumption that generally include significant energy taxes.⁹⁶

Even in such cases, the issue of service versus manufacturing complicates the question of true decoupling, since the energy consumption of imported goods is not included. There is no evidence that even moderately industrialized countries, much less LDCs, can achieve such decoupling. Given the lack of evidence, it is unrealistic and unfair to expect LDCs to achieve any kind of decoupling of energy from economic growth and development. Aggressive energy taxation and similar policies are thus rarely appropriate in the LDCs due to the importance of energy in supporting economic development and the already disproportionate share of income that the poor must devote to energy costs.

The energy access problem is particularly acute in sub-Saharan Africa and South Asia, where rural populations often rely exclusively on traditional biomass for their energy needs. Four out of five people without electricity live in rural areas of the developing world, mainly in South Asia and sub-Saharan Africa.⁹⁷ Other regions have somewhat lower numbers of affected people and/or face different but no less important challenges, such as the difficulty of providing energy access within the complex island geography of Indonesia or to the vast reaches of the Amazon rain forest in South America.

⁹⁴ This appendix is based on a 2009 background paper to the Commission by F. Johnson and F. Lambe, "Energy Access, Climate and Development," available at www.ccdcommission.org.

⁹⁵ United Nations Development Programme, *World Energy Assessment* (New York: 2004).

⁹⁶ EUROSTAT, *Panorama of Energy: Energy Statistics to Support EU Policies and Solutions* (Brussels: European Commission, 2008).

⁹⁷ International Energy Agency, *World Energy Outlook* (Paris: 2002) p. 365.

Energy services, health, and development in LDCs

In poor households in LDCs, cooking often accounts for 90% or more of total energy demand. When burned indoors on open fires or inefficient stoves, fuels such as wood, dung, or crop residues produce levels of indoor air pollution many times higher than international ambient air quality standards allow for, exposing poor women and children to a major public health hazard. There is now consistent evidence that biomass smoke exposure increases the risk of childhood acute respiratory infections, particularly pneumonia.⁹⁸

Women exposed to indoor smoke are three times more likely to suffer from chronic obstructive pulmonary disease (COPD) than women who cook with electricity or gas.⁹⁹ Indoor air smoke was estimated to be responsible for 1.6 million deaths and 2.7% of the global burden of disease in 2000.¹⁰⁰ Without systematic changes, household biomass use will result in an estimated 8.1 million deaths from lower respiratory infection among young children and 1.7 million COPD deaths among adult women in sub-Saharan Africa alone between 2000 and 2030.¹⁰¹

The task of gathering fuelwood also falls mainly on women and children. The opportunity costs of spending several hours per day gathering fuelwood have significant socioeconomic impacts. Using that time to engage in income-generating and educational activities could contribute to the stability and advancement of households and communities. There are also personal safety risks for women and girls who must travel far by foot alone or in small groups. Where fuel is purchased, spending money on large quantities of inefficient fuels severely constrains household budgets.

Access to energy for lighting is linked to economic and social development, as it enables home study in the evenings, increases security, enables the use of information and communications technologies, and allows commercial activity to occur after dark. Without modern lighting, many community centers cannot be used in the evening, hindering the social development of villages and communities. The tangible benefits of lighting have been documented in many case studies; an analysis in Bangladesh found that over 90% of recently electrified households reported improvements in children's study time, household security, and overall well-being.¹⁰²

The productive use of energy is essential for poverty reduction. At the local level, access to energy encourages economic development by improving productivity and enabling income generation through, for example, improved agricultural development (irrigation, crop processing, and storage) and non-farm commercial activities such as micro-enterprise development. By providing additional employment opportunities, energy services also enable farmers to diversify their income sources and thus alleviate the inherent risks of dependence on farming. Access to mechanical power can improve the quality of life of women and girls by reducing the drudgery of food grinding and threshing, thereby freeing young girls to pursue more regular schooling.

In areas with sensitive ecological systems or degraded lands, reliance on traditional biomass fuels creates additional pressures on the local resource base. There is a growing body of literature focusing on the potential public health and resource co-benefits that can be achieved by incorporating climate measures as upstream elements of energy systems and adaptive response mechanisms.¹⁰³

The Japanese Development Agency has formulated a comprehensive framework for exploiting co-benefits by carefully assessing different elements of projects and programs so as to combine climate initiatives with environmental management or pollution reduction elements that

⁹⁸ N. Bruce, R. Perez, and R. Padilla, *The Health Effects of Indoor Air Pollution Exposure in Developing Countries* (Geneva: WHO, 2002).

⁹⁹ WHO, *Fuel for Life: Household Energy and Health* (Geneva: 2006).

¹⁰⁰ WHO, *Indoor Air Pollution: National Burden of Disease Estimates* (Geneva: 2007).

¹⁰¹ R. Bailis, M. Ezzatti, and D. Kammen, "Health and Greenhouse Gas Impacts of Biomass and Fossil Fuel Energy Futures in Africa," *Boiling Point*, no. 54 (2007), pp. 3–8.

¹⁰² National Rural Electric Cooperative Association (NRECA) International Ltd., *Economic and Social Impact Evaluation Study of the Rural Electrification Program in Bangladesh*, prepared by Human Development Research Centre, for NRECA, Partners with the Rural Electrification Board of Bangladesh and USAID for the Rural Power for Poverty Reduction (RPPR) Program, 2002.

¹⁰³ J. Patz, D. Campbell-Lendrum, H. Gibbs, and R. Woodruff, "Health Impact Assessment of Global Climate Change: Expanding on Comparative Risk Assessment Approaches for Policy Making," *Annual Review of Public Health*, vol. 29 (2008), pp. 27–39.

bring clear local and regional benefits.¹⁰⁴ For developing countries, depending on traditional solid fuels for cooking and heating, there appears to be a high degree of co-benefit effectiveness for targeted interventions in the household energy sector.

Climate dimensions and policy synergies

Until recently, there has been a tendency to separate energy access from climate change issues, both mitigation and adaptation. In terms of scientific research about the causes of climate change, traditional biomass was not considered an important contributor. In the domain of specific energy-climate projects, even where some mitigation benefits were identified, the costs of energy access interventions were generally considered high, and the likelihood of success or sustainability were often thought to be low. In the international policy and donor communities, energy access and climate change have traditionally involved different actors, often at different levels.

This artificial separation is changing in a number of ways. First, data and analysis on traditional energy use and its impacts have been improving. With traditional biomass estimated to account for almost 10% of global energy use, the impacts are more significant and widespread than realized. Second, the complex phenomenon of black carbon has been analyzed in more detail, indicating that incomplete combustion of traditional biomass and the carbonaceous aerosols it produces may be posing a much greater relative set of GHG impacts than previously estimated.¹⁰⁵

Third, energy access and adaptation at the policy level appear to be much more amenable to exploiting synergies than mitigation and adaptation, which tend to involve very different institutions and actors. The increasing body of policy analysis and the greater political emphasis on adaptation has brought to the fore local and subnational institutions that could help facilitate synergies in designing policies and programs to jointly improve energy access and adaptive capacity. Due to the fact that both adaptation and energy access have strong local and subregional characteristics, there are many synergies yet to be exploited. Regions that could face more flooding or lower rainfall could build improved energy access policies into the same institutions that improve preparations for changing climatic conditions and could use these policies to strengthen the region's overall energy security.

In this sense, the energy access issue naturally extends beyond household energy use to the issue of energy for transport, since improved mobility contributes to adaptive capacity. The availability of locally produced biofuels such as ethanol could create a decentralized source of energy for household and transportation uses, thereby contributing to local energy security as well as to mitigation and adaptation.

In response to the dual problems of energy poverty and land degradation, the government of Senegal launched a national “butanization” program in 1974 to substitute liquefied petroleum gas (LPG) for biomass cooking fuels, particularly charcoal. Through a series of energy sector reforms and fuel subsidies, LPG consumption was raised by an annual rate of 12%.¹⁰⁶ Moreover, by 2002, it was estimated that replacement with LPG meant the avoidance of production of 337,500 metric tons of charcoal and 40,500 hectares of deforestation.¹⁰⁷

Less reliance on traditional biomass can reduce pressures on the already degraded resource base and improve the adaptive capacity of resource-dependent communities. Switching from a traditional biomass fuel source (i.e., charcoal) to a fossil fuel source (i.e., LPG) can often lead to net GHG reductions, a counterintuitive result. The reduction is due in part to the land use emissions from clearing forests to produce charcoal (assuming that the land is used for non-forestry purposes after being cleared). The reductions in GHG emissions are even deeper, however, due to the contribution of soot to the formation of atmospheric aerosols and subsequently GHGs.¹⁰⁸

¹⁰⁴ Overseas Environmental Cooperation Center, “Co-benefits Approach to Climate Change and CDM in Developing Countries – Towards the Achievement of Co-benefits in Environmental Pollution Control and Climate Change Mitigation” (Tokyo: 2008).

