



WORLD  
RESOURCES  
INSTITUTE

# BUILDING CLIMATE EQUITY

*Creating a New Approach from the Ground Up*

---

SONJA KLINSKY, DAVID WASKOW, WENDI BEVINS, ELIZA NORTHROP,  
ROBERT KUTTER, LAURA WEATHERER, AND PAUL JOFFE

---

WRI.ORG



Design and layout by:  
**Nick Price**  
[nickprice.contact@gmail.com](mailto:nickprice.contact@gmail.com)

# TABLE OF CONTENTS

<b>v</b>	<b>Foreword</b>
<b>1</b>	<b>Executive Summary</b>
<b>11</b>	<b>Introduction</b>
13	Understanding Equity in the Context of Climate Change
16	A New Narrative
<b>19</b>	<b>Rights, Capabilities and Building Equity</b>
20	The Relationship of Capabilities to Human Rights and Development
24	Characteristics of a Capabilities Approach
25	Two Pillars for a Capabilities Approach to Climate Change Equity
26	Capabilities and the International Equity Challenge
28	Common but Differentiated Responsibilities and Respective Capabilities
<b>33</b>	<b>Applying the Capabilities Approach to Low-Carbon Pathways</b>
34	Five Key Policy Areas to Promote Low-Carbon Pathways
34	Renewable Energy Access, Deployment, and Innovation
39	Carbon Pricing
42	Fossil-Fuel Subsidy Reform
45	Low-Carbon Transportation Planning
48	Community Forestry Management
52	International Policy Strategies for Supporting Low-Carbon Pathways
<b>57</b>	<b>Applying the Capabilities Approach to Climate Resilience, Adaptation, and Loss and Damage</b>
59	A Capabilities Approach to Adaptation Requires Understanding, Participation, and Innovation
66	Using Capabilities to Strengthen National Adaptation Planning
73	Building International Support for Climate Resilience, Adaptation, and Loss and Damage
<b>77</b>	<b>Climate Equity, Capabilities and the 2015 Agreement</b>
78	Consider Equity in Formulating Nationally Determined Contributions
84	Promoting Capabilities through Multiple Elements of the 2015 Agreement
97	Achieving Equity in the 2015 Agreement from a Capabilities Perspective
<b>99</b>	<b>Capabilities and Long-Term Climate Transformation</b>
<b>101</b>	<b>References</b>
<b>111</b>	<b>Endnotes</b>



# FOREWORD

Climate change raises fundamental questions about equity. Who is responsible for taking action, and what actions should they take? How do we deal with impacts that often fall on those least responsible for creating the problem? What are our responsibilities to future generations?

These questions persist despite more than 20 years of international cooperation and discussion. With the impacts of climate change already being felt, it is clear that that we need answers—and action—more urgently than ever.

While a new international agreement in 2015 offers a tremendous opportunity to tackle climate change, we must also ensure it helps tackle, rather than heighten, other urgent challenges people face, from food security and housing to decent livelihoods and adequate transportation. By focusing not on what separates us but what unites us—the opportunity for all humans to achieve wellbeing and lead a dignified life—climate action and equity can go hand in hand.

*Building Climate Equity* provides just that new perspective. It draws on successful experiences tackling climate change while building peoples' basic capabilities. It demonstrates that climate action and equity can be intricately linked and mutually reinforcing.

Focusing on these links between climate action and capabilities can result in greater consensus and more ambitious and effective climate outcomes. This report provides recommendations to strengthen the synergies between climate action and equity both in a new 2015 climate agreement and beyond. While we cannot set aside critical issues such as responsibility for emissions, a focus on capabilities can help us build the necessary consensus to support a strong, durable, and ambitious international framework.

We hope this report guides the international community on the design and implementation of climate action that builds capabilities and achieves equity. By doing so, we can look forward to a more-inclusive, low-carbon and climate resilient future for everyone.



**Andrew Steer**  
*President*  
*World Resources Institute*



# EXECUTIVE SUMMARY

Climate change poses significant and inter-related equity challenges. As climate impacts increase so too does the urgency of addressing these equity challenges. This report offers a new approach to these challenges by linking actions to combat climate change with broader equity objectives, placing the wellbeing of people and communities at the core of climate action. Building on the findings of 30 case studies in 23 countries it demonstrates how climate policies within countries, including policies directed at both low-carbon energy development and resilience to climate change effects, can simultaneously build the capabilities of individuals and communities. It provides recommendations for how international institutions and policymakers can support these national level actions, and the key role that the new international climate agreement can play in creating transformational climate action by focusing on equity and capabilities.

For more than two decades, crafting global actions that all nations find equitable has been a central challenge for international climate policy. Contentious debates over how to equitably combat climate change and how to equitably assess which countries are most responsible for taking action has slowed progress toward a global climate agreement.

As climate impacts mount, so does the urgency of resolving this challenge. Those least responsible for climate change are often the most vulnerable to changes in weather patterns, sea level rise, and other impacts, further exacerbating existing inequities. Meanwhile, actions—both to address climate impacts and to reduce emissions—are intertwined with broader equity issues involving livelihoods, health, food security, and energy access.

The urgency of the equity challenge is heightened by recent negotiations for the new international climate agreement in 2015. Parties have determined that the agreement must both be “applicable to all Parties” while remaining “under the Convention,” raising questions regarding equity that must be addressed by global leaders if the agreement is to build consensus and ambition (UNFCCC 2011).

This report offers a new approach to these challenges by linking actions to combat climate change with broader equity objectives, placing the wellbeing of people and communities at the core of climate action. It expands the narrative for climate equity to one that is capable of addressing current and future climate impacts, human development, and responsibility for emissions, and that can accelerate—not impede—momentum for climate action. It demonstrates that climate action and equity are integrally linked and can be mutually supportive, and that the 2015 Agreement, in particular, can play a key role in strengthening those synergies.

## A Capabilities Approach to Climate Action

*Building Climate Equity* proposes that the international community adopt a capabilities approach as a means of embedding equity in climate policy.

First formulated in the development arena by economist Amartya Sen and philosopher Martha Nussbaum (Sen 1999; Nussbaum 2003), the capabilities approach emphasizes the role that access to a range of basic capabilities plays in human wellbeing and

This report offers a new approach to these challenges by linking actions to combat climate change with broader equity objectives, placing the wellbeing of people and communities at the core of climate action.

the realization of human rights. These capabilities include the opportunity to pursue a decent livelihood; to benefit from sufficient nutrition, transport, education, housing, physical safety, and security; and to engage in collective decision-making.

Climate policies—both those reducing emissions and those adapting and building resilience to climate impacts—can contribute to protecting and strengthening these basic capabilities. Such an approach not only addresses the challenges posed by climate change but will build equity and in turn enable greater consensus for climate action.

