

**EXECUTIVE SUMMARY**

**WORLD RESOURCES**

# **DECISION MAKING IN A CHANGING CLIMATE**

**ADAPTATION CHALLENGES  
AND CHOICES**

**2010-2011**



# WORLD RESOURCES 2010-2011

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## FOREWORD

**C**ONDITIONS ARE CHANGING IN OUR WORLD. Some are feeling the impact now, from the heat wave and wildfires in Russia of the last two years, the devastating floods in Pakistan and Australia, tornadoes in the United States, mudslides in Brazil, drought in China. Others are worrying about the impacts to come: the tea growers in Kenya's highlands who are seeing cases of malaria they didn't see only five years ago; the cocoa farmers in Ghana who think about how changes in rainfall will affect their sensitive crops; the rice farmers in Vietnam who are increasingly concerned about rising water levels.

Around the world, there is a growing recognition that, no matter what steps may be taken to control greenhouse gas emissions, we need action to prepare for the likely impacts of greater climate variability and climate change. Governments increasingly realize that they need to make hard policy choices today about a world they may face in 20, 30, or 40 years from now—choices that take into account the scale, pace, and complexity of the risks presented by a changing climate.

This edition of *World Resources* is designed for governments making these difficult choices. The report is based on a broad research program and consultations with experts from more than 30 countries, and that research is publicly available on the WRR web site ([www.worldresources-report.org](http://www.worldresources-report.org)). The report identifies five critical elements that will significantly strengthen the ability of national governments to make effective adaptation decisions:

- **Early and ongoing public engagement** on climate change issues, to ensure that people appreciate the risks, understand policy decisions, and have a voice in how they are implemented and monitored.
- **Information**, such as geographically relevant weather data, that is easily accessible, can be shared with those affected, and used effectively to make informed decisions for varying time-scales.
- **Institutional design** that allows governments to coordinate among agencies and stakeholders at local, sub-national, regional, and international levels, and to prioritize climate risks in planning and policymaking processes.
- **Resources**—financial, human, ecological, and social—at every level and over time.
- **Tools** to help governments assess climate risks and vulnerabilities, and decide among policy options. Some tools, such as hazard mapping, may be in place already, but need to be customized to support adaptation planning and policymaking; others will need to be created to meet the challenges and uncertainties that lie ahead.

Some countries are already making an impressive start in addressing these elements and accounting for climate risks. Others, however, are just beginning to grasp the enormity of the challenge—even as they are dealing with the pressing demands for energy, jobs, education, and health care.

We hope this report can offer guidance for policymakers in countries around the world as they begin to address climate change risks—but particularly in developing countries. Although no country is unaffected by climate change, we know that countries will not be impacted evenly or to the same extent: some are vulnerable simply because of geography, while others will have to deal with climate change on top of existing economic and social vulnerability. Developing countries will bear the brunt of climate change and its costs, and the poor will suffer the earliest and the most from its effects. The economies of these countries, in large measure, are dependent on sectors such as agriculture and forestry, which are most susceptible to weather changes.

Climate change will test the ability of governments to lead, as never before. Trade-offs will be necessary in the choices policymakers must make—between the urgency of today's problems and the need to prepare for future risks. But how governments and societies make these choices will define how they adapt to a changing climate, and shape the world in which our children and grandchildren live and thrive.

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# EXECUTIVE SUMMARY

**A** **DAPTATION TO ACCOMMODATE CLIMATE CHANGE WILL FRAME** the future for countries and communities across the globe. Responding to climate impacts as diverse as altered rainfall patterns, more frequent or intense extreme weather events, and rising sea levels will challenge decision makers at every level of government and in every sector of the economy. What steps should be taken to protect vital infrastructure, such as roads, dams, and factories, or to ensure the safety of housing stocks, both existing and yet to be built? What policies should be adopted or investments made to help agriculture adapt to new rainfall and temperature regimes and to secure local food supplies? How should valuable ecosystems like forests or coral reefs be managed to maintain the vital services they render and livelihoods they support? How can we ensure that the unique challenges faced by the most vulnerable and disadvantaged people are not overlooked or ignored?

