

W R I R E P O R T



HEATHER MCGRAY

ANNE HAMMILL

ROB BRADLEY

WITH

E. LISA SCHIPPER

JO-ELLEN PARRY

WEATHERING THE STORM

Options for Framing Adaptation and Development

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JO-ELLEN PARRY



WORLD
RESOURCES
INSTITUTE

HYACINTH BILLINGS
Publications Director

HEATHER MCGRAY, ANNE HAMMILL, ROB BRADLEY
Authors

E. LISA SCHIPPER AND JO-ELLEN PARRY
Contributors

MAGGIE POWELL
Layout

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ISBN 978-1-56973-672-2

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Acknowledgments

This report has benefited immensely from advice, information, and assistance generously provided by many people. The authors would especially like to thank the following individuals who took the time to speak with us in detail about lessons and insights from their work: Ian Burton, Boubacar Dembele, Bill Dougherty, Leilani Duffy, Roger Few, Richard Klein, Bo Lim, Silvia Llosa, Tom Mitchell, Balgis Osman, Thomas Tanner, Chuluun Togtohyn, and Jessica Troni. Special thanks are also due to Mathias Bell, Alark Saxena, Sarah Schumann, and Olivia Tanujaya, whose tireless research support enabled us to analyze 135 cases.

Peer review contributed enormously to the improvement of the manuscript. The authors wish to thank Thea Dickinson, John Drexhage, John Furlow, and Pablo Suarez for extensive, constructive, and challenging review comments. Lisa Schipper and Jo-Ellen Parry generously looked beyond their own contributions to provide detailed critique of the entire report. Within WRI, Maria Cordeiro, Al Hammond, Norbert Henninger, Piet Klop, Hilary McMahon, Jesse Ribot, and Dan Tunstall all went beyond the call of peer review by engaging in rich discussions about ideas in earlier drafts. Together with their detailed manuscript comments, this no doubt meant some late nights at the office for each of them, given the time taken from their own work. The authors are duly grateful.

Manish Bapna, Jennifer Layke, and Jonathan Pershing all lent invaluable strategic guidance and keen editorial eyes to the development of this report. Special thanks go to Jonathan for his late-night contributions to improving Section V. David Jhirad also provided helpful advice, in spite of the coincidence of our drafting timetable with a major professional transition for him.

Lauretta Burke, Emily Cooper, Charles Iceland, Lalanath de Silva, Carrie Stokes, and Darren Swanson all provided valuable advice and material that informed many of the text boxes. Robert Bailis, Britt Childs, and Kelly Levin (together with Robert's students) contributed to selecting and analyzing the first round of cases. Remi Moncel provided French-English interpretation for a key phone call.

For production and organizational support, we thank Hyacinth Billings, Greg Fuhs, Jennie Hommel, and Natalie Bushell. Thanks also to Joan O'Callaghan of Communications Collaborative for her editing, and to Maggie Powell for graphic design.

Finally, we are grateful to USAID (agreement # ESP-A-00-06-00005-00), and to the government of the Netherlands for the financial support that made this report possible.

*Heather McGray
Anne Hammill
Rob Bradley*

Foreword

Climate change is upon us. The Earth is warming, seasons are shifting, species are moving, and water is flowing at different times and in different amounts.

The accelerating and deepening impacts of climate change will touch everyone on Earth in some way, but those who stand to suffer most are the poor. Poor people already live on the margins; they have limited resources with which to adapt to changes in the climate. Most of the world's poor depend for their livelihoods directly upon highly climate-sensitive resources: fields, forests, fisheries, and other natural assets are “the wealth of the poor.” Climate change will make these resources less reliable in many places, lowering the prospects for many poor communities to escape from poverty.

The people of the world and their governments must find the will and the means to slow, stop, and reverse the buildup of global warming gases in the atmosphere to avert catastrophic warming. But it is too late to avert serious consequences, so we must also learn to adapt to a warmer world. The question of how humanity adapts to climate change is a pressing development issue. As leaders begin to consider policies and measures to respond to mounting climate effects, it is critical that adaptation efforts be designed to reach the poorest communities to safeguard their development efforts. Likewise, development must foster adaptation if it is to succeed under a changing climate. That the poor are the people least responsible for global warming makes these efforts all the more imperative.

In *Weathering the Storm: Options for Framing Adaptation and Development*, Heather McGray, Anne Hammill, and Rob Bradley review examples of adaptation efforts drawn from throughout the developing world. They describe strategies of adaptation and development on an encouraging trajectory of convergence: adaptation efforts that reflect an awareness of how the effects of climate change intersect with poverty, discrimination, resource degradation, and other underlying sources of vulnerability; and development that is devising ways to account for the changing climate in decisions.

Unfortunately, the merging of the development and adaptation agendas has a down side. Most existing mechanisms for funding adaptation to climate change have been designed to distinguish carefully between “normal” development activities and the “additional” activities needed to adapt to climate change. Such mechanisms do not fit well with a world that calls for integrated approaches to these problems, and one result has been a paucity of resources available for adaptation. It is imperative that support for adaptation be scaled up significantly—and soon. The framework of adaptation approaches proposed in this report contributes to breaking down the “either/or” thinking that has constrained adaptation funding, by providing a practical alternative for thinking about when and how adaptation and development intersect.

Weathering the Storm is among the first global reviews of adaptation efforts to date and, as such, takes a relatively early step in understanding how adaptation and development can best support one another. There is much left to learn. The report also represents the World Resources Institute's first major engagement in the global dialogue on adaptation. In this respect, as well, it is an early step; much scope remains for applying WRI's expertise on environmental governance and ecosystem services to this critical emerging issue. I hope that readers within both the climate change and the development communities will find it a valuable contribution as they consider how best to support adaptation efforts in the context of the need for development, and I would welcome readers' thoughts on approaches to this issue.

JONATHAN LASH
President
World Resources Institute



Executive Summary

Adaptation to climate change continues to rise on the agendas of researchers, practitioners, and decision-makers, driven by growing evidence that climate change is real, already observable, and threatening to undermine development. Any effective development and planning process will need to take climate adaptation into account and, conversely, adaptation efforts themselves will often require development interventions to succeed. This paper explores the link between the climate adaptation agenda and the development agenda, building on evidence from more than 130 case studies in developing countries.

While climate impacts are increasingly observed, the debate over managing adaptation has progressed very slowly. This in part is due to confusion about the relationship between adaptation and development—a definitional problem that has hindered not only project design, but also the allocation of funding for adaptation efforts. Notwithstanding the difficulty in developing a concise operational definition, failure to clarify this relationship has meant that funding mechanisms create redundancies or leave gaps in the landscape of critical adaptation and development activities.

TAKING STOCK OF GLOBAL ADAPTATION EFFORTS

Drawing on Internet resources, the authors analyzed 135 examples of adaptation projects, policies, and other initiatives from the developing world. The review found:

- A significant area of overlap between adaptation and development is methodological. Rarely do adaptation efforts entail activities not found in the development “toolbox.” The uniquely “adaptive” elements of most efforts are those involved in defining problems, selecting strategies, and setting priorities—not in implementing solutions.
- In line with current approaches to development, adaptation efforts are highly integrated. Most projects utilize multiple strategies and address multiple sources of vulnerability. Many cross sectoral boundaries and address more than one impact associated with climate change.
- There are three “models” of how adaptation and development objectives coincide:

1. **“Serendipitous” Adaptation:** Activities undertaken to achieve development objectives incidentally achieve adaptation objectives. The adaptation components of a given activity may even be noticed or emphasized only after the fact.
2. **Climate-Proofing of Ongoing Development Efforts:** Activities added to an ongoing development initiative to ensure its success under a changing climate. Adaptation thus serves as means to achieve development ends.
3. **Discrete Adaptation:** Activities undertaken specifically to achieve climate adaptation objectives. Development activities may be used as means to achieve adaptation ends.

Two roughly distinct perspectives inform how people approach the challenge of adaptation: one focuses on creating response mechanisms to specific impacts associated with climate change, and the other on reducing vulnerability to climate change through building capacities that can help address a range of challenges, including the effects of climate change. In practice, many instances of adaptation fall between these extremes of orientation toward impacts- or vulnerability.

FRAMING ADAPTATION: A CONTINUUM OF APPROACHES

The range of adaptation activities may be framed as a continuum of responses to climate change, from “pure” development activities on the one hand to very explicit adaptation measures on the other. At one far end of the continuum, the most vulnerability-oriented adaptation efforts overlap almost completely with traditional development practice, where activities take little or no account of specific impacts associated with climate change. At the far opposite end, highly specialized activities exclusively target distinct climate change impacts, and fall outside the realm of development as we know it. In between lies a broad spectrum of activities with gradations of emphasis on vulnerability and impacts. The continuum can be roughly divided into four types of adaptation efforts:

1. **Addressing the Drivers of Vulnerability**
At the development end of the spectrum, activities reduce poverty and address other fundamental shortages of capability that make people vulnerable to harm. Very little attention to specific climate change impacts is paid during these interventions, although they help to buffer households and

communities against climate trends or shocks. Sample activities include efforts to improve livelihoods, literacy, and women’s rights, and even projects that address HIV/AIDS.

2. **Building Response Capacity**
Adaptation activities focus on building robust systems for problem solving. These capacity-building efforts lay the foundation for more targeted actions, and overlap substantially with many institution-building and technological approaches familiar to the development community. Examples include the development of robust communications and planning processes, and the improvement of mapping, weather monitoring, and natural resource management practices.
3. **Managing Climate Risk**
Climate information is incorporated into decisions to reduce negative effects on resources and livelihoods, accommodating the fact that often the effects of climate change are not easily distinguished from the effects of hazards within the historic range of climate variability. Examples include disaster-response planning activities, drought-resistant crops, and efforts to “climate-proof” physical infrastructure.
4. **Confronting Climate Change**
Actions focus almost exclusively on addressing impacts associated with climate change, typically targeting climate risks that are clearly outside historic climate variability, and with little bearing on risks that stem from anything other than anthropogenic climate change. Examples include communities that relocate in response to sea level rise, and responses to glacial melting.

Two factors appear to predominate in shaping the characterization of an adaptation response: (1) the existing capacity of the affected community, and (2) the level of information about projected climate impacts. Lower levels of capacity necessitate greater investment in addressing underlying sources of vulnerability (i.e., adaptation efforts focus more on the development end of the continuum). Higher certainty regarding climate change prediction enables efforts to more directly target specific impacts (i.e., on the climate-specific end of the continuum). However, it is important to note that neither of these drivers has a linear relationship to how closely adaptation efforts may target specific hazards or impacts.

GOVERNANCE AND DECISION-MAKING UNDER UNCERTAINTY

As understanding of climate risk improves, adaptation experience grows, and the effects of climate change are felt more strongly, impacts-oriented approaches—especially climate risk-management approaches—seem likely to be implemented more widely. However, the effectiveness of climate risk management depends heavily upon the ability to reduce uncertainties linked with climate risk to a level at which risk management tools can be reliably implemented.

Unfortunately, many of the most vulnerable populations will not be able to approach climate risks in a standard risk-management sense; their core adaptation task will instead be to build the capacity to cope with uncertainty. Moreover, even when good climate risk information is available, it does not necessarily make adaptation decisions easier or better. A society's adaptation decisions inevitably involve many intersecting—and often competing—values and interests. Fair and effective processes for weighing and resolving these play a central role in adaptation across the full spectrum of vulnerability- and impacts-based approaches.

Investment in institutions and decision-making processes that embody principles of good governance will provide a solid foundation for identifying adaptation priorities, making fair trade-offs and building resilience. While more attention has been paid to building processes and institutions to facilitate adaptation at the community level, establishing effective processes for adaptation decision-making at the national and sectoral levels is also needed. Policies that themselves adapt to changing conditions will provide a critical supporting environment for adaptation processes at all scales. Development of “adaptive policymaking” will require policymakers to treat policies as ongoing experimental and learning processes.

Managing uncertainty requires effective use of information at all scales and across the spectrum of emphasis on vulnerability and impacts. For example, geographical information plays a central role in adaptation planning, irrespective of whether the information mapped relates to sources of vulnerability or predicted changes in climate. Thus, mapping (e.g., for flood risk, soil moisture, poverty indicators, watershed boundaries) and other broadly relevant information (e.g., census data and historical and current weather records) play a central role in adaptation planning. The centrality of information argues for adaptation investments in communications infrastructure, as well as training to enable educators and the media to understand and interpret information relevant to climate adaptation.

FINANCING ADAPTATION

Funding for adaptation in developing countries flows mainly from two sources: dedicated multilateral adaptation funds and official development assistance (ODA). The dedicated adaptation funds have focused on climate-specific activities, while ODA focuses on the development-related agenda. In projects undertaken to date, ODA represents the far larger share. However, the universe of dedicated adaptation funds is now poised to grow, as national governments take on the adaptation agenda, as the United Nations Framework Convention on Climate Change (UNFCCC) Adaptation Fund nears its launch, and as Parties to the UNFCCC explore adaptation funding mechanisms for a post-2012 agreement.

Within the ODA community, dedicated adaptation funding streams are also being created. In addition to guidance on the importance of information, the need for adaptive policies, and the importance of local, national, and regional adaptation efforts, our analysis suggests:

- It is critical that funders include vulnerability-reduction and capacity-building activities in adaptation projects.
- Fostering inclusive, accountable decision-making is a central task, as decision-making processes are at the heart of effective adaptation, especially in the context of ensuring that policies are poised to adapt to the uncertain future.
- Many adaptation information needs have surprisingly little to do with climate prediction. Priorities for support include geographical information capacities, gathering and managing national census data, historical and current weather data, communications infrastructure, and the ability of educators and media personnel to understand and interpret climate information.
- Donor coordination is needed to ensure that gaps and redundancies are avoided as adaptation efforts progress.

Box 1. REPORT GUIDE

Section I. Introduction: Adaptation or Development?

- Failure to clarify the relationship between adaptation and development runs the risk that funding mechanisms will create redundancies or leave gaps in the landscape of activities that receive support.
- However, efforts to draw a distinct line between adaptation and development can prove counterproductive.
- A broader, more nuanced definition of “adaptation” is needed to accommodate its complex relationship with development.

Section II. Adaptation Around the World: Taking Stock

A review of 135 “adaptation” cases from developing countries reveals a diversity of ways that adaptation and development intersect:

- In many instances, development is seen as a means to adaptation ends.
- In other cases, adaptation objectives serve as means to achieve development ends.
- In even more cases, activities undertaken to achieve development objectives incidentally also serve an adaptation function.
- Few activities are targeted exclusively at meeting a climate adaptation need without reference to the development agenda.

Section III. Framing Adaptation: A Continuum of Approaches

- Two factors appear to predominate in shaping an adaptation response:
 - the existing capacity of those responding, and
 - the level of information available about expected climate change.
- These factors play out across a continuum of adaptation from “pure” development activities to very explicit adaptation measures.
 - At one far end of the continuum, adaptation efforts overlap almost completely with traditional development practice, where activities take little or no account of specific climate change impacts.
 - At the far opposite end, highly specialized activities are developed in response to observed or anticipated changes in climate (and their effects), and fall outside the realm of development as we know it.
 - In between lies a broad spectrum of activities with gradations of “normal” development and climate change-focused activities.

Section IV. Governance and Decision-Making Under Uncertainty

The framework presented in Section III suggests that processes for weighing and resolving competing values and interests will play a central role in adaptation. Promoting effective processes will require:

- incorporating adaptation decisions in appropriate places within the development landscape,
- adhering to principles of good environmental governance,
- fostering adaptive policy, especially at the national level,
- providing a solid information foundation for decisions, and
- implementing effective monitoring and evaluation.

Section V. Financing Adaptation

- Resources available for adaptation through international funding mechanisms fall far short of what is needed. Moreover, constraints upon the Global Environment Facility have hampered these mechanisms in addressing the intersection of adaptation and development.
- The focus of adaptation funding is shifting toward official development assistance (ODA), which represents a larger pot of money. However, national decision-making about spending ODA is often disconnected from the environment ministries that typically lead on adaptation planning.
- As new sources of adaptation funding are created, there is an opportunity to improve upon existing mechanisms. To do so, supporting vulnerability-reduction and capacity-building activities at the heart of enabling effective adaptation is critical, though the “additional cost” due to climate change may not be clearly identifiable.

Section VI. Lessons Learned and Next Steps

Priorities for additional research and analysis include:

- supplementation of the present case set,
- additional quantitative and qualitative analysis of cases,
- development of decision tools using the continuum framework, and
- development of case studies and models for adaptive policymaking.



Introduction: Adaptation or Development?

Over the last five years, adaptation to climate change has risen on the agendas of researchers, practitioners, and decision-makers in a variety of fields. Among the reasons for this more prominent profile is the growing evidence that climate change is already occurring, and a consensus that continuing change threatens to undermine economic development and social well-being.

This emerging consensus is driving the recognition that any effective development planning process will need to take climate change into account—and, more particularly, will need to facilitate adaptation to the effects of climate change. Development actors are waking up to this reality, as evidenced by efforts to “mainstream” adaptation into aid programs and projects.

However, the converse is also true: in many cases, adaptation will have to include “regular” development interventions to ensure the sustainability and overall success of its results. This conclusion has most recently been affirmed by the Intergovernmental Panel on Climate Change (IPCC) in its Fourth Assessment Report,

which notes that “sustainable development can reduce vulnerability to climate change, and climate change could impede nations’ abilities to achieve sustainable development pathways.”¹

Efforts to mainstream adaptation into development efforts imply it is something new and/or additional, while reliance on existing development efforts to support or “do” adaptation implies they are one and the same. These two perspectives on the relation of adaptation to development raise challenging questions about what really constitutes adaptation to climate change. Is it fundamentally different from “good” development, or is there a need to employ different approaches, tools, and policy processes? Is adaptation the means to a development end, or vice versa? The need to answer these questions is growing, since the lack of clarity about the relationship between adaptation and development has contributed to the unacceptably slow growth of resources available for adaptation.

This report posits that the relationship between adaptation and development is not an “either/or” consideration. Rather, how adaptation relates to development varies across circumstances; as such, efforts to draw a fine line between them cannot be universally applicable. Reviewing the current landscape of adaptation experience suggests a new framework for understanding adaptation that can inform efforts to mobilize resources and develop policy in support of effective adaptation work.

Box 1 provides a guide to the main ideas in each section of this report. This section provides an introduction to the challenge of adaptation and discusses the importance of questions surrounding its relationship with development. Section II presents examples and key lessons from a review of 135 on-the-ground instances of adaptation. In Section III we propose a framework for considering adaptation measures within the context of development, and explore some factors that influence what measures are appropriate. Section IV considers the central role of environmental governance in adaptation, while Section V presents the report’s implications for financing adaptation initiatives. Section VI presents lessons and next steps for further research and analysis.

ADAPTATION AND DEVELOPMENT: A TALE OF TWO TOWNS

On 29 August 2005, Hurricane Katrina made landfall in Louisiana, USA. The warm sea surface revved the storm up to a Category 5 storm as it veered toward the city of New Orleans. While the city weathered the storm itself (by then Category 3) relatively well, the Mississippi River later breached its levees and, as the world watched, took an estimated 1,570 lives.² More than two years after the event, vast sums have been wasted, misspent, or outright stolen, with the result that many of the poorest families will most likely never recover their losses.

The catastrophe was not an inevitable result of the hurricane. While few cities would hope to escape wholly unscathed from a storm of Katrina’s intensity, the real devastation was due to a series of failures in human systems. These failures have been extensively catalogued elsewhere,³ and include poor infrastructure design; failure to conduct needed repairs and maintenance; endemic poverty and inequality; poor communication between agencies at a local level; and poor coordination among city, state, and federal agencies after the event, exacerbated by political party differences and corruption.

That these failings should have been encountered in a major city within the richest nation on Earth—a nation that prides itself on its civic institutions and has the

world’s most pervasive information networks—is sobering. Perhaps the most striking feature of the calamity is how clearly it illustrates the importance of wealth and capacity differences. The most serious and lasting damage was felt by the city’s poorest residents. Middle class New Orleans had evacuated in private vehicles before Katrina hit, and its houses, generally insured and on higher ground, were proportionately less harmed. Poor residents lived in the most vulnerable areas, were more dependent on government authorities to evacuate them, and had less insurance. In other words, those with the least lost the most.