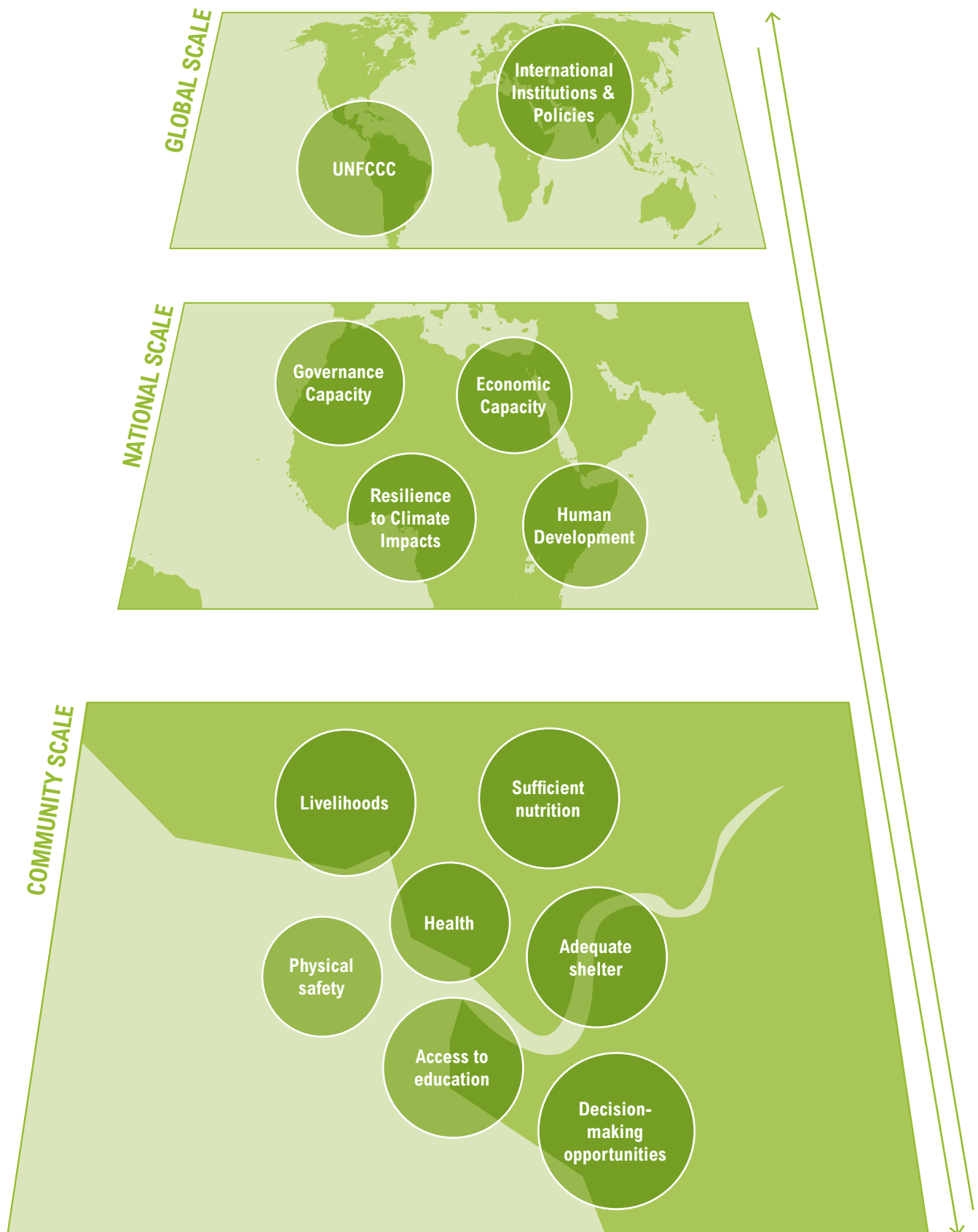
### Climate Policies at Multiple Levels

Climate action and capabilities are linked at multiple, interdependent levels as shown in Figure 1. This includes the capabilities of individuals and communities, such as those involving livelihoods, health, nutrition, shelter, physical safety, and decision making.

It also includes national capabilities, such as human development, economic capacity, resilience to climate impacts including physical security and capacity to adapt in the face of climate change, as well as governance capacity and social support structures. This report examines how a capabilities approach can be used to guide equitable climate action at the international, national, and sub-national levels by focusing on the promotion and enhancement of capabilities of the most vulnerable and least well off.



Figure 1 | Climate Action and Capabilities at Multiple Levels



## The Report in Brief

This report begins by highlighting how climate policies within countries, including policies directed at both low-carbon energy development and resilience to climate change effects, can simultaneously build the capabilities of individuals and communities. These policy examples are drawn from 30 case studies in 23 countries around the world, including renewable energy, equitable carbon pricing, fossil fuel subsidy reform, low carbon transportation, community forestry, and a range of adaptation and resilience policies. We focus in particular on the capabilities of the most vulnerable and least well off because their capabilities are most at risk and in need of strengthening.

Building on the findings in these case studies, this report provides recommendations about ways that international institutions and policymakers can concretely support the development and implementation of these types of actions at the national and sub-national levels.

Next, the report specifically addresses how the 2015 international climate agreement can take account of and help build capabilities. This approach enhances the meaning of “respective capabilities” within the

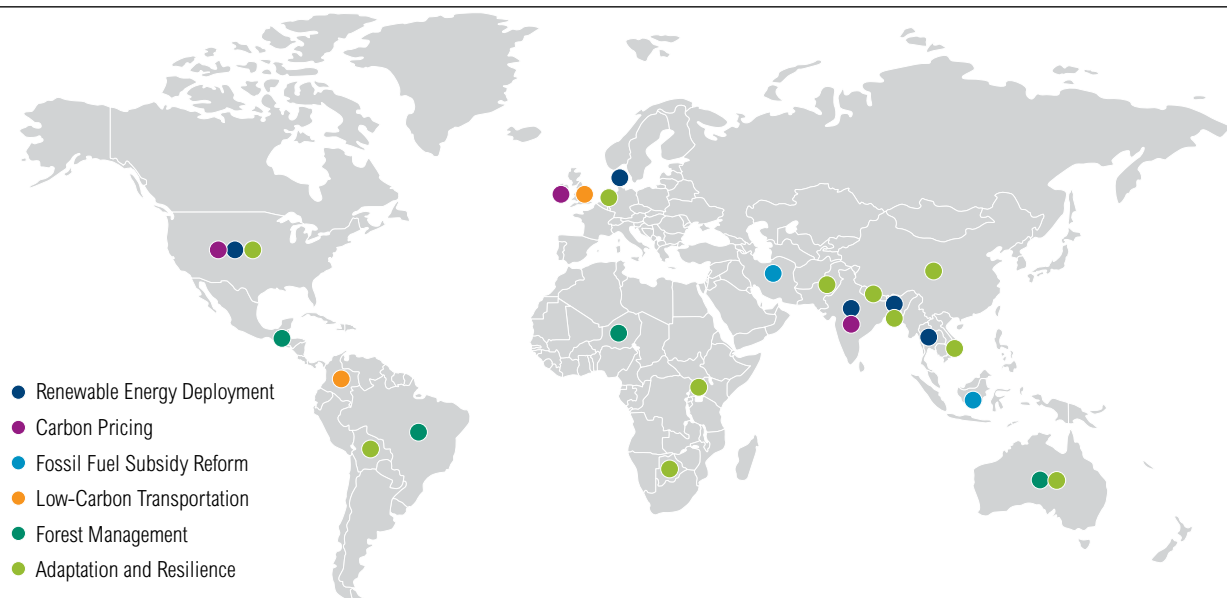
Convention’s principle of “common but differentiated responsibilities and respective capabilities” (UNFCCC 1992).

A pragmatic and multidimensional understanding of national capabilities can assist countries in evaluating the equitability of actions in the 2015 Agreement. However, this report does not suggest that capabilities become the sole framework for pursuing climate equity. Responsibility for climate change, including historical responsibility, remains fundamental to the equity discussion and to shaping global mitigation and adaptation efforts.

To provide a framework for developing and evaluating countries’ intended nationally determined contributions (NDCs) in the negotiations, this report proposes equity criteria based on national capabilities along with emissions responsibility. It then suggests how a capabilities approach can focus attention on the ways in which each element of the 2015 Agreement can build the capabilities of countries and communities.

Each of these components is described in more detail below.

Figure 2 | Policy Examples Drawn from Low-Carbon Development, and Adaptation and Resilience Case Studies Globally



Source: Authors.

## Equitable National and Local Climate Policies

The 30 case studies, drawn from developing and developed countries, demonstrate how a “capabilities approach” can achieve ambitious low-carbon energy pathways and climate adaptation and resilience goals while simultaneously enhancing access

to decent livelihoods, healthy food, quality housing, physical safety and other capabilities for individuals, communities, and nations. Examples from the case studies point to low-carbon energy policies in Table 1, and to climate change adaptation and resilience policies in Table 2.

Table 1 | **Equitable Climate Policies to Achieve Low-Carbon Pathways**

PATHWAYS TO A LOW-CARBON FUTURE	EXAMPLES OF CLIMATE ACTIONS THAT PROTECT OR ENHANCE CAPABILITIES
<p><b>Renewable energy access and deployment</b></p>	<p>Scaling-up the use of renewable energy can improve energy security and access while avoiding greenhouse gas emissions, and can also offer long-term economic savings and health benefits (Torres-Duque et al. 2008; Fullerton, Bruce, and Gordon 2008; Palit and Chaurey 2011; Köhlin et al. 2011).</p> <p>By making finance for renewable energy accessible to marginalized and nontraditional banking populations (Omwansa and Sullivan 2014) or by designing equitable feed-in tariffs or other mechanisms (Tongsopit 2014; Chrometzka 2014 ), deployment of renewable energy can enhance capabilities (Mendonça, Lacey, and Hvelplund 2009).</p>
<p><b>Equitable carbon pricing</b></p>	<p>Carbon pricing schemes can incentivize emission reductions, support energy efficiency and security initiatives, and protect or enhance capabilities. Progressive schemes can redirect revenues or other in-kind benefits to vulnerable populations (British Columbia 2009) (California 2014).</p> <p>International and national efforts to promote carbon pricing or markets should be based on assessments of differential vulnerability and include stakeholder participation to ensure that monetary and nonmonetary benefits flow to vulnerable populations.</p>
<p><b>Fossil fuel subsidy reform</b></p>	<p>Reduction and eventual elimination of fossil fuel subsidies could contribute to emissions reductions, support energy efficiency and security, and free up resources for other development priorities, all of which could benefit long-term capabilities (Mourougane 2010) (IEA 2012).</p> <p>Subsidies often do not provide a direct benefit to the poorest communities, which are the most vulnerable to the effects of reform (Arze del Granado, Javier, Coady, and Gillingham 2012). Reform efforts require careful design and can include transfer mechanisms, broad public communication, and supports for core development needs (Hassanzadeh 2012).</p>
<p><b>Low-carbon transportation planning</b></p>	<p>Safe and affordable transport options are crucial from a capabilities perspective. Low-carbon transport systems can help meet mobility needs, as well as reduce emissions and provide health benefits (United Nations 2013).</p> <p>Using policy and finance signals to incentivize development of public transit has been successful in multiple contexts (Road Traffic Technology n.d.).</p>
<p><b>Community forestry</b></p>	<p>Strengthening community forest management and community forest rights can help reduce emissions and can also enhance capabilities (Stevens et al. 2014). Efforts to establish legal protections, support community-led reforestation, and support community management can contribute to both climate and capabilities goals.</p>