Complicating these challenges is the uncertainty that surrounds how such changes will unfold. Future rainfall projections for Ghana in 2050, for example, vary from much wetter to much drier, with estimates ranging from a 49 percent increase to a 65 percent decrease from 2010 levels<sup>1</sup> in annual precipitation. Such a range makes it difficult for governments to prepare for the impacts on key sectors such as agriculture and electricity generation.

Another challenge that decision makers will need to face is that climate change will not play out on a level playing field. The vulnerability of affected populations and ecosystems will influence the outcomes of climate change on the ground. When a disaster strikes or a long-term change unfolds, the impact will vary between and often within regions, countries, and localities, based on the vulnerability of affected people. For example, a cyclone in Australia will not have the same impact on communities as one of equal magnitude in Bangladesh.

While there are early examples of adaptation efforts now taking place, many national governments have yet to integrate climate change risks into current and long-term planning and policy-making. Developing countries face particularly difficult challenges in doing so. Many will bear a heavier burden of climate change impacts because of factors beyond their control, such as geography. At the same time, their ability to undertake adaptation initiatives to accommodate long-term impacts, such as glacial melt or sea level rise, is severely constrained by the press of meeting current development needs, among other factors. Yet integrating climate risks into governmental decision making will be essential if development and other goals are to be met.



**Rainfall projections for Ghana in 2050 range from much wetter to much drier.**

## **DECISION MAKING FOR A CHANGING CLIMATE: OUR FOCUS**

*World Resources 2010–2011* is a joint publication of the United Nations Development Programme, the United Nations Environment Programme, the World Bank, and the World Resources Institute. It focuses on how national governments, particularly those of developing countries, can make effective decisions in a changing climate.

The ways in which governments anticipate and respond to the short- and long-term risks posed by climate change can have lasting consequences on the future of their countries. Even though many adaptation activities are led and implemented by local governments and communities, national-level decisions play key roles in enabling local and private-sector adaptation efforts, especially by providing information and guidance.

Climate change will affect many sectors, including agriculture, electricity production, transportation, forest and land use, and water management. Climate change is not just an environmental problem; its impacts affect all departments of government. This underscores the need for a comprehensive response by government and for different approaches to decision making that respond to the unique nature of the climate challenge.

This publication explores five key elements—*public engagement, decision-relevant information, institutional design, tools for planning and policymaking, and resources*—that we believe will significantly strengthen the ability of national governments to make effective adaptation decisions. Our arguments for why decision makers should focus on these elements are based upon the results of a wide-ranging and interactive research program (see Methods Box on page 20). Over 100 adaptation experts, public officials, sector-based practitioners and civil society representatives, from more than 30 countries, contributed to our research effort.

## Public Engagement

Because of the potential disruptions and trade-offs inherent in decision making in a changing climate, early and ongoing public engagement is essential to effective adaptation. Involving the public can help governments define adaptation needs, choose among various priorities, and define acceptable levels of risk. Governments will need to ensure that those affected by climate impacts and adaptation decisions fully participate in those processes.

## Decision-Relevant Information

User-driven, sufficient, accurate, accessible, long-term, frequently updated, cost-effective and targeted information is essential to effective adaptation. This report argues that governments should step up efforts to collect and distribute such information in a usable form in order to make informed decisions.

## Institutional Design

Coordination among national-level government agencies and with other stakeholders and institutions at local, sub-national, regional and international levels will be a prerequisite of successful climate adaptation efforts. In many countries, present planning for the risks posed by climate change is often divided among different ministries and lacks a coordinating authority. Furthermore, effective government leadership and the use of institutional mandates are necessary if the integration of climate risks into planning and policymaking processes is to be a high priority.