Meanwhile, half a world away in Maharashtra, India, a remarkable success story was emerging. A state of some 100 million people, Maharashtra is plagued by drought. During the dry season, water is trucked to thousands of villages. In the early 1990s, the village of Darewadi had enough water for agricultural activities for only 3 to 4 months of the year, and during the driest periods villagers depended on tanker trucks for even their most basic water needs. Agriculture represented almost the only economic activity of the village, so work and incomes were correspondingly limited.

Since then, supported by nongovernmental organizations (NGO) and the German government, the village has deployed a series of soil and water conservation measures that have transformed water availability. Agriculture is now possible for 9 to 10 months of the year, greatly enhancing incomes, and trucked water is no longer needed. Notably, these successes were made possible not by major outside interventions, but by the establishment of local institutions, in particular a Village Watershed Committee. With strong local confidence in these institutions, villagers were willing to volunteer work, temporarily refrain from grazing certain areas, and take other measures necessary to allow restoration of the watersheds. Today, with an improved ecosystem and more robust livelihoods, the people of Darewadi are better able to cope with drought conditions⁴.

LEARNING FROM NEW ORLEANS AND DAREWADI

Both New Orleans and Darewadi offer compelling climate and development stories. The settings are of course dramatically different—an urban center in a wealthy nation versus a poor village in a developing country. Humid, coastal New Orleans was hit by an unusually violent storm, while semi-arid Darewadi suffered the slow, cumulative effects of recurring drought. In neither case is it clear that climate change played a causal role. Yet both examples illustrate a core challenge of adaptation

to climate change: that reducing vulnerability to climate stresses can be difficult to distinguish from promoting sustainable development.

Adaptation and development efforts can be difficult to distinguish for several reasons. The first relates to objectives: any given action that aims to facilitate adaptation to climate change almost always achieves other objectives at the same time. For example, Darewadi village worked to increase water availability in order to pull people out of poverty; climate change was not the motivating force for action, but the community is now better equipped to deal with its effects. Can we say that adaptation did not occur? Similarly, New Orleans had many reasons unrelated to storms or levees why it would benefit from shoring up its infrastructure, reducing corruption, and promoting interdepartmental cooperation. Its failure to take these measures played out day-to-day in local news headlines about crime, education, health care, and other matters; in the context of a historic storm it became clear that these were also failures of disaster preparedness. As Katrina-like storms are expected to become more frequent as the Earth warms,⁵ disaster preparedness becomes an important element of adaptation to climate change.

A second reason that adaptation and development can be difficult to distinguish is methodological. Many strategies and activities that help reduce vulnerability to climate stresses are the same ones used to address other, non-climate problems. In both the successes of Darewadi and the failures of New Orleans, natural resource management practices, infrastructure development and maintenance, and institutional capacity building are needed. Would the nature of these efforts on the ground have changed if they were used for adaptation to climate change instead of poverty reduction and economic development? Probably not. The distinction is even more difficult to make as climate change often tends to reinforce other stresses that harm human and natural systems.

Adaptation and development blend together for a third reason: the complexity of the climate system and the limits of human science make it difficult to dissociate anthropogenic climate change from “normal” climate variability. Whether or not climate change played a role in Katrina, the Mississippi River had long been at risk of bursting its levees. In South Asia, climate change is predicted to bring more frequent and intense droughts,⁶ so Darewadi’s efforts to address current climate challenges contribute to its efforts to address future climate change.

While climate change did not factor into decisions in either New Orleans or Darewadi, the decisions certainly factor into readiness for climate change. This blurring of adaptation and development raises a central question: does distinguishing between adaptation and development

Box 2. A READER’S GUIDE TO ADAPTATION VOCABULARY

There is no universally satisfactory definition of adaptation to climate change. While a large number of definitions have been proposed, most are fairly broad and vary more in emphasis than in substance.¹ Few of these generic definitions prove helpful when trying to determine whether a specific activity is or is not “adaptation to climate change.” This report thus attempts to avoid focusing overly on developing a universally applicable definition, and chooses instead to explore the many different factors that may play into the adaptive function of a particular effort.

However, when dealing with as complex and contentious an issue as adaptation to climate change, definitions clearly cannot be dodged entirely. The following discussion of terms is designed to help readers navigate this report with a minimum of confusion:

Adaptation

From the Intergovernmental Panel on Climate Change (IPCC): “Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.”² Adaptation is a process, not an outcome.

Climate Change

From the United Nations Framework Convention on Climate Change: “A change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods.”³ This definition is chosen over the IPCC definition simply to facilitate discussion of climate change and climate variability as separate phenomena; this should not in any way be construed to exclude climate variability from adaptation processes.

Development

The pursuit or attainment of well-being in all its dimensions, including economic sufficiency, social equity, personal security, good health, opportunity, and personal freedom.

Impacts

From the IPCC: “The effects of climate change on natural and human systems.”⁴ The term “impact” is frequently used loosely in the climate change discourse. Use of the term to describe effects associated with a change in climate sometimes muddies the waters by implying that climate change alone is responsible for particular effects, when in fact the effects of climate change are predicated on a large set of contributing or underlying variables. For human systems in particular, “impact” should not be read to ascribe exclusive causality to climate change.

Maladaptation

Those responses that address immediate risks in a manner that increases future risks because they create conditions that ultimately raise vulnerability.

Vulnerability

Vulnerability is, broadly speaking, the ability to be harmed. This broad definition is practical, since people and systems (such as poor communities) that are relatively more vulnerable to one set of harms are frequently also vulnerable to others.

Notes

1. For a thorough review of various definitions, see Schipper 2007.
2. IPCC 2007b, p. 869.
3. UNFCCC 1992, Article 1.
4. IPCC 2007b, p. 876.

Box 3. ECOSYSTEMS: SERVICE PROVIDERS TO THE WORLD

“Ecosystem services” are the benefits that people obtain from ecosystems. They include *provisioning services*, such as food, fresh water, timber, and fiber; *regulating services* that affect climate, floods, disease, wastes, and water quality; and *cultural services* that provide recreational, spiritual, and aesthetic benefits. Human beings, though buffered against environmental changes by culture and technology, depend fundamentally on the flow of these goods and services.

Human societies too often take nature’s services for granted, in large part because decision-makers lack sufficient information, incentives, rights, management processes, and accountability for sustainably managing ecosystems. The results are apparent. The Millennium Ecosystem Assessment, a four-year international scientific appraisal undertaken by nearly 1,400 experts from 95 countries, concluded that 60 percent of the world’s major ecosystem services have been degraded over the past 50 years. This degradation is expected to increase over the first half of this century.

Climate change contributes to the degradation of ecosystems and their services, as do population growth, urbanization, land-use change, and other drivers. Examples of how climate change can contribute to changes in ecosystem services include:

- declines in fresh water availability;
- decreasing crop yields;
- drought and flooding (water regulation) due to the accelerated melting and receding of glaciers worldwide;
- shifts in optimal areas for forest growth;
- sea level rise, which could seriously affect the aquaculture industry; and
- negative effects on high-conservation-value ecosystems and biodiversity (cultural services).

Climate-driven degradation will work independently or in combination with other drivers to affect different constituents of human well-being, such as good health, good social relations, and security. These consequences will be felt more acutely by people more directly dependent upon ecosystem services—typically, the poor. To optimize adaptation opportunities and truly reduce human vulnerability, societies need to better understand how they depend upon and affect ecosystems and the services they provide.

Source: Millennium Ecosystem Assessment 2005.

matter if vulnerability to climate stresses ultimately is reduced? On the ground, in places like New Orleans and Darewadi, the answer is often “No.” However, when it comes to mobilizing resources for adaptation to climate change, some people say, “Yes.” The tension between these two answers has created an intractable dilemma: should additional funding be provided for a new challenge called “adaptation,” when the work it entails looks so much like what is already taking place under the rubric of “development”? If so, how?

WHY DISTINGUISH BETWEEN ADAPTATION AND DEVELOPMENT? THE FUNDING DILEMMA

Adapting to climate change will require additional resources and investments. Some initial (and wide-ranging) estimates on the costs of climate impacts and adaptation provide an indication of the scale of support needed. The World Bank has reported that approximated 20–40 percent of activities financed by Official Development Assistance (ODA) and concessional finance are subject to climate risks, and that the annual cost of addressing this risk would be US\$1–\$8 billion.⁷ A recent review by the UNFCCC⁸ concluded that by 2030 the world will be spending somewhere around US\$49–\$171 billion *more each year* on infrastructure than would otherwise be needed in response to impacts associated with climate change. In developing countries, the UNFCCC estimates US\$28–\$67 billion a year of additional investments and financial flows will be needed for adaptation to impacts on water, agriculture, forestry and fisheries, and health. In a wide-ranging review addressing both climate impacts and mitigation, the 2006 Stern Report estimated that the cost of climate change in the absence of mitigation would lead to a 5 percent loss in global gross domestic product (GDP).⁹

These estimates calculate the costs of adaptation in global aggregate, as if climate damages were as consequential in the United States as in Malawi. However, the harm associated with climate change falls disproportionately on poorer nations and communities: whereas the wealthy may lose some wealth, the poor risk losing their livelihoods and lives. Poor people often tend to live in fragile or degraded environments and have livelihoods that are more dependent on ecosystem services (see Box 3). With fewer resources from which to draw during periods of stress or crisis, they are more vulnerable to increasing frequency and intensity of weather extremes, seasonal shifts in precipitation, sea level rise, and other observed or predicted effects of climate change. Supporting adaptation measures in poor communities is an urgent priority.

Moreover, the poor have contributed only marginally to the problem of climate change—they are suffering damage largely caused by the consumption patterns of the rich. As such, the poor (both in developed and developing countries) have a strong moral claim on their wealthier neighbors to help finance the cost of their adaptation efforts. This obligation is explicit in the United Nations Framework Convention on Climate Change (UNFCCC), which requires developed countries to “assist developing country Parties that are particularly vulnerable to the

adverse effects of climate change in meeting costs of adaptation to those adverse effects.”¹⁰ The UNFCCC also stipulates that this support must go beyond conventional development assistance, through adaptation funding that is “new and additional” to what is already needed for sustainable development. Thus, the dilemma: how can “new and additional” funds be provided for adaptation, when distinguishing between adaptation and development is so difficult?

For example, what climate change means for farmers in the Sahel is poorly understood. Some climate models predict an increase in precipitation, while others predict a decrease.¹¹ In spite of this uncertainty, much can be done to build resilience in the region to help its inhabitants adapt to whatever changes they ultimately face. Building robust local institutions, such as village water resource management committees, or establishing early-warning systems can help communities deal with whatever precipitation future materializes. These initiatives will not address specific climate change impacts and, by and large, will look a lot like typical development efforts.

Should such “development” efforts qualify for “adaptation” funding? Though typically they will not meet funding criteria that are based upon the concept of “additional costs,” they represent the very foundation of adaptation to climate change in many places. Failure to make development-related investments may leave gaps in the landscape of adaptation efforts, and these gaps may arise where people are already especially vulnerable.

While the overarching need for “additional” funding for adaptation is clear, projecting this need universally onto adaptation efforts at the operational level risks leaving much-needed interventions unfunded.

Therefore, policymakers must reconcile the need for new and additional funding with the recognition that traditionally funded development efforts are an important part of adaptation. While experiences with designing and implementing adaptation strategies are still in their infancy, a review of some of these early experiences sheds some light on what currently is being supported under the banner of adaptation, where further support is needed, and where funding modalities must adjust to accommodate the overlap of adaptation and development. A first step toward doing this requires a closer look at adaptation experience to date.

Notes

- ¹ IPCC 2007a, p. 20.
- ² Kates et al. 2006.
- ³ Ibid.
- ⁴ WRI 2005 provides a detailed discussion of the Darewadi case.
- ⁵ IPCC 2007a.
- ⁶ Ibid.
- ⁷ World Bank 2006
- ⁸ UNFCCC 2007.
- ⁹ Stern 2006.
- ¹⁰ UNFCCC 1992, Article 4.
- ¹¹ Boko et al. 2007.

SCOTT WALLACE/THE WORLD BANK

Adaptation Around the World: Taking Stock

While definitions of adaptation abound, they have not been particularly helpful in building understanding of what adaptation really entails. For example, our definition of adaptation as “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities”¹ does not paint a very clear picture. One can imagine any number of diverse activities that could qualify.

This report seeks to go beyond definitions in order to create more functional principles for understanding adaptation. Building on practical examples, the analysis reviews a series of global adaptation activities to better understand the scope of what may be considered adaptation, and to identify analytic parameters that can help to make the diversity of potentially useful adaptation activities more manageable at the funding and policy levels. In particular, we seek to identify concepts that can assist in characterizing when the distinction between

adaptation and development is useful, when it doesn’t matter, and when it could be counterproductive.

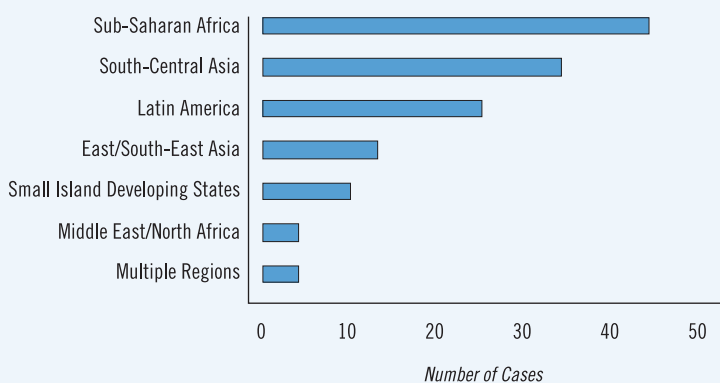
WHAT IS ADAPTATION? GATHERING PRACTICAL EXAMPLES

To undertake this analysis, data on 135 “adaptation” activities labeled as such by project implementers or researchers were gathered from Internet sources. Activities in the database range from concrete projects to policy development efforts, from small village-level programs to huge transboundary initiatives. For each example selected, there had to be evidence of practical, on-the-ground activity, not merely research or study. The review cast a broad net to avoid being prescriptive or exclusive, and to capture the full diversity of current efforts that may help us understand the relationship between adaptation and development.

The selection of case examples took place through an iterative process. An initial set of 120 cases identified through UNFCCC sources and the “Development and Adaptation Days” were narrowed to 47 on grounds that 73 of them primarily represented knowledge generation, not practical action. Subsequent efforts to augment the 47 examples with additional cases focused on the Web sites and databases of United Nations agencies, bilateral development agencies, and international NGOs. We also solicited cases via the Climate-1 and CAN-talk e-mail list serves, in response to which 32 people sent e-mail replies, leading to 12 examples that were included in the review.² Annex A provides a list of all 135 cases in the final data set and provides links to the sources used; Annex B provides additional detail on case selection methods. Further description of the case data may be found online at www.wri.org/climate/. It should be noted that the one major segment excluded from the start of the study was adaptation in the developed world.³

While we believe that our review has covered the current major sources for adaptation information, a number of selection biases may affect our findings. First and foremost, the review draws heavily on Internet-based sources, and most likely excludes examples of adaptation by agencies in the developing world that do not have a Web presence. This constraint may partly explain the relatively low number of legislative and policy activities captured in the study. Emphasis on online sources also most likely excludes practical efforts underway within the business community, for whom adaptation efforts link closely to confidential business strategies. However, most private-sector activity on adaptation to date focuses on the developed world⁴ and, therefore, is not central to this study. The review also heavily emphasizes resources available in English, and may under-represent efforts underway in Latin America, Francophone Africa, and other non-English-speaking places.

Figure 1. Distribution of Cases by Region



CHARACTERIZING ADAPTATION EFFORTS

Of the cases examined, the largest regional grouping was found in Sub-Saharan Africa, followed by South-Central Asia, and Latin America (Figure 1). By far, the majority of cases had a rural focus, while adaptation efforts in urban settings appear to be very limited (Figure 2). In terms of geographic scale, the largest body of cases was found at the community (most often village) level, followed by other subnational jurisdictions (such as a coastal zone, a water basin, or a district). Relatively few examples aimed to create change at the national level, and even fewer were truly international (Figure 3). Figure 4 shows the sectoral breakdown of the cases examined. Agriculture and Disaster Risk Management predominate, followed by Water Resource Management and Coastal Resources.

The parameters described in Figures 1 through 4 represent some of the most common ways of characterizing adaptation efforts. This study’s findings around these parameters provide evidence for gaps in action toward adaptation that are frequently discussed anecdotally within the adaptation community. For example, Figure 2 suggests that little attention has been paid thus far to adaptation in the urban context, relative to rural areas. Likewise, Figure 3 suggests that national-level adaptation initiatives have developed slowly, relative to community-based efforts. Figure 4 indicates relatively little work is taking place on adaptation in the human health and energy sectors. These findings may indicate areas where additional work is needed.

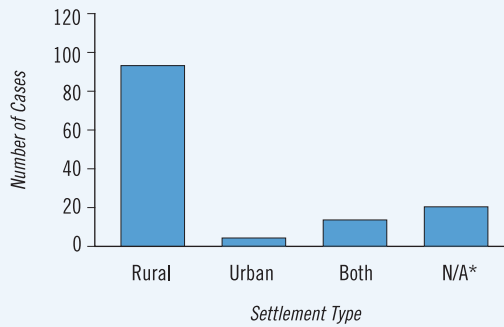
GETTING BEYOND SECTOR AND PLACE

While the above analysis of geography and sector can help to identify trends and gaps in the current body of work described as “adaptation,” it helps little with the challenge of distinguishing adaptation from development. With this in mind, the authors looked to both the objectives of case activities and the strategies at play in each case to see if distinguishing characteristics emerge.

Case Objectives

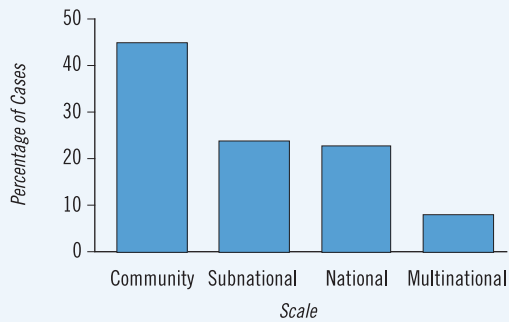
To understand the original objective of the activity vis-à-vis adaptation to climate change, each case was reviewed to ascertain whether the initiative aimed at adaptation to climate change from the start; had adaptation elements that supplemented work with other core aims; or was interpreted as “adaptation” only after-the-fact. This criterion is of interest because project goals and planning provide one option for distinguishing adaptation efforts from business-as-usual development. Based on the objectives of activities studied, three models emerged:

Figure 2. Settlement Type of Cases Reviewed



* Cases marked "N/A" represent national initiatives (often unfinished planning processes) for which a rural or urban designation is either irrelevant or impossible to assign given data available.

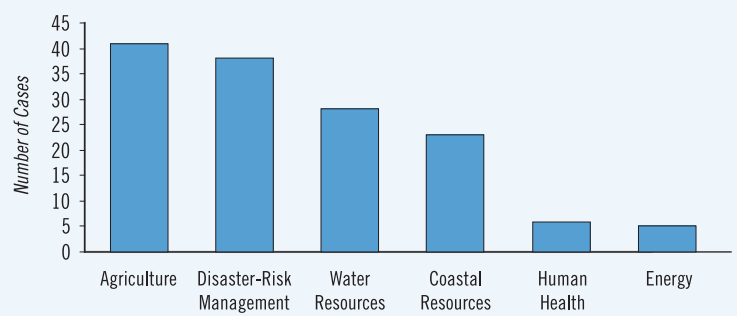
Figure 3. Geographic Scale of Cases Reviewed



1. "Serendipitous" Adaptation

Because of the overlap of development and adaptation strategies, many activities undertaken to achieve development objectives have outcomes that incidentally may also support adaptation. As was the case with the work in Darewadi village, in Maharashtra, India, the adaptation function of many initiatives was noticed or emphasized only after the start of the project—and sometimes even after its completion. Some observers say this approach to adaptation does not represent *real* adaptation and suggest that authors and project developers may be cynically positioning their work to take advantage of the growing interest in adaptation to climate change. However, whether or not the adaptive function of an initiative is noticed or articulated does not change the adaptive value of the activity. Moreover, retrospective examination of work to find "serendipitous" adaptation effects can serve a valuable learning function by helping to identify the universe of relevant strategies, understand the scope of current work that supports adaptation, and prioritize areas for future investment. Many development agencies are currently conducting reviews of past and ongoing projects to understand which have supported

Figure 4. Distribution of Cases by Sector



adaptation processes, and which require additional investments to be effective.^{5,6}

2. Climate-Proofing of Development Efforts

In a number of cases, additional activities were added to an ongoing development initiative to ensure its success under a changing climate. In these cases, adaptation is seen as a means to a development end, and falls under the rubric of "climate-proofing," in which information about climate is integrated into decisions or additional investments are made to reduce or eliminate climate change risks.⁷ Box 4 provides an example of a major ongoing infrastructure project for which the Chinese government obtained climate-proofing funds from the Global Environment Facility (GEF). However, not all climate-proofing efforts take the form of activities added to ongoing development initiatives. Some development efforts take a climate-proofing approach from the start. In these cases, climate change predictions are usually used to help shape plans for development projects.