Table 2 | **Equitable Climate Policies to Achieve Adaptation and Resilience**

BUILDING ADAPTIVE CAPACITY AND RESILIENCE	EXAMPLES OF USING CLIMATE ACTION TO PROTECT OR ENHANCE CAPABILITIES
<b>Addressing adaptation needs of the most vulnerable populations</b>	<p>Recognizing that different levels and types of vulnerability exist, both among and within communities, can help generate equitable adaptation and resilience plans that focus on capabilities.</p> <p>Integrating assessments of climate hazards with assessments of social vulnerability can result in more targeted and effective policy interventions (Burton, Huq, Lim, et al. 2002; Huq, Rahman, Konate, et al. 2003; Adger, Neil, Agrawala, et al. 2007).</p>
<b>Inclusive participation</b>	<p>Enabling communities and vulnerable populations to determine effective adaptation and resilience strategies through highly participatory processes can increase their ability to take locally appropriate and long-term adaptation measures that protect and enhance their social and economic opportunities (WRI, UNPD, UNEP, et al. 2011; Osbeck, Powell, Gerger Swartling, et al. 2010).</p>
<b>Support for innovation</b>	<p>Providing access to credit to early adopters of innovative adaptation and resilience practices, particularly among highly vulnerable populations, and enabling local and indigenous practices to be disseminated, are essential to mobilizing effective adaptation (UNFCCC 2013).</p>
<b>National equitable adaptation planning</b>	<p>Prioritizing the needs of the most vulnerable in national adaptation planning, ensuring their participation in the planning process, and undertaking robust assessments of vulnerability that address capabilities and social and economic contexts, can all play a vital role in achieving equitable adaptation and resilience outcomes (UNFCCC 2013).</p>

### Recommendations for International Institutions and Policymakers

International institutions and policymakers can help enable national and local governments to undertake the types of equitable climate policies highlighted in Tables 1 and 2. To encourage action, this report proposes recommendations for a wide range of international institutions and policymakers, including multilateral and bilateral development finance institutions. These recommendations include the need to:

- Provide upfront investment for low-carbon pathways and adaptation efforts that are designed to enhance equity and build capabilities, including for equitably designed energy policies.
- Provide technical assistance, capacity building, and guidance to enable countries to formulate and implement the types of equitable climate policies highlighted here.

- Ensure that finance is accessible to those who need it, including nontraditional banking populations, to undertake innovative and locally appropriate climate action.
- Support the implementation of “before and after” vulnerability assessments and evaluations to identify impacts of climate action on the capabilities of affected groups.
- Enable participatory planning and stakeholder engagement in the development of climate policies across all sectors.

### Operationalizing Equity and Capabilities in the 2015 Climate Agreement

The 2015 international climate agreement offers a critical opportunity to make fundamental progress on equity issues globally. A capabilities approach to equity can inform two key dimensions of the agreement. The first dimension concerns the content of individual countries’ intended nationally determined

contributions (NDCs), while the second dimension concerns the multiple elements of the 2015 Agreement as a whole—including mitigation, adaptation, loss and damage, finance, capacity building, technology, and transparency and accountability.

### Incorporate Equity and Capabilities into Intended Nationally Determined Contributions

#### 1. Use equity considerations in formulating and evaluating national contributions

Intended NDCs, which are to become the core national commitments in the 2015 Agreement, provide a focal point for embedding equity into the agreement. The process established for intended NDCs in the 2015 agreement should ensure that contributions are equitable as well as sufficient to achieve the objectives of the Convention. The following aspects of equity provide a set of criteria by which to measure the types and levels of contributions that countries should put forward:

- Emissions responsibility, including historical, current, and projected emissions both in per capita and aggregate terms; and
- National capabilities, including:
  - human development;
  - economic capacity, including consideration of the relative costs of climate action and the economic benefits from taking climate action;
  - resilience to climate impacts, including physical security and capacity to adapt in the face of climate change; and
  - governance capacity and social support structures.

These criteria offer a perspective concerning respective capabilities in a range of countries, while maintaining the clear differences between developed and developing countries. The criteria provide a means to evaluate countries' intended NDCs in terms of the types and levels of actions proposed.

#### 2. Include specific capabilities-focused policies in nationally determined contributions

The benefit of using a capabilities approach to help countries identify specific policies to include in their intended NDCs is that it encourages an examination of actual pathways—and potential barriers—to achieving equitable climate action. Considering intended NDCs in terms of their national capabilities provides countries with the opportunity to identify actions that can be undertaken without additional resources, as well as further actions that would be possible with international support.



## Incorporate Equity and Capabilities across Multiple Elements of the 2015 Agreement

### **1. Focus adaptation and loss and damage on the most vulnerable populations**

A capabilities approach highlights the role that well-designed adaptation policies can play in protecting and improving the long-term well-being and livelihoods of vulnerable populations. The 2015 Agreement should include a collective goal focused on building the resilience of the most vulnerable populations. Given the increasing importance of loss and damage and the need to develop a response that is robust, consistent, and sustained, the 2015 Agreement should also support the development of national loss and damage scoping studies to identify the needs of particularly vulnerable populations.

### **2. Provide adequate and targeted finance to build capabilities**

Adequate and appropriately directed finance is essential to building capabilities and enhancing equity. The 2015 Agreement should link post-2020 finance with developing countries' national climate strategies and provide the investment needed for climate policies that also focus on strengthening long-term capabilities.

### **3. Create a capacity-building facility**

A lack of governance and technical capacity constrains many governments from undertaking the planning and analysis needed to take climate action and enhance capabilities (UNFCCC 2014a). To prioritize capacity building within the UNFCCC, the 2015 Agreement should create a dedicated capacity-building facility, which would serve as a focal point to design, coordinate, support, and manage capability building across all elements of the 2015 Agreement.

### **4. Develop and deploy innovative technology that focuses on capabilities**

Technology that is accessible to, and designed for, the most vulnerable and least well off will be essential to advancing low-carbon pathways and adapting in ways that build capabilities. The 2015 Agreement should stress the importance of financial institutions in funding research, development, and deployment of innovative technologies with a particular focus on technologies that can build the capabilities of the most vulnerable and least well off.

### **5. Strengthen transparency and accountability with a focus on capabilities**

Transparency and accountability are essential for a climate agreement capable of tracking progress and deepening action over time. A capabilities approach emphasizes the need to build countries' capabilities so they can track and report on emissions, climate action, and finance. It also focuses on integrating monitoring of the ways in which climate policy affects capabilities.

### **6. Establish an equitable long-term mitigation goal**

A collective long-term trajectory for emissions reductions or specific mitigation actions should be constructed in a way that helps countries identify specific policies and investments that help build capabilities, such as increased access to renewable energy. In committing to such a goal, the 2015 Agreement must recognize that countries with different capabilities will progress toward the goal at different paces and support will be needed to help countries with lower capabilities achieve the common goal.

### **7. Establish cycles of action to strengthen capabilities**

The set of "cycles" envisioned in the 2015 Agreement for strengthening action after 2015 should incorporate a focus on building capabilities (UNFCCC 2014b). Each cycle should include an analysis of how future actions can be designed to further strengthen capabilities. The formulation and assessment of countries' commitments should be informed by a set of equity criteria, including those involving capabilities, determined through a technical process in the UNFCCC after 2015.

## Capabilities and Long-Term Transformation

The long-term goal of climate policy should be to protect and strengthen the capabilities and fundamental well-being of current and future generations. In doing so, we must look at familiar principles with new eyes. The discussion should not be in the abstract but rather focused on action to preserve and strengthen specific outcomes for people and communities. As policymakers and communities encounter new challenges, a capabilities approach to climate policy analysis and implementation can help keep the long-term enhancement of human well-being firmly at the center of attention and build the political momentum needed for transformation.







# INTRODUCTION

Equity is at the heart of three core issues for climate change policy: addressing the impacts of climate change, which are felt unequally; determining who is responsible for taking actions to limit its effects; and understanding the ways in which climate policy intersects with other dimensions of human development, both globally and domestically. This report uses the capabilities approach to address these challenges, creating a new narrative for equitable climate action that focuses on building the capabilities of those on the ground as well as building consensus in the international climate negotiations.

Equity in the climate change policy context is a central, but still deeply debated, concept. In its simplest form, equity involves concepts of fairness or justice in the way people are treated, though it ultimately depends on the perspectives of those involved in striving to achieve it. The central equity challenges for climate change policy involve several core issues: addressing the impacts of climate change, which are felt unequally; identifying who is responsible for causing climate change and for actions to limit its effects; and understanding the ways in which climate policy intersects with other dimensions of human development, both globally and domestically.

In 1992, the United Nations Framework Convention on Climate Change (UNFCCC or the Convention) laid out the centrality of equity in its core principles. Article 3(1) states that, “The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities” (UNFCCC 1992).

Ever since, debates about precisely what equity means in a climate policy context, and how to put it into practice, have been at the center of international climate negotiations and policymaking. Many of these debates have focused on questions about who should take action to combat climate change, what actions they should take, and who should finance them. Resolving these differences is critical to achieving a workable international climate agreement in 2015. It also requires us to look at equity

in new ways, to bring countries together around an ambitious but equitable climate action agenda.