## Tools for Planning and Policymaking

Both commonly used and more specialized decision support tools can help public officials make difficult adaptation decisions. They can be deployed, for example, to assess climate risks and vulnerability and decide among policy options. Some existing tools, such as hazard mapping, can be customized to serve adaptation planning and policymaking purposes by integrating climate risks and vulnerability into their use.

## Resources

Adapting to climate change impacts will require a full array of resources over time, including financial, human, ecological and social resources. Governments and donors will need to make investments that account for the lifespan of projected long-term climate impacts. Developing countries urgently need to acquire the skills and capacity to implement adaptation plans, policies, and initiatives.



**Climate change will affect many sectors including agriculture, electricity, transport, forestry, land use and water.**





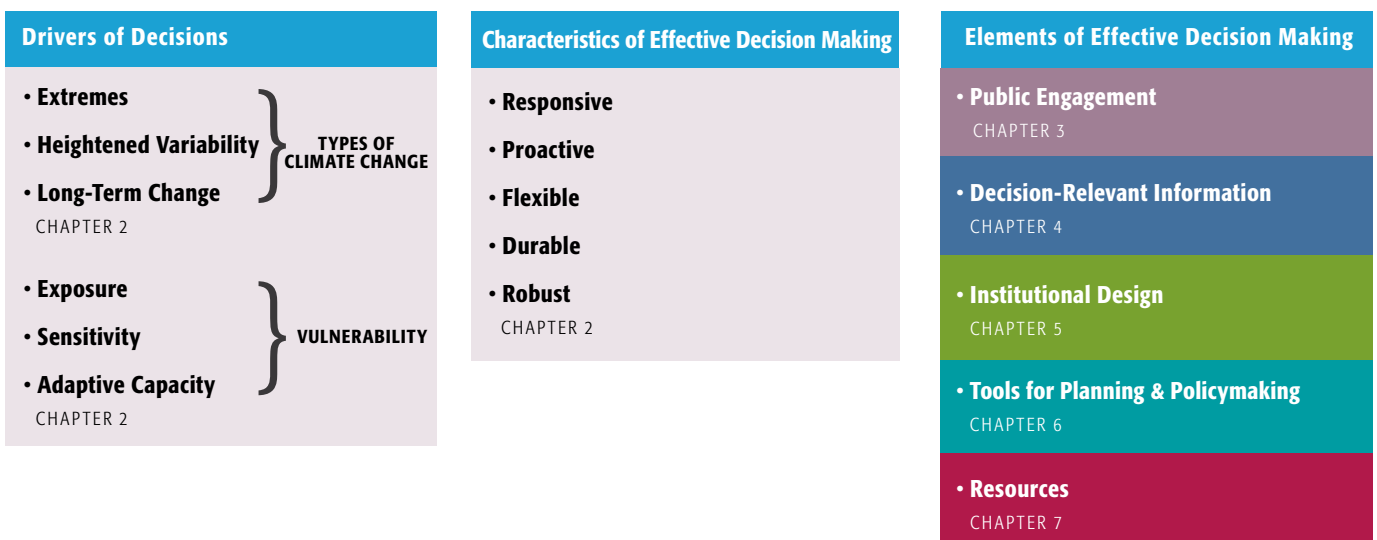
## NAVIGATING THIS REPORT

We have organized this report in a manner that we hope will allow ease of access to the full range of information it contains. Figure E.1 is a navigational guide to the report. Chapter 1 gives an overview of the adaptation imperative facing decision makers. Chapter 2 describes some key types of challenges climate change will pose for governments—extreme events, heightened variability, and long-term change. It also describes the uncertainty surrounding the rate and magnitude at which impacts will take place across the globe. The Chapter then describes how climate change should be viewed and acted on in the context of the vulnerability of specific populations and ecosystems. Finally, Chapter 2 explores the characteristics of decision making—responsive, proactive, flexible, durable or robust—that will be needed, depending on the type of climate change being addressed.