¹⁰⁵ Ö. Gustafsson, M. Kruså, Z. Zencak, R. J. Sheesley, L. Granat, E. Engström, P. S. Praveen, P. S. P., Rao, C. Leck, and H. Rodhe, “Brown Clouds over South Asia: Biomass or Fossil Fuel Combustion?” *Science*, vol. 323 (2009), pp. 495–98.

¹⁰⁶ Y. Sokona, J. Thomas, and O. Toure, “Development and Climate, Country Study: Senegal” *Environnement et Développement du Tiers Monde* (ENDA-TM, 2003), p. 36.

¹⁰⁷ United Nations Development Programme, *Energizing the Millennium Developing Goals: A Guide to Energy's Role in Reducing Poverty* (New York: 2005).

¹⁰⁸ Gustafsson et al., op. cit. note 105.

Links to climate and development goals

The head of the Intergovernmental Panel on Climate Change (IPCC), Rajendra Pachauri, has lamented the “glaring neglect” in improving energy access for the world’s poor in recent years, noting that “today energy remains the missing MDG.”¹⁰⁹ Such comments are a reminder of the critical need for improving energy access even as energy consumption itself is under increased scrutiny for climate reasons; there is a danger that goals related to poverty reduction, health, and education will not be achieved without significant progress in scaling up energy access in LDCs.

In the absence of specific targets for access to energy services stipulated as part of the Millennium Declaration, a few initiatives have been taken to set targets for what type of energy services are needed to support the achievement of the Millennium Development Goals. One such initiative is the MDG Energy Vision, developed and used as part of the Millennium Development Project.¹¹⁰

The increase in public attention to climate change during the past decade has thus sometimes obscured the need to increase energy consumption in developing countries in order to raise their living standards and thereby improve their adaptive capacity. This tendency has been countered by the recognition that developing countries and especially LDCs have the right to use their emission space in any future climate agreement for significant increases in energy consumption while industrial countries rapidly decrease their emissions.¹¹¹ There is also an increasing body of analyses aimed at identifying synergies between climate and development goals but based on a “development first” approach for the LDCs.¹¹²

Since most LDCs have resource-dependent economies, and given the need to leverage different sources of development assistance and support, there is an urgent need to link energy-development strategies to efforts to improve adaptive capacity. The impacts of climate change will pose particularly difficult challenges for households and communities whose energy supplies are obtained directly from the ecosystem. As both agricultural and forest systems face greater pressures in a changing climate, local communities will need other energy options and alternative livelihoods. Supporting development strategies that diversify energy sources is therefore an important part of improving adaptive capacity in many regions.

In recent years, many developing countries in tropical and subtropical regions have sought to take advantage of a comparative advantage as modern bioenergy producers. Bioenergy is special among all classes of energy resources in representing synergies as well as conflicts with respect to both mitigation and adaptation goals.

On the one hand, modern bioenergy offers excellent income opportunities and more sustainable development paths by replacing inefficient traditional biomass or nonrenewable petroleum fuels. Some bioenergy crops can even be grown on degraded lands unsuitable for food production and can improve soil quality and return the lands to productive capacity, thereby contributing to both mitigation and adaptation efforts. However, when bioenergy crops encroach on valuable ecosystems or food crops, or when land clearing or transformation is used to obtain quick but unsustainable profits, there can be negative consequences for both mitigation and adaptive capacity.

LDCs should incorporate domestic uses into their bioenergy strategies so as to avoid the boom-and-bust cycle associated with high dependence on cash crops for export. Nevertheless, those LDCs wishing to significantly expand bioenergy and biofuels can greatly benefit from export markets due to the access to infrastructure and the economies-of-scale that such markets afford them, in comparison to a generally small domestic market.¹¹³

The development-oriented impulse to focus only on domestic markets for biofuels and ignore the export market

¹⁰⁹ Reuters, “Energy Missing Millennium Goal-U.N. Climate Chief,” 21 January.

¹¹⁰ V. Modi, S. McDade, D. Lallement, and J. Saghir, *Energy and the Millennium Development Goals*, Energy Sector Management Assistance Programme, United Nations Development Programme, UN Millennium Project, and World Bank (New York: 2006).

¹¹¹ P. Bauer, T. Athanasiou, and S. Kartha, *The Right to Development in a Climate Constrained World: The Greenhouse Development Rights Framework*, Heinrich Böll Stiftung Publication Series on Ecology, Volume 1 (2008).

¹¹² O. Davidson, K. Halsnæs, S. Huq, M. Kok, B. Metz, Y. Sokona, and J. Verhagen, “The Development and Climate Nexus: The Case of Sub-Saharan Africa,” *Climate Policy*, vol. 3 (2003), pp. 97–113.

¹¹³ F. Johnson and E. Matsika, 2006, “Bioenergy Trade and Regional Development: The Case of Bio-ethanol in Southern Africa,” *Energy for Sustainable Development*, vol. X no. 1 (March 2006).

can deny the local industry the chance to get off the ground, due to the high costs of small-scale operations in remote areas. Some reasonable balance is needed in policy formulation between domestic energy security goals and market access, investment, and infrastructure from international trade that may be needed to improve competitiveness. In any case, detailed analysis is needed to sort out the climate and development implications of bioenergy expansion; there is no “one-size-fits-all” prescription for bioenergy.

Implementation Strategies

Responses to the climate-development challenge must address the root causes of low development levels and at the same time complement development assistance with new and improved measures for adapting to economic and environmental disruptions. Underdevelopment fundamentally constrains adaptive capacity, especially because of a lack of resources to hedge against extreme but expected events.¹¹⁴

A number of decentralized renewable energy technologies, sometimes in combination with each other, can support energy access as well as mitigation and adaptation goals. In addition to improving basic household energy supplies, these technologies contribute to key village-level services such as water pumping for irrigation and refrigeration for vaccines. An example in Bangladesh illustrates how some village-level projects address energy access, mitigation, and adaptation all at the same time: the installation of biogas at poultry farms reduced environmental hazards and turned them into an energy source, thereby also improving the economic feasibility of the farms in the longer term and contributing to cleaner water supply as well as reducing GHG emissions from methane.¹¹⁵

Development assistance can only support joint climate-development strategies for LDCs to the extent that it incorporates the energy access challenge. The institutional framework and the financing opportunities available through development assistance will need to be upgraded and increased. The upgrading in content needs to incorporate more evidence-based program formulation, such as analyzing in more detail some of the product-specific attributes associated with the household energy problem at a local scale rather than generalizing across socioeconomic variables.¹¹⁶ Scaling up could be accomplished regionally in some cases, such as the current policy process under way in

the East African Community, in which the energy access goals are incorporated into regional planning processes.

One clear lesson from the past few decades of energy access programs is that electricity is not enough; other alternatives will be needed for many decades to come. Despite considerable efforts to improve energy services to rural populations over the past 30–40 years, about 2 billion people remain unserved. Poor, rural populations in developing countries are often beyond the reach of the national grid and do not benefit from large, centralized energy systems. There is a strong case for alternative, decentralized energy delivery systems and technologies, as well as new policy frameworks to provide essential energy services to such dispersed populations. These will need to include both renewable options such as solar energy systems and non-renewable options such as LPG.

Regardless of the delivery method, reaching the energy targets needed for achieving the MDGs will require a substantial scaling up of energy services to the poorest people of the world. However, the absolute amount of energy is not that large. The total amount of energy required has been estimated at 900 TWh annually, comparable to the amount of energy Sweden consumes in 18 months.¹¹⁷

The total annual financing needed to achieve the MDG Energy Vision has been estimated at \$45 billion. The challenge will nevertheless be to package energy access programs in ways that complement – and in some cases synergize with – climate financing for both mitigation and adaptation.