These questions found their original expression in the Convention through differentiation of Parties central obligations. Countries categorized under Annex I, primarily but not solely developed countries, are obligated to take measures to mitigate climate change. Annex 1 Parties later agreed to more detailed obligations and commitments for emissions reductions under the Kyoto Protocol (UNFCCC 1998 Article 3).

Differentiation between developed and developing country Parties has also informed obligations for finance and technology transfer under the Convention. Developed countries in Annex II, a subset of those included in Annex I, committed to provide funding and other resources to help developing countries both reduce their emissions and adapt to climate change (Winkler and Rajamani 2013).

Over time, however, the binary distinction between developed and developing countries has softened as global economies and emission trajectories have changed leading to calls from many Parties, both developed and developing, that a new model of differentiation may be required (Rajamani 2012, 616). In 2011, the 17th Conference of the Parties (COP 17) in Durban agreed to launch a new platform of negotiations for a new international climate agreement to be finalized in 2015 and become operational in 2020 (called the 2015 Agreement) (UNFCCC 2011). The negotiating platform, called the Durban Platform, contained no explicit reference to equity, but



the Parties agreed that the 2015 Agreement would be “a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties.”

The term “applicable to all” was intensely debated at Durban because it was seen by many Parties as signaling a political intention to create greater symmetry in the commitments undertaken by all Parties to the 2015 Agreement (Winkler and Rajamani 2013, 2). How to satisfy this requirement, while remaining under the Convention, namely the principle of common but differentiated responsibilities and respective capabilities (CBDR-RC) as laid out in Article 3(1), has once again brought questions about the meaning of equity to the forefront in international climate negotiations. If the 2015 Agreement is to establish a more complex model of differentiation, how might it be designed to take into account the varying human development needs and inequities in human well-being among Parties to the Convention? What is an equitable allocation of responsibility and action in the context of growing emissions and climate impacts?

In addition, the process for negotiating a new climate agreement at COP 21 in 2015 has itself triggered questions about fair treatment. Countries will present the mitigation measures they propose to undertake in the form of “intended nationally determined contributions” (intended NDCs). These will be assessed or reviewed and countries might be expected to adjust their proposed contributions. Because governments submit their own initial proposals, there is an urgent need to determine

the equity considerations that should guide those contributions. An expanded view of how to assess equitable action is necessary to encapsulate the multidimensional nature of equity.

Ensuring equity in the 2015 Agreement is not limited to mitigation measures, a point that has been highlighted by climate policy analysts Harald Winkler and Lavanya Rajamani (2013, 4), stating that “Applying equity only to mitigation is unlikely to be fair to all.” As a result, in equity debates globally. As nations face the early consequences of, and rising threats from, climate impacts, the objectives and institutions of the global climate regime, including the UNFCCC, have expanded beyond the imperative of emissions reduction – so too has the analysis of equity. Increasing focus must accordingly be placed on the issues that support climate adaptation and resilience as well as mitigation—including finance and investment, transparency and accountability, and technology, and capacity building (Klinsky and Winkler 2014).

### Understanding Equity in the Context of Climate Change

Three key dimensions of equity cut across the climate debate. These are responsibility for greenhouse gas emissions, the disproportionate nature of vulnerability to climate impacts and the need to support the continued ability for countries to develop in the face of climate change. Each of these considerations is discussed below, highlighting the complex and multidimensional nature of equity in the context of climate change.



## Equity Considerations in Reducing Emissions

In the climate context, international discussions of equity have traditionally focused on interpretations of the principle of CBDR-RC and, more specifically, on how to apportion the mitigation actions needed to reduce greenhouse gas emissions. The responsibility to take action has been seen as a function of a country's emissions: how much it has emitted, is emitting, or will emit, have been the key factors considered in proposing requirements for action. However, linking greenhouse gas emissions and mitigation actions in a concrete way has been a matter of substantial debate.

### Consider Historic Emissions

According to one view, expressed by many developing countries, particularly emerging economies, developed countries should take the lead in the mitigation effort because they are historically responsible for the majority of global greenhouse gas emissions (see, for example, Algeria 2014; China 2014; Cuba 2014; Like-Minded Developing Countries 2014a; Like-Minded Developing Countries 2014b;). Their case is bolstered by the Convention, which states that developed countries should “take the lead in combatting climate change” (UNFCCC 1992).

Proponents of this viewpoint often argue that an allocation of emissions should be assigned to countries on a per capita basis. For instance, the BASIC Expert Group, a group of climate policy experts from the governments and leading academic institutions of the BASIC countries (Brazil, South Africa, India, and China), explored the implications of using different cumulative emission metrics as a framework for assigning mitigation burdens among parties (BASIC Experts Group 2011). Among their proposals was a methodology that involves calculating total GHG emissions since the beginning of the industrial revolution in 1850 on an equal per capita basis (BASIC Experts Group 2011, 61). Using this approach, the quantity of future emissions still possible if the world is to keep temperature below a specific level—the available “carbon budget”—would be assigned to countries according to how much of the per capita budget they have already used.

Proponents of this approach assert that, because developed nations have exceeded their fair share of

the carbon budget, they must take the greatest share of emissions reductions and provide the means (support for finance, technology, capacity building) for developing countries to mitigate and adapt.

Others, including major developed nations and some developing countries, have argued that the convention's principles are dynamic and should respond to changing environmental, geopolitical, and economic realities (see, for example, Mexico 2014; Switzerland 2014; United States 2014; Australia 2014; Norway 2014). Proponents argue that all major emitters should be held to obligations to take climate action and the UNFCCC's annexes must be made more flexible or relaxed.

### Focus on Current Emissions

These countries argue that responsibility to act should focus on greenhouse gases released in the present and future to keep temperature rise below catastrophic levels. According to this approach, emissions are considered in the aggregate rather than on a per capita basis, since a ton of carbon has the same effect no matter where it is emitted. The pattern of greenhouse gas emissions among countries has shifted significantly in the past 15 years and will shift even further in the near future. In 1990, developing countries (those not listed in Annex I of the Convention) contributed 40 percent of annual global emissions. By 2010, their share of global emissions was nearly 60 percent; in that time, China's share of global emissions increased by 12 percent, representing the majority of developing countries' increased share (CAIT 2.0).

Proponents of this view include not only developed countries but also countries that contribute little to emissions but lack the financial and other resources to adapt to climate change, such as small island states and least developed countries. In addition, a growing number of middle-income countries, particularly in Latin America, have asserted that the collective objective of avoiding catastrophic impacts is a pressing reason for them to act by reducing emissions (AILAC 2014).

However, the average per capita emissions of developing countries, and particularly of the least developed countries (LDCs), generally remain smaller than those of developed countries. Given that efforts to pursue development can at times

conflict with the need to reduce emissions, an essential question for the long term is how developing countries can pursue low-carbon pathways in ways that promote economic development.

### Consider Capability to Mitigate

The question of which countries should take what mitigation actions has also been explored on the basis of countries' capabilities, drawing on the "respective capabilities" language of CBDR-RC in Article 3(1) of the Convention as a starting point. Proponents have generally defined capability as the ability of a country to pay for mitigation action, with some suggesting gross domestic product (GDP) per capita as the metric for determining capacity to pay for emissions reductions.

Some policy experts have proposed that the weight given to emissions in determining responsibility could depend on whether they are "survival," "development," or "luxury" emissions, and have suggested reducing emissions responsibility to allow for costs that are necessary for poverty reduction (Fleurbaey et al. 2014, sec. 4.6.2.1; Müller and Mahadeva 2013, 2). Using this approach, the concept of capability includes the "right to development," implying that least-able countries would have lower emissions reduction requirements, based on measures such as the Human Development Index (BASIC Experts Group 2011).

### Use an Equity Reference Framework

More recently, the Africa Group and others have proposed the use of an "Equity Reference Framework" (ERF) to inform emissions reduction allocations (Africa Group 2014). This would include a basket of factors, such as emissions responsibility, GDP per capita, and development metrics, allowing a more flexible approach that reflects the multiple dimensions of equity in a climate context.

### Cost Effectiveness

An additional approach to respective capabilities, is to consider the cost-effectiveness of countries' actions to reduce emissions, which suggests that reductions should be apportioned to equalize marginal costs across countries (Höhne, den Elzen, and Escalante 2013, 5; Höhne, et al. 2014, 2).



### Equity Considerations in Climate Impacts

In addition to responsibility for emissions, the impacts of climate change on human society also raises profound equity concerns that must be addressed through climate action. The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) warned that climate change is happening now and that, within the 21st Century, "climate-change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security, and prolong existing and create new poverty traps, the latter particularly in urban areas and emerging hotspots of hunger." (Romani, Rydger, and Stern 2012).