Chapters 3 through 7 describe the five focus elements and why they are critically important to decision making in a changing climate. Each chapter provides examples of approaches that governments can deploy to bolster the resilience of communities and ecosystems.

The report also includes 12 case study summaries of national-level decision-making processes that already manage short-term and long-term risks (both climate and non-climate-related) within existing plans and policies, enabling us to draw useful lessons. These were commissioned from practitioners in Africa, Asia, Australia, Europe, Latin America, and North America working in sectors facing complex decision-making challenges: agriculture, electricity, coastal zones, water and forest management and land use. The complete studies may be found at [www.worldresourcesreport.org](http://www.worldresourcesreport.org).

**Figure E.1 Navigating Decision Making in a Changing Climate**



## FINDINGS AND CONTEXT FOR RECOMMENDATIONS

As the following pages demonstrate, climate impacts are occurring already; they are not just concerns for the future. The pace, scale and scope of these impacts require different approaches to decision making. Climate extremes, for example, call for government policies and plans that are responsive to such events. Decision making will also need to be proactive if it is to effectively prepare for the occurrence of such extremes, as well as other types of climate change. Other types of change will require decision making to be flexible (to contend with heightened variability), robust (to withstand multiple scenarios in the future, given the uncertainty surrounding future impacts), or durable (to enable decisions to withstand long-term change).

Furthermore, the profound and far-reaching nature of the likely impacts of climate change will require decision makers to make extremely difficult choices. Given scarce resources, how is a decision maker to choose among competing priorities? For some adaptation decisions, planners and policymakers can take a stepwise approach, while always ensuring that short-term, “low regrets” decisions keep open future options as climate impacts unfold.

For other decisions, decision makers will need to take more aggressive action when making choices today that take future risks into account. This is especially true when planning long-term, expensive infrastructure projects, or taking other decisions that have long-lasting consequences. For example, the expansion of irrigation programs that depend on glacial water flows may need to be designed with future projections in mind, because that source of water may decrease in volume or shift in seasonality within a few years.

Finally, our research suggests that decision makers should be aware of and anticipate thresholds—points beyond which conditions or system performance can change dramatically—especially those thresholds having long-term, irreversible consequences, as they make adaptation choices. There are thresholds in natural systems as well as in man-made structures. The latter are easier to manage. For example, an existing flood control system may be effective against flooding from increased rainfall if it is understood when further action should be undertaken. Above a certain level of rainfall, additional improvements may be necessary or an entirely new system may be required that might also involve relocation of certain communities. Identifying such thresholds and building this knowledge into adaptation plans is one key method for improving adaptation decisions and outcomes.

Ecosystem thresholds, on the other hand, are far less likely to be evident until they have been breached. For example, wetlands may dry up in warmer temperatures as groundwater is depleted. Increases in temperature may encourage the invasion of woody plants into grasslands; the increased competition for moisture and nutrients could result in slow desertification.<sup>2</sup> Monitoring of ecosystem stress will be essential, as will further research into such thresholds. It will also be critical to take more aggressive action to protect such ecosystems, such as activities to restore ecosystems or limit their use.

The context for our findings, along with specific recommendations aimed primarily at governments and donors, comes from our research, which is laid out in Chapters 2 through 7, and explored further in the final chapter. The recommendations are organized by the five elements we have identified as key to effective adaptation decision making.

While readers may note that many of these recommendations would apply to many other public policy challenges, what calls attention to these elements and the accompanying recommendations is precisely the context in which they will be employed—the nature of climate change and its potential disruptive impacts. It is this context—decision making in a changing climate—that makes these elements and recommendations so important.





## RECOMMENDATIONS

### 1. Public Engagement

**Governments should convey to the public the scale and range of the risks, including known uncertainties, and expected impacts of climate change.**

Many members of the public will not be aware of the risks climate change poses to their livelihoods and safety. Because of this, governments should provide targeted information on the risks facing various sectors, regions, ecosystems and communities. This will help build support for activities undertaken. It will take time for officials and communities to absorb the reality of having to accept some losses, such as the inability to grow certain crop varieties, and even longer to become comfortable entertaining alternatives, such as relocation of certain communities, that will disrupt entrenched patterns of society.