¹¹⁴ R.J.T. Klein, S. Huq, F. Denton, T.E. Downing, R.G. Richels, J.B. Robinson, and F.L. Toth, “Inter-relationships between Adaptation and Mitigation.” In *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge, U.K.: Cambridge University Press, 2007), pp. 745–77.

¹¹⁵ H.D. Venema and M. Cisse, *Seeing the Light: Adapting to Climate Change with Decentralized Renewable Energy in Developing Countries* (Winnipeg, Canada: International Institute for Sustainable Development, 2004).

¹¹⁶ T. Takama, S. Tsephel, F. Zuzarte, M. Debebe, F. Lambe, and F.X. Johnson, “Socio-economic and Product Specific Factors to Promote a Clean Cooking Bio-ethanol Stove in Ethiopia: A Discrete Choice Model to Understand the Decision Making Factors of Stove Preferences,” presented at International Choice Modeling Conference, April 2009.

¹¹⁷ Stockholm Environment Institute, *Sustainable Pathways to Attaining the Millennium Development Goals: Assessing the Key Role of Water, Energy and Sanitation* (Stockholm: 2005).

6. RISK AND INSURANCE¹¹⁸

Climate change is greatly increasing risks, and this trend will accelerate. Just as people adapt largely by their own devices, so too do they manage risks. Many of these approaches are described in Chapter 3: families and villages share resources, family members travel to find work, and so on. Just as there is a continuum from the local to the international in other forms of adaptation, so too is there a continuum in risk management.

Insurance coverage in developing countries is much lower than in industrial ones, and because weather-related risks are rarely covered by traditional insurance solutions, there is often a wide gap between insured losses and economic losses when natural disasters strike. Non-life insurance, in terms of premiums as a percentage of gross national product, amounts to roughly 4% in industrial markets but less than 2% in developing markets.

The complexity of risk and all the ways it can be pooled, shared, transferred, and financed cannot be adequately described here. The main messages are that much more research and experimentation must be done on novel ways of management. And the limits of such approaches, which are serious, must also be mapped.

The Bali Action Plan that emerged from the thirteenth Conference of the Parties to the climate convention at the end of 2007 called for “enhanced action on adaptation, including, inter alia, consideration of risk management and risk reduction strategies, including risk sharing and transfer mechanisms such as insurance.”

A great deal is happening in this field. In the public sector, the World Bank Group is developing a global facility for hedging developing-country risk. In the private sector, the reinsurance company Swiss Re (represented with a member of this Commission) has established a Climate Adaptation Development Programme to build a market for innovative financial risk transfer instruments in low-income areas.

Munich Re initiated the Munich Climate Insurance Initiative in April 2005 to provide a forum and gathering place for insurance-related expertise applied to climate change issues. It includes insurers, climate change and adaptation experts, NGOs, and policy researchers intent on finding solutions to the risks posed by climate change.

Most of the novel schemes being experimented with now

are based on indexes that automatically trigger payouts. These indexes can cover anything from rainfall (too much or too little), soil moisture, hail, wind, temperature, and so on. Such an approach eliminates the “old-fashioned” need for expensive damage and/or loss assessments. It also decreases moral hazards, in that farmers who manage reasonable harvests are still paid. Paying based on an index can mean very speedy payouts, but these do not necessarily cover losses (as explained below).

These schemes can work at several levels: the macro (in which a national government and perhaps large NGOs are the main players), the meso (involving corporations and small and medium-size enterprises), and the micro (involving farmers’ associations, banks, and insurers).

These efforts are receiving so much attention for a number of reasons. While more than half of the planet’s population now lives in cities, most of the people in the developing-world tropics are rural and depend on farming for their livelihoods. Many rely on loans to buy seeds and agro-chemical products, so crop failures send them into deeper, more long-lasting debt. Most tropical developing nations rely on agriculture for much of their gross domestic product, so weather disasters can affect many companies and reverberate through the economy.

Also, relieving disasters after the fact has rarely proved efficient or timely, and farm families may have to sell off productive equipment trying to survive before help reaches them. Protecting rural incomes can decrease poverty.

Such programs usually involve local-international connections. In one macro-level example, the US Agency for International Development pays for insurance for the World Food Programme in Ethiopia, the program responsible for distributing food should harvests fail. The WFP receives the insurance money when rainfall drops below a certain minimum over time (rainfall index). The ultimate beneficiaries are the small farmers who receive food from WFP when harvests fail.

When governments secure a weather derivative product,

¹¹⁸ This appendix is based on material and guidance provided by Margaret Arnold of the ProVention Consortium and Ivo Menzinger of SwissRe.

if there is significant drought in the country the government will get a payout. The payout level is determined by the size of the premium paid and the severity of the drought. This payout may be used to help purchase grain to cushion supply shortfalls or to distribute grain from strategic grain stocks. Unlike traditional indemnity insurance policies transacted through an insurance company with a payout when a problem is judged to have occurred, weather derivatives are financial contracts based on an agreed weather index.

A program in Malawi works at the micro level in that it involves microcredit, with small farmers being the direct beneficiaries. Peanut farmers receive small loans from Opportunity International Bank. They transfer some of the loan to the Farmers Association to get seeds and some to insurance companies to get weather insurance. The Farmers Association guarantees to buy harvests at fixed prices, and loans can be paid back either through income from harvest or insurance. Here again, a rainfall index provides the payment trigger.

Meso-level schemes usually involve companies such as agrochemical providers that are exposed to risk of defaulting farmers and food-processing companies dependent on a certain group of growers; if they fail, the company must buy inputs on the international market.

For example, East African Malt has contract farming arrangements with barley growers. In the first ever indemnity-based crop insurance scheme in Kenya, underwritten by four local insurance companies, East Africa Malt has indemnity cover for production costs due to losses through hail, drought, excessive rainfall, pests and disease, or excessive heat.

The ingenuity of the deals and combinations seems limitless. Fundación PROFIN in Bolivia developed a scheme that combines incentives for risk reduction and a flexible, people-centered index mechanism. (See Chapter 3.) The trigger is based on the production levels of reference farming plots in areas that are geographically similar in terms of temperature, precipitation, humidity, and type of soil. This scheme also provides an example of how to deal with one of the biggest constraints of other payout programs: poor availability of data from local or regional weather stations.

In another Malawi case, corn (maize) production is estimated based on rainfall data. If the rainfall level is above

a given threshold, there will be no payout. Payout grows as the severity of the drought increases and will not depend on confirmation that the country or any particular farmer has suffered a loss.

The World Bank treasury acts as intermediary on behalf of the government of Malawi to facilitate the country's access to the international weather derivatives market and to reduce transaction costs. The UK Department for International Development (DfID) paid the premium of £300,000 in September 2008. This is a small contract designed to test the market, with an expected maximum payout of about £3 million if a drought occurs.

In the event of a drought, the payout will be used to place a call-option for corn in the South African Futures Exchange. This would guarantee Malawi's access to up to 200,000 tons of corn imports at a price agreed six months before the corn is actually needed in the country.

DfID support is provided as part of a four-year £20-million program designed to increase agricultural production and develop the corn, fertilizer, and seed markets. The World Bank's Commodity Risk Management Group provides the technical advice needed on weather and corn price derivatives.

DfID has also funded the upgrade of the Malawi Met Office's telecommunications infrastructure at a cost of £100,000. This upgrade will make it possible for 23 weather stations in Malawi to report live data through an automated process, a prerequisite not only for this national-level drought insurance but also for expanding the farmer-level insurance pilots that the World Bank is funding.

The Caribbean Catastrophic Risk Insurance Facility (CCRIF) is innovative in that it takes a regional approach for index insurance (based on loss modeling) to allow fast payouts to governments, letting them cover the immediate liquidity crunch that follows a severe disaster. This was demonstrated in payouts to Dominica and St. Lucia within a month after being struck by the November 2007 earthquake.

DfID's support for CCRIF acts on the Stern Review notion that protection against increasingly severe climatic events requires more-effective interaction with financial markets. In June 2008, all 16 participating countries in the Caribbean renewed their policies and commitments.

These approaches are promising but need a great deal

more work; policy makers need more experience with them, particularly during and after major payouts, to understand their limitations.