These climate impacts will be felt globally, but they will not be experienced equally. The impacts of climate change pose, and will continue to pose, the greatest threats to those most vulnerable—typically those who have the fewest resources to meet them, or are the most socially and politically marginalized (Box 1). This is true today and will be for many decades to come, with future generations—who have no representation and have not contributed to the problem—likely to be most affected. For

## BOX 1 | WHO IS MOST VULNERABLE TO CLIMATE CHANGE?

References to vulnerability, and those most vulnerable, capture those systems, sectors, regions, and individuals most likely to be especially impacted by climate change. The types of climate change impacts that will occur, such as shifts in seasonal rainfall, droughts, cyclones, and rising sea levels, will vary from location to location.

The severity of impacts in any location will be determined, in part, by the vulnerability of the local people and ecosystems on which they rely. These differences in vulnerability—both within and among countries—stem from a wide range of social, economic, political, geographical, and ecological factors. In all sectors and regions, certain groups of people will be particularly vulnerable because of structural and situational drivers of vulnerability that may be unconnected to geographical location. These typically include the poor, young children, women, the elderly and populations such as indigenous people who have been historically marginalized and underrepresented.

example, shifting monsoon seasons are likely to disrupt agricultural patterns across South Asia, wreaking havoc with communities' abilities to grow sufficient food and continue to inhabit rural agricultural areas. Salt-water intrusion, sea level rise, and coastal erosion could threaten physical safety, economic vitality and the ability to pursue livelihoods in coastal communities around the world. Even a 1.5° C global temperature increase will result in serious harm to sensitive areas and vulnerable populations (IPCC 2014).

### Meeting Development Needs

Addressing issues of human development are critical to consensus-based international climate action. The causes and consequences of climate change are deeply intertwined with global patterns of inequality. Climate change acts as a multiplier of existing vulnerabilities and threatens to roll back gains in poverty reduction and progress toward the Millennium Development Goals that already have been achieved as well as undermining future efforts toward the Sustainable Development Goals (World Bank 2010).

There is no argument among countries that economic development must continue in order to address the substantial global inequities in well-being. Although global poverty has been halved in recent decades, wide disparities remain in health, education, energy, housing, transport, and access to water and other resources (World Bank 2014b). Recognition of ongoing human development needs in the climate context has always been enshrined in Article 2 of the Convention, which recognizes that GHG stabilization, “should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner” (UNFCCC 1992). Thus, efforts to reduce development inequities among countries must inform any climate policy approach, if it is to be considered equitable. Moreover, progress in human development is threatened by increasing climate impacts, whose severity varies in part according to the vulnerability and capacity of those facing them. Building the underlying capabilities of communities is therefore a central strategy for minimizing climate losses and safeguarding human development.

Recent evidence shows substantial opportunities for social and economic gains from climate action, in addition to savings related to avoiding catastrophic impacts (The Global Commission on the Economy and Climate 2014). Moreover, as this report argues, climate action is mutually supportive of efforts to build capabilities and enhance equity.

### A New Narrative

Global progress has been held back largely by disagreement over what level of action is appropriate for whom and when such action must be taken. Disagreement has been most contentious when considering competing needs for development and climate action—often creating a false competition, resulting in a zero-sum outcome. Since climate action is in the long-term interest of all, establishment of the conditions supporting consensus is also in the interest of all. What is needed is an understanding of how action will strengthen consensus over time so that increasingly stronger action can be taken to confront climate change and achieve development simultaneously.

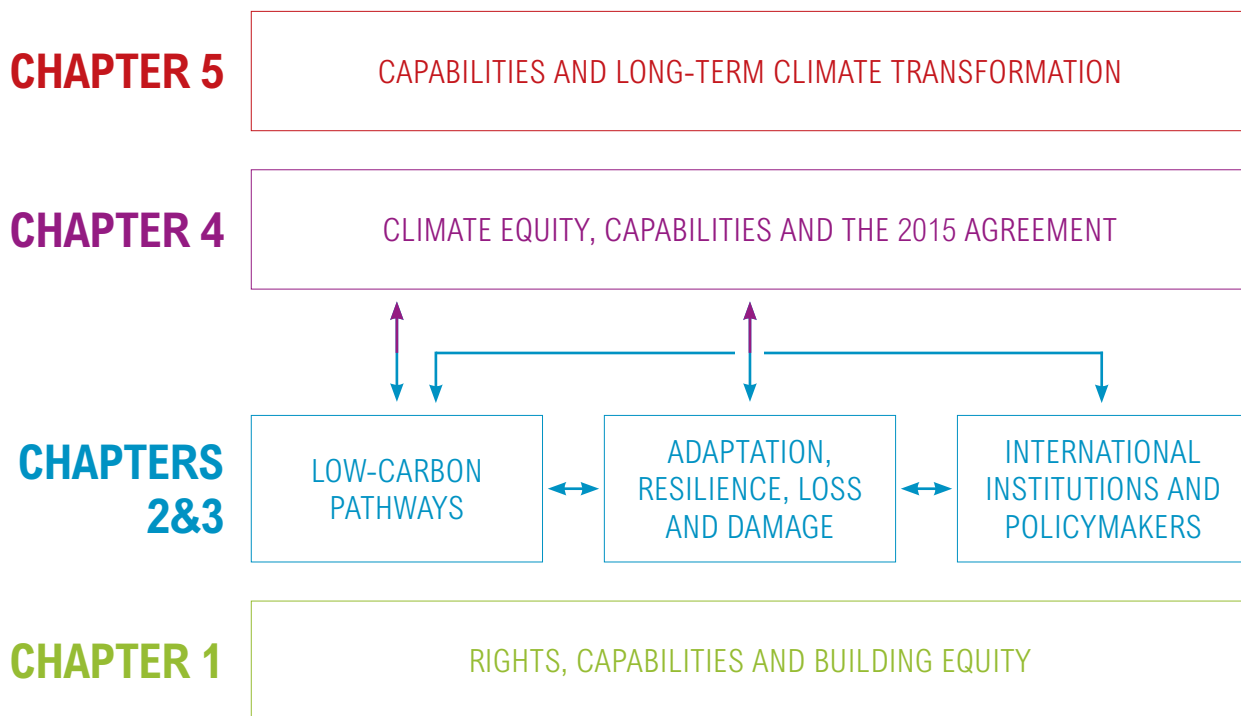
If this is to happen, this report argues, we must consider familiar principles in new contexts. In considering the principles of equity and CBDR-RC, an enhanced notion of “respective capabilities” should inform our deliberations. When responsibility to take action is discussed, the discussion should be focused on responsibility for action to achieve particular outcomes. We suggest that one important outcome is to preserve and strengthen the capabilities of people, especially the poor and most vulnerable, to confront climate change. Over time, this will build the capacity of nations and strengthen their ability to take climate action, and can even strengthen the consensus for action.

Fortunately, we have reached a point where countries do not have to choose between making progress on poverty and growth and confronting climate change. In the following chapters, we elaborate on the meaning and significance of viewing climate

action through the lens of a capabilities approach. We show how capabilities can be strengthened by climate action at the country level in a way that promotes equity and addresses poverty.

This report does not argue that a capabilities approach should become the only framework for pursuing climate equity. Rather, we propose that the concept of capabilities offers useful guidance in achieving equitable climate action that is grounded in a thorough understanding of the geographical, social, and economic differentiation that exists among individuals and communities. This understanding can be used to build consensus and collective ambition in the international climate agreement in 2015, as well as to support the design and implementation of policies at all scales that strengthen capabilities.

Figure 3 | Report Overview





Handwritten text on the white sheet of paper, including the words "Good", "Matters", "Soy", and "Matters".



# RIGHTS, CAPABILITIES AND BUILDING EQUITY

Given the state of equity discussions in the climate negotiations, and the opportunities and challenges provided by the 2015 Agreement, this chapter introduces the concept of the capabilities approach and discusses how it applies to climate action. We describe how the capabilities of individuals, communities and nations can be built through well designed climate action. By proposing a capabilities approach for climate action, we also explain how a focus on capabilities in climate policy can be used to augment an understanding of national capabilities and common but differentiated responsibilities and respective capabilities (CBDR-RC).

Given the state of equity discussions in the climate negotiations, and the opportunities and challenges provided by the 2015 Agreement, this chapter introduces the concept of the capabilities approach and discusses how it applies to climate action. We describe how the capabilities of individuals, communities and nations can be built through well-designed climate action. By proposing a capabilities approach for climate action, we also explain how a focus on capabilities in climate policy can also be used to augment an understanding of national capabilities and common but differentiated responsibilities and respective capabilities (CBDR-RC).