3. Discrete Adaptation

In cases of "discrete adaptation," adaptation to climate change is the primary objective of a project or initiative. From the beginning, implementers and funders of these efforts have climate change in mind. However, methods and strategies for achieving adaptation objectives may be drawn from the development "toolbox," and development outcomes may be seen as a means to an adaptation end. For example, numerous cases included activities that foster new livelihood activities, promote better natural resource management, or promote literacy.

As can be seen in Figure 5, the largest group of cases reviewed for this study is found in the "serendipitous" adaptation category. This finding is not surprising, given the large body of longstanding development work with potential adaptive function. Discrete adaptation activities were the second-largest grouping, followed by climate-proofing, a relatively new approach that seems likely to grow.

Box 4. CHANGING COURSE: CHINA INTEGRATES CLIMATE INTO AGRICULTURAL PLANNING

Climate conditions affect our everyday lives—whether we’re planning a picnic, packing for a trip far from home, or deciding when to harvest the last of the summer garden. Decision-makers who ignore climate conditions face much higher stakes if they set a development project into motion without considering how changes in climate may influence its success.

A World Bank-funded project from northern China shows how climate change considerations were overlooked in planning a development project—and how this omission was then rectified. Begun in 2004, the project aimed to address declining agricultural productivity in the “3H” Basin (comprising the Huang, Huai, and Hai River Basins). The project drew on time-proven techniques for increasing output: irrigation upgrades, improved water-use efficiency, and broader access to markets and information.

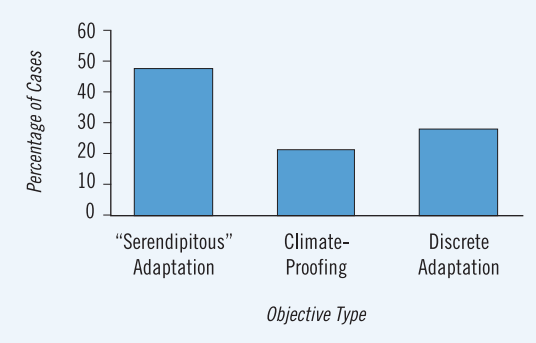
One year after the project’s initiation, China solicited a second loan from the World Bank, this time from the Global Environment Facility’s Special Climate Change Fund. This grant, titled “Mainstreaming Adaptation to Climate Change into Water Resources Management and Rural Development,” was intended to address a missing element of the initial project. The grant proposal noted that “although key components of [the agricultural project] are climate sensitive, adaptation measures for climate change were not included in [the] project design because the role of adaptation has been widely recognized only recently.” The realization of the relevance of climate change to this project was spurred by predictions that higher temperatures could increase evaporation and that sea level rise could cause salinization of ground water, restricting any increase in agricultural productivity.

The new grant incorporates climate change concerns into the existing project by modeling climate change impacts on hydrology and agriculture and by testing a wide range of adaptation measures at demonstration sites. As the project’s title attests, a broader aim is the integration of adaptation to climate change into agricultural development planning throughout the country. Through workshops, training, and institution of a national climate change adaptation plan for the agricultural sector, China hopes to reverse the inattention to climate change evidenced in the original project, and install in its place a focused awareness of the relevance of climate change to development.

Source: World Bank 2007.

The objective-based typology described above is helpful in describing the current landscape of adaptation efforts. It highlights valuable assessment processes and learning that have emerged as the development community turns an adaptation lens to existing strategies and project portfolios. However, given the growing interest in and tools available for mainstreaming adaptation into development,⁸ it seems clear that these two separate objectives will increasingly blur as they come to be considered together in decision-making. The distinction between adaptation as a means to development (as we see in climate-proofing cases) and development as a means to adaptation (as we see in discrete adaptation cases) is already challenging to discern in many cases, and it is likely to grow even fuzzier.

Figure 5. Characterization of Cases According to Objective



Case Strategies

A second parameter used to characterize the adaptation cases is strategy. Although no system for categorizing adaptation strategies will ever be perfect, 12 strategies emerged from the data set (Table 1). The strategies indicate a clear methodological intersection between adaptation and development. Of the 12 strategies identified, only climate change awareness-raising is unique to climate adaptation. The majority of cases utilize methods and approaches that come straight from the development toolbox; when seen on the ground, few of them would be easily distinguished from development initiatives.

The strategy parameter also indicates that many adaptation efforts are highly integrated. Most projects utilize multiple strategies to address multiple sources of vulnerability (Figure 6). For instance, many people picture physical infrastructure projects when they think of adaptation, since roads, bridges, and buildings in many places will need to withstand more frequent or stronger storms and floods as climate changes. However, all 13 examples in our data set that focus on infrastructure also incorporate other strategies, such as technological change, institution building, and planning.

LESSONS FROM THE CASE REVIEW

In looking at the objectives of activities labeled “adaptation,” we find that sometimes adaptation is viewed as a means to achieve a development objective, while other times development provides a means to achieve an adaptation objective. This dual relationship is positive: when the two objectives are viewed as supporting each other, they both are more likely to be achieved. Given the current interest in mainstreaming adaptation into development, however, the two will increasingly be treated as dual objectives, rather than ends and means. This means that those who wish to examine objectives to distinguish adaptation from development will increasingly

TABLE 1. ADAPTATION STRATEGIES EMPLOYED IN THE CASES EXAMINED

	STRATEGY	NUMBER OF CASES
1	CHANGING NATURAL RESOURCE MANAGEMENT PRACTICES Emphasizes new or different natural resource management practices (e.g., for managing water, land, protected areas, fisheries) as adaptation strategies.	57
2	BUILDING INSTITUTIONS Creates new or strengthens existing institutions (e.g., establishing committees, identifying mechanisms for sharing information across institutional boundaries, training staff responsible for policy development).	43
3	LAUNCHING PLANNING PROCESSES Sets in motion a specific process for adaptation planning (e.g., developing a disaster preparedness plan, convening stakeholders around vulnerability assessment findings).	35
4	RAISING AWARENESS Raises stakeholder awareness of climate change, specific climate impacts, adaptation strategies, or the environment in general.	33
5	PROMOTING TECHNOLOGY CHANGE Promotes implementation or development of a technology new to the location (e.g., irrigation technology, communications technology).	31
6	ESTABLISHING MONITORING/EARLY WARNING SYSTEMS Emphasizes the importance of creating, implementing, and/or maintaining monitoring and/or early warning systems.	25
7	CHANGING AGRICULTURAL PRACTICES Focuses on new or different agricultural practices as adaptation strategies.	23
8	EMPOWERING PEOPLE Emphasizes literacy, gender empowerment, or the creation of income generation opportunities as a basis for adaptation.	22
9	PROMOTING POLICY CHANGE Promotes establishing a new policy or adjusting an existing policy.	14
10	IMPROVING INFRASTRUCTURE Focuses on creating or improving built infrastructure (e.g., roads, sea walls, irrigation systems).	13
11	PROVIDING INSURANCE MECHANISMS Creates, modifies, or plans an insurance scheme.	4
12	OTHER STRATEGIES Consists of three instances of relief work and one focused on eradication of climate-related diseases.	4

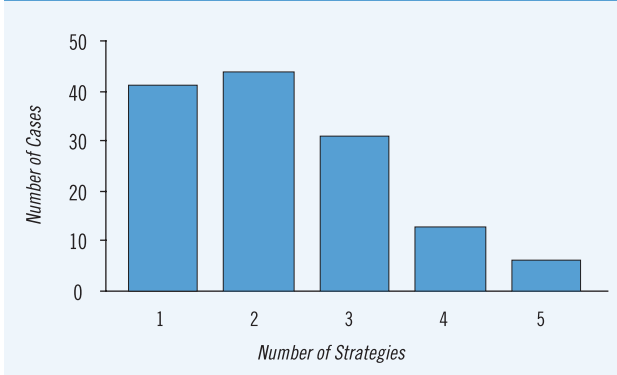
have trouble doing so. In particular, understanding adaptation as an entirely separate process is unlikely to provide a useful rubric for allocating scarce resources or selecting among competing policy options.

Exploration of the strategies used in the cases finds that a significant area of overlap between adaptation and development is methodological. Even when adaptation is the primary objective of an activity (as opposed to being a means to development), efforts labeled “adaptation” almost always utilize strategies that look remarkably like those used in development. This suggests that if there are uniquely “adaptive” elements to these efforts, they are

those involved in defining problems, selecting strategies, and setting priorities, not in implementing solutions. Further work to survey these planning processes could perhaps identify clearer ways to distinguish adaptation from development work.

For the moment, however, the parameters examined seem primarily to highlight the intersections of adaptation and development, and have limited utility in providing a broadly applicable way to differentiate between them. Thus, it seems appropriate to instead turn to a conceptual framework that pursues the idea that the relationship between adaptation and development will vary with changing circumstances.

Figure 6. Number of Strategies Employed in Each Case



Notes

- ¹ IPCC 2007b, p. 869.
- ² These included particularly rich contributions from the World Bank and GTZ, for which the authors are grateful.
- ³ Countries listed in Annex 1 of the UNFCCC were considered “developed” for the purposes of this study; all others were considered “developing.”
- ⁴ UNEP Finance Initiative 2006.
- ⁵ The UNFCCC’s Coping Strategies Database, for example, presents strategies useful in adapting to climate change (<http://maindb.unfccc.int/public/adaptation/>), irrespective of whether they were first implemented specifically to achieve adaptation objectives.
- ⁶ Klein et al. 2007.
- ⁷ Reid and Huq 2007.
- ⁸ See, for example, USAID 2007.



ERIC MILLER/THE WORLD BANK

Framing Adaptation: A Continuum of Approaches

If there is one clear lesson from the experience of adaptation responses to date it's that there is no one clear lesson. Responses to climate change encompass countless sectors and different communities. Some involve detailed understanding of the emerging impacts; others, only the vaguest notion that a vulnerable community will be under climatic stress. Some involve a deliberate attempt to cope with climate change; many contribute to adaptation without intending to.

How then do we approach the messiness and diversity that characterizes adaptation? The first thing to realize is that no one model for framing adaptation efforts will be completely satisfactory. Any set of criteria for sorting adaptation initiatives can and will be critiqued. A framework is important only insofar as it is useful in making a particular point; in other cases, we may carve up the problem differently. Here we introduce a framework of approaches to adaptation based upon how closely those approaches target specific climate change impacts. Our framework makes a key point: rather than draw a sharp

distinction between adaptation and development, we instead place them on a continuum. This enables users to better understand the overlap between efforts, and should allow policymakers and funders more latitude in designing and implementing adaptation programs.

MAPPING ADAPTATION EFFORTS

Two roughly distinct perspectives inform how people approach the challenge of adaptation: one focuses on creating response mechanisms to specific impacts associated with climate change, and the other on reducing vulnerability to climate change through building capacities that can help deal with a range of impacts. The first approach uses understood impacts as a starting point for distinguishing between adaptation and “normal” development. However, making this distinction can be technically and conceptually difficult, as discussed in Section I, and has been critiqued for neglecting the real causes of vulnerability. A more vulnerability-

focused approach, on the other hand, starts by targeting the underlying factors that cause climate change to be harmful.¹ Such an approach may fall outside the mandate of climate change policies, and can also appear massive in scope.

In practice, of course, many instances of adaptation fall between the extremes of vulnerability and impacts foci: actions are taken with a specific type of impact in mind, but nevertheless involve activities with more general benefits in reducing vulnerability. One way of framing this diversity is as a continuum between “pure” development activities on one hand and very explicit climate change measures on the other.

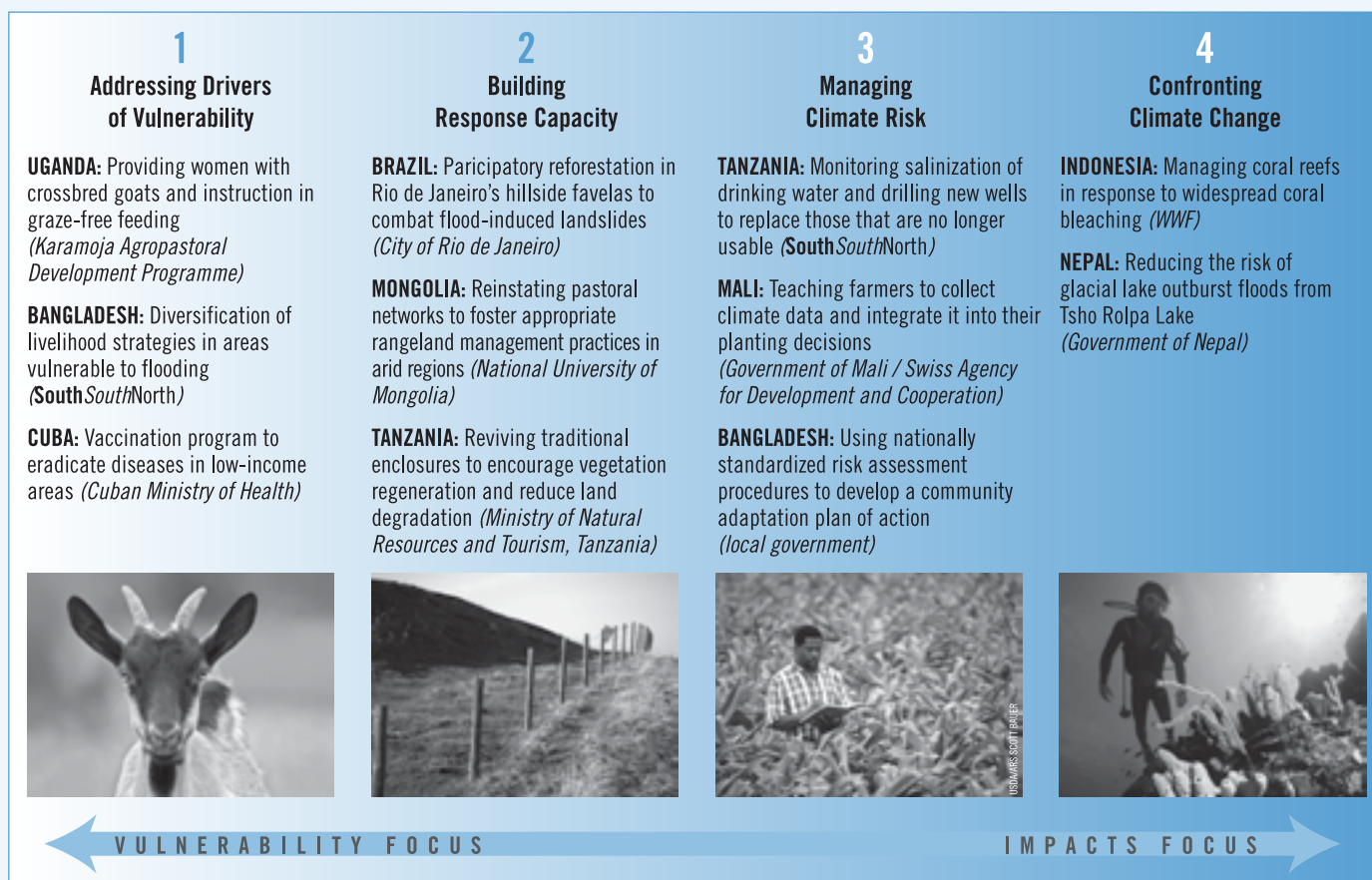
Figure 7 represents one way of mapping out adaptation efforts—that is, actions undertaken to limit the harm associated with climate change. On the left-hand side of the continuum, the most vulnerability-oriented adaptation efforts overlap almost completely with traditional development practice, where activities take little or no account of specific impacts associated with climate change, and have many benefits in the absence of climate change.

On the far right, highly specialized activities exclusively target distinct climate change impacts, and fall outside the realm of development as we know it. Their benefits will materialize *only* in the event of climate change. In between lies a broad spectrum of activities with gradations of emphasis on vulnerability and impacts. The continuum can be roughly divided into four types of adaptation efforts (from left to right):

1. Addressing the Drivers of Vulnerability

At the left end of the spectrum, activities are fundamentally about bolstering human development. These activities focus on reducing poverty and addressing other fundamental shortages of capability that make people vulnerable to harm, regardless of whether the stressors that can lead to harm are related to climate change. Example activities include livelihood diversification efforts, literacy promotion, women’s rights initiatives, and even projects that address HIV/AIDS (see Box 5).

Figure 7. A Continuum of Adaptation Activities: From Development to Climate Change



Very little, if any, attention to the specifics of climate change is paid during these interventions; these activities buffer households and communities from the effects of climate change simply because they buffer them from nearly all sources of harm. Many of these activities are capacity-building activities that strengthen individuals' abilities to take action. One capability often fostered is the ability to "cope," or take short-term action to ward off immediate risk from climatic events (e.g., taking shelter to survive a storm, or saving enough food to survive a drought).

Often, poverty and other core reasons for vulnerability must be dealt with before more impact-oriented adaptation efforts can be effective. In other cases, however, vulnerability-oriented efforts can be conducted concurrently with more impacts-oriented initiatives. In

our data set, 65 percent of the examples that we have characterized as addressing the drivers of vulnerability also included activities that more directly focused on impacts associated with climate change.

However, because climate change effects are not taken into account, some interventions at the left of the continuum run the risk of maladaptation. For example, while diversifying agricultural livelihoods typically reduces vulnerability and strengthens resilience, diversification efforts that introduce crop varieties that cannot withstand increased drought conditions could undermine development gains over the longer term if droughts become more frequent. Likewise, while coping capacity can be critical for surviving short-term dangers, repeated coping may undermine long-term adaptation.

Box 5. HIV/AIDS, FOOD SECURITY, AND CLIMATE CHANGE: A VICIOUS SPIRAL

Around the world, community-based organizations, United Nations (UN) agencies, and national governments are striving to prevent, treat, and cope with the pandemic of HIV/AIDS. The scale of the problem is enormous,¹ with an estimated 39.5 million people currently living with HIV. Southern Africa remains the global epicenter for HIV/AIDS, home to 32 percent of people with HIV and 34 percent of AIDS deaths globally. The highest rate of infection is found in Swaziland, where approximately one in three people are infected.²

"In the present circumstance, even where sound policies are in place, the coping strategies of communities and families are so mangled and eroded by AIDS that full recovery simply isn't possible."

— Stephen Lewis (2003)
Former UN Special Envoy for HIV/AIDS in Africa

The HIV/AIDS crisis increases the vulnerability of communities and countries to the impacts of climate change. The pandemic upsets informal social safety nets, places immense burdens on already stretched health care systems, undermines knowledge generation and transfer through the loss of teachers and researchers, weakens governance capacity, and disrupts economic activity. For example, by 2010, the International Labor Organization estimates that 17 countries (16 in Africa, plus Haiti) will lose more than 10 percent of their labor force to AIDS, and 5 of those countries will lose more than 20 percent of their labor force.³

The relationship between HIV/AIDS, food security, and nutrition is particularly closely linked. Good nutrition is recognized as being a critical factor in delaying the onset of AIDS and increasing the capacity of people living with HIV to participate in their own health care.⁴ However, HIV/AIDS is undermining the productive capacity of the subsistence agricultural sector—the main source of livelihood for up to 80 percent of the population of countries hit hard by the pandemic⁵—reducing food security, and increasing poverty. As farmers (typically women) decline in health and die,⁶ fewer workers are engaged in planting, harvesting, and marketing; time is diverted from the field to caring for the sick; and critical intergenerational transfer of knowledge is reduced, including

knowledge of alternative agricultural and food foraging techniques needed in times of drought and famine.⁷ The HIV/AIDS pandemic also creates significant institutional gaps due to staff attrition among agricultural researchers and professionals, reducing the functionality of research organizations, educational institutions, extension services, disaster management agencies, and local informal organizations.^{8,9}

Ongoing efforts to prevent HIV infection, improve access to antiretroviral treatment, and improve the lives of people living with HIV/AIDS typically do not consider climate change. Nor is it necessary for these efforts to do so in order to support adaptation to climate change. By working to achieve a core requirement for any well-functioning society—a healthy population—these efforts serve to increase the adaptive capacity of families, communities, and governments.