Index-based solutions are not suited to cover the entire range of risks faced by developing countries, and they do not eliminate the need for good policies and practices, such as land zoning, building codes, agronomic practice, and trade policy.

They do not pay out for any factor that is not reflected in the index but causes economic losses anyway, an issue known as “basis risk.” An index therefore needs to be designed to correlate as closely as possible with the economic losses that should be covered.

Participating governments must have in place the necessary regulatory structures and systems (financial and legal), as well as the human capacity, to make sure that the schemes work effectively.

A more profound concern was raised in a World Bank Policy Research Working Paper, which pointed out that insurance modeling tends to be backward-looking, basing present approaches on historical trends, while climate modeling looks ahead, trying to identify future trends. The authors could find no evidence of the two approaches being put together – for instance, basing index-based drought insurance on climate change models.¹¹⁹

When they did this for the Malawi peanut program, they found that “climate change induced stress will likely decrease the robustness of the Malawian insurance pool in the 10-year period between 2008–2017.” Unless premiums were raised, more backup capital would be needed.

Such schemes also need to be designed to better serve the poor. Global and national schemes that provide payouts to national governments are important ways to help relieve the fiscal burden placed on governments, but the same challenges of targeting the poorest (elite capture, timeliness, and so on) remain if the payments are not going directly to the affected communities. Where schemes aim to provide direct benefits to affected communities, they should:

- ▶ Be designed to be affordable to the poor (and the poorest of the poor),
- ▶ Provide a quick (and adequate) payout to keep the would-be recipients from selling off assets, and
- ▶ Provide some incentive for investment in risk reduction.

Experience with micro-insurance is limited, and such approaches have yet to demonstrate their long-term viability

or their ability to benefit wide segments of the poor.

Distribution of micro-insurance solutions is often very difficult and expensive, as standard insurance distribution channels cannot be used to access micro retail clients in developing countries. Existing schemes considered low-cost are often unaffordable to very low-income households that must consider trade-offs between insurance and more immediate needs. Families with no culture of insurance are especially likely to opt for the more immediate.

Governments can help by using regulatory frameworks to take a pro-poor approach. India passed regulations in 2002 that require insurance companies to increase their coverage in low-income communities. As a result, India has the greatest number of micro-insurance schemes for disaster risk.

¹¹⁹ S. Hochrainer et al., *Investigating the Impact of Climate Change on the Robustness of Index-Based Microinsurance in Malawi*, World Bank Policy Research Working Paper (Washington, DC: World Bank, 2008).

7. MIGRATION¹²⁰

There has been much concern in the media and even in the academic literature that climate change will spark mass migration, particularly international movement from developing to industrial nations.

The authors of such reports tend to ignore the fact that families affected by climate change have many other coping and adapting strategies besides migration and that migration is a reasonable and usually orderly form of adaptation that can improve the sustainable development of both sending and receiving areas. Historically, large migrations have helped to develop many parts of the globe, a process that continues today.

The debate over climate change and its effects on migration is part of a larger debate concerning the effects of environmental change on migration. The terms of debate are imprecise, and the concept of “environmental migration” covers a multitude of activities. It can be a response to various kinds of sudden-onset disasters or slow-onset changes (usually a combination of both), and it may comprise movements over short distances or long distances and from short time periods to “permanent” relocations.

Judging such migration depends on your point of view. Migration from developing to developing countries can increase economic growth in both, but it may be hard on women left behind. Migration from countryside to cities has helped develop most developing countries, but it may overwhelm these cities, while perhaps benefiting rural families through money sent home.

There is a continuum of migration decisions, with completely voluntary movements – seeking better jobs – at one end and completely forced movements – perhaps fleeing famine – at the other. Very few decisions are ever entirely forced or voluntary. Decisions to move in response to extreme environmental changes, such as food crises arising from droughts and floods or large declines in natural capital arising from land degradation or deforestation, are more forced than voluntary. Decisions to move in response to incremental environmental changes, such as declining mean precipitation or degradation of coral reefs, may be more voluntary.

In policy terms, the issue is best framed as maintaining people’s right to stay as well as their right to leave, so that people are free to choose the response that best suits their needs and values.

There is debate about weighing the various factors in migration decisions. For example, farmers in Australia suffering droughts akin to those in Ethiopia tend not to suffer hunger and migrate in the same numbers as do those in northern Ethiopia. Thus it could be argued that migrations triggered by drought in Ethiopia are driven more by poverty and institutional failures than by climatic variability; climate is a trigger, but poverty the cause.

The social processes that create poverty and marginality are more important causes of migration than environmental changes. Reducing the likelihood of migration due to climate change is therefore in theory within the control of governments and policy makers, but this control posits vastly improved political and economic structures that reduce poverty and marginality.

Disasters do lead to large displacements of people, and they do undermine development, but the displacement is usually temporary, as most displaced people want to return, rebuild, and continue living in familiar ways and places. Such displacements are usually over short distances; few people displaced by disasters cross an international border. The patterns of movement tend to be largely determined by social networks, as people move to stay with family and friends.

Sustained migration out of a disaster-prone region can reduce vulnerability to disasters by lowering the number of people exposed to hazards, and those who leave usually send back money.

It is difficult to discern the effects of slow-onset changes such as desertification on migration, but there is evidence to show that such changes are important in encouraging long-term or permanent migration. Ultimately it becomes difficult to return to a desert.

Migration in response to slow-onset changes seems most often to take the form of a household selecting an individual to move to seek work; this reduces the number of people that the household must support, can create an alternative

¹²⁰ This appendix is based on a 2009 background paper to the Commission by J. Barnett and M. Webber, “Accommodating Migration to Promote Adaptation to Climate Change,” available at www.ccdcommission.org.

income stream, and can establish a bridge that may help if more family members need to move.

Where environmental change stimulates permanent migration, the people who have the financial resources and social networks to move long distances may move to another country, and those with sufficient wealth may move to an industrial nation. However, in most cases the people who move in response to such changes are the lower middle classes, who have enough money to move, but not enough to move far.

Although some people fear that migrants may cause environmental degradation in the areas they move to, there is little proof of this. Land tenure and other property systems are important determinants of the environmental outcomes of influxes of migrants. Where local landowners have some security of tenure and are able to develop systems that allow migrants access to it, land can be shared, and migrants tend to use it sustainably.

Much also depends on the reception of host communities and the actions of planners and donors. Where efforts to help migrants settle include local communities as well as migrants and promote sustainable resource management, the combined effects of additional labor and money can enhance sustainability.

Taking into account the likelihood of effective adaptations in many places, the extent of climate-driven migration in coming decades seems to be overstated and the oft-cited estimate of 200 million more people displaced by 2050 appears to be an upper limit on the numbers permanently displaced by climate change. However, the sum of temporary displacements due to extreme events, coupled with the number permanently displaced, may well exceed this figure. And if climate change accelerates, migrations may increase greatly.

Present patterns of movement may offer some guidance on how population movements may be exacerbated by climate change. Currently most migrants move within their own countries. (There were nearly as many internal migrants in China alone – 130 million people – as there are international migrants in all countries – about 190 million in 2005.) Most internal migrants are “economic migrants” moving from rural areas to urban areas in search of work. The majority of people uprooted by conflict, ethnic strife, and human rights violations are internally displaced peo-

ple, according to the UN High Commissioner for Refugees, which suggests that the routes and intermediaries used by migrants fleeing conflicts are similar to those used by economic migrants.

Half of the world’s international migrants come from 20 countries, with the largest source of migrants (21%) coming from Europe (including Russia and Turkey), followed by 11% from South Asia, 6% from Mexico, 5% from East Asia, 5% from Central Asia, and slightly less than 4% from Africa.

Moving costs money, so there appears to be an economic migration hump, where the rate of migration from a community increases as incomes rise beyond a level necessary to meet subsistence needs, and then net migration decreases again as the gap between incomes at the place of origin and the main destination closes. Thus the poorest do not tend to migrate, or at least not very far.

Climate change may well have the most severe impacts on people’s basic needs in those parts of the world where low-income, resource-dependent communities are living in environments that are already variable and declining. In places such as the Sahel, migration is already a response to the combined effects of environmental and economic changes. There is also an association between vulnerability to climate change, migration, and existing or recent violent conflict.

In the coming decades climate change is more likely to exacerbate existing migration patterns than create new flows. This means that present movements provide a crude guide to the geography of future movements.