### The Relationship of Capabilities to Human Rights and Development

The Universal Declaration of Human Rights states that “All human beings are born free and equal in dignity and rights” (United Nations 1948, Article 1). The declaration then articulates a suite of fundamental rights common to all people, which they should be able to exercise. These include:

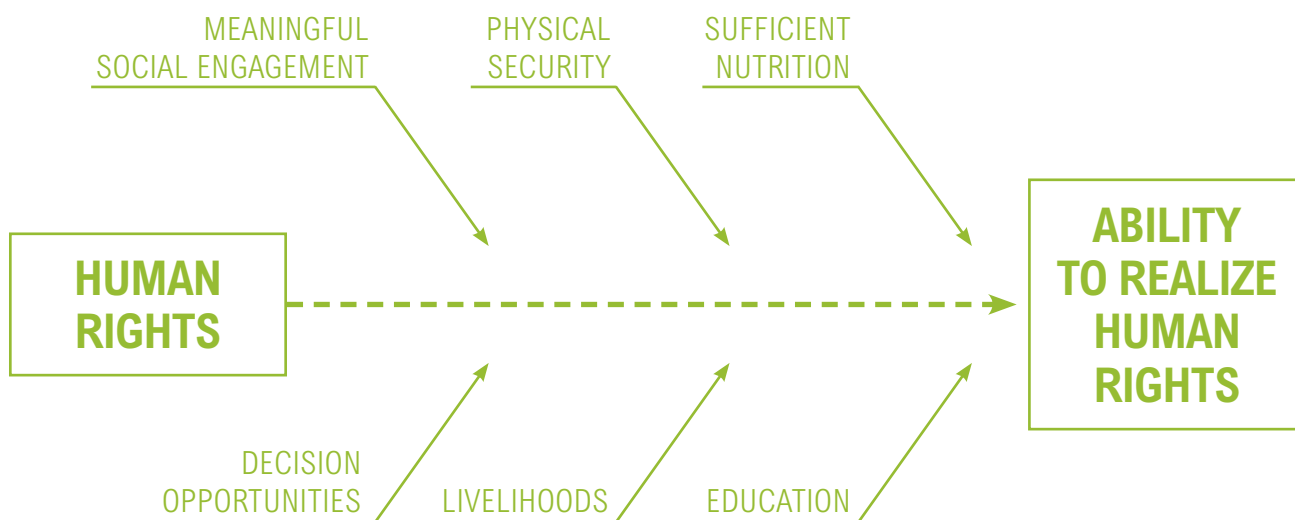
- Rights to life and liberty and security of person
- Social, political, and cultural rights that guarantee one’s right to engage in social and political life and participate in decisionmaking

- Rights designed to ensure adequate material resources to allow free and dignified choices.

Since its adoption in 1948, the Universal Declaration of Human Rights has become a powerful document asserting the essential importance of each individual’s claim to the core rights needed to live a dignified life. These rights have been adopted by the vast majority of the world’s countries, but many people are still denied some or all of their human rights. For example, Article 23 recognizes that “everyone has the right to work, to free choice of employment, to just and favorable conditions of work and to protection against unemployment.” Yet, faced with dire poverty and limited opportunities to access education, mobility, or essential resources, millions of people do not have free choice of employment or access to safe or adequate working conditions.

It was recognition of precisely this gap between the fundamental rights all people can claim in theory, and their ability to access and exercise these rights in practice that spurred a focus on capabilities.

Figure 4 | Capabilities Support the Realization of Human Rights



## Focus on Capabilities

In the late 1990s and early 2000s, development specialists Amartya Sen (Sen 1999) and Martha Nussbaum (Nussbaum 2003) proposed that scholars and public policymakers focus on efforts to ensure capabilities. In this context, capabilities are what provide people the ability to achieve their human rights. For example, a capabilities approach asks whether people are able to become educated, and then examines what resources are needed to ensure that all people can access and exercise their right to education. This approach to public policy has been deployed in a wide range of contexts (see Robeyns 2006 for a review). For instance, it has been used to examine the ways in which gender (Robeyns 2003) and disability (Burchardt 2004; Nussbaum 2009) have shaped the achievements and choices of women and people with disabilities. In these cases, it has led to better identification of specific policies and changes needed to help empower people to achieve their capabilities.

A capabilities approach has been instrumental in informing thinking in the development arena (Box 2, leading, for example, to the formulation of the Human Development Index produced by the United Nations Development Programme (UNDP). In the climate context, its central tenet—that capabilities are needed to ensure realization of human rights—can be used to propose proactive capability-building strategies as part of climate policy.

## BOX 2 | USING A CAPABILITIES APPROACH IN PUBLIC POLICY

Amartya Sen characterized a capabilities approach as a way to recognize that human flourishing depends on multiple factors, such as adequate shelter, sufficient nutrition, and social engagement, that cannot be easily aggregated into a single metric.

Recognition that human development could not be captured by a single metric informed the design of the United Nations Development Programme's (UNDP) Human Development Index, which covers several key capabilities—namely health, education, and economic resources. However, the index was seen as only one possible manifestation of a capabilities approach.

Since then, the UNDP's annual Human Development Reports have expanded on multiple aspects of capabilities—including gender, human rights, and democratic political institutions (see Fukuda-Parr 2003 for a review).

The central rationale for using a capabilities approach has been to identify what supports or hinders people as they try to live full lives. In Sen's words, "development is freedom." This capabilities perspective can draw attention to pathways that enhance people's well-being and can be used to identify strategies that support climate actions and contribute to multiple aspects of human well-being.



## Human Well-Being

The capabilities approach focuses directly on human well-being, which is conceptualized as the ability of each person to have the freedom and dignity to make meaningful choices about how he or she wishes to live. This approach recognizes that each human requires multiple core needs and rights to be satisfied in order to achieve well-being. For example, sufficient income without physical safety does not result in well-being, nor would access to education without sufficient nutrition. Capabilities consist of people's ability to access and use resources to achieve their own ideas about what a dignified life looks like.

The conceptualization of human well-being in the capabilities approach is important in two ways. First, the capabilities approach recognizes multiple, nonsubstitutable capabilities because of the multidimensionality of human well-being. Second, by centering on human well-being, the capabilities sees resources as necessary means to an end but not the core focus of attention. Instead, a capabilities approach emphasizes the need to understand which resources or opportunities are limiting the achievement of well-being in particular situations and to focus on identifying pathways for building capabilities. Using this approach can move debates away from zero-sum stalemates about resources in the abstract, and refocus attention to the creative process of supporting people's ongoing efforts to achieve well-being.

## BOX 3 | CAPABILITIES AND THE UNIVERSAL DECLARATION OF HUMAN RIGHTS

The Universal Declaration of Human Rights provides a framework for identifying capabilities essential to realizing human rights. An ongoing debate has examined the need for, or utility of, a universal list of capabilities. In this report we do not insist on a universal list but suggest that many important capabilities can be identified by basing our conception of human well-being on the call for human rights. An illustrative list of capabilities stemming from the Declaration, and likely to be impacted in a changing climate, includes the following:

- Sufficient nutrition as guaranteed by the right to life (Article 3)
- Physical safety, health, and bodily integrity (Article 3, Article 25)
- Adequate shelter and physical comfort (Article 25)
- Sufficient and safe employment (Article 23)
- Active inclusion and engagement in a meaningful social network or community (Article 27)
- Access to education (Article 26)
- The opportunity to be engaged in decision-making at the individual or collective level (Article 21)



In proposing the capabilities approach as a new lens through which to achieve equity in climate actions, there must be an awareness of its limitations. A key criticism has been that while the approach provides a framework for analyzing the relationships between specific policies and human well-being, it does not provide a full-fledged theory of justice (Robeyns 2005). It does not tell us who should be responsible for providing the resources necessary to achieving capabilities, although it does help us identify who has which capabilities, and why differences among people or groups of people may be occurring. In addition, there is a wide range of capabilities; fully assessing all of them would be data intensive and perhaps impossible (Clark 2006).

In this report, we do not seek to evaluate a complete set of capabilities for an individual or group of individuals; rather, we use the approach to identify links between climate policies and capabilities in the interest of proactively designing policies that can enhance equity (Box 3). Sen's capabilities approach asks us to focus on understanding what, exactly, is either helping or preventing people from being able to live in dignity; each person should have the resources and opportunities to be able to make meaningful decisions about how he or she wishes to live his or her life. We therefore focus our discussion of equity on the most vulnerable and the least well off because they either do not have sufficient capabilities or are on the edge of having these capabilities eroded to a point at which they would again face deeply limiting options about their lives (Box 4).

#### BOX 4 | WHY THE CAPABILITY APPROACH FOCUSES ON THE MOST VULNERABLE AND LEAST WELL OFF

The capabilities approach is not a complete theory of justice because it does not indicate specifically what an equitable allocation of resources or burdens is, nor does it identify who is responsible for particular obligations. Instead, the capability approach acknowledges the equal value of all people, and imposes a strong guideline that each person must have sufficient resources and opportunities to live in dignity, however he or she defines this. The opportunities people have to make genuinely free decisions are their "capabilities." This criterion draws attention to the situation of those who either do not have sufficient capabilities, or who are on the edge of having these capabilities eroded to a point at which they would lose the ability to make free and dignified choices about their lives. For this reason the report focuses particularly on the capabilities of those who are least well off or most vulnerable to the impacts of climate change.

The capabilities that we address are a starting point to illustrate how the capabilities approach can support the achievement of broader human rights in line with the Universal Declaration of Human Rights and support an understanding of national capabilities to augment the principle of CBDR-RC in the international context.



## Characteristics of a Capabilities Approach

Viewing equity through the lens of a capabilities approach places people and communities at the heart of climate policy and moves beyond abstract arguments about burden sharing. The key driver for such an approach is recognition that climate change will have particularly negative impacts on those who are most vulnerable, regardless of where they live. Without addressing this fundamental inequity and supporting approaches that build capabilities as well as the systems that provide for them, the international response to climate change will fall short of its equitability mandate.