However, it should be recognized that climate change impacts also have significant potential to undermine current efforts to tackle the HIV/AIDS problem. As drought conditions become more prevalent, access to water declines, sea water inundates shoreline communities, and extreme events become more common, it more likely that migration, conflict, and disruption of social networks will occur. These circumstances are in turn more likely to lead to the outbreak and transfer of infectious diseases, including HIV.¹⁰

Notes

- ¹ In 2006, approximately 2.9 million people died from AIDS-related illness and 4.3 million people were newly infected with HIV (UNAIDS and WHO 2006).
- ² UNAIDS and WHO 2006.
- ³ ICAD 2006.
- ⁴ Gomme et al. 2004.
- ⁵ ICAD 2006.
- ⁶ FAO estimates that 20 percent or more of agricultural workers in southern Africa (about 16 million people) will die from AIDS by 2020 (Lewis 2003; ICAD 2006).
- ⁷ Lewis 2003.
- ⁸ FAO 2007.
- ⁹ Suarez et al. 2007.
- ¹⁰ Gomme et al. 2004.

Box 6. ADAPTING TO UNCERTAINTY IN RWANDA

An estimated 43 percent of Rwanda's 8.2 million inhabitants live in extreme poverty.¹ Most of the country's economy is based on rain-fed agriculture, and 95 percent of its energy needs is met through the use of traditional biomass-based fuels. These factors, combined with high population density, place enormous pressure on an already fragile environment.²

Rwanda's growing population and economy are increasing its energy demand, almost all which will continue to be met through biomass in the near and medium terms. Electricity remains expensive and underdistributed, and alternative energies, such as peat, methane gas, solar, and wind power, are only starting to be tapped. To address the growing energy (and looming environmental) crisis, the Government of Rwanda has prioritized the rehabilitation and expansion of the country's electricity generation capacity.³ Almost all of Rwanda's electricity is hydro-generated, but limited investment and overuse of hydropower have resulted in severe capacity deficits. Moreover, environmental degradation and climate variability have reduced river flows, further decreasing the productivity of hydropower facilities. If Rwanda is to diversify and enhance its energy supply, it will need to address these problems through adjustments that allow the hydroelectric sector to adapt to the growing threat of climate change.

Recognizing this urgent need, the Government of Rwanda secured funding through the United Nations Environment Program under the Global Environment Facility (GEF) to reduce the vulnerability of its hydroelectric sector to the effects of climate change. But what will these effects be? Climate information in Rwanda is limited. Most of the country's hydro-meteorological infrastructure was lost during the war in the early 1990s, and only one station remains, at Kigali airport. Information analyzed from this station indicates that, overall, Rwanda is getting warmer and drier. However, subnational historical data shows that some parts of the country are more exposed to rainfall deficits and drought, while others are more exposed to rainfall excesses. Knowing whether these patterns of exposure are expected to persist or change with global warming has significant implications for the functioning and productivity of a hydropower station. For example, drought conditions would mean less runoff and storage in reservoirs, limiting the electricity generated from hydropower stations. On the other hand, heavy rainfall could lead to more erosion and siltation, also reducing the potential to produce hydroelectricity.

The GEF pilot project in Rwanda has targeted two hydropower stations located in the Northern Province⁴ on the shores of two connected lakes that are fed by an internationally significant wetland upstream. Because climate information is scarce and projections remain uncertain, the project is focusing on increasing current hydropower potential through an integrated approach. Human activities have severely degraded the watershed ecosystem, reducing water availability from the wetland and increasing erosion along the lakeshores. Therefore, interventions at the watershed level seek to protect hydropower potential by reducing human pressure on the landscape and rehabilitating ecosystem functioning. Specific project activities include livestock provisioning, installation of rainwater harvesting systems, reforestation, construction of erosion-control structures, and introduction of alternative energy sources.

Meanwhile, activities at the hydropower stations focus on improving the operation and maintenance of the stations, as well as building the capacity of station operators to collect and analyze environmental data. These activities will allow managers to monitor and better run the stations in the face of environmental change, including climate change. Complementing these efforts is ongoing research into the links between hydropower and climate change. Lessons from the field activities and research will be fed into national development policies, such as Rwanda's Energy Policy.

Thus, while concern about the future impacts of climate change helped motivate the Government of Rwanda to act, the activities themselves are largely in response to current stresses and priorities. They put Rwanda's environment, rural population, and energy sector in a better position to deal with future climate stress, whether they are associated with more or less rainfall.

Notes

- 1 Republic of Rwanda 2007.
- 2 Republic of Rwanda 2004.
- 3 Ibid.
- 4 IISD 2007.

We find that activities that address the foundations of vulnerability frequently are located in projects that were termed "serendipitous" adaptation in Section II. However, some of these efforts are incorporated into cases of discrete adaptation work, frequently in combination with activities that fall elsewhere on the Figure 7 continuum.

2. Building Response Capacity

In this zone of the continuum, adaptation focuses on building robust systems for problem solving. These capacity-building efforts lay the foundation for more targeted actions and frequently entail institution-building

and technological approaches familiar to the development community. Examples include the development of communications systems and planning processes, and the improvement of mapping, weather monitoring, and natural resource management practices.

These activities may have many benefits other than adaptation to climate change, but they typically occur in sectors more directly relevant to climate change than literacy, women's rights, or HIV/AIDS efforts. Though climate change information does not play a central role in the work, awareness of climate change is a reason for prioritizing it over work in other areas.

Activities that build response capacity may map to any of the models identified in Section II. Many are development activities to which an adaptive function was ascribed only after the fact, but many such activities are also incorporated into discrete adaptation efforts. Adaptation initiatives that must contend with high levels of uncertainty will often have resilience-building activities that fall into this category.

With building response capacity, the extent to which activities are targeted toward specific impacts is limited, either by limited ability to predict expected impacts or by limitations on other capacities needed for highly targeted action. For example, in Rwanda, efforts to “climate-proof” hydropower production hit a roadblock because of uncertainty as to whether climate change will bring more or less rainfall (Box 6). Adaptation efforts are moving forward by strengthening hydropower operations in general, with the expectation that these strengths will help the power sector adapt to specific effects of a changing climate, whatever they may be. In the meantime, more reliable power production helps to address numerous non-climate-related needs in Rwanda.

3. *Managing Climate Risk*

When adaptation efforts focus more specifically on hazards and impacts, an important framework for action is provided by the concept of climate risk management (CRM). CRM refers to the process of incorporating climate information into decisions to reduce negative changes to resources and livelihoods.² This framework accommodates the fact that often the effects of anthropogenic climate change are not easily distinguished from the effects of events and trends within the historic range of climate variability. The CRM approach encourages managing current climate-related risks as a basis for managing more complex, longer-term risks associated with climate change.³

Use of climate information distinguishes the CRM approach from typical development efforts, though the success of CRM may have strong development implications and vice-versa. Many disaster-response planning activities fall into the CRM category, as do many technological approaches (e.g., drought-resistant crops). Climate-proofing projects most often fall into this category, though many discrete adaptation projects also focus on CRM. In the dry lands of Kenya, a CRM approach is being used to prepare for future droughts, which are expected to intensify as climate changes (see Box 7).

The success of CRM depends heavily upon the availability of climate information, and is enhanced when climate change predictions can be made with relatively high certainty and precision. If adaptation initiatives plan

Box 7. MANAGING CLIMATE RISK IN RURAL KENYA

Home to 10 million people, Kenya’s arid and semi-arid lands have the lowest development indicators and highest incidence of poverty in the country. Over 60 percent of inhabitants currently live below the poverty line. Increasing population pressures, overgrazing, crop reduction in fallow fields, and recurring conflicts between pastoralists and farmers all pose serious development challenges. These will be exacerbated by climate change, which is expected to bring increased frequency and severity of both floods and droughts.¹

In response to the devastating effects of past droughts—and the prospect of more as climate change intensifies—the Centre for Science and Technology Innovations has partnered with the Arid Lands Resource Management Project to work with communities in Makueni District in introducing a suite of measures to reduce vulnerability to climate change. Climate and weather forecasts are being downscaled and communicated to farmers to help them select appropriate planting times. Local production systems are being diversified through the use of drought-tolerant crop varieties and better systems for collecting and storing seeds. Farmers have been trained in soil and water conservation; weather prediction and interpretation; selection of seeds to fit climatic and land conditions; and early land preparation and planting. As well, such technologies as sand dams and drip irrigation have been introduced to improve access to water. Credit systems are being strengthened, allowing community members to pursue diversified or alternative livelihood activities.²

Taken together, these interventions represent a climate risk management approach to development. Historical, current, and future climate information has been used to understand vulnerability to drought and devise strategies to decrease it. Specifically, information on the effects of past droughts has highlighted where livelihood systems fall short and where capacity is needed. Access to current and seasonal weather forecasts allows farmers to make more informed decisions that reduce their exposure to short-term climate risk. Knowledge of longer-term trends associated with climate change encourages them to think about how decisions and investments made today will stand up to even drier and more variable conditions tomorrow. Selecting seeds that are appropriate to expected climatic conditions further safeguards against drought. Through better access to and understanding of climate information, these communities have improved their understanding of future conditions, are able to implement agronomic practices based upon this knowledge, and thus have increased their capacity to adapt to climate change.

Notes

¹ Government of Kenya 2002.

² IISD 2007.

too concretely based on risk assessments that turn out later to have been inaccurate, investments may be wasted, and maladaptation could result.

4. *Confronting Climate Change*

For a small set of examples of adaptation in our review, actions taken focus almost exclusively on addressing impacts associated with climate change. Typically, these actions target climate risks that are clearly outside of historic climate variability, and have little bearing on risks that stem from anything other than anthropogenic climate change. For example, communities that relocate in response to sea level rise mainly fall into this category,

as do many responses to glacial melting (Box 8). Radical or costly policy and technological approaches that address unprecedented levels of climate risk also belong in the highly targeted category. Few of these approaches have been seen to date, but efforts in the Himalayas to prevent harms from glacial melting, and Australia's overhaul of water allocation rules after six years of drought probably are signs of things to come.

Because measures that are highly targeted at climate change impacts do not address non-climate change challenges, they tend to require new approaches that fall outside of the relatively well-understood set of practices that we might think of as a development "comfort zone." This level of innovation usually takes the form of a discrete effort, and is often both costly and fundamentally challenging to cultural and political norms. After all, even with the clearest, most certain climate predictions in hand, it isn't easy to decide to leave the island where your family has lived for generations, or to accept that the land your community has farmed for centuries is becoming too dry to sustain agriculture. Moreover, initiatives that relocate whole groups of people or that launch large, untested engineering endeavors come with large price tags that require a high level of political will.

As such, many measures in this continuum zone take on an extreme or "last-ditch" quality, and many people, quite rightly, wish to avoid them. This is one reason we see so few activities from this category in our set of examples. A more important reason, however, is that, at least for the moment, climate change effects and "normal" climate variability are difficult to disassociate. Therefore, we see more adaptation approaches that address climate change and other sources of risk together using a CRM approach (see above). Given the current state of climate change, highly "impacts-targeted" activities also require long-term planning, since the most clearly distinguishable impacts of climate change are still years or decades from being felt in many places.

However, it is also clear that the need for highly impacts-targeted climate change action can in many cases be reduced by the success of other types of adaptation efforts, and by work to stabilize greenhouse gas concentrations in the atmosphere. We can think of the boundary on the continuum between Managing Climate Risk and Confronting Climate Change as a threshold that moves right if greenhouse gas mitigation and climate adaptation are successful, shrinking the scope of impacts-targeted action needed. To the extent that climate adaptation and greenhouse gas mitigation fail, the threshold moves left, expanding the scope of impacts-targeted activity, since the direct affects of climate change will be felt more directly by more people.

Box 8. ADAPTING TO CHANGING HAZARDS IN NEPAL: REDUCING THE RISK OF GLACIAL LAKE OUTBURST FLOODS

As the Earth warms, mountain glaciers are melting.¹ The meltwater pools behind unstable natural dams, which are formed of moraine, the sediment that glaciers carve out of the mountains as they move. Glacial lakes have existed as long as there have been glaciers, but with climate change, the volume of water stored in these lakes is growing. This heightens the risk of the moraine dams being breached, suddenly releasing huge volumes of water downstream.

In August 1985, an avalanche dumped tons of ice into the Dig Tscho glacial lake in eastern Nepal. The resulting 5-meter (m) wave overtopped the moraine dam and released a flood that destroyed homes, bridges, farmland, and a nearly completed hydropower plant.² The glacial lake was drained within six hours. Four or five deaths resulted from this event—a figure that could have been much higher had the flood occurred during the height of the tourist season.

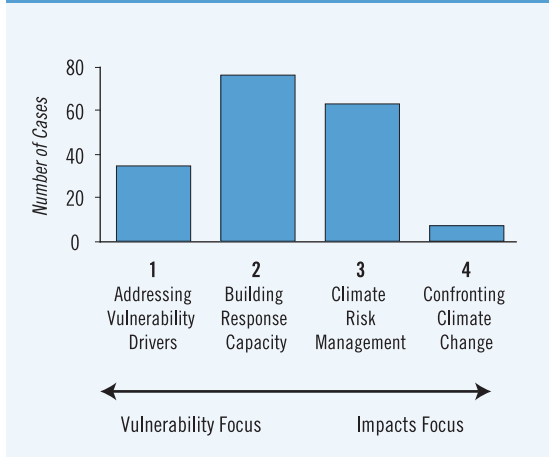
The risk of another Dig Tscho-type outburst flood is growing, as temperature increases at high altitudes in the Himalayas correlate with increasing glacial lake volumes.³ A 2001 inventory carried out by the United Nations Environment Programme and the International Centre for Integrated Mountain Development identified 20 sites at risk in Nepal. Among the most dangerous sites is the Tscho Rolpa glacial lake, situated 4,580 m above sea level and fed by the rapidly retreating Tradkarding glacier. The glacial lake had grown from an area of 0.23 square kilometers (km²) in the late 1950s to 1.65 km² in 1997. At this size, the lake stored 90–100 million cubic meters (m³) of water, at least a third of which would be released downstream if the 150-m-tall moraine dam were breached.⁴

Recognizing the risk this high-altitude warming and lake expansion posed to rural communities and infrastructure, such as the Khimiti hydropower plant, in 1998 the Government of Nepal initiated a project to drain down the Tscho Rolpa glacial lake. An expert group recommended cutting a channel into the moraine to reduce lake levels by 3 m, which was expected to reduce outburst flood risk by 20 percent.⁵ This measure was carried out in conjunction with the establishment of early-warning systems in 19 downstream villages. However, experts are warning that total outburst flood prevention will require a further draining of as much as 17 m—a costly endeavor. Nevertheless, the initial step toward reducing glacial lake outburst flood risk in Nepal provides an example of anticipatory development planning that targets a clear impact of climate change.

Notes

- ¹ Lemke et al. 2007.
- ² Germanwatch 2004.
- ³ Agrawala et al. 2003.
- ⁴ Ibid.
- ⁵ Rana et al. 2000.

Figure 8. Characterization of Cases by Adaptation Type



This is not to say that climate change-specific action can be avoided entirely. Science shows us with increasing precision that we are already “committed” to a certain amount of global warming, which has direct implications for many people in many places. Places such as Nepal (Box 8) are moving forward with proactive planning for some specific eventualities. That these instances remain relatively few indicates that society will need more than climate predictions to prompt proactive planning for those consequences of climate change that will be most unique and potentially most difficult to address.

USING A FRAMEWORK OF ADAPTATION APPROACHES

It is important to emphasize that the continuum presented in Figure 7 describes a set of approaches to adaptation, not the specific circumstances or the type of impact faced. The continuum categorizes adaptation efforts according to whether vulnerability or impacts are emphasized in the approach taken. Most other frameworks for analyzing adaptation have distinguished among efforts based upon sectoral divisions, impacts addressed, ecosystem characteristics, or the scale (location, national international, etc.) of the intervention.

It is also important to emphasize that, as befits a continuum, the lines between the categories are blurry. As such, it is often difficult to decide whether a given activity is best described, for example, as building response capacity or managing climate risk. In truth, there is much more variation in the extent to which an activity may target a specific climate change impact than can be described with four zones. However, we believe we have characterized four roughly distinct possible relationships

between an adaptation effort and a specific impact associated with climate change.

The typology developed here does not attempt to rank the different types of adaptation; rather, it simply attempts to describe present adaptation efforts in developing countries. The typology also should not be thought of as a series of stages over time, with highly targeted climate change activities as the ultimate goal. (In fact, the need for highly targeted climate change activities is something we would all like to avoid, to the extent possible.) It is clear, however, that addressing vulnerability drivers, building response capacity, and managing climate risk do augment one another. There are many examples where adaptation initiatives incorporate elements of two or three of these approaches.

Placing individual instances of adaptation along this spectrum is at best an inexact science. However, as Figure 8 illustrates, we find the bulk of the experience to date focuses on the “messy middle” of building capacity and managing climate risk, where adaptation is neither wholly focused on climate change impacts nor completely oriented toward the underlying drivers of vulnerability. Approximately one-fifth of the cases studied fall into the vulnerability drivers category; they are essentially “pure” development activities. Quite likely, our study substantially underestimates the extent of adaptation underway as a result of this type of intervention, given the many similar efforts not yet labeled “adaptation.” Conversely, very few instances of highly climate change-specific adaptation measures have been recorded.

What determines the type of adaptation activity? Two factors appear to predominate in shaping the characterization of an adaptation response: the existing capacity of those responding and the certainty of information about climate impacts.

Lower levels of capacity necessitate greater investment in addressing underlying sources of vulnerability (i.e., adaptation efforts more to the left of the continuum). Higher certainty regarding climate change prediction enables efforts to more directly target specific impacts (i.e., on the right of the continuum). However, it is important to note that neither of these drivers has a linear relationship to how closely adaptation efforts may target a specific impact. For example, in a case where storm risks are very well understood, a CRM approach may be impossible if basic communications infrastructure does not exist. In this case, the broader capacity building involved in creating the communications infrastructure would be an adaptation priority, even though information may exist that could support more impacts-targeted efforts.

Notably, the *type* of impact does not always drive the response taken. A country or community faced with a given change in climate can select from among a range of

responses. For instance, as coral reefs die off from ocean warming, coastal communities may be more exposed to storm surges. One response may be to build artificial reefs to mitigate surges—an activity that would fall on the right of the continuum. Conversely, building more permanent and robust housing and infrastructure may enhance the resilience of coastal communities while fitting a broader set of development needs—placing it more centrally along the continuum. Taking a response from the far left of our continuum, broad capacity building may be needed to equip the affected communities to make the appropriate choices for facing these and any other consequences associated with climate change.

It seems likely that other factors, such as the specificity, severity, and immediacy of an impact, as well as people's perceptions of risk and access to information, may play a role in determining the appropriate extent to which interventions should target specific impacts. Further exploration of such factors is needed to better understand when to home in on specific impacts and when to build more broadly applicable capacities.

Notes

- ¹ Ribot (1995) provides an early articulation of the difference in focusing on vulnerability as opposed to impacts.
- ² Hellmuth et al. 2007.
- ³ UNDP 2002.



Governance and Decision-Making Under Uncertainty

As we have seen, a large body of adaptation work is neither wholly targeted at specific climate change impacts nor wholly focused on addressing root causes of vulnerability. That we find so many adaptation efforts in this middle ground of the continuum reflects the core challenge of climate change: learning to live with new sources of uncertainty. Given the relatively high uncertainty associated with effects of climate change in many places, adaptation efforts cannot universally focus on planning for an expected new climate. Instead, actors reduce vulnerability to an uncertain climate by selecting integrated strategies that may map to a number of potential climate change futures, as well as reduce vulnerability to non-climate sources of harm.