**Governments should recognize that public engagement processes can lead to better decisions and should not be treated as “rubber stamps” on a pre-determined policy or plan. Policymakers should build opportunities for public engagement into all steps of the decision-making process.**

Engaging communities can build support for difficult adaptation choices as well as improve the quality of outcomes achieved. Public engagement throughout the entire policy process often is necessary to ensure the effectiveness and long-term viability of a policy or an activity. Civil society organizations can help facilitate this exchange between government and the public.

**Specifically, governments should recognize the public as a vital contributor when prioritizing needs, providing information, determining acceptable levels of risk, and choosing among and implementing adaptation decisions.**

The public, including affected communities and experts, often are more aware than national-level government officials of the needs that exist locally, as well as what types and levels of risk communities are willing to accept. By consulting with the public first, decision makers can increase the likelihood that plans truly serve the needs of those who are affected by them. When the setting of adaptation priorities involves difficult trade-offs, public engagement can facilitate understanding of choices and their consequences.

**Governments should ensure that those affected by climate change have legal rights to be consulted and engaged in policy and planning processes.**

Those most vulnerable often are the least consulted and engaged in planning and policymaking. In some situations, those affected will not have a right to participate in governmental decision-making processes. Securing rights to participation is a critical step in enhancing public engagement. International treaties such as the Aarhus Convention and a growing number of national laws have codified such rights as access to information, public engagement, and to justice.<sup>3</sup> Legal mechanisms such as these can help empower communities in the decision-making process.

Given the potential for disruption resulting from certain adaptation decisions, it is important that all groups know and understand that they have been accorded rights to participate. Not all decisions will be able to accommodate the concerns of all groups, but governments should endeavor to make sure that all groups have an opportunity to express their views.

**Decision makers should make use of innovative methods when engaging the public.**

Innovations, such as the use of games and videos, and incentives, such as providing bicycles or cell phones to farmers gathering local climate information, can promote public engagement in adaptation efforts and increase chances of success. Government officials should learn from the effective use of these innovations elsewhere and examine how they can be implemented in their own country. Methods of engaging the most vulnerable should be tailored to their different circumstances.



## RECOMMENDATIONS (CONTINUED)

### 2. Decision-Relevant Information

**Governments should collect, analyze, and distribute decision-relevant information about climate risks and vulnerability as a basis for action. Information users must be engaged in determining needs.**

Many developing countries lack the basic infrastructure and capacity to gather and distribute adequate, accurate, and user-friendly information necessary for decision making. Systems established for collecting and disseminating relevant information should respond to users' needs.

**Information for adaptation planning and policymaking goes far beyond climate information; demographic, economic, social, and environmental information is also vital if actions are to meet the needs of those affected.**

While most efforts related to adaptation focus only on climate-related information, non-climate information is needed to assess the vulnerability of regions, infrastructure and populations and to understand what decision options are available for both short and long-term climate impacts.

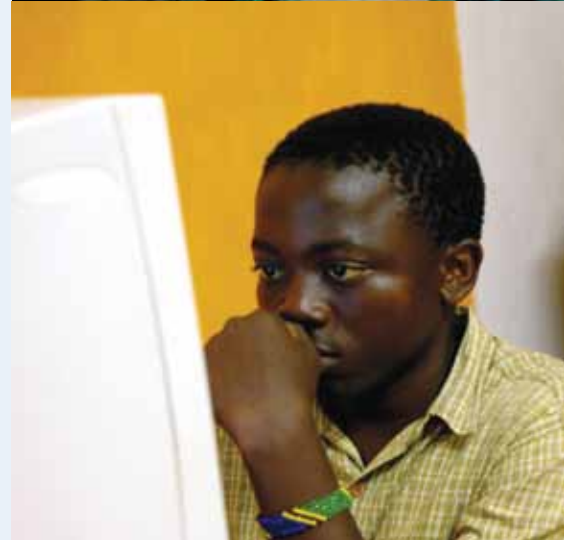
**Governments and donors should establish and fund long-term and regularly updated information management systems.**