There is no serious study of the links between climate change and conflict that suggests with any certainty that climate change will increase the risk of violent conflict. This is true for case-based as well as quantitative studies.

The pessimistic literature on climate change and migration creates a bias against the development of policies to harness migration as a strategy to promote adaptation for migrants, their communities of origin, and their host communities. There is evidence that framing migration as a threat leads to policies that do little to control migration but that limit the benefits of migration to migrants and their original and destination communities.

There is also evidence that can be used to inform policies to maximize the benefits and minimize the costs of

migration. A growing body of studies shows that in most cases migration contributes positively to the capacity of households, communities, and countries of origin to adapt to climate change. It also most often leads to net gains in wealth in receiving areas. However, these findings depend heavily on their context.

Many of the benefits for the communities of origin arise through remittances, which globally may be double the volume of official development assistance (ODA).

Migration expands the social networks of households and communities, which reduces the risks associated with short-term displacement in response to crisis. It also boosts incentives to pursue education, as this is a determinant of success in moving, so migration increases the educational attainment of sending populations.

Migrants of all kinds consistently display initiative in helping themselves. Labor migrants tend to be hard-working, seeking to maximize incomes to finance a better life for themselves and their children (irrespective of whether they are temporary or permanent migrants), to send money to families at home, and to help new migrants overcome barriers to movement and settlement.

However, one type of migration that rarely has positive results for those moved is involuntary resettlement. People who are resettled lose their land, their understanding of the local environmental and institutional conditions necessary for development, their jobs if they were employed, and their trust in social institutions such as government. Their social networks are disrupted. The resettlement process creates opportunities for corruption. For these reasons, resettlement that is anything other than entirely voluntary would not constitute an “adaptation” in the sense of an avoided impact from climate change.

Policies to restrict migration rarely succeed, are often self-defeating, and increase costs to migrants, communities of origin, and destination communities. There is considerable scope for careful and coordinated policies to minimize many of the potential costs and maximize many of the potential benefits arising from migration that may be affected by climate change.

In the case of labor migrants, such policies might include:

- ▶ Orient international migration policies to benefit people in the most vulnerable regions;

- ▶ Target training packages to encourage the development of skills that are scarce in industrial countries;
- ▶ Reduce the transaction costs on remittances;
- ▶ Reduce the barriers to return migration;
- ▶ Create industrial/developing-country migration agreements that facilitate migration in exchange for agreements to maximize the benefits of that migration to communities of origin (for example in the form of dual citizenship, protection of rights in both destinations, reduced costs of remittance exchanges);
- ▶ Ensure migrants have the same rights and freedoms as local people;
- ▶ Coordinate aid and migration policies in industrial countries;
- ▶ Build networks among diaspora and encourage them to support communities of origin, for example by offering matching funding and assistance with visas, shipping, and financial transfers;
- ▶ Develop migration plans and strategies that identify areas of labor scarcity (skills, workers relative to capital) and facilitate voluntary movements; and
- ▶ Develop regional labor migration agreements to manage “brain drain” situations – countries that benefit from skilled international migrants may offset this effect by investing in skills training in countries of origin, for example.

Policy suggestions for people displaced by extreme events might include:

- ▶ Increase commitments to the UN Central Emergency Response Fund;
- ▶ Improve the international emergency response system, including increasing the number of professional emergency response staff, stockpiles of emergency supplies, and logistical capacity for transporting displaced people, response staff, and supplies;
- ▶ Promote awareness of the responsibility of governments to protect displaced people;
- ▶ Develop frameworks between countries with respect to mechanisms for triggering an international response to an emergency and allowing free passage of refugees in times of crisis;
- ▶ Increase investment in disaster risk reduction (DRR) in developing countries;
- ▶ Develop bilateral and regional disaster response sys-

tems, including for repatriation of displaced peoples;

- ▶ Promote awareness of and work to improve implementation of the Guiding Principles on Internal Displacement of the UN Office of the High Commissioner for Human Rights;
- ▶ After an extreme event, mainstream adaptation into reconstruction activities to reduce vulnerability;
- ▶ Do not encourage or facilitate movement into conflict zones; and
- ▶ Give people who move en masse the choice of staying in camps or moving into settlements, and support them in their decisions.

Suggested policies with respect to people permanently displaced might include:

- ▶ Facilitate adaptation among communities where livelihoods are now or may in the future be stressed by climate change, including the poor living in drylands, low-lying coastal areas, and areas exposed to damage from extreme wind and flooding events;
- ▶ Develop systems to deliver well-timed and effective disaster assistance;
- ▶ Facilitate secure access to land in places at risk;
- ▶ Facilitate secure access to land for migrants;
- ▶ Create short-term jobs to help migrants meet their immediate needs;
- ▶ Provide microfinance, skills training, health care, and agricultural extension to migrants and host communities alike;
- ▶ Encourage local hosts to see the benefits of new migrants, and foster cultural awareness;
- ▶ Ensure migrants have the same rights and freedoms as local people;
- ▶ Plan for developments that can boost employment of people in the host community as well as migrants; and
- ▶ Increase efforts to build and broker peace to avoid civil wars.

8. CITIES¹²¹

Cities and city dwellers have received too little attention in discussions of climate change impacts and adaptation.

This is perhaps due to irrational, psychological reasons. Climate change impacts tend to be thought of as rural: floods and droughts in the countryside affecting crops and farmers, afflicted ocean atolls and loss of forests.

In fact, among the worse risks – to large populations, to individuals, and to national economies based largely in big cities – may be found in the urban areas of the developing world.

More than a third of the world's total population lives in urban areas in low- and middle-income nations, which now have most of the world's urban population and most of the largest cities. Their urban centers will house most of the growth in the world's population over the next few decades. How this growth is planned and managed has large implications for the extent to which adaptation limits the costs of climate change and for whether prosperity can be delinked from high greenhouse gas emissions.

Extreme weather events have caused increasing devastation to developing-world urban populations and economies in recent years. Storms and floods have been the most dramatic disasters, but climate change will also bring other less dramatic stresses such as heat waves, reductions in freshwater availability, and sea-level rise for coastal cities.

Since 1950, there has been a sevenfold increase in the urban populations of low- and middle-income nations and an increased concentration of people and economic activities in low-lying coastal zones or other areas at risk from flooding and extreme weather events. Two-fifths of the people of Africa, long considered a rural continent, live in urban areas; in fact, the continent has a larger urban population than North America does.

The number of urban dwellers living in poverty and lacking basic infrastructure and services that should protect them from environmental health hazards and disasters has greatly increased over the past 50 years. Some 1 billion urban dwellers live in poor-quality, overcrowded housing in “slums,” shantytowns, or other forms of informal settlements, and a high proportion of these settlements are at risk from flooding or landslides.

National economies depend on well-functioning urban centers, particularly in the developing world, where the

capital may be the only big city and the center of most administration and economic activity. Yet many of these capitals have worn buildings and infrastructure, or no infrastructure in the case of many informal settlements, and 99% of households and businesses in low-income nations have no disaster insurance.

As has been emphasized throughout our report, adaptation requires local knowledge, local competence, and local capacity within local governments. It needs households and community organizations with the knowledge and capacity to act. It also requires a willingness among local governments to work with lower-income groups.

Most well-governed cities should be able to adapt to the risks of climate change for the next few decades. They will adapt buildings and infrastructure, work with groups and settlements most at risk to find solutions, and improve disaster preparedness.

However, infrastructure that is not there cannot be adapted. Hundreds of millions of urban dwellers have no all-weather roads, no piped water supplies, no drains, and no electricity supplies; they live in poor-quality homes on illegally occupied or subdivided land, which inhibits any investment in more-resilient buildings and often prevents the provision of infrastructure and service.

Many are tenants unable to pay for improved housing, and their landlords have no incentive to invest in better buildings. Most low-income city people would find it difficult if not impossible to move to safer sites, both because they need to be close to places of work and because they cannot afford better areas.

Worldwide, many of the cities that most need to adapt lack the means to do so. Most risks to citizens in these cities stems from the incapacity of local governments to provide for infrastructure and for disaster risk reduction and preparedness or from their refusal to work with the inhabitants of “illegal settlements.”