Over time, as understanding of climate risk improves, adaptation experience grows, and the effects of climate change are felt more strongly in more places, impacts-oriented approaches—especially climate risk-management approaches—seem likely to become more widely implemented. However, the effectiveness of climate risk

management depends heavily upon the ability to reduce uncertainties surrounding climate impacts to a level at which risk management tools can be reliably implemented. In some sectors and locations, this reduction of uncertainty will happen relatively rapidly, while in others it may happen only over decades, or not at all. It is critical, therefore, that certainty about climate risk not become a prerequisite for action on adaptation. Many of the most vulnerable places and communities will not be able to approach climate risks in a standard risk management sense; for them, the core adaptation task will instead be to build the capacity to cope with uncertainty.¹

Take for example, much of the Sahel, where climate models disagree about even the most basic question about change: Is it getting wetter or drier? In these circumstances, approaches that take a climate impact, such as drought, as a starting point and aim for specific outcomes are likely to prove costly and ineffective. They risk maladaptation, since even the starting point of the planning process is under question.

However, the availability of good climate risk information does not necessarily make adaptation decisions easier or better. For instance, how certain do you have to be about the likelihood of a Category 5 cyclone to invest an extra billion dollars in building levees that are more likely to withstand one? Even if uncertainties could be removed from the picture, the question of how to make such a decision still would have no simple answer, as such decisions inevitably involve many intersecting—and often competing—values and interests. Processes for weighing and resolving these play a central role in adaptation across the full spectrum of decision-making.

PROCESS, NOT PRODUCT

When trying to distinguish between adaptation and development, many people look at a given initiative and ask, “Did it take climate change into account?” They look for evidence that climate change predictions were considered in designing the initiative, or that vulnerabilities specific to climate change were identified. Often, they want to ensure that the initiative’s core objective relates to an anticipated change in the climate. That is, they are looking for evidence of planned, intentional, efforts to adapt. The adaptation community often contrasts “planned adaptation” with “autonomous adaptation”, through which a natural or human system adjusts to a change in climate independently, without formal, collective decision-making.

An emphasis on the process of making adaptation decisions puts the idea of planned adaptation in a new light. Instead of planning to adapt to a given impact, planning for adaptation decision-making processes lays a foundation for ongoing adaptation efforts that can adjust and improve as new information, techniques, or conditions are encountered. What kinds of processes are needed?

- processes for learning as we go;
- processes for checking and correcting for maladaptation as we learn;
- processes for making trade-offs that reflect public values; and
- processes for sharing information to support the trade-offs.

For example, as with most other decisions, adaptation decision outcomes will frequently have winners and losers. Box 9 provides an example from Rwanda where efforts to reduce the vulnerability of the nation’s hydroelectric sector led to an increase in vulnerability for communities surrounding the Rugezi wetland. The overall effectiveness of adaptation in this case depends upon processes that can reconcile competing demands upon wetland resources.

Box 9. ADAPTATION TRADE-OFFS

In Rwanda’s Northern Province, protecting and enhancing the regional energy supply means protecting the Rugezi wetland, a Ramsar site located near the Ugandan border. The wetland feeds lakes Burera and Ruhondo, which supply hydroelectric energy to the Ntaruka and Mukungwa hydropower stations. Mounting population pressures in the 1990s led households to grow crops in the wetland and to collect other resources there, such as thatching grasses. Downstream, communities living on the steep slopes around lakes Burera and Ruhondo were engaged in intensive farming practices, which resulted in loss of vegetative cover, declining soil fertility, and accelerated soil erosion. Together, these population pressures on the wetland and downstream lakes contributed to declining water availability for hydropower generation.

Facing a mounting energy crisis, which would be compounded by the impacts of climate change (See Box 6), the Government of Rwanda passed national laws to restore hydropower potential. These laws forbade human settlements and cultivation in the Rugezi wetland, as well as within 50 meters of the lakeshores. The laws led to many households losing supplementary farming plots and access to other key resources. At the same time, however, the recent rise in lake levels has in part been attributed to these new land-use policies. Clearly, the policies created both winners and losers in the watershed.

The Rugezi experience highlights some of the challenges associated with development trade-offs and what they may mean for adaptation to climate change. On the one hand, protecting and restoring the Rugezi and lake ecosystems will enhance hydropower potential, therefore reducing the vulnerability of the regional energy supply to climate variability and change. Moreover, in the longer term this will presumably translate into more energy available for rural electrification programs, which will ultimately enhance livelihoods and therefore increase the capacity of beneficiary communities to deal with shocks and stresses, such as those associated with climate change. Thus, these policies will contribute to adaptation in both the energy sector and local communities.

In contrast, at least in the short term, the government’s policies are making communities living upstream more vulnerable to shocks and stresses, as their productive base has been diminished and they are less able to meet basic needs. With less land on which to grow crops, they are restricted to subsistence farming and unable to earn supplemental incomes. Reduced access to wetland resources has meant some households cannot maintain their roofs or collect medicinal plants.

Without some form of compensation or support, these communities will face worsening conditions of poverty and may be compelled to illegally access wetland and lakeside resources to survive. This would be detrimental to both the watershed ecosystem and hydropower potential in the region, as well as the communities themselves. Thus, supporting upstream communities in diversifying and enhancing their livelihoods will be important for the sustainability of the government’s watershed land-use policies, which will then contribute more effectively to adaptation to climate change.

Principles of good governance underpin the development of fair and effective decision-making process that can serve the functions discussed above. For example, in the 1992 Rio Declaration on Environment and Development, 178 countries endorsed the following principles²:

- **Make Decisions at the Appropriate Level**
Decision authority should reside at a scale that matches the communities and natural resources affected by the decision.
- **Provide Access to Information**
Decisions should be made transparently, with opportunities for public oversight. Citizens should have access to information that enables them to provide informed input.
- **Enable Participation by All Stakeholders**
The public should have opportunities to provide input to decisions both large and small, both concrete and strategic.
- **Provide Access to Justice**
Citizens need mechanisms for resolving conflicts peacefully and for challenging decisions that may be flawed or unfair.
- **Integrate the Environment into All Decisions**
To pursue sustainable development, environmental considerations must be integrated into the decision-making of agencies and stakeholders for whom the environment is not a core responsibility.

A further governance principle underpinning good process is that of **representation**. Key decisions should be made by representative authorities who are accountable to a broad public. Means especially need to be created to ensure that the most vulnerable and marginalized populations are adequately represented.

While the above principles support sustainable development decision-making in any context, they are likely to grow in importance as the effects of climate change complicate decision-making and intensify conflicts over resources. Proactive investment in institutions and decision-making processes that embody these principles will provide a solid foundation for identifying adaptation priorities, making fair trade-offs, and building resilience. As demonstrated in Darewadi good governance can indeed make a significant difference.

INVESTING IN PROCESSES AT ALL SCALES

An overarching priority for effective adaptation is to identify where within the landscape of development decision-making investment can support adaptation

processes. This will vary from place to place and system to system, depending upon the structure of institutions, existing capacities, and the scope of vulnerability to climate change.

To date, most attention has been paid to building processes and institutions to facilitate adaptation at the community level. This work is critically important, given the fundamentally local nature of climate change impacts. However, the community scale is not the only level at which good process is needed. Especially as international flows of funding for adaptation grow, good processes at the national level will be needed for supporting development of adaptation priorities, allocation of funding, monitoring of progress, and adjusting efforts based on lessons learned. This may be particularly true in cases of water management, where limited resources may cross regional and national boundaries, and water management strategies must accommodate local needs and avoid regional conflicts.

Establishing processes for effective adaptation at the sector level is also critical. In most countries, sectorally organized institutions already play a central role in decision-making, and therefore provide a logical focal point for adaptation processes. Identifying and implementing principles of good decision-making process for each relevant sector will be increasingly important as adaptation decisions mount. Table 2 outlines other sectors important for adaptation and illustrative elements of decision-making processes that need attention to enable effective adaptation.

However, as noted above, some elements of effective process transcend the unique circumstances of a specific institutional setting or sector where decisions

TABLE 2. ILLUSTRATIVE GOVERNANCE CONSIDERATIONS FOR ADAPTATION DECISION-MAKING IN KEY SECTORS

Water	<ul style="list-style-type: none"> • Do institutions exist for decision making at the basin (watershed) scale? • How well integrated are water management decisions (e.g., water allocation, water quality, sanitation, water pricing)? • Do poor communities have a say in decisions about their water resources?
Agriculture	<ul style="list-style-type: none"> • What mechanisms link agricultural decision making to related processes in other sectors (natural resource management, land use, etc.)? • What factors drive agricultural prices, and what regulatory mechanisms exist?
Disaster Risk Management (DRM)	<ul style="list-style-type: none"> • Do DRM plans exist at national, subnational, and local levels? If so, what mechanisms link them to each other? • Does a communications infrastructure exist to support disaster planning and response? If so, does it reach poor, illiterate, or isolated communities?
Coastal Resources	<ul style="list-style-type: none"> • Are there institutions with special responsibilities for coastal zones? • What mechanisms link coastal decision making to decision making in infrastructure, tourism, health, and disaster planning? • Do coastal planning processes integrate considerations of the natural and human systems?

are made. In addition to core governance principles with broad relevance, we have identified three elements with particularly important roles in enabling effective adaptation decision-making: national policy, information systems, and the monitoring and evaluation of interventions.

The Role of National Policy

National policies that themselves adapt to changing conditions will provide a critical supporting environment for adaptation processes at all scales.³ Public policies, however, are typically oriented toward providing certainty, and many are designed implicitly or explicitly to operate within a certain range of conditions. Faced with conditions outside this anticipated range, policies can have unintended consequences and may not accomplish their goals. Policies that are rigid and become increasingly disconnected from the evolving context in which they operate—that are unable to adapt to changing circumstances—will become a hindrance to adaptation.

To facilitate adaptation, policies need to be effective in a range of possible futures, and be able to respond to both anticipated and unanticipated changes in underlying conditions. They need to have clear criteria by which to judge success, measurement and feedback mechanisms to monitor implementation, and review mechanisms to enable response if the policy ceases to meet its goals due to changing conditions.

Adaptive policies can respond to anticipated changes through conventional approaches, such as introducing no-regrets policies that perform under a range of conditions with little modification (e.g., energy-efficiency policies); and through automatic adjustment of policies when the monitoring of key system indicators indicates that a predefined trigger has been reached (e.g., unemployment insurance policies). Adaptive policies are also able to respond to unanticipated changes through less conventional approaches that draw upon the principles for intervening in complex adaptive systems and that build in formal learning and review processes.

Though adaptive policymaking is still an emerging discipline, successful policies are likely to include:

- clearly stated goal(s) and parameters, with benchmarks against which to measure progress and determine if a policy is achieving its intended objective(s);
- features that encourage continuous learning, experimentation, monitoring, and revision, such as formal review processes and feedback loops between policy designers and policy implementers to encourage ongoing modification of policies to meet changing or better-understood circumstances;

Box 10. INDEX-BASED WEATHER RISK INSURANCE IN INDIA

In India, changes in insurance regulations are giving rise to index-based weather risk insurance contracts as an alternative to traditional crop insurance. Traditional crop insurance depends upon farm loss sampling after a given disaster. This means settling a claim can take up to a year, during which time farm families may suffer a loss of income. Private weather insurance contracts, on the other hand, can improve recovery times because they offer quick payouts triggered by independently monitored weather indices.

These more innovative insurance mechanisms emerged in 1999, when India lifted its ban on private players in the insurance market. The resulting competition led to a series of pilot initiatives, through which companies tested a diversity of products and modes of delivery, often in partnership with state government or local development banks. At the same time, regulations required each company to provide some coverage in the rural sector, as well as for the “social sector,” which includes unorganized or informal workers, as well as underprivileged or economically vulnerable classes. This directed innovation and market penetration toward agriculture.

This example highlights a number of characteristics of adaptive policy. For one, the automatic adjustment feature of index-based insurance—triggered by climate information—provides a simple mechanism for managing insurer risk and determining farmer eligibility for benefit payments. It also passes along incentives for farmers to adjust to long-term change by providing signals calculated on the basis of actuarial risk. More generally, using pilot approaches has enabled policymakers and insurers to test key assumptions for iteratively refining program deliver, so as to better understand risk patterns and create awareness among farmers. The delivery of weather insurance through local microfinance institutions suggests the importance of two-way communication channels in fostering adaptive policy design by building in feedback mechanisms to respond to changing client needs or other conditions.

Source: IISD and TERI 2006.

- devolution of decision-making to the local level, enabling decisions to be made by those closest to their application; and
- linkages to other policies that influence potential effectiveness.

Incorporating features such as these into policies to increase their adaptability requires policymakers and implementers to become more comfortable with uncertainty and be willing to treat policies as ongoing experimental and learning processes. It means moving the emphasis from policies providing solutions to particular problems to policies establishing processes and frameworks that enable alterations to be made in response to identified constraints and changing circumstances. Box 10 provides an example from India where an automatic

adjustment has been incorporated into policies that govern crop insurance for farmers.

The Role of Information

As discussed in Section III, adaptation initiative choices vary with the information available to support their development and implementation. For highly impacts-oriented adaptation efforts, information about climate change predictions often serves as a starting point for planning. For efforts that address the underlying drivers of vulnerability, climate predictions are less critical, and the most important information may focus on indicators of socioeconomic circumstances.

However, irrespective of whether efforts are more vulnerability- or impacts-oriented, some common information needs can be identified. This points toward specific capacity-building priorities with relevance across the spectrum of approaches to adaptation. For example, geographical information plays a central role in adaptation planning, irrespective of vulnerability- or impacts-orientation. Whether this means mapping of flood risk, soil moisture, poverty indicators, watershed boundaries, or any number of other relevant parameters, the capacity to synthesize and convey information geographically is needed, given the location-specific nature of climate change effects.

Likewise, basic national statistical data play a fundamental role in most vulnerability assessment processes larger than the community scale. Investment in systems for gathering and managing reliable census data is a precondition for identifying vulnerable populations, with or without climate prediction information. Similarly, given the likelihood that most adaptation efforts will continue to focus on capacity-building and risk-management approaches, historical and current weather data play a more important role in adaptation than do climate change predictions. Therefore, national weather services are central adaptation players; effective adaptation decision-making will ensure that they are well funded, well managed, and able to reach both key decision-makers and the population at large. The SERVIR project (Box 11) provides an example where governments are collaborating to produce, share, and use climate information for decision-making.

Information dissemination and awareness-raising also plays a significant role in implementation, and provides the foundation for fair and effective public participation in adaptation decisions. Information dissemination processes need to be tailored to their audiences, and will have unique elements depending upon the nature of the information being conveyed.⁴ However, the centrality of information dissemination argues for adaptation investments in communications infrastructure, such

Box 11. SERVIR: ACCESSING CLIMATE INFORMATION FOR ADAPTATION IN CENTRAL AMERICA

Unlike their neighbors in North and South America, the countries of Central America do not have their own satellites or space agencies. They have traditionally had to make important decisions affecting their human and natural systems without the benefits of Earth observation data. This is changing, however, as these countries have started to leverage the satellite resources of other countries, such as the United States, to process Earth observation information through a system called SERVIR (the Spanish word for “to serve”). The system, which is based in Panama and serves all seven Central American countries and southern Mexico, uses this information to develop regional visualization and monitoring tools that ultimately enhance national and regional decision-making.

The operational framework for SERVIR is relatively straightforward. Each participating country submits its own geospatial data to the central SERVIR hub in Panama, which is located at the Water Center for the Humid Tropics of Latin America and the Caribbean (CATHALAC). The SERVIR team then links this information to various types of satellite imagery for the region and disseminates the resulting data sets to decision-makers, researchers, educators, students, and the public via an Internet portal in both Spanish and English (<http://www.servir.net>). The portal offers online map viewing and free downloads of tools that help users understand the data. Additionally, CATHALAC provides training to environment ministries and meteorological services in the region for using SERVIR tools in their everyday work.

SERVIR can generate different types of decision-support information. The system offers products for both monitoring and forecasting weather conditions on an hourly basis. Weather forecasters on the major television stations in Panama and El Salvador use SERVIR forecasts in their daily televised weather reports. The SERVIR system can also be used for disaster risk reduction measures, where computer-generated scenarios help identify vulnerable areas and populations. For example, during a November 2006 storm in Panama, SERVIR analysis was used as a basis for identifying, notifying, and evacuating inhabitants in areas vulnerable to flooding and landslides. SERVIR's Web Fire Mapper, which is implemented in partnership with the University of Maryland, detects burning fires and can send out e-mail alerts on the location of the fires. In Nicaragua, the forestry department sends out ground crews to assess the situation upon receipt of fire alerts from the system. Satellite data available through the SERVIR can also help governments monitor ocean tides, helping them warn fishermen of toxic algal blooms (“red tides”).

These decision-support products and experiences all rely on regional data sharing, which SERVIR encourages. In fact, SERVIR allows for the standardization of disparate data sets from multiple sources. It is the first regional system of its kind in the world and is a testament to leveraging North–South and South–South collaboration for using Earth observations for the benefit of society.

Source: USAID/SERVIR 2007.

as radio and television, and in the ability of educators and media personnel to understand climate change and interpret its local implications for specific audiences.

The Role of Monitoring and Evaluation

Given the heightened need under a changing climate to adjust policies and projects in response to changing circumstances, monitoring and evaluation efforts will play an especially important role in enabling effective adaptation. For example, Darewadi village will need mechanisms for monitoring how the success of its water management activities is driving changes in crop selection by farmers, assessing whether those changes are sustainable in light of changes in water availability, and if not, identifying how to adjust the management regime.

However, both the diversity of adaptation strategies and the intersection of adaptation and development objectives present challenges to developing effective monitoring and evaluation tools. It seems likely that different tools will be needed, depending upon how closely activities target climate change impacts.

For example, many activities that fall within the rubric of Building Response Capacity will require evaluation tools that assess institutional strengthening and decision-making effectiveness. The Access Initiative (Box 12) provides an example of one such evaluation tool, which applies many of the Rio Declaration's governance principles to decision-making processes that affect the environment. It has been used by civil society coalitions to conduct independent assessments across a broad range of institutional, cultural, and economic settings and to call for specific changes in law, policy, and government practice based upon their findings. Effective monitoring and evaluation will require further development of such tools to address the unique decision-making challenges related to adaptation.

One such challenge for adaptation decision-making is the extent to which climate change impacts and sources of vulnerability cut across the sector boundaries that often define existing institutional structures and decision-making processes. As discussed above, Rwanda's Rugezi wetland case (Box 9) provides an example of how adaptation can potentially go awry if the broader picture is not considered. The concept of ecosystem services (Box 3) could provide an organizing framework for ensuring that risks of maladaptation are identified early and remedied where possible.

Changes in climate conditions often have their most severe effects when they damage the ability of ecosystems to provide needed goods and services, such as drinking water or forest products. Moreover, poor people are often most affected by such changes, given that they often depend directly upon ecosystems for their livelihoods. In this context, the ecosystem services framing could

Box 12. THE ACCESS INITIATIVE: IMPROVING POLICY BY MONITORING GOVERNANCE

To the extent that adaptation involves planning and policymaking, governments will play a critical role in many adaptation decisions. Some decisions will be made by top government officials through uniquely "climate change-centric" decision processes. However, many effects of climate change will unfold over long periods of time as incremental changes to existing climate variability. Governments and government agencies are likely to respond to incremental changes through established decision-making systems, which vary from place to place depending upon the laws, institutions, and practices of particular governments.

Are these decision-making systems ready for climate change? Do they give a voice to and a seat at the table for citizens and other stakeholders who will feel the impacts? Do they provide access to the information that stakeholders need to play an informed and effective role in adaptation? And will decision-makers be held accountable to stakeholders for the decisions they make? Answering these questions is the work of a unique global coalition of civil society organizations called The Access Initiative (TAI).

TAI is a network of organizations in over 40 countries dedicated to ensuring that citizens have the right and ability to influence decisions about the natural resources that sustain their communities. TAI partners have developed an indicator toolkit with which they measure how well their governments provide transparent, participatory, and accountable governance as an essential foundation for sustainable development. This Web-based assessment toolkit helps TAI partner organizations conduct legal research and case study analysis in order to identify how their countries can improve public access to information, participation, and justice in decision-making that affects the environment.

TAI partners use their national assessment findings as a platform for collaborating with their government, and together they seek to strengthen the public's voice in decision-making. Work has focused on a broad spectrum of important areas of governance, including public information laws, environmental monitoring systems, sustainable development planning processes (such as Poverty Reduction Strategy Papers), forest agencies, and water management institutions. TAI initiatives that foster multi-stakeholder collaboration help build both government and citizen capacities to make effective decisions in these and other areas, many of which are important for adapting to climate change.

Since TAI's inception in 2000, more than 90 public interest groups have joined national TAI coalitions and have completed over 30 national assessments using the indicator toolkit. New partners from 7 countries began TAI assessments in 2006–07.