Information for adaptation decision making may require new funding models to ensure the necessary scope, continuity and analysis of this information. Approaches could include the design of effective, two-way information exchange systems between governments and communities and investments into basic information-gathering infrastructure such as weather monitoring stations. Long-term donor support can help advance and maintain such systems, as can donor strategies to strengthen governments' abilities to maintain these systems on their own over time.

**Governments should target information dissemination strategies to reach vulnerable populations that will be most affected by climate change.**

Information must reach those affected in a form that makes it useful for decision making. Dissemination methods must at times be rapid, particularly in the case of extreme events. They should also be capable of reaching remote communities, which may involve scaling up, where appropriate, information and communication technologies including text messaging and satellite communications devices. This is an area ripe for donor and private sector investment.

**The pace, scale and scope of climate change impacts require different approaches to decision making.**



## RECOMMENDATIONS (CONTINUED)

### 3. Institutional Design

**Governments and donors should support the integration of climate risk management into ministries for economic development, finance, and relevant sectors, and they should consider appointing a dedicated central agency to coordinate all adaptation efforts.**

Coordination among national agencies is critical to delivering effective responses to, and preparation for, climate change. Clear and effective coordination and communication is also essential between national agencies and local governments. Donors can greatly assist adaptation efforts by providing capacity building and technical support for coordinated approaches among national agencies and across all levels of government.

**Governments, donors, and civil society organizations should cultivate and reward strong leadership.**

Governments, donors and civil society organizations can and should foster leadership at all levels through appointments and incentives, as the choice of agencies and individuals to take the lead on adaptation can make a significant difference in whether adaptation activities are prioritized and implemented effectively.

**Governments should reform institutional mandates to better contend with climate risks.**

Mandates to integrate climate risks into decisions will likely be required. This is especially true for long-term risks that would not typically be considered in plans and policies. For example, national funding to local or regional governments for road construction and improvement projects could be dependent on a mandate that all related projects include an assessment of potential climate impacts and how they will be managed. Other mandates that may be required to address climate risks include those that are longer term to ensure ongoing consideration of climate risks, those that establish mechanisms for rapid response, and those that allow for continuous policy updates.

**Governments should endeavor to make sure that all groups have an opportunity to express their views.**



## RECOMMENDATIONS (CONTINUED)

### 4. Tools for Planning and Policymaking

**Planners and policymakers should integrate climate risks into existing decision-making tools.**

As they begin to account for climate change in policies and plans, officials should deploy common tools, such as environmental impact assessments and economic cost-benefit analyses, modified to integrate the risks posed by climate change.

**Decision makers should also seek out innovative tools that are especially useful for planning for short- and long-term climate risks.**

There are a number of tools that are not yet standard in the policymaker's toolkit that could prove useful for adaptation, such as decision support maps, predictive instruments, and scenario planning and simulation exercises. These tools show promise for scaling up for more widespread application.

**Effective use of tools will require training and capacity building.**

Many decision support tools require specialized knowledge. Governments and donors should fund training programs that give practitioners the skills necessary to use these tools.

**Clear and effective coordination and communication is essential between national agencies and local governments.**



## RECOMMENDATIONS (CONTINUED)

### 5. Resources

**Governments and donors should provide targeted and sustained funding delivered through fit-for-purpose mechanisms that respond to the unique challenges of climate change.**

Because climate change will evolve over decades, long-term financial support from governments and donors will be essential to maintain initiatives and infrastructure and to ensure a return on their investments. Fit-for-purpose mechanisms will be necessary to provide access to longer-term financial support for activities such as the continuous collection of adequate, basic weather and climate data. In addition, countries will need access to secure credit lines that can be tapped quickly for extreme events; they will also need to shift away from “hard” investments to those that build capacity, and support softer investments such as maintaining ecological climate buffers.