Pro-poor adaptation strategies do not emerge from city

¹²¹ This appendix is based on D. Satterthwaite, S. Huq, M. Pelling, H. Reid, and P. Romero Lankao, *Adapting to Climate Change in Urban Areas* (London: International Institute for Environment and Development, 2007).

governments that refuse to work with the poor or that see their homes, neighborhoods, and enterprises as “the problem.” Many nations have weak, ineffective, and unaccountable local governments; some also suffer from civil conflicts and have little or no economic or political stability.

The vulnerability of poor urban dwellers to climate change is often ascribed to their poverty, but it is far more the result of failures or limitations in local government. These in turn are linked to the failure of national governments and international agencies to support urban policies and governance systems that ensure needed infrastructure is in place, along with preparedness for extreme weather and, where needed, sea-level rise. Most international agencies have chosen to avoid investing in urban initiatives.

Building local capacity

Most national governments and international agencies have had little success in supporting local development in cities. They need to learn to be more effective in this and in supporting good local governance if they are to help build adaptive capacity.

The growing recognition within international development assistance agencies of the importance of supporting “good governance” rarely focuses on the importance of good local governance. Meanwhile, the international agencies leading the discussions on adaptation to climate change do not understand the political and institutional constraints on successful local adaptation. There is also a tendency to assume that as long as new funding sources for adaptation are identified, adaptation can take place.

There are clear links between adaptation to climate change and most other areas of development and environmental management. Housing and infrastructure policies and housing finance systems that support better-quality housing and provision for water and sanitation are key parts of adaptation that require competent, accountable urban governments.

Managing health issues means not only better health care available to all (which should include emergency response capacity for extreme weather events) but also a reduction of environmental health risks, especially those associated with climate change.

Adaptation also has to focus on what is needed to reduce the vulnerabilities of particular groups to particular aspects

of climate change – for instance, the vulnerabilities of infants, their caregivers, and older age groups.

A large part of city planning should focus on providing lower-income groups with safer, legal alternatives to informal settlements by increasing the supply and reducing the cost of land for housing and by supporting infrastructure on suitable sites. Land use management should protect and enhance natural buffers and defenses for cities and their surrounds. Getting the needed collaboration between so many different departments within national and local governments is difficult.

Companies have a role to play in urban adaptation, starting with their own premises and extending to the many enterprises that can offer goods and services that help individuals, households, and governments adapt. Providing appropriate financial services to lower-income groups can help them save and invest in safer homes and better livelihoods, all of which increases adaptive capacity.

The potential of private sector investments and public-private partnerships to manage urban development issues has long been overestimated. An analysis of private investment flows into urban areas in low- and middle-income nations shows their potential to help fund some forms of infrastructure improvement and adaptation, but not the infrastructure most urgently needed.

There are innovative urban policies and practices under way that show that adaptation is possible and can be built into development plans. These include examples of community-based initiatives led by organizations formed by the urban poor that greatly reduce their vulnerability to storms and floods at very low unit cost. There are also good examples of local governments working in partnership with their low-income populations to improve housing conditions and infrastructure provision or to develop new good-quality settlements. These include many partnerships between local governments and federations formed by slum and shack dwellers. There are also more post-disaster responses that recognize the competence and capacity of those displaced to rebuild their lives, including their homes and livelihoods, if the organizations that respond to the disaster allow them to do so.

But these are the exceptions. Few government bodies or international agencies recognize the competence and capacity within the populations they identify as “most at risk.”

Such bodies need to consider how local “development + adaptation” innovations like those just mentioned can be encouraged and supported in many more places. This would not be simple replication, because each city needs forms of adaptation based on particular local conditions and capacities and able to overcome particular local constraints.

Most of the nations in which the competence and accountability of city and municipal governments have increased considerably are middle-income. Even in these it is difficult to get much attention to climate change adaptation from city governments or from most national ministries and agencies within their urban policies and investments. Most have more pressing issues, including large backlogs in providing infrastructure and services and improving housing. They are also under pressure to improve education, health care, and security and to expand employment and attract new investment.

Even competent and accountable national and local (city and municipal) governments will not engage with adaptation to climate change unless it is seen as supporting and enhancing the achievement of development goals.

What needs to be done?

The key issue is how to build resilience in tens of thousands of cities to the many impacts of climate change – resilience that:

- ▶ Reduces risks to other environmental hazards, including disasters (there are strong complementarities between reducing risk from climate change, non-climate-change-related disasters, and most other environmental hazards);
- ▶ Is strongly pro-poor (the majority of those most at risk from climate change and from other environmental hazards have low incomes, which limits their autonomous adaptive capacity);
- ▶ Builds on the knowledge acquired over the last 20 years on reducing risks from disasters in urban areas (there have been important advances here);
- ▶ Is based on and builds a strong local knowledge of climate variabilities and of the likely local impacts from climate change scenarios;
- ▶ Encourages and supports actions that reduce risks (and vulnerabilities) now while recognizing the importance

of current measures to begin the needed long-term changes – urbanization processes have a momentum and drivers that are difficult to change, but at present these are mostly increasing risks from climate change and so can be considered maladaptation;

- ▶ Recognizes that the core of these efforts is building the competence, capacity, and accountability at city and neighborhood levels of government and changing their relationship with those living in informal settlements and working in the informal economy – and the importance within this of supporting civil society groups, especially representative organizations of the urban poor (this is also to avoid the danger of “adaptation” providing opportunities for powerful groups to evict low-income residents from land they want to develop);
- ▶ Recognizes that government policies must encourage and support the contributions to adaptation of individuals, households, community organizations, and enterprises;
- ▶ Recognizes the key complementary roles to be played by higher levels of government and international agencies to support this (and that this requires major changes in policy for most international agencies that have long ignored urban issues and major changes in how adaptation is funded);
- ▶ Builds resilience and adaptation capacity in rural areas – given the dependence of urban centers on rural production and ecological services and the importance for many urban economies and enterprises of rural demand for producer and consumer goods and services; and
- ▶ Builds into all of this a mitigation framework (if successful cities in low- and middle-income nations develop without this, global greenhouse gas emissions cannot be reduced).

9. DISASTER RISK REDUCTION

Whether natural hazards have disastrous impacts in human and physical terms depends on the force of the event and on the vulnerability of people, infrastructure, and ecosystems. A major flood or storm in a country at the low end of the Human Development Index consistently leads to devastating consequences, often remaining for years or even generations, while a similar event in a country at the other end of the scale can be managed without long-lasting impacts. The human security impact of disasters is thus a function of hazard and vulnerability, with the latter being highly context-specific.

The multiple causes of hazards and vulnerability and the different elements of disaster risk reduction were addressed by governments in the Hyogo Framework for Action (HFA), agreed in early 2005. It identifies five priority areas:

- ▶ Ensuring that disaster reduction is a national priority with a strong institutional basis,
- ▶ Identifying disaster risks,
- ▶ Building a culture of resilience through awareness and education,
- ▶ Reducing underlying risk factors, and
- ▶ Strengthening preparedness for effective response.

Governments are encouraged to ensure effective implementation of HFA through establishing national platforms where all relevant government bodies as well as civil society and private sector actors can coordinate and exchange information.

Current development dynamics and demographic change put more people in harm's way. Rural-urban migration, the growth of informal urban neighborhoods, and increasing degradation of natural resources and ecosystems increases exposure to natural hazards. People live dangerously in unplanned housing areas on or close to steep slopes where protective vegetative cover has been removed, without supporting infrastructure such as drainage or access to clean water and sanitation. Such areas are exposed to the risk of landslides triggered by floods and storms and to vector-borne and infectious disease.

While more people live in danger, data also show a consistent increase in the number of weather-related disasters such as storms and floods over past decades, as well as in the number of people affected.¹²² Disasters have a direct, erosive, and cumulative impact on the lives and livelihoods

of the poor for whom the margins of resilience are small. Floods and storms disrupt agriculture and economic activity and – if they occur again and again – prevent farmers and laborers from saving and building assets. Repeatedly experiencing the destruction of their property and exhaustion of their coping mechanisms ultimately affects people's ability and motivation to recover.

Statistics show a decreasing trend in the number of people killed annually by natural disasters.¹²³ Much of this reduction is because the large-scale droughts and famines of the 1980s in sub-Saharan Africa have not been repeated. Drought-related deaths have thus been reduced, while deaths due to other weather-related disasters remain relatively stable in spite of their increased frequency and intensity and a growing population. This is likely due to improvements in early warning, disaster preparedness, and response capacity.¹²⁴ For example, in Bangladesh the extensive cyclone shelter program, including improved early warning, is thought to have contributed to the drastic reduction in the number of people killed in recent cyclones.