Sources: Petkova, et al 2002; www.accessinitiative.org

provide a basis for assessment, monitoring, and evaluation tools that help identify who is vulnerable to changes in ecosystem service provision, as well as mapping key pathways through which changes in climate harm vulnerable populations. Box 13 illustrates how this framing can be used to understand the effects of coral bleaching and assist in selecting approaches to reduce its harm.

Notes

- ¹ See Scoones 2004 for a concise discussion of this perspective on adaptation.
- ² UNCED 1992.
- ³ IISD and TERI 2006.
- ⁴ Suarez et al. (in review) provide a useful typology for thinking about how information supports adaptive action, with emphasis on assuring that assumptions about the role of information do not limit its ability to support adaptation of the most vulnerable.

Box 13. REEFS AND CLIMATE: USING ECOSYSTEM SERVICES TO SELECT ADAPTATION MEASURES

Warming of ocean water damages coral reefs by causing the loss of their symbiotic algae and associated brilliant colors—a phenomenon known as coral bleaching. Photosynthesis performed by algae is an essential contributor to coral nutrition and growth; if the algae do not return, the coral will eventually die. Bleaching associated with a 1998 El Niño event damaged 16 percent of global coral reefs in a single year,¹ which may give an indication of what lies in store for the world's reefs if sea surface temperatures rise as predicted. In addition, the more frequent and severe storms resulting from climate change reefs cause more structural damage to reefs, and increased dissolved carbon dioxide in ocean water leads to lower rates of coral calcification—and slower coral growth.

The effects of climate change on coral reefs are multiple and significant, and no obvious solution to these pressures is immediately at hand. It is too late at this point to completely prevent the warming and the “souring” of the water. It may even seem, at first glance, that reefs are so deeply affected by climate change that no adaptation is possible. However, a coral reef ecosystem is complex, and the stresses on it are multiple and interactive (climate-related and direct human impacts, such as overfishing and polluted runoff). Thus, reducing non-climate-related stresses, such as overfishing and nutrient pollution, can assist in coral recovery.

Ecosystem services provided by reefs include fish habitat and coastal protection. Reef-based tourism also can provide an important source of local income. The relative importance of these services will vary from place to place, however, depending upon such factors as the intensity of coastal development and the reliance of the economy upon fishing or tourism. Understanding which ecosystem services are provided by a given reef, what their relative values are to nearby communities, and how climate and non-climate factors contribute to degradation of each service can help communities identify, prioritize, and select among a range of adaptation options, such as changes to coastal zoning, artificial replacements for the reef structure, or measures to reduce overfishing.

Source: Burke and Maidens 2004

Notes

- ¹ Wilkinson 2000.



Financing Adaptation

Given the high estimated costs of adaptation, the disproportionate effects of climate change upon the poor, and legal commitments made through the UNFCCC, developed countries have an obligation to provide funding for adaptation in developing countries. Within the UNFCCC negotiations, this obligation has led to contentious debates about what adaptation efforts to pay for, and how much to pay. The Convention provides little or no guidance on how much money developed countries should make available or how they should share the burden of assistance.¹

Currently, the funding available for adaptation in developing countries flows mainly through two sets of mechanisms: dedicated multilateral adaptation funds (see Box 14) and official development assistance (ODA). The total resources estimated to be available through the discrete adaptation funds—currently around US\$200 million—falls far short of what is needed.² Moreover, developing countries have expressed frustration with the strings attached to these funds, particularly the GEF Trust

Fund, which will only finance the “incremental” costs of producing “global environmental benefits.”

In an effort to move away from the constraints of the Trust Fund, the GEF created the concept of “additional costs” to guide the disbursement of funding under the Special Climate Change Fund and Least Developed Countries Fund. “Additional costs” are calculated as the difference between the cost of development activities undertaken in the absence of climate change and the cost of those undertaken in response to the adverse effects of climate change.³ However, the multiple factors that obscure the distinction between adaptation and development make it challenging to quantify the additional costs of adaptation. Meanwhile, failures within the GEF to provide or adhere to clear guidance have further constrained the use of these funds.⁴

When the Parties to the UNFCCC negotiated these new adaptation funds, they also established a procedure for least-developed countries to report on their specific national adaptation plans of action (NAPAs). These

Box 14. DISCRETE INTERNATIONAL INSTRUMENTS FOR ADAPTATION FUNDING

Four adaptation funding mechanisms have been established through the international climate change negotiations:

1. **Global Environment Facility (GEF) Trust Fund:** A multilateral financial mechanism funded through developed country contributions that are replenished every four years. Climate Change is one of the six GEF focal areas, under which a Strategic Priority on Adaptation has been established for “Piloting an Operational Approach to Adaptation.” The total amount available in the GEF Trust Fund is US\$50 million.
2. **Special Climate Change Fund (SCCF):** Established under the UNFCCC, managed by the GEF, and funded through discretionary pledges from developed countries, this fund supports activities, programs, and measures on climate change that are complementary to those funded by the GEF Trust Fund. Adaptation is identified as one of four priority areas. The total amount available in the SCCF is US\$50 million.
3. **Least-Developed Countries (LDC) Fund:** Also established under the UNFCCC and funded through discretionary pledges from developed countries, this fund supports the preparation and implementation of National Adaptation Plans of Action (NAPAs) and other components of the LDC work program. The total amount available in the LDC Fund is US\$115 million.
4. **Adaptation Fund:** Established under the Kyoto Protocol and funded through the receipt of 2 percent of the proceeds from Clean Development Mechanism, this fund is supports concrete adaptation projects in developing countries. The World Bank estimates that US\$100–500 million will be available through this fund by 2012.¹

Source: Mace 2005

Notes

- ¹ Dollar amounts for each fund were found in GEF 2007 (GEF Trust Fund) and World Bank 2006 (SCCF, LDC Fund, and Adaptation Fund).

reports, of which 23 have been prepared to date, provide a process for countries to identify priority activities that respond to their urgent needs with regard to adaptation to climate change. In their NAPAs, countries tend to focus on enhancing adaptive capacity to climate variability, which itself would help address the adverse effects of climate change. NAPAs seek to take into account existing coping strategies at the grassroots level, and build upon those to identify priority activities, rather than focusing on scenario-based modeling to assess future vulnerability and long-term policy at the state level. NAPAs also include short profiles of projects and/or activities intended to address urgent and immediate adaptation needs of least developed countries. In almost all cases, NAPAs are developed by national environment ministries.⁵

In spite of the wealth of project-specific information provided, few of the adaptation projects proposed in the NAPAs have yet been funded. The lack of implementation, largely driven by the conflicts in funding procedures discussed above, have further exacerbated tensions in the international climate negotiations.

Given the confusion with the discrete adaptation funds and limited success of NAPAs to direct financial assistance to country priorities, the focus of adaptation funding is shifting increasingly to the role of ODA, which represents a much larger pot of money (approximately US\$104 billion in 2006 from donor countries within the Organisation for Economic Co-operation and Development⁶). However, decisions about how such development assistance is allocated have also been changing.

At about the same time that the UNFCCC Parties were negotiating the framework for reporting on and funding adaptation needs, the World Bank and the International Monetary Fund (IMF) were developing and refining a new approach to their relations with low-income countries, centered around the development and implementation of poverty-reduction strategies. Incorporated into national Poverty-Reduction Strategy Papers (PRSPs), these strategies were required as a precondition for access to debt relief and concessional financing; they also served as a framework for better coordination of development assistance among other development partners. The PRSP approach sought to empower governments to set their development priorities and encouraged donors to align their assistance around a country’s priorities, rather than their own. By providing an operational framework for governments to set their development priorities and to specify policies, programs, and resources needed to meet their goals, this process was intended to help crystallize political commitment and accountability—both for countries themselves and for their development partners—for accelerating progress toward the Millennium Development Goals.⁷

In theory, the commonalities between the NAPA and PRSP approaches should have led both to common project proposals and increased resources to key priorities. However, in practice, this has seldom occurred. In many cases, reflecting the critical importance of development assistance to the national economies of least-developed countries, the PRSPs were prepared by ministries of finance or planning. Unfortunately these ministries are often entirely disconnected from the environment ministries most closely associated with the NAPA process and charged with articulating the impacts potentially associated with climate change. Efforts to mainstream adaptation into development agendas have so far largely failed to penetrate the world of PRSPs.

In general, while ODA funders seem more comfortable with the overlap of the adaptation and traditional development agendas, their support for adaptation is voluntary and takes a second place to poverty reduction. In contrast, funds flowing through the UNFCCC mechanisms represent a commitment under international

law—even though that commitment has been honored only with very modest resources. ODA funders are also under some pressure to demonstrate that they are not shifting funds from other development priorities into adaptation work. Developing countries frequently point out that most donor countries fall well short of the commonly cited global target of spending 0.7 percent of their GDP on ODA, and want assurances that any money targeted to adaptation is additional to development assistance. In this context, most ODA donors will want to clearly delineate how their investments are responding to the challenge of adapting to climate change, and how much it is costing them. As such, they face much the same dilemma as do the discrete climate change funds.

The conflict in priorities between development and climate change funders (and project proponents) may not soon be resolved. In spite of the inherent desirability of mainstreaming adaptation into development planning—and the equally valid need to have development agendas help steer adaptation project resources—few developing country governments currently have institutions that are sufficiently aligned or integrated to make this likely. This suggests that moving forward, increasing efforts should be made to streamline planning processes, so that development and climate agendas are more successfully combined.

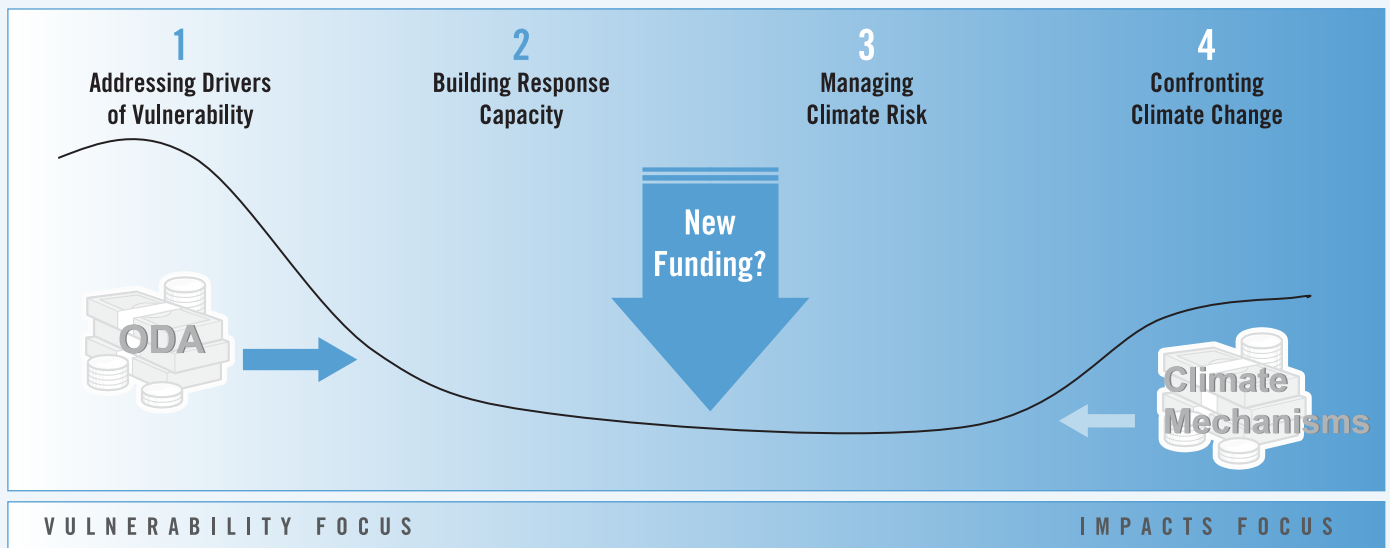
Figure 9 indicates the funding focus of ODA and the dedicated adaptation funds, and suggests how they may be better deployed in the adaptation effort. As noted above, to date, the dedicated adaptation funds have largely supported activities on the climate-specific side of the adaptation continuum, while ODA has dominantly focused on the development side.

As the mainstreaming of climate change into development gains ground, ODA-funded activities will increasingly gain—and deserve—the label “adaptation.” This process is represented in Figure 9 by the arrow pushing ODA from Zone 1 on the continuum toward Zones 2 and 3. However, this movement is limited by the finite level of ODA funding and, in particular, by the reluctance of recipient countries to see ODA diverted from existing priorities. The limitation of ODA in this context is that it is not driven by the imperative for increased funding in response to climate change.

On the other end of the continuum, the discrete climate funding mechanisms, managed by the GEF, are based explicitly on this imperative. However, their mandate obliges these funds to seek out instances in which the additional cost due to climate change can be identified with reasonable certainty. This mandate tends to limit the use of these funds to activities on the right-hand side of the continuum. While match-funding approaches have enabled the climate mechanisms to leverage funding from less constrained sources, legal and operational constraints upon the GEF have tended to limit diversification of activities supported by these funds. This limitation is represented by the smaller size of the arrow pushing the discrete funding sources toward the center of Figure 9.

Nevertheless, the universe of dedicated adaptation funds is now poised to grow, as national governments take on the adaptation agenda, the UNFCCC Adaptation Fund nears its launch, and Parties to the UNFCCC explore adaptation funding mechanisms for a post-2012 agreement. Within the ODA community, dedicated adaptation funding streams are also being created. It is important that these new mechanisms not replicate the

Figure 9. Types of Adaptation Supported by ODA and International Climate Funding Mechanisms



constrained funding dynamic of the existing climate funds. In particular, the review of early adaptation experience in this study clearly indicates that many activities important for adaptation fall in the “messy middle” of Figure 7. Though the “additional cost” due to climate change may not be clearly identifiable, these vulnerability-reduction and capacity-building activities need to fit squarely within funders’ definitions of adaptation.

In addition, as new sources of adaptation funding come on line, a number of other conclusions may be drawn from this report to help target investments:

- Fostering inclusive, accountable decision-making is a central adaptation task, especially in institutions where water and land-use decisions are made. Thus, appropriate attention should be paid to funding strong and flexible decision-making processes that are at the heart of effective adaptation.
- To date, most attention has been paid to implementing adaptation activities at the community level. Investments at the national and watershed levels are also needed to facilitate effective adaptation, especially in the context of ensuring that policies are poised to adapt to the uncertain future.
- Adaptation information needs often have surprisingly little to do with climate prediction. Priorities for

support include geographic information capacities, gathering and managing national census data, historical and current weather data, communications infrastructure, and the ability of educators and media personnel to understand and interpret climate information.

- Donor coordination is needed to ensure that gaps and redundancies are avoided as adaptation efforts progress. Funders can address their own constraints through partnerships with other funders that have complementary approaches and priorities.

Notes

- ¹ Paavola and Adger 2006.
- ² World Bank 2006.
- ³ Möhner and Klein 2007.
- ⁴ Ibid.
- ⁵ For a review of the NAPA process, as well as to examine individual NAPAs from the 23 countries that have submitted them, see the UNFCCC NAPA site: <http://unfccc.int/national_reports/napa/items/2719.php>.
- ⁶ OECD 2007.
- ⁷ For a more thorough review of the PRS and PRSP process, see the World Bank Web pages: <<http://www.imf.org/external/np/prsp/prsp.asp#pp>>.



Lessons Learned and Next Steps

One may approach climate adaptation by focusing on the impacts of climate change, or by reducing vulnerability to climate change in the course of reducing vulnerability in general. Many instances of adaptation blend these two approaches. We see this blending in part because precisely mapping a particular adaptation intervention to a distinct climate change impact is in many cases technically difficult, due to uncertain climate predictions. In many cases, making such a link between interventions and impacts is also unwise, given that climate change is not in and of itself a driver of vulnerability.

By framing approaches to adaptation as a continuum between “pure” vulnerability reduction on one hand and very explicit impacts-oriented measures on the other, we make possible a definition of adaptation that does not depend upon drawing a line between adaptation and development. By better understanding how the relationship between adaptation and development varies with varying circumstances, we can create a firmer basis

for selecting, supporting, and implementing appropriate adaptation interventions.

Giving priority to adaptation efforts where activities directly target known climate risks runs the chance of neglecting some of the most vulnerable communities, where adaptation investments are most needed. Instead, adaptation needs to be regarded as a “big tent,” encompassing the full range of responses—from reducing poverty and building capacity, to managing risk and directly confronting climate change impacts. All of these responses have adaptive value in a world with varying levels of need, capacity, and uncertainty. However, it is worth emphasizing that a “big tent” is not the same as “anything goes” with adaptation. On the contrary, the seriousness of the adaptation challenge calls for rigorous processes that enable the adaptation community to identify and replicate effective approaches, curtail ineffective ones, and learn from both positive and negative experiences.

NEXT STEPS IN RESEARCH AND ANALYSIS

The review of adaptation activities presented in this paper draws upon an unusually large and diverse set of experiences in the developing world. The analytic framework used is unique in categorizing adaptation efforts by response type, instead of by sector, impact, ecosystem type, or geographic scale. However, it is by no means a comprehensive or conclusive analysis. Next steps for refining and building upon this work could include:

- The database of case examples developed for this study needs supplementation and further development. Many gaps remain, both in characterizing the body of experience gathered and in the information obtained about any given effort. Furthermore, the existing (and an enlarged) database may offer an opportunity for additional qualitative and quantitative analysis on trends in adaptation efforts, as well as provide a baseline for evaluating, over time, the efficacy of particular types of adaptation projects.

Thus, for example, analysis could examine whether there is a particular relationship between certain types of adaptation efforts (e.g., between human empowerment and climate proofing, or between promoting policy change and addressing drivers of vulnerability). Analysis might also be able to identify examples of cases where adaptation policies were consistent with national development strategies (including PRSPs) or with ODA projects not specifically targeted to climate change efforts. In a similar vein, evaluations could be made as to the correlation between NAPAs under the UNFCCC and projects that have been implemented. These kinds of analyses would require additional data collection, but could usefully inform the ongoing agenda of development agencies and multilateral development funding institutions.

- Refinement of the proposed framework could provide the basis for the development of decision tools. The present study suggests that greater certainty with regard to climate change effects supports impacts-driven approaches, while low capacity and high uncertainty regarding effects drive more vulnerability-oriented approaches. However, additional drivers of response choice deserve examination, including the specificity, severity, and immediacy of an impact; specific factors contributing to vulnerability; and perceptions of risk and access to information.
- To accommodate the diversity of approaches to adaptation, various monitoring and evaluation tools need to be developed. Principles of good governance and an ecosystem services framing should be explored as a basis for identifying indicators and developing frameworks for interventions in the middle zones of our continuum, where monitoring and evaluation may be especially challenging.
- Developing approaches to adaptive policymaking should be a research priority. Policy models and case studies are needed, as well as identification of opportunities and leverage points in existing policy processes.