Three core characteristics of the capabilities approach enable the approach to guide policy towards a focus on people and communities and towards equitable climate action. These are that human well-being is (1) multidimensional, (2) it is the end goal, and (3) individual capabilities are embedded in larger systems. Each characteristic is described below.

### Human Well-Being is Multidimensional

As described earlier, a basic tenet of a capabilities approach is the recognition that each human being has multiple human rights, and these are not substitutable. Since capabilities are what people need to realize and use their rights, capabilities too are multiple and non-substitutable, although interdependent.

For example, the ability to access and benefit from education requires several other capabilities, including the ability to enjoy bodily health and experience physical and psychological safety. If a child does not have sufficient nutrition, physical safety, and social support, she is unlikely to benefit fully from the presence of a village school to access her right to education, but this does not mean that these capabilities are interchangeable. Rather, they are interdependent, and non-substitutable.

The multidimensional nature of well-being means that single metrics cannot and should not be used to determine equity in the context of climate-change policies. If the ultimate goal of climate policy efforts is to promote and ensure human flourishing, then a multidimensional approach that acknowledges many different human needs and capabilities is required.

### Human Well-Being is the End Goal

A capabilities approach places the achievement of human well-being as the ultimate end goal. This is also reflected in the UNFCCC's objective of human development: "The ultimate objective of this Convention ... is to achieve... stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a timeframe sufficient...to enable economic development to proceed in a sustainable manner." (UNFCCC 1992, Article 2)

We argue that climate change policy should also be oriented toward furthering human well-being both through avoiding climate impacts, and through using climate action to support and enhance capabilities. The capabilities approach forces decisionmakers to consider the resources that might be needed in specific situations, and encourages long-term innovative thinking about policy options for achieving well-being.

### Individual Capabilities are Embedded in Larger Systems

Finally, people do not live in isolation but are embedded in social, political, and economic systems. The capability to achieve human well-being depends on a range of resources, many of which need to be supplied by the state or society in general. Capabilities are experienced individually; however, social, economic, and material structures, many of which operate at the national level, provide the foundations for developing individual capabilities.

While national and individual capabilities are different, they are related. By acknowledging the extent to which human capabilities and well-being in general are dependent on, and affected by, larger national systems and structures, we can begin to think further about countries' capabilities that should be included in international debates about equity and climate action.

The capabilities of countries, in terms of their abilities to provide structures and resources to enable human well-being, is an important element of the international equity conversation around action on climate change, discussed later in this chapter. Because inadequate access to resources can prevent

people from developing capabilities, attention to both specific resource needs and their distribution is important for directing policy efforts toward increasing the capabilities of the most vulnerable or least well off.

## Two Pillars for a Capabilities Approach to Climate Change Equity

Drawing on an understanding of the capabilities approach as expressed above, this report proposes that the international community adopt the approach as a means of embedding equity in climate policy. The capabilities approach, as it applies to climate equity, rests on two interrelated pillars:

**Pillar 1.** Sufficient mitigation and adaptation actions are required to prevent the direct impacts of climate change from eroding the capabilities of the least well off and most vulnerable, now and in the future.

This pillar concerns the direct impacts of climate change on people's capabilities, particularly those of the most vulnerable. This includes impacts that result from inadequate mitigation, insufficient adaptation, or a failure to address loss and damage caused by climate change. Impacts on both current and future generations should be considered.

**Pillar 2.** Climate policies should be designed to enhance, rather than diminish, the capabilities of those who are most vulnerable, least well off, and least able to represent themselves.

This pillar addresses the effects that climate policies themselves can have on human capabilities. Climate policies to reduce emissions or build resilience to climate impacts can either enhance the capabilities of the most vulnerable and least well off, or exacerbate existing inequities and undermine efforts in other policy arenas.

Taken together, these two pillars provide a basis for understanding how to apply a capabilities approach to equity in climate action. Such a basis encourages climate policies to seek to build long-term capabilities, while also contributing to society's ability to move toward a low-carbon and climate-resilient model of development. By recognizing that climate action and equity are linked and can be mutually supportive, this base requires focusing attention

## BOX 5 | INTERGENERATIONAL EQUITY AND CAPABILITIES

Intergenerational equity is the principle that humans "hold the natural and cultural environment of the Earth in common both with other members of the current generation and with other generations, past and future (Weiss 1990). It is a core component of equity.

The UNFCCC recognizes that climate change is fundamentally an intergenerational problem. "The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities" (UNFCCC 1992, Article 3[1]).

Strong mitigation action to prevent a 2°C warming, and the devastating impacts it would trigger, is essential to protecting the core capabilities of future generations. In addition, purposefully considering future generations in the design of climate action could build their capabilities and well-being. For example, efforts to invest in new employment strategies that expand the reach of renewable energy to marginalized communities could provide long-term livelihood options. Similarly, investments in low-carbon, climate-resilient building or climate-resilient agriculture research and practice support the ability of communities and countries to build the foundations for future well-being.

Thinking about intergenerational equity from a capabilities perspective may help to identify investments that could reduce future generations' vulnerability to such situations. For example, Bangladesh is building long-term capabilities in the face of serious coastal threats by increasing educational opportunities. Shifting the employment patterns of youth and future generations away from agriculture in climate-sensitive areas and toward new opportunities could build long-term resilience, but it requires investments in education now.

and resources on ensuring that climate action contributes to efforts to promote the well-being of all vulnerable people—regardless of location—and to preferentially provide benefits to those who are least well off, or least represented.

A capabilities approach to achieving climate equity demands strong mitigation action to avoid future climate impacts, addressing equity concerns

under the first pillar. However, since many climate impacts are already occurring, it also urges actions that include efforts to address those impacts in ways that will build the long-term capabilities of impacted communities. It emphasizes that climate action should not come at the expense of human well-being (second pillar).

Finally, and of critical importance, a capabilities approach is applicable to both current and future generations, and therefore accords with the principle of intergenerational equity (Box 5). Climate change presents significant threats to future well-being. Not only are future generations likely to be most vulnerable to its impact, they are also least represented in current decisions on climate action. Without transformation toward low-carbon and climate-resilient development, future generations who played no part in generating historic emissions will have increased difficulty in achieving well-being. A capabilities approach can therefore serve as a useful tool to guide policymakers toward efforts that support the development of long-term and lasting human capabilities and the ultimate goal of transformative climate action.

## Capabilities and the International Equity Challenge

### National Capabilities and Climate Change

Many of the core systems crucial to the development of capabilities—including education, health care, social security, legal recourse for public engagement and property rights, and the judiciary—are explicitly dependent on functioning governments. Other resources needed for certain capabilities, such as income, are tightly linked to the vitality of national economic systems. At some level, all capabilities depend on physical security and environmental integrity.

As highlighted in the Introduction, the capabilities approach was designed to facilitate comparison and to highlight inequalities in actual or potential capabilities. This element of the approach can be used to operationalize concepts of equity in international negotiations under the UNFCCC. Individual rights and capabilities are at the heart of the capabilities approach, and are necessary to ensure the achievement of equity concerns in international and national policy decisions. Nevertheless,

international policymaking within the UNFCCC is largely concerned with agreements among nations and requires some degree of comparing capabilities among countries.

While the capabilities of individuals and nations are very different, they are also related and can be mutually supportive. The capabilities of a nation are a product of the capabilities of its individual citizens, and conversely, individuals' capabilities are embedded within the broader social system, which is facilitated or created by the nation.

In recognition of the socially embedded nature of individual capabilities, this report proposes four national capabilities. They provide a limited but pragmatic starting point for considering capabilities in the UNFCCC discussions. They relate to core systems that enable individuals to achieve their capabilities. The four national capabilities are: human development, economic capacity, resilience to climate impacts, and governance capacity and social security structures. Together these four capabilities can be used to craft a more robust framing of “respective capabilities” than has previously been developed. Each is described below as it relates to climate change, along with possible metrics.

### Human development

A country's level of human development has long been acknowledged as an important component of its capabilities. The aggregate state of well-being of a national population clearly affects what is possible in terms of climate action, and what is needed in terms of policies to enhance individual capabilities. Aggregate well-being can include factors such as health and education, levels of poverty, access to energy sources, and gender equality. A range of metrics has been used to describe human development, the most common of which is the Human Development Index; a metric that itself was based on a capabilities approach. Other ways of representing human development include aggregate measurements of poverty—number of people living on less than \$2 a day, or people with insufficient energy access—or through specialized metrics that take other issues into account, such as the Gender Inequality Index.



### Economic capacity

Economic capacity has long been of central concern in the discussion of capabilities. A country's ability to make the investments required for climate mitigation or adaptation, or compensating for loss and damage, is directly tied to its access to liquid financial assets, its debt load, and overall fiscal health. From the perspective of its citizens, issues like employment, functioning local markets, and access to credit may be crucial for the development of capabilities. The economic costs to a country of climate actions can be significant; what often goes unexamined is the economic benefit a country can derive from climate actions.

### Resilience to climate impacts

Climate impacts can significantly reduce capabilities, particularly of those who are most vulnerable or least well off. Future generations also face heightened risks from climate impacts. At the national level, physical, social, and economic security against climate change is an important element of capabilities. A country that faces major threats to its physical security or cultural heritage and identity from climate change must divert resources to address the issue and, if these efforts are insufficient, to deal with the short- and long-term impacts of loss and damage.