Yet economic losses continue to grow, particularly as measured in insured and non-insured assets in industrial countries. In the early part of the twentieth century, Florida in the United States was largely rural, and death tolls in hurricanes were high, as people could not be warned or evacuated. As the state turned from rural to urban, death tolls decreased steadily, but property damage has risen precipitously.

Reliable data on economic losses for developing countries are scarce, partly because only a fraction of these assets is insured. It is likely, however, that there is a strong increase in the erosion of livelihoods of the poor along with the increase in asset-loss in hazardous events.

Many of the measures reported by countries as disaster risk reduction focus on hazard events – preparedness, early warning, response – while reduction of vulnerability is not deliberately done as part of DRR, if done at all, or at least is

¹²² Centre for Research on the Epidemiology of Disasters, *Annual Disaster Statistical Review: Number and Trends 2007* (Brussels: 2008).

¹²³ Ibid.

¹²⁴ Ibid.

not reported as such.¹²⁵ In fact, a reduction in vulnerability to disasters depends on factors often completely unrelated to what is regarded as risk reduction.

“Changing access to communications, financial systems, transport, utilities, health services and local to global social networks heavily influence where people live, their overall mobility and the vulnerability of their livelihood systems to disruption during floods, droughts or other climate related events,” according to Marcus Moench and his colleagues.¹²⁶

The increasing number of small-scale, localized disasters that are largely ignored by international actors have a stronger impact on the poor than the dramatic large-scale disasters.¹²⁷ (See Chapter 3.) Local flash floods, landslides, or wildfires go unreported but affect poor families and cause death, injury, and damage and destroy their property and assets.

Disaster risk reduction has obvious links to several aspects of human security – food security, water, ecosystems, the nature of urban environments, and access to services. DRR is therefore not a sector but an approach to development with the identification and management of risks at its center. Since lead responsibility for DRR in most governments still rests mainly with institutions managing emergency response, few countries have ensured a more comprehensive implementation of actions that reduce the vulnerability and build the resilience of the poor.

Reducing disaster risk includes transferring risk. There is a wide range of risk transfer instruments, although focus and discussion are often limited to insurance products. A number of pilot or larger-scale projects to insure governments or individuals against weather-induced disasters have been launched during recent years. Most have been designed for the agricultural sector, with promising results, particularly those based on an index directly related to objective measures of rainfall or wind speed rather than time-consuming assessments of damage to individual farming plots. (See Appendix 6.)

Other forms of risk transfer with a more pronounced vulnerability focus are also important. Social protection measures that target those with few productive assets and the urban poor, or schemes that guarantee temporary employment for laborers, clearly belong among disaster risk transfer instruments.

Impacts of climate change

Higher temperatures lead to higher evaporation and increase the energy contained in the atmosphere. The growth in intensity and frequency of hydro-meteorological disaster events is consistent with predictions made by the IPCC, which also finds that weather-related hazard events will become more unpredictable with climate change.¹²⁸ They will happen when and where they are not expected, possibly negating achievements in disaster preparedness and response. Small-scale and localized disasters will increase drastically, probably combining to have larger-scale and more extensive impacts.

This means that disaster responders are already dealing with the impacts of climate change. Some recent dramatic events – such as cyclone Nargis in May 2008 or the heatwave in Europe in 2003 – are indicative of the type of events that are likely to become more frequent as the globe becomes warmer.

This includes greater weather variability, so that annual rainfall may become concentrated during a shorter period than in the past or will occur earlier or later than people have been used to. This, in turn, will upset the normal supply and provision of foodstuffs, which means that food security will be undermined. A large portion of poor smallholder farmers cannot satisfy the nutritional needs of their families on the basis of their own production, but rely on markets. If the volume of marketed foods declines and prices go up, the poor will be affected in a double sense.

Other risks relate to health impacts of climate change. In addition to the direct effects of higher temperatures on human well-being and capacity to work, an expanded distribution of malaria and other vector-borne diseases is likely to lead to large-scale outbreaks of disease in new

¹²⁵ International Strategy for Disaster Reduction (ISDR), *Disaster Risk Reduction Global Review 2007* (Geneva: United Nations, 2007).

¹²⁶ M. Moench and Risk to Resilience Study Team, *Understanding the Costs and Benefits of Disaster Risk Reduction under Changing Climatic Conditions*, Working Paper No 9 (Kathmandu, Nepal: ISET-Nepal and ProVention, 2008).

¹²⁷ ISDR, op. cit. note 125.

¹²⁸ IPCC, op. cit. note 71.

areas. Poor people in growing informal cities without proper water and sanitation will become increasingly exposed.

Consequences for policy and action

Many of the human security impacts of disasters and climate change are linked and should therefore be addressed in a coordinated fashion. This means mutual learning, a common approach to vulnerability reduction with an emphasis on livelihood protection, a common institutional location, and a preparedness for surprises.

Measures that reduce vulnerability and disaster risk are obviously also important for adapting to a more violent climate. The capacity to respond to emergencies is important from an adaptation perspective, but perhaps even more important are investments in reducing underlying risk factors and vulnerability. This could include more efforts such as stabilizing and providing infrastructure for informal urban settlements, or broadly improving food security by ensuring the supply and entitlements to food during periods of flooding or drought, including targeted social protection measures for those without productive assets. Moving from a focus on saving lives to saving lives and protecting livelihoods must be the new disaster reduction paradigm.

There are hence important overlaps and possibilities for learning between the DRR and adaptation agendas, although the two are not identical. Countries that develop comprehensive adaptation plans and strategies seem to incorporate elements from their DRR plans. Many of the urgent projects of the National Adaptation Programs of Action actually have a strong DRR connotation, such as aiming to stabilize the availability of water for agriculture during dry periods or managing increased malaria risk.

These types of measures require clear government policy and possibly legislation at the national level, as well as capacity and resources for identifying and implementing appropriate action at the local level. The close connection between the DRR and adaptation areas also means that it is rational and appropriate that they are led and managed from within the same government structure. This needs to be located at the highest possible level to ensure leadership and the permeation of a risk management and reduction approach in development planning and budgeting processes. National DRR platforms would naturally form part of this framework. The same arrangement needs to be replicated

at lower government levels.

Communities, countries, and regions will increasingly face the unexpected – the sudden and disastrous events that have not been prepared for, where there are no plans, no experience, and no good practice to rely on.¹²⁹ Adaptation will require a new kind of leadership for dealing with potentially chaotic situations. Surveillance for new and low signals, intelligence not dependent on established models and procedures, and empowerment of the appropriate level for action will be needed. “Not to strive to foresee the unforeseeable but to train ourselves to cope with it,” notes Patrick Lagadec. “Not to clarify, map and plan for every single surprise, but to train to be surprised.”¹³⁰

The DRR implications of increasing climate change impacts at the local and national levels require a mirroring institutional architecture and governance at regional and international levels – not the other way round. In particular, the expansion of small-scale but extensive disasters calls for close monitoring of events at a different scale than at present to enable the international community to provide the support needed to fight vulnerability.

¹²⁹ P. Lagadec, “A New Cosmology of Risks and Crises – Time for a Radical Shift in Paradigm and Practice” (Paris: Département D’Economie, Ecole Polytechnique, 2008).

¹³⁰ Ibid.

10. COMMISSION'S TERMS OF REFERENCE

The Swedish government established the independent Commission on Climate Change and Development to focus especially on risk reduction and adaptation in developing countries and on climate-proofing the development process. The main task of the Commission was to make proposals on how to climate-proof official development assistance by integrating risk reduction and adaptation to climate change into the development and poverty reduction plans of poor countries and also to present proposals on how to design ODA so that it takes account of climate impacts and the risk of disasters in developing countries.

Based on how climate change affects the ability of developing countries to attain the MDGs, the Commission presents concrete proposals on how to integrate adaptation, risk reduction, and climate-proofed development effectively into development and poverty reduction plans in developing countries. The proposals take account of a bottom-up perspective and consider local and traditional knowledge in order to ensure effective adaptation and are to be socially efficient and cost-effective.