Current donor trends towards results-based lending may not facilitate such investments. A key challenge for donors and others will be to create incentives for developing countries to integrate climate risks into decision making, so that this integration is seen as an opportunity and not merely another claim on scarce resources. It will also be necessary for donors to strengthen government capacity to implement activities, and create a clear and appropriate exit strategy to ensure government ownership.

**Donors and governments should promote and fund technical training and strengthen human resources, which will enable more informed decision making.**

Developing countries urgently need to build the knowledge, staff, and technical skills among public officials that will enable them to integrate climate risks into existing decision-making processes. Those capacities are necessary to create, implement, manage, monitor, and enforce adaptation strategies.

**Donors, governments, and the public should take steps to protect and maintain basic ecosystem processes that provide a crucial buffer for adaptation processes.**

Ecosystems can mitigate many natural hazards. Maintaining them can be less costly than building expensive infrastructure, while providing more benefits to society. Donors and governments should fund ecosystem monitoring programs and should take proactive measures to ensure that critical thresholds within ecosystems are not overshot so as to protect the services they provide. Measures must also be taken to ensure that ecosystems themselves are resilient in a changing climate. Accordingly, their ability to enhance the adaptive capacity of human communities will not be diminished.

**National governments should enable the development of social resources, which can play a crucial role in building the adaptive capacity of vulnerable groups and populations.**

Activities such as extensive public engagement in the policymaking process and investment in improved communications platforms can build interconnectedness among communities. By providing opportunities for the development of such social resources, governments can facilitate coordination and cooperation among communities, enable opportunities for collective action to provide safety nets in times of crisis, and develop mechanisms to share other forms of capital. 🐟



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# WORLD RESOURCES 2010-2011

**United Nations  
Development Programme**

[www.undp.org](http://www.undp.org)

**United Nations  
Environment Programme**

[www.unep.org](http://www.unep.org)

**World Bank**

[www.worldbank.org](http://www.worldbank.org)

**World Resources Institute**

[www.wri.org](http://www.wri.org)

## **ADAPTATIONS TO ACCOMMODATE CLIMATE CHANGE WILL FRAME THE FUTURE**

for countries and communities across the globe. Responding to climate impacts as diverse as altered rainfall patterns, more frequent extreme weather events, and rising sea levels will challenge decision makers at every level of government and in every sector of the economy. What steps should be taken to protect vital infrastructure, such as roads, dams, and factories, or to ensure the safety of housing stocks, both existing and yet to be built? What policies should be adopted or investments made to help agriculture adapt to new rainfall and temperature regimes and to secure local food supplies? How should valuable ecosystems like forests or coral reefs be managed to maintain the vital services they render and livelihoods they support? How can we ensure that the unique challenges faced by the most vulnerable and disadvantaged people are not overlooked or ignored?

The decisions made to address these questions will influence the path of growth and development in communities and nations for years to come, yet such decisions are rarely straightforward, and are often contentious. This difficulty is compounded by the complexity of natural systems and national economies, by the uncertainties of predicting climate impacts, and by the diversity of stakeholders that these decisions must serve. It is not surprising, then, that many governments are unsure how to approach adaptation-related decisions in a manner that meets their environmental, economic, and social challenges efficiently and fairly.

*World Resources 2010–2011* addresses the difficulty of—and pressing need for—adaptation decision making. It examines current decision-making practices, acknowledging the inherent challenge in anticipating and responding to both short-term and long-term climate change risks in national policies and plans. This report then focuses on how national governments, particularly those in developing countries, can adapt to climate change by integrating climate risks into their current practices so as to increase the resilience of their communities and ecosystems.

*World Resources 2010–2011* is available electronically as a PDF document on the WRR website; also available is the complete body of research commissioned for this report. For more information, please go to [www.worldresourcesreport.org](http://www.worldresourcesreport.org).

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