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Annex A. List of Cases Analyzed

COUNTRY	SECTOR ADDRESSED	ADAPTATION STRATEGIES EMPLOYED	CASE DESCRIPTION AND LINK
Afghanistan	Disaster-risk management	Awareness	TearFund integrates disaster risk and reduction messages into the storylines of a radio program to raise community awareness. (http://maindb.unfccc.int/public/adaptation_planning/adaptation_list.pl?id_country=1&id_org=&id_level=&id_scope=&id_type=)
Argentina	Disaster-risk management	Institutions	The Red Cross is strengthening its institutions for disaster prevention in response to climate change and is linking with universities to develop disaster management work plans. (http://www.climatecentre.org/downloads/File/articles/Argentine%20Red%20Cross.pdf)
Argentina	Energy	Empowerment	Argentina's rural electrification project grants scattered communities access to the technological and educational benefits of electricity, helping them become resilient to floods, droughts, and crop loss. (http://www.cckn.net/pdf/seeing_the_light_dre.pdf)
Bangladesh	Agriculture	Agriculture; Resources; Technology; Empowerment	SouthSouthNorth and the Society for Wetland Eco-Research are implementing several measures (e.g., crop diversification, disaster preparedness) targeting the threat of sea level rise and storms. (http://www.southsouthnorth.org/country_home.asp?country_id=11#112)
Bangladesh	Agriculture	Technology; Agriculture; Resources	In a case of autonomous adaptation, communities recover from floods by draining fields, planting late-transplant rice, or switching to other, faster-growing crops. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=160)
Bangladesh	Agriculture	Agriculture; Institutions; Planning	The Food and Agriculture Organization and the Asian Disaster Preparedness Centre developed a good-practice adaptation option menu, evaluating and field testing locally selected options with farmers. (http://www.fao.org/docrep/009/a0820e/a0820e00.htm)
Bangladesh	Coastal resources	Resources; Empowerment; Planning; Agriculture	SouthSouthNorth and partners are implementing a suite of adaptation measures (e.g., agricultural diversification, aquaculture promotion, disaster risk reduction) in coastal areas to deal with sea level rise and storms. (http://www.southsouthnorth.org/country_home.asp?country_id=11#113)
Bangladesh	Coastal resources	Planning; Awareness; Institutions; Policy	The Ministry of the Environment is analyzing threats and adaptation options for the coastal zone. (http://www.nlcap.net/countries/bangladesh/)
Bangladesh	Disaster-risk management	Awareness; Institutions; MEWS; Empowerment	Bangladesh's Comprehensive Disaster Management Program is incorporating risk assessment and reduction into its scope of activities to better deal with floods, droughts, and storms. (http://www.cdmp.org.bd/)
Bangladesh	Disaster-risk management	MEWS	CARE Bangladesh is working to increase adaptive capacity in southwestern Bangladesh through climate change-related information collection and dissemination. (http://www.cdpbd.org/rvcc_home.html)
Bangladesh	Disaster-risk management	Technology; Resources	The Intermediate Technology Development Group-Bangladesh introduced flood-friendly fisheries technologies. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=36)
Bangladesh	Disaster-risk management	Institutions; MEWS	The Bangladesh Red Crescent Society Cyclone Preparedness Programme engages volunteers in cyclone warnings, evacuation, rescue, first aid, and emergency relief. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=37)
Bangladesh	Disaster-risk management	Institutions; Resources	The Intermediate Technology Development Group conducted a participatory rural appraisal focusing on the impact of floods and developed a low-cost housing model based on results. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=35)
Bangladesh	Disaster-risk management	Technology; Empowerment	The Grameen Bank provides loans for two house designs that are specially adapted to heavy rains and floods, and can be dismantled and reassembled in severe flood events. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=38)
Bangladesh	Disaster-risk management	Agriculture; Empowerment; Planning; Other	Oxfam is helping poor communities prepare for various climate change impacts, by forming committees and training people, promoting appropriate crops, and assessing water supply and storage. (http://www.oxfamnovib.nl/id.html?lang=EN&id=PROJ_DETAIL&pid=BAN-501114-0006018)
Bangladesh	Disaster-risk management	Infrastructure; Technology; Institutions	Oxfam has built raised villages in flood-prone areas, distributed rescue boats and lifesaving equipment, and trained disaster preparedness committees. (http://www.oxfam.org.uk/what_we_do/issues/climate_change/story_facingheat.htm)

Excel files providing additional information on each case may be downloaded from www.wri.org/climate/.

KEY TO STRATEGY ABBREVIATIONS

Agriculture = Changing Agricultural Practices; Awareness = Raising Awareness; Empowerment = Empowering People; Infrastructure = Improving Infrastructure; Institutions = Building Institutions; Insurance = Providing Insurance Mechanisms; MEWS = Establishing Monitoring/Early Warning Systems; Planning = Launching Planning Processes; Policy = Promoting Policy Change; Resources = Changing Natural Resource Management Practices; Technology = Promoting Technology Change; Other = Other Strategies

COUNTRY	SECTOR ADDRESSED	ADAPTATION STRATEGIES EMPLOYED	CASE DESCRIPTION AND LINK
Bangladesh	Disaster-risk management	Planning	North South University is developing risk communication strategies and testing adaptation options to foster adaptation policy at the local level. (http://www.accaproject.org/evolution/modules/knowledgebox/external2/view.php?id=304&kbid=5)
Bangladesh	Energy	Empowerment	The Ministry of Environment and Forest established a poultry/biogas plant providing both electricity and food, which will alleviate the problem of declining fish stocks. (http://www.cckn.net/pdf/seeing_the_light_dre.pdf)
Bangladesh	Energy	Resources; Institutions	Caritas' reforestation program reduces erosion and guarantees a standing stock of biomass that can be used in emergencies. (http://www.cckn.net/pdf/seeing_the_light_dre.pdf)
Bangladesh	Water resources	Awareness; Resources; Agriculture; MEWS; Empowerment	SouthSouthNorth and partners are using a variety of means (e.g., integrated farming methods, rainwater gathering) to promote adaptive capacity in agriculture and water conservation. (http://www.southsouthnorth.org/country_home.asp?country_id=11#111)
Bhutan	Agriculture	Technology	Bamboo stem is used for irrigating fruit trees as a crop-loss prevention strategy during droughts. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=21)
Bhutan	Agriculture	Resources; Institutions	Local people have taken measures to conserve bamboo, helping it better withstand droughts. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=25)
Bolivia	Human health; Water resources	Planning	The Ministry of the Environment is analyzing threats and adaptation options for climate change in semi-arid mountain regions. (http://www.nlcap.net/countries/bolivia/)
Bolivia	Water resources	Technology	In a case of autonomous adaptation, the Aymara people store rainwater as a source of drinking water during droughts. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=137)
Brazil	Disaster-risk management	Resources	The Community Reforestation Project counters erosion and landslides in Rio de Janeiro's <i>favelas</i> by planting trees. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=139)
Brazil	Water resources	Technology; Empowerment	SouthSouthNorth and local partners are improving agricultural productivity and resilience through the use of water pumping. (http://www.southsouthnorth.org/country_home.asp?country_id=11#109)
China	Water resources	Planning; Institutions	In an effort to mainstream adaptation to climate change, China will use hydrological modeling and pilot projects to develop drought-related policies. (http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P105229)
Colombia	Coastal resources	Policy; Planning	The Colombian government, with the help of NGOs, is preparing a plan that will integrate climate change adaptation policy for the coastal zone into national legislation. (http://www.nlcap.net/fileadmin/NCAP/Countries/Colombia/NCAP_workplan_Colombia_summary.01.300106.pdf)
Colombia	Disaster-risk management	Insurance; MEWS; Institutions; Infrastructure; Awareness	Concerned about floods and landslides, Bogota is improving risk-detection technology, emergency response, recovery finance, and awareness. (http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P085727)
Colombia	Human health; Water resources	Planning; MEWS; Resources; Institutions	Conservation International is addressing the impacts of climate change through land-use planning, watershed protection, and disease control efforts. (http://web.worldbank.org/external/projects/main?Projectid=P083075&Type=Overview&theSitePK=40941&pagePK=64283627&menuPK=64282134&piPK=64290415)
Colombia	Water resources	Resources; MEWS	WWF is developing a pilot adaptation strategy for wetlands in the central Colombian Andes to safeguard water supply. (http://www.panda.org/about_wwf/what_we_do/climate_change/problems/global_warming/scientific_proof/ipcc_report/colombia.cfm)
Costa Rica	Disaster-risk management	Institutions; Infrastructure	The Costa Rican Red Cross runs a flood early-warning system and a community training program in disaster preparedness and prevention, community first aid, and psychological support. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=140)
Cuba	Coastal resources	Resources; Infrastructure	Cuba has developed beach restoration technology to restore the ecological and functional values of the coasts. (http://maindb.unfccc.int/public/adaptation_planning/adaptation_list.pl?id_country=56&id_org=&id_level=&id_scope=&id_type=)

COUNTRY	SECTOR ADDRESSED	ADAPTATION STRATEGIES EMPLOYED	CASE DESCRIPTION AND LINK
Cuba	Disaster-risk management	Planning; MEWS	Cuba's Framework for Disaster Reduction focuses on preparing for and recovering from storms. (http://maindb.unfccc.int/public/adaptation_planning/adaptation_list.pl?id_country=56&id_org=&id_level=&id_scope=&id_type=)
Cuba	Human health	Other	The Cuban Vaccination Program increases adaptive capacity by making the population less vulnerable to climate-related diseases. (http://maindb.unfccc.int/public/adaptation_planning/adaptation_list.pl?id_country=56&id_org=&id_level=&id_scope=&id_type=)
Ecuador	Agriculture	Agriculture; Resources	The Rainforest Rescue Foundation's Analogue Forestry Initiative is promoting tree crop species resilient to climatic changes and is establishing nurseries to investigate adaptation of different tree species. (http://www.bothends.org/project/project_info.php?id=26&scr=st)
El Salvador	Agriculture	Agriculture	The Red Cross Drought Response and Mitigation Project provides technical assistance to help subsistence farmers survive droughts. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=143)
El Salvador	Agriculture	Policy; Empowerment; Institutions; Agriculture; Resources	El Salvador is strengthening the capacities of rural people in the coastal plain to incorporate adaptation to climate change in their socioeconomic activities. (http://maindb.unfccc.int/public/adaptation_planning/adaptation_list.pl?id_country=67&id_org=&id_level=&id_scope=&id_type=)
Ethiopia	Agriculture	Agriculture; Resources; Planning; Empowerment; MEWS	Ethiopia is testing a range of adaptation measures, including agricultural practices to cope with droughts and use of early-warning systems for agriculture. (http://www.gefweb.org/Documents/Medium-Sized_Project_Proposals/MSP_Proposals/documents/Ethiopia-CopingwdDrought-CC.pdf)
Ethiopia	Disaster-risk management	MEWS	Ethiopia uses an early-warning system to assess and communicate the danger of food shortages. (http://iriportal.ldeo.columbia.edu/portal/server.pt/gateway/PTARGS_0_2_1171_0_0_18/Climate%20and%20Society%20No1_en.pdf)
Fiji	Coastal resources	MEWS; Awareness	WWF's Friends of the Reef project monitors and protects coral reefs in response to increasingly common bleaching events associated with warming. (http://www.panda.org/about_wwf/where_we_work/asia_pacific/our_programmes/for/index.cfm)
Ghana	Human health	Institutions; Planning; Policy	Several organizations are collaborating to devise adaptation options in response to climate-related diseases and to integrate adaptation into national and local health policy. (http://www.acccproject.org/evolution/modules/knowledgebox/external2/view.php?id=298&kbid=5)
Guatemala	Agriculture	Institutions; Planning; Awareness; Resources	The Climate Change Studies with Emphasis on Adaptation project aims to reduce vulnerability and increase adaptive ability in the face of increased climate variability. (http://www.nlcap.net/fileadmin/NCAP/Countries/Guatemala/NCAP_workplan_Guatemala_summary.01.300106.pdf)
Guatemala	Disaster-risk management	Institutions; Planning	The Red Cross is strengthening capacities to respond to climate change in the Department of Chiquimula through disaster preparedness training and other actions. (http://www.climatecentre.org/downloads/File/latin_america/Santa%20Rosa%20Guatemala%20ENG.pdf)
Guyana	Coastal resources	Infrastructure; Planning	Guyana is developing a sea level rise contingency plan and improving drainage of the East Demerara Water Conservancy dam during heavy rains. (http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P103539)
India	Agriculture	Institutions; Technology; Resources	The Watershed Organisation Trust helps poor communities in Maharashtra state reclaim drought-degraded lands through watershed management. (http://www.iisd.org/pdf/2003/envsec_livelihoods_3.pdf)
India	Agriculture	Awareness; Planning	Several organizations are collaborating to develop communication materials about agriculture and water risk and to conduct a pilot adaptation project, which will ultimately lead to integrating adaptation measures into policy. (http://www.acccproject.org/evolution/modules/knowledgebox/external2/view.php?id=302&kbid=5)
India	Disaster-risk management	Awareness; Insurance; Infrastructure; Planning	KfW Entwicklungsbank has built 59 cyclone shelters and has raised awareness of climate-related risk in Orissa state. (http://www.kfw-entwicklungsbank.de/DE_Home/Service/Online_Bibliothek/PDF-Dokumente_KfW_Entwicklungsbank/fz_jb_99_e.pdf)
India	Water resources	Technology	Tarun Bharat Sangh (an NGO) has facilitated the construction of earthen check dams to retain monsoon water during droughts. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=41)
India	Water resources	Resources	The government of India and several partners are testing technical solutions for watershed and forestry management programs and financial instruments, such as micro insurance. (http://www.gtz.de/de/dokumente/en-climate-results-asia.pdf)

COUNTRY	SECTOR ADDRESSED	ADAPTATION STRATEGIES EMPLOYED	CASE DESCRIPTION AND LINK
Indonesia	Coastal resources	Planning; Institutions; Policy	SouthSouthNorth and local partners are working to bridge the knowledge gap between local and expert into a participatory decision-making process to address climate threats to coastal communities. (http://www.southsouthnorth.org/country_home.asp?country_id=11#114)
Indonesia	Coastal resources	Resources; MEWS	WWF's Friends of the Reef project monitors and protects coral reefs in response to increasingly common bleaching events associated with warming. (http://www.panda.org/about_wwf/where_we_work/asia_pacific/where/indonesia/wwf_indonesia_conservation/bali_barat/the_background/friends_of_the_reef/index.cfm)
Indonesia	Disaster-risk management	Awareness; Institutions; MEWS; Planning	The Red Cross is establishing institutional structures and plans in East Jakarta to take a proactive approach to climate change, including raising public awareness and establishing an early-warning system. (http://www.climatecentre.org/downloads/File/asia_and_pacific/concept%20paper%202007-2008.pdf)
Kenya	Agriculture	Technology	Small-scale farmers in Kenya have developed a way to make low-cost sprinklers out of recycled materials, helping farmers protect their crops from droughts. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=130)
Kenya	Agriculture	Institutions; Infrastructure; Empowerment	The Ilkerin Loita Integral Development Programme helps Loita Maasai pastoralists prepare for droughts by growing grain and accessing credit. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=114)
Kenya	Disaster-risk management	Institutions; Empowerment; Planning	Kenya is integrating a climate-risk perspective into national and local policymaking and developing programs to enhance adaptive capacity in communities. (http://www.gefonline.org/ProjectDocs/ClimateChange/Kenya - Adaptation to CC in Arid Lands (KACCAL)/Project Document Final 11-10-06.doc)
Kenya	Human health	Awareness	Several organizations are collaborating to develop a model of climate-sensitive malaria and appropriate risk communication strategies. (http://www.acccaproject.org/evolution/modules/knowledgebox/external2/view.php?id=284&kbid=5)
Kenya	Water resources	Technology; Resources	The SASOL Foundation helps communities build forested sand dams to provide a source of water during droughts. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=170)
Kenya	Water resources	Resources	The Kenyan Red Cross trains communities in flood prevention and protection, including changes they can make to waterways to better control flooding. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=109)
Laos	Agriculture	Resources	As an example of autonomous adaptation, people living in the Mekong River floodplain switch from farming to fishing during the rainy season. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=65)
Madagascar	Coastal resources	MEWS; Awareness; Resources	WWF and Conservation International are analyzing and raising awareness about the vulnerability of marine and terrestrial environments to climate change. (http://www.worldwildlife.org/climate/adaptation.cfm)
Malawi	Agriculture	Insurance; Technology	A joint private-sector project helps farmers cope with uncertainty through an insurance program for droughts and loans for seed purchase. (http://iriportal.ideo.columbia.edu/portal/server.pt/gateway/PTARGS_0_2_1171_0_0_18/Climate%20and%20Society%20No1_en.pdf)
Malawi	Disaster-risk management	Awareness	The Red Cross is raising awareness of food security and disaster risks related to climate change. (http://www.climatecentre.org/downloads/File/preparing%20malawis%20preparing%20for%20climate%20change%20program%20july%202006.pdf)
Malawi	Disaster-risk management	Awareness	The Red Cross and partner organizations are finding creative ways to communicate climate predictions to subsistence farmers. (http://www.acccaproject.org/evolution/modules/knowledgebox/external2/view.php?id=294&kbid=5)
Mali	Agriculture	MEWS; Awareness; Technology	The government of Mali and the Swiss Agency for Development and Cooperation use data collected by farmers to help farmers make planting decisions. (http://iriportal.ideo.columbia.edu/portal/server.pt/gateway/PTARGS_0_2_1171_0_0_18/Climate%20and%20Society%20No1_en.pdf)
Mali	Water resources	Awareness; Planning	Several organizations are collaborating to raise awareness and plan for the future regarding water resources and climate change. (http://www.acccaproject.org/evolution/modules/knowledgebox/external2/view.php?id=290&kbid=5)
Mauritius	Coastal resources	Awareness; Technology	Environment Care Association is spreading awareness of climate change through talks and booklet distribution to schools, women's groups, and youth organizations. (http://sgp.undp.org/web/projects/11569/sensitisation_on_environment_protection_with_emphasis_on_climate_change.html)

COUNTRY	SECTOR ADDRESSED	ADAPTATION STRATEGIES EMPLOYED	CASE DESCRIPTION AND LINK
Middle East	Water resources	Resources	The International Development Research Centre promotes water demand management through research, capacity building, networking, and advocacy. (http://www.idrc.ca/en/ev-100570-201_101806-1-IDRC_ADM_INFO.html)
Mongolia	Agriculture	Awareness; Institutions; Resources	The National University of Mongolia and other partners are reinstating traditional land-use practices to cope with droughts. (http://www.acccaproject.org/evolution/modules/knowledgebox/external2/view.php?id=301&kbid=5)
Mozambique	Agriculture	Infrastructure; Resources; Agriculture; Institutions; MEWS	Mozambique is testing a range of drought-adaptation measures, such as diversifying livestock and crops, ensuring access to water and land, and developing an early-warning system. (http://www.gefweb.org/Documents/Medium-Sized_Project_Proposals/MSP_Proposals/documents/Mozambique-CopingwdDrought-CC.pdf)
Mozambique	Agriculture	Institutions; Empowerment; Agriculture	A market-oriented small-holder development project is aiming to accelerate agricultural growth and reduce poverty in the face of drought and land degradation. (http://www.gefonline.org/projectDetails.cfm?projID=2889)
Mozambique	Disaster-risk management	Awareness; Institutions	The Red Cross is strengthening its disaster preparedness capacity and promoting awareness of climate change impacts. (http://www.climatecentre.org/downloads/File/dealing%20with%20climate%20change%20in%20mozambique%20july%202006.pdf)
Mozambique	Disaster-risk management	Policy; Planning	The Programme for Rural Development is preparing the Buzi district for storms and floods by establishing preparedness committees and early-warning systems and promoting risk-reduction policy. (http://www.gtz.de/en/themen/umwelt-infrastruktur/umweltpolitik/16057.htm)
Mozambique	Water resources	Technology; Resources	SouthSouthNorth and local partners are supplying farmers with renewable energy to combat water shortages. (http://www.southsouthnorth.org/country_home.asp?country_id=11#165)
Multinational	Agriculture	Institutions; Resources; Empowerment	PASOLAC (Programa para la Agricultura Sostenible en las Laderas de América Central) helps hillside farmers in Central America implement sustainable soil and water management techniques and gain access to markets. (http://www.iisd.org/pdf/2003/envsec_livelihoods_2.pdf)
Multinational	Agriculture	Technology; Empowerment	The New Seed Initiative for Maize in Southern Africa provides poor farmers with drought-resistant seed. (http://www.sdc.admin.ch/en/Home/Projects/Maize_initiative)
Multinational	Agriculture	Technology; Institutions	The West Africa Agricultural Productivity Program Support Project generates and disseminates agricultural technologies and information. (http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P094084)
Multinational	Coastal resources	Resources; Planning; MEWS	WWF and The Nature Conservancy are adapting marine-protected area monitoring and planning to encompass facets of bleaching resistance and coral resiliency in Mexico and the Caribbean. (http://www.panda.org/about_wwf/what_we_do/climate_change/news/impacts/index.cfm?uNewsID=74900)
Multinational	Coastal resources	Technology; Planning; Awareness	The Caribbean Community Secretariat is raising awareness of climate change among Caribbean nations through risk communication strategies and pilot projects. (http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P073389)
Multinational	Coastal resources	Planning	The Implementation of Adaptation Measures in Coastal Zones Project designs and tests adaptation projects protecting biodiversity in Dominica, St. Lucia, and St. Vincent and The Grenadines. (http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P090731)
Multinational	Coastal resources	Resources; Planning; Technology; Institutions	WWF is testing methods to restore degraded mangrove forests to make them resilient to climate change in Fiji, Cameroon, and Tanzania. (http://www.panda.org/about_wwf/what_we_do/climate_change/problems/global_warming/scientific_proof/ipcc_report/cameroon.cfm)
Multinational	Coastal resources	Planning	The United Nations Development Programme is incorporating climate change concerns, such as coastal erosion and declining fish stocks, into integrated coastal management in Western Africa. (http://www.undp.org/gef/adaptation/projects/06c.htm)
Multinational	Disaster-risk management	Resources; Planning	WWF is monitoring glacial melt, predicting glacial lake outburst floods, and educating communities about associated risks and preparedness actions in Nepal, India, and China. (http://www.panda.org/about_wwf/where_we_work/asia_pacific/where/nepal/our_solutions/projects/index.cfm?uProjectID=NP0898)
Multinational	Disaster-risk management	Institutions; Awareness; Policy; Infrastructure	Action Aid is working in Nepal, Malawi, Haiti, Kenya, Ghana, Bangladesh, and India to make schools in high-risk disaster areas safer, enabling them to act as a locus for disaster risk reduction. (http://www.actionaid.org/main.aspx?PageID=212)