The Commission also presents proposals on how to design ODA that takes account of climate impacts and disaster risks in developing countries. The Commission builds on and links with ongoing initiatives in this area, such as the UNFCCC, the Organisation for Economic Co-operation and Development, and the European Union, to ensure added value.

The Commission has concentrated on:

- ▶ Identifying and analyzing the incentives for and barriers to poor countries undertaking risk reduction and climate-proofing measures in their development cooperation and also contributing to increased awareness of the need to integrate climate-proofing, risk reduction, and adaptation measures into development and poverty reduction strategies. The focus has been on weather-related disasters and climate-related impacts on development. A comprehensive approach to risk reduction has been pursued, including all major disaster risks.
- ▶ Analyzing how best to combine long-term work on climate change mitigation with the immediate need to support adaptation measures in developing countries.
- ▶ Identifying guidelines for international development co-

operation in the fields of adaptation and risk reduction, taking account of local and national perspectives in developing countries.

- ▶ Considering how to achieve policy coherence by integrating concerns for climate change into wider development efforts and drafting proposals for methods of conducting Integrated Analysis for Climate-Proof Development in development cooperation.

The Commission has also:

- ▶ Assessed the role and importance of ecosystems in disaster prevention and devised strategies to strengthen their capacity to meet climate change.
- ▶ Given special attention to the dangers that slum dwellers are exposed to and identified solutions to reduce their vulnerability.
- ▶ Given priority to slow-onset disasters such as prolonged droughts and chronic instability stemming from water scarcity.
- ▶ Assessed how risk management mechanisms in the insurance industry might be used for risk reduction and adaptation measures in developing countries.

The Commission has 13 members, including its chairperson. They represent different areas of expert knowledge, have a broad geographical base, and are widely acknowledged and established as important actors in the area of climate and development.

The commission held four meetings for the period of its mandate; participated in relevant international conferences through workshops, lectures, and so on; and commissioned papers by experts.

11. COMMISSIONER BIOGRAPHIES

Gunilla Carlsson

Gunilla Carlsson is the Minister for International Development Cooperation at the Swedish Ministry for Foreign Affairs. Minister Carlsson served in the Swedish Parliament from 2002 to 2006 in several capacities, notably as Deputy Chair of the Committee on Foreign Affairs and as Deputy Member of the Committee on EU affairs. From 1995 to 2002 she served in the European Parliament and from 2004 to 2006 was the Vice Chair in the Parliament of the European People's Party.

Angela Cropper

Angela Cropper is Assistant Secretary-General and Deputy Executive Director of the UN Environment Programme. Cropper is co-founder and currently President of The Cropper Foundation, a not-for-profit organization that contributes, among other things, to public policy for sustainable development. She is based in Trinidad and Tobago, where she served as Independent Senator in the country's Parliament. Cropper co-chaired the Assessment Panel of the Millennium Ecosystem Assessment. Her previous positions include Senior Advisor in Environment and Development at the UN Development Programme (UNDP) and inaugural Executive Secretary of the UN Biodiversity Convention.

Mohamed El-Ashry

Mohamed El-Ashry is Senior Fellow at the United Nations Foundation. El-Ashry is the former Chairman and Chief Executive Officer of the Global Environment Facility, which he led from 1991 to 2003. Prior to that, El-Ashry was the Chief Environmental Advisor to the President and Director of the Environment Department of the World Bank. He moved to the World Bank after serving as Senior Vice President of the World Resources Institute (WRI) and as Director of Environmental Quality with the Tennessee Valley Authority. El-Ashry received his BS degree with honors from Cairo University and his PhD degree in geology from the University of Illinois.

Sun Honglie

Sun Honglie is Professor and Vice President of the Chinese Academy of Sciences and the Director of the China Climate

Change Expert Committee. Sun's academic career has focused on surveying and researching agricultural natural resources and regional comprehensive development. His academic contributions include advocating that natural resources should be comprehensively studied as part of an integrated system.

Nanna Hvidt

Nanna Hvidt is Director of the Danish Institute for International Studies. Hvidt has worked at the Danish Ministry of Foreign Affairs as Director of the Department for the UN and the World Bank and Director of the Department for East, West, and Central Africa. Hvidt earlier served as Embassy Counsellor at the Danish Permanent Representation in Brussels. Hvidt has also served at the Directorate General for Development of the European Commission.

Ian Johnson

Ian Johnson is Chairman of IDEACarbon, a market research and consultancy group. Johnson joined IDEACarbon following a distinguished career at the World Bank. For eight years he was the Bank's Vice President for Sustainable Development, overseeing its work on climate change and carbon finance. He was also the Chairman of the Consultative Group on International Agricultural Research. Prior to that, he played a major role in the establishment of the Global Environment Facility.

Jonathan Lash

Jonathan Lash is President of the World Resources Institute. Before joining WRI, Lash directed the environmental law and policy program at the Vermont Law School. Lash also served as co-chair of the US President's Council on Sustainable Development, a group of US government, business, labor, civil rights, and environmental leaders who developed visionary recommendations for strategies to promote sustainable development. He has served in a broad range of national and international groups, including the Organisation for Economic Co-operation and Development's Round Table on Sustainable Development.

Wangari Maathai

Wangari Maathai is Professor at the University of Nairobi and the founder of the Green Belt Movement. Maathai is former Assistant Minister for Environment, Kenya. In 1977

Mathaai founded the Green Belt Movement, the main focus of which was tree planting by women's groups as a way to conserve the environment and empower women by improving the quality of their lives. Maathai is internationally recognized for her persistent struggle for democracy, human rights, and environmental conservation. She won the Nobel Peace Prize in 2004.

Ivo Menzinger

Ivo Menzinger is a Managing Director at Swiss Re. Prior to heading the Strategy Department, Menzinger was responsible for Swiss Re's Sustainability & Emerging Risk Management operations. In this capacity he oversaw the firm's climate change activities. He holds a Master of Science degree in Environmental Sciences from the Federal Institute of Technology in Switzerland.

Sunita Narain

Sunita Narain is Director of the Centre for Science and Environment in New Delhi. Narain is a researcher, journalist, and campaigner on environmental issues. She has co-edited publications on the state of India's environment, conducted in-depth research on the governance and management of the environment, and co-authored reports on climate change. She has been publisher of the fortnightly news magazine *Down to Earth* since 1992. In 2005 she received the Stockholm Water Prize.

Bernard Petit

Bernard Petit is former Deputy Director General of the Directorate General for Development of the European Commission. Petit holds a PhD in European Economy from the University of Paris and a degree from the School of Business Management. Petit joined the European Commission in 1971 and has worked on development issues ever since. Before becoming Deputy Director General, he was Director of Development Policies; prior to that, he led several divisions including Financing, Programming, Macroeconomic Support, and Forward Planning.

Youba Sokona

Youba Sokona is Executive Secretary of the Sahara and Sahel Observatory (OSS), Tunis. Before joining OSS, Sokona was Coordinator of the Energy Programme and the Execu-

tive Secretary for international relations of ENDA-TM in Dakar, Senegal. He has also taught at the Ecole Nationale d'Ingénieurs in Bamako, Mali.

Margareta Wahlström

Margareta Wahlström is Assistant Secretary-General for Disaster Risk Reduction and the Secretary-General's Special Representative. During 2004–07 she served as the UN Assistant Secretary-General for Humanitarian Affairs and Deputy Emergency Relief Coordinator. Wahlström has previously served as the Secretary-General's Deputy Special Representative for the UN Assistance Mission in Afghanistan, where she was in charge of relief, reconstruction, and development. Prior to that, she held numerous senior positions with the International Federation of Red Cross and Red Crescent Societies in Geneva.

Chair of expert group

Anders Wijkman

Anders Wijkman is a Member of the European Parliament, where he sits as a full member in the Committee on the Environment, Public Health and Food Safety and as a substitute on the Committee on Development. Wijkman has been Ambassador at the Swedish Ministry for Foreign Affairs (1998), Assistant Administrator of UNDP (1995–97), Director General of the Swedish Agency for Research Cooperation with Developing Countries (1992–94), Secretary-General of the Swedish Society for Nature Conservation (1989–91), Secretary-General of the Swedish Red Cross (1979–88), and a Member of the Swedish Parliament (1970–78). He holds a university degree in political science from the University of Stockholm.