COUNTRY	SECTOR ADDRESSED	ADAPTATION STRATEGIES EMPLOYED	CASE DESCRIPTION AND LINK
Multinational	Human health	MEWS	The Roll Back Malaria Initiative in southern Africa developed a monitoring and early-warning system that uses climatic data to predict malaria outbreaks. (http://iriportal.Ideo.columbia.edu/portal/server.pt/gateway/PTARGS_0_2_1171_0_0_18/Climate%20and%20Society%20No1_en.pdf)
Nepal	Disaster-risk management	Resources; MEWS	The government of Nepal reduced the water level in Tsho Rolpa Lake to prevent glacial lake outburst floods, and instituted an early-warning system for downstream villages. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=72)
Nepal	Disaster-risk management	Institutions; Planning; Awareness	The Knowledge and Research Program improved flood-risk reduction by establishing and training several committees and by distributing a flood-protection manual. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=67)
Nepal	Disaster-risk management	Technology	An Intermediate Technology Development Group project is reducing the impact of floods by strengthening the capacity of local communities to set up early-warning systems. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=67)
Nepal	Disaster-risk management	Institutions; Insurance; MEWS	The Himalayan Climate Centre is initiating a collective disaster insurance scheme in Western Nepal. (http://www.acccaproject.org/evolution/modules/knowledgebox/external2/view.php?id=300&kbid=5)
Nicaragua	Disaster-risk management	Awareness	The Red Cross conducts stakeholder seminars on climate change risks and works with teachers to integrate climate change impacts into school curricula. (http://www.climatecentre.org/downloads/File/articles/Nicaraguan%20Red%20Cross.pdf)
Nicaragua	Disaster-risk management	Technology; MEWS	The autonomous government of the North Atlantic Region has improved its early-warning systems and disaster planning to cope with hurricanes and floods. (http://www.gtz.de/en/themen/umwelt-infrastruktur/umweltpolitik/16057.htm)
Niger	Water resources	Institutions; Resources; Infrastructure	The Niger Basin Authority is working to improve watershed management, irrigation, hydroelectric power, and institutional coordination on water resources. (http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P093806)
Nigeria	Agriculture	Technology; Infrastructure	The World Bank's <i>fadama</i> irrigation project helps ensure water availability during droughts. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=152)
Peru	Agriculture	Technology	The Waru Waru Restoration Project has revived an ancient canalization technique designed to provide moisture to farms during droughts and drainage during heavy rains. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=134)
Philippines	Agriculture	Awareness	Several organizations are collaborating to develop climate risk communication materials for policymakers, local farmers, and other local stakeholders. (http://www.acccaproject.org/evolution/modules/knowledgebox/external2/view.php?id=303&kbid=5)
Philippines	Coastal resources	MEWS	WWF's Friends of the Reef project monitors and protects coral reefs in response to increasingly common bleaching events associated with warming. (http://www.panda.org/about_wwf/where_we_work/asia_pacific/our_programmes/for/index.cfm)
Philippines	Disaster-risk management	Resources; Technology; Other	Oxfam set up a relief and rehabilitation program in response to increased storms, droughts, floods, and warfare. The program includes food and medicine provision and credit and training for entrepreneurship. (http://www.oxfamnovib.nl/id.html?lang=EN&id=PROJ_DETAIL&pid=FILE-501437-0001742)
Samoa	Coastal resources	Resources	The Vaiusu Bay restoration project is replanting and protecting mangroves to safeguard biodiversity. (http://sgp.undp.org/web/projects/11284/replanting_of_the_degraded_vaiusu_bay_to_improve_the_mangrove_ecosystem_biodiversity_for_food_security.html)
Samoa	Coastal resources	Resources	Matafa village is conserving nearby mangroves to safeguard biodiversity, provide income, and protect the village from storm surges. (http://sgp.undp.org/web/projects/11280/conservation_of_the_last_standing_mangrove_ecosystem_in_matafaa_village_for_its_biodiversity_and_cul.html)
Samoa	Water resources	Resources	Lepa - Komiti Tumama is helping the village of Lepa store clean drinking water for use during floods. (http://sgp.undp.org/web/projects/11292/restoration_of_the_lepa_village_natural_spring_and_development_of_water_catchment_for_village_drinki.html)
Samoa	Water resources	Resources; Planning; Empowerment	Vailoa Palauli - Komiti a Tina ma Tamaitai is helping the village of Vailoa Palauli store clean drinking water in the face of climatic variation. (http://sgp.undp.org/web/projects/11288/upgrading_coastal_spring_for_the_village_of_vailoa_palauli.html)
Senegal	Agriculture	Institutions; Resources	Environnement et Developpement du Tiers Monde helps farmers set up agroforestry co-ops, reducing erosion and improving food security in the face of droughts. (http://www.ckn.net/pdf/seeing_the_light_dre.pdf)

COUNTRY	SECTOR ADDRESSED	ADAPTATION STRATEGIES EMPLOYED	CASE DESCRIPTION AND LINK
Senegal	Energy, Agriculture	Empowerment; Infrastructure	The German/Senegalese Photovoltaic Solar Energy Project installs solar energy in remote villages for use in homes and farming operations, helping residents cope with water shortages. (http://www.cckn.net/pdf/seeing_the_light_dre.pdf)
South Africa	Agriculture	Agriculture; Empowerment; Awareness	SouthSouthNorth and Indigo Development and Change are helping farmers adapt their practices to anticipated climate change. (http://www.southsouthnorth.org/country_home.asp?country_id=11#159)
South Africa	Water resources	Awareness; Resources	The Climate for Water project aims to improve climate prediction tools from a water resources perspective. (http://www.c4w.org.za/c4w/custom/com/c4w/home/index.jsp)
South Asia	Disaster-risk management	MEWS	The International Centre for Integrated Mountain Development is developing a database and early-warning system for glacial lake outburst floods. (http://www.sdc.admin.ch/en/Home/Projects/Floods_from_the_Roof_of_the_World)
Sri Lanka	Agriculture	Institutions	Pangu, a traditional system of cooperative irrigation reservoir maintenance, helps ensure water availability during droughts. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=152)
Sri Lanka	Coastal resources	Resources	Sri Lanka is protecting itself from sea level rise and storms by restoring coastal ecosystems. (http://www.gefonline.org/projectDetails.cfm?projID=2753)
Sudan	Agriculture	Resources; Agriculture; Empowerment; Institutions	The Community-Based Rangeland Rehabilitation for Carbon Sequestration project helps communities in Bara province manage farms and forests and prepare for droughts. (http://www.aiaccproject.org/working_papers/Working%20Papers/AIACC_WP42_Osman.pdf)
Sudan	Agriculture	Resources; Agriculture	In the name of food security and enhanced livelihoods, SOS Sahel is improving water management, agricultural practices for farming in arid areas, credit, and literacy. (http://www.aiaccproject.org/working_papers/Working%20Papers/AIACC_WP42_Osman.pdf)
Sudan	Water resources	Resources; Agriculture	The Intermediate Technology Development Group supports community-developed water conservation and agricultural practices that help cope with droughts and global warming. (http://www.aiaccproject.org/working_papers/Working%20Papers/AIACC_WP42_Osman.pdf)
Suriname	Coastal resources	Policy; Planning; Institutions	Several ministries are conducting studies to develop committees and reports on climate change impacts and adaptation needs and options in coastal zones. (http://www.nicap.net/fileadmin/NCAP/Countries/Suriname/NCAP_workplan_Suriname_summary.01.300106.pdf)
Tajikistan	Agriculture	Resources; Technology; Institutions	CARE teaches households to extend the vegetable growing season by using cold frames and to plant trees on hillsides to stabilize land in the face of glacial melting. (www.seepnetwork.org/files/4674_file_SEEP_CARE_Tajikistan_.ppt)
Tajikistan	Disaster-risk management; Agriculture	Technology; Institutions; Policy	Oxfam is addressing the water-provision problems associated with droughts and flooding by introducing new technologies, promoting new crops, and launching a disaster preparedness program. (http://www.oxfam.org.uk/what_we_do/issues/climate_change/story_tajik.htm)
Tanzania	Agriculture	Resources	The Ministry of Natural Resources and Tourism is reviving a traditional soil conservation practice known as <i>nigtili</i> to cope with droughts. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=117)
Tanzania	Water resources	Infrastructure; Resources; Empowerment	SouthSouthNorth and local partners are addressing ground-water salinization by testing well water and drilling new wells in agricultural areas. (http://www.southsouthnorth.org/country_home.asp?country_id=11#146)
Tanzania	Water resources	Agriculture; Resources	Several organizations are collaborating to solve problems of overfishing and potable water shortages in Lake Victoria and will explore aquaculture as a reduction in vulnerability to climate change. (http://www.accapproject.org/evolution/modules/knowledgebox/external2/view.php?id=297&kbid=5)
Tanzania	Water resources	Resources; Awareness; Institutions	The Mwashu Water User Group is training communities in water management and irrigation to combat water shortages. (http://sgp.undp.org/web/projects/11331/formation_of_water_user_association_and_river_namwi_catchments_for_sustainable_irrigation_at_mwashu.html)
Tanzania	Water resources	Technology; Planning	Tanzania is preparing for climate change impacts on the Pangani River by improving technical knowledge and watershed management. (http://www.gefweb.org/Documents/Medium-Sized_Project_Proposals/MSP_Proposals/documents/Tanzania-PanganiMainstreaming.pdf)
Tanzania	Water resources	Institutions; Resources; Policy	The Water Sector Support Project is strengthening institutions for integrated water resource management and broadening access to water supply and sanitation. (http://web.worldbank.org/external/projects/main?agePK=64283627&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P087154)

COUNTRY	SECTOR ADDRESSED	ADAPTATION STRATEGIES EMPLOYED	CASE DESCRIPTION AND LINK
Thailand	Agriculture	Technology; Agriculture; Resources	As an example of autonomous adaptation, communities in the Lower Songkram River Basin are modifying their fishing gear and their rice-growing strategies to conform to climate changes, such as flooding and drought. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=77)
Thailand	Coastal resources	Institutions; Resources	Thailand's community mangrove reforestation projects help protect the coast from storms. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=154)
Thailand	Coastal resources	MEWS	WWF's Friends of the Reef project monitors and protects coral reefs in response to increasingly common bleaching events associated with warming. (http://www.panda.org/about_wwf/where_we_work/asia_pacific/our_programmes/for/index.cfm)
Trinidad and Tobago	Disaster-risk management	Awareness	The Red Cross is developing booklets, posters, a Web site, and kids' clubs to raise awareness among children of the risks associated with climate change. (http://www.climatecentre.org/downloads/File/latin_america/Trinidad%20and%20Tobago.pdf)
Tunisia	Water resources	Policy; Awareness	GTZ helped Tunisia develop a National Adaptation Strategy. (http://www.gtz.de/de/dokumente/en-climate-results-maghreb.pdf)
Tuvalu	Disaster-risk management	Policy	The Pacific Access Category allows 75 Tuvalu citizens to migrate to New Zealand each year as a way to cope with sea level rise. (http://www.foe.org.au/resources/publications/climate-justice/CitizensGuide.pdf)
Uganda	Agriculture	Agriculture	The Karamoja Agropastoral Development Programme provides women with cross-bred goats and instruction in graze-free feeding to improve goat survival during droughts. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=35)
Uganda	Agriculture	Technology; Awareness; Agriculture	The Radio and Internet Project enhances collection and dissemination of early-warning and climate information at the local level through radio and the Internet. (http://www.acts.or.ke/pubs/monographs/pubs/ecopolicy15.pdf)
Vietnam	Disaster-risk management; Coastal resources	Awareness; Resources; Planning	The Red Cross has integrated a climate change and adaptation unit into its disaster preparedness training modules and is focusing on mangrove restoration as a cyclone-protection strategy. (http://www.climatecentre.org/downloads/File/asia_and_pacific/Vietnam%20February%202007.pdf)
Vietnam	Water resources	Planning; Awareness; Technology; Institutions; Policy	The Institute of Meteorology and Hydrology is using water modeling and stakeholder discussions to develop adaptation plans addressing biodiversity loss. (http://www.nlcap.net/countries/vietnam/)
Yemen	Agriculture	Agriculture; Empowerment	Yemen is increasing the adaptive capacity of rural communities through conservation of agro-biodiversity and traditional knowledge. (http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P103922)
Yemen	Water resources	Resources; Institutions; Policy	The Netherlands Climate Change Studies Assistance Programme in Yemen focuses on social-based adaptation to climate change, especially water-use planning. (http://www.nlcap.net/fileadmin/NCAP/Countries/Yemen/NCAP_workplan_Yemen_summary.01.300106.pdf)
Zimbabwe	Agriculture	Agriculture; Resources	The ISSD and Zimbabwe ENDA Community Drought Mitigation project helps farmers improve water-use efficiency and decrease runoff as a way of coping with droughts. (http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=120)
Zimbabwe	Agriculture	Planning; Agriculture; MEWS; Resources	Zimbabwe is promoting sustainable livelihoods in the face of drought, enhancing the use of early-warning systems, and developing community drought-preparedness plans. (http://www.undp.org/gef/adaptation/docs/CwD2/CwD_MSP_Zim_PAC2.ppt)
Zimbabwe	Energy; Water resources	Technology	ZERO (an NGO) installed wind power for home use and irrigation pumps, helping rural villages cope with water shortages. (http://www.cckn.net/pdf/seeing_the_light_dre.pdf)

Annex B. Methods, Criteria, and Sources for Selecting Case Examples

Defining the scope of the case review presented in Section II was challenging. To maintain an open-minded perspective on what qualifies as “adaptation” without overwhelming the study with meaningless data, we took an iterative approach to identifying cases.

The first iteration of case selection focused on sources available through the UNFCCC Web site (including links from there to presentations made for “Development and Adaptation Days” and other side events). These sources led us to 120 examples of adaptation projects, activities, assessments, and strategies.

In analyzing these examples, a central challenge for our review quickly became clear: much of this work on adaptation is more academic than practical. Cases found frequently assess the scope or magnitude of particular impacts, characterize specific sources of vulnerability in particular places or communities, or propose particular adaptation strategies. This finding led us to distinguish between adaptation activities where generating knowledge was the principal objective and those aimed at creating a concrete change; our focus is on the latter. Following this distinction, we included examples drawn from academic papers, but not academic investigations as examples of adaptation themselves. Vulnerability and impacts assessments were included in the scope of the review only if they were an integral part of a specific adaptation strategy or decision-making process, not if they were stand-alone studies.

In line with this criterion, we excluded 73 of the 120 initial examples gathered from our review on grounds that they primarily represented knowledge generation, not practical action. The low proportion of cases that fit our criteria suggests that either (1) more adaptation

effort currently focuses on knowledge creation than on-the-ground action, or (2) the existing body of more practical efforts is not being highlighted in the UNFCCC clearinghouses from which we drew our initial example set. Based on subsequent efforts to gather cases from other sources (see Annex A for the source of each case), we believe that both circumstances are true. While we encountered numerous practical examples that we could not find on UNFCCC-related Web sites, we also re-encountered many examples in multiple fora, suggesting that the overall body of practical experience is not yet large.

In the end, the review covered a total of 135 examples of practical adaptation. Each case was examined according to a series of parameters, including its location, geographic scale, sectoral focus, strategic emphasis, and the climate impacts the activity addressed. Characterizing the examples in this manner was challenging: project descriptions frequently use different adaptation terminology, and boundaries between categories can be unclear, even when terminology is consistent. Many adaptation efforts are also complex, with multiple funders, implementers, strategies, localities, impacts, and vulnerability drivers frequently at play in a single project. This created a problem of “comparing apples to oranges,” which was impossible to fully resolve, given the data available for the present study: some cases are large and multifaceted, while others consist of smaller, relatively more focused sets of activities. Further analysis could better divide each case into its component parts for more effective comparison.

A more detailed treatment of the data may be found at www.wri.org/climate/.

Annex C. Acronyms

ACRONYM	FULL NAME
CATHALAC	Water Center for the Humid Tropics of Latin America and the Caribbean
CRM	Climate Risk Management
DRM	Disaster Risk Management
GDP	Gross Domestic Product
GEF	Global Environment Facility
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
IMF	International Monetary Fund
IPCC	Intergovernmental Panel of Climate Change
LDC	Least Developed Countries
NAPAs	National Adaptation Plans of Action
NGO	Non-Governmental Organization
ODA	Official Development Assistance
PRSPs	Poverty Reduction Strategy Papers
SCCF	Special Climate Change Fund
TAI	The Access Initiative
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change

About the Authors

HEATHER MCGRAY is a Senior Associate in WRI's Climate and Energy Program. She currently leads WRI's project on vulnerability and adaptation to climate change. Her previous work with WRI focused on the role of transparency, participation, and access to justice in addressing environmental problems, including research and training in China's Yunnan Province. Prior to joining WRI, Ms. McGray's professional experience included research on environmental management in China; research and negotiations on ISO 14000 environmental standards; coordination of an urban education and development network; and management of US-China educational exchange programs. Ms. McGray holds a Master of Environmental Management degree from Yale University and a Bachelor's degree in Biology from Oberlin College.

ANNE HAMMILL is a project manager and researcher with the Climate Change & Energy and Environment & Security programs at the International Institute for Sustainable Development (IISD). Much of her work focuses on understanding how better environmental management can contribute to human security through resilience to climate stress, conflict prevention, and peacebuilding. Ms. Hammill's most recent work has involved field research, training, and policy analysis on climate change adaptation, as well as conflict-sensitive conservation in Eastern and Central Africa. She holds a Bachelor of Arts in Geography and Environmental Studies, and a Master of Arts in Geography.

ROB BRADLEY directs WRI's International Climate Policy Initiative. His research focuses on climate policy instruments and the relationship between climate change and development. Mr. Bradley's areas of expertise include international emissions trading, clean energy technologies, and European climate and energy policy. Mr. Bradley has been a regular participant in the U.N. Conferences of the Parties to the UNFCCC since 1998, and has been active in EU climate and energy policy formulation. He has spoken and published widely, on such subjects such as emissions trading, renewable energy finance, climate change and health, and East-West European energy collaboration. Prior to joining WRI in 2004, Mr. Bradley worked as a consultant on energy and environmental policy issues. He holds a Bachelor of Science in Physical Sciences from University College London and a Master of Environmental Sciences from the University of East Anglia.

JO-ELLEN PARRY serves as Manager for the Climate Change and Energy program at IISD. Her recent work has focused on the intersection of developing countries, adaptation to the effects of climate change, opportunities to improve the Clean Development Mechanism, and establishment of a post-2012 climate regime. She also coordinates activities of the KyotoSmart Network, an initiative that brings together Canadian industry, labor, NGO, and provincial government representatives. Ms. Parry undertook a secondment from IISD to the Canadian International Development Agency's Policy Branch in 2002, where she primarily worked on climate change issues related to the least developed countries. Prior to joining IISD, Ms. Parry held various research positions and worked internationally in Ghana and Pakistan. She holds a Master in Environmental Studies degree from York University and a Bachelor of Science in Environmental Science from the University of Manitoba.

LISA SCHIPPER is an interdisciplinary researcher focused on development and global environmental change. In particular, she is interested in socio-cultural factors causing vulnerability to natural hazards, adaptation policy issues and the linkages between development and risk. Dr. Schipper has worked and consulted for numerous international organisations, including the UNFCCC, UNDP, UNEP, ISDR, GTZ, DFID, IISD, and IWMI, among others. She is currently based at the Southeast Asia START regional center at Chulalongkorn University in Bangkok, Thailand, where she also works on research capacity building in the realm of adaptation and vulnerability reduction.

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