### Governance capacity and social support structures

The ability of a national government to effectively govern and make decisions within its territory, regulate industries, provide adequate social support, and provide access to justice for all citizens within national borders, is a necessary condition for supporting a wide range of individual capabilities. Effective governance is also necessary to enable climate action to be designed and implemented in ways that can both meet climate goals and enhance capabilities.

For example, as countries face climate impacts, investments in social support systems may provide necessary development opportunities in vulnerable communities. Similarly, sufficient governmental capacity to conduct impact assessments and monitor policy effectiveness is important in all forms of climate action. The inclusion of governance capacity as a national capability resonates with the long-standing acknowledgment of the importance of capacity building as a key element in enabling broad climate action.



## Metrics for national capabilities

Countries, like individuals, have multiple capabilities; a fact that poses challenges to developing an aggregated measure. In Table 3, we suggest a number of possible metrics that might be used in assessing national capabilities.

Some metrics, such as countries' Human Development Index ratings, or income per capita, are already available and can be compared easily. Others, such as qualitative loss and damage risks to cultural systems, or degree of governmental competence, are more difficult to measure but they may be no less essential to an adequate assessment of a country's overall ability to support the core systems required for citizens to develop their capability potential. We propose that countries should be encouraged to use quantitative metrics where appropriate and systematically recognize elements that cannot easily be quantified and include them in overall evaluations of national capabilities.

Table 3 | **Proposed National Capabilities and Potential Metrics**

NATIONAL CAPABILITY	POTENTIAL METRICS
<b>Human development</b>	Human Development Index (health and education), national poverty burden, energy access, Gender Inequality Index
<b>Economic capacity</b>	GDP, GDP per capita, employment, debt ratio, internal access to credit, relative costs of climate action, economic benefits from climate action
<b>Resilience to climate impacts</b>	Aggregate vulnerability metrics, qualitative acknowledgment of cultural or other vulnerabilities; identification of specific physical vulnerabilities
<b>Governance capacity and social support structures</b>	Accessibility of judiciary, human capital and resources, regulatory abilities, qualitative assessment of governance strengths and needs, health care coverage, educational enrollment

Source: Authors.

## Common but Differentiated Responsibilities and Respective Capabilities

The principle of “common but differentiated responsibilities and respective capabilities” (CBDR-RC) is fundamental to the UNFCCC, and to the concept of operationalizing equity. To date, considerable effort has been devoted to understanding the implications of the “common but differentiated responsibilities” component, but the “respective capabilities” element has been less fully explored.

While a capabilities approach itself is not a theory of justice, the concept of capabilities can be applied within the international framework established by the UNFCCC (Box 6). This report proposes that a robust approach for assessing capabilities be used alongside assessments of responsibility. Such an approach would not replace concerns about responsibility, but would offer an expanded framework for discussing national capabilities, and for identifying and supporting actions aimed at protecting the most vulnerable, the poor, and future generations. In the international climate context, this means that countries with greater capabilities should take the lead on climate action and actively support policies and measures that have the potential to build the capabilities of the most vulnerable or least well off.

The underlying argument is that equity is multifaceted and makes multiple demands: global mitigation and adaptation to address existing impacts is essential for well-being now and in the future, and efforts to support and implement climate action should be shared with due consideration for both responsibility and capabilities. Addressing climate change need not impose only burdens; smart climate policies could result in significant long-term benefits. This multifaceted approach offers multiple resources for supporting the political momentum needed to achieve global climate stabilization and build capabilities.

## BOX 6 | A CAPABILITIES APPROACH AND THE PRINCIPLE OF COMMON BUT DIFFERENTIATED RESPONSIBILITIES AND RESPECTIVE CAPABILITIES

The principle of common but differentiated responsibilities and respective capabilities (CBDR-RC) is built on principle 7 of the Rio Declaration on Environment and Development, adopted in 1992 at the United Nations Conference on Environment and Development, but finds expression in the UNFCCC in Article 3; it also permeates the balance of responsibilities between countries in Article 4.

The phrase “respective capabilities” suggests there are two bases for differentiation—one based on contribution to harm (responsibilities), and the other based on capability to take action (capabilities). It is implied that such differentiation must be in service of the common environmental goal (Rajamani 2006).

This report does not suggest that capabilities become the sole framework for pursuing climate equity. Responsibility for climate change, including historical responsibility,

remains fundamental to shaping global mitigation and adaptation efforts.

Acknowledging historical responsibility for emissions is necessary because it allows the inequity of cumulative contributions of GHG emissions, which have led to higher atmospheric concentrations, to be explicitly incorporated into the international discussion of climate change. However, responsibility alone cannot adequately address either the issues raised by inequitable climate impacts or the need to share the benefits of climate action and enhance human well-being.

Our proposal seeks to address this limitation by augmenting the principle of “respective capabilities” with a capabilities approach that can provide guidance for climate policy and action. Individual and national capabilities are separate but can be viewed as reinforcing each other. The capability of a country, and therefore its ability to contribute to global climate action, is a reflection of individual

and local capabilities. Policies that build individual capabilities, therefore, support the community and, ultimately, the national system. The evidence we present suggests that an additional focus on the capabilities of communities and countries will help governments operationalize this principle by designing climate policies that actively promote equity and further human development.

An emphasis on capabilities can also underscore the ways in which responsibility for emissions—including historical responsibility—is critically important. The emissions that result in climate change are also the cause of the climate impacts that can erode the capabilities of the poorest and most vulnerable. Adopting this approach could, therefore, help countries effectively address the multiple dimensions of climate equity and craft an effective and broadly supported 2015 Agreement.

### Using the Capabilities Approach in a Climate Context

The capabilities approach, as it is understood at both the individual and national levels, has four elements that facilitate its use as a framework for advancing equity in climate action: focus on the most vulnerable and least well off, now and in the future; address benefits as well as burdens; focus on pathways of action; and effectively engage respective capabilities. The elements are elaborated below.

Focus on the most vulnerable and least well off, now and in the future

Using a capabilities approach maintains focus on those who are most vulnerable or least well off, now and in the future, regardless of where they are

located. Such an approach requires that significant, and equal, attention be paid to adaptation, building resilience, and addressing loss and damage. Applying a capabilities approach allows these issues to be addressed at the core, not the periphery, of climate action. When looking at individual capabilities and pathways for action, it stresses awareness of differences in vulnerabilities, potential impacts, and resources, even within communities.

Address benefits as well as burdens

The capabilities approach highlights the opportunities that climate action has for human development. For instance, developments in renewable energy and energy efficiency have the potential to provide rural electrification, which improves health and economic opportunities for communities. Further-

more, climate-resilient agriculture has been shown to improve food security while contributing to global climate mitigation.

The increased potential for benefits, and opportunities to build capabilities, necessarily adds a positive new dimension to the climate equity debate. Instead of overlooking this potential, a capabilities approach asks, “how could the benefits from technological or social innovation be used to further the capabilities of those who have the least, or are most vulnerable?” Conversely, capabilities can be damaged by climate policies that are not well designed or that have not addressed the needs of particular communities. Either way, a capabilities approach explicitly requires an assessment of the impact on communities, in particular those that are most vulnerable or least well off.

#### Focus attention on pathways of action

The capabilities approach encourages attention to the specific opportunities, resources, and barriers that either assist people to live with dignity, or prevent them from doing so. Despite equity being central to climate action, international equity debates have too often ended in stalemate, with few concrete suggestions for climate action. Many international approaches to equity have relied on high-level abstract metrics that are generalized across all nations. There are good reasons for this, since any attempt at creating a burden-sharing arrangement needs ways of comparing countries. However, dependence on such metrics can overlook possibilities or pathways for action at national or local levels.

#### Effectively engage respective capabilities

An understanding of capabilities and an acknowledgment of the linkages between individual and national capabilities benefits international policy discussions by providing a means of more fully comparing and evaluating the capabilities of different countries. Defining national capabilities provides a multidimensional framework for comparison more suited to the diversity of countries than are single metrics. If used within the principle of CBDR-RC, national capabilities could provide a pragmatic approach for comparing efforts and contributions across countries.

Without transformation toward low-carbon and climate-resilient development, future generations who played no part in generating historic emissions will have increased difficulty in achieving wellbeing.





# APPLYING THE CAPABILITIES APPROACH TO LOW- CARBON PATHWAYS

Climate actions that promote low-carbon energy pathways must also build capabilities of those who are potentially most vulnerable. This chapter examines case studies from 15 countries across five policy areas of renewable energy deployment, carbon pricing, fossil-fuel subsidy reform, low carbon transportation, and forest management to draw some lessons on how climate policies enhance capabilities and address equity. Based on these examples, we put forward recommendations on what the role of international policies and institutions could be and how the international community could support national and local level low-carbon actions.

In this chapter the report examines case studies from 15 countries, both developing and developed, that exemplify how capabilities can be met while at the same time pursuing a low-carbon pathway.

Although we distinguish between actions to promote low-carbon energy pathways in this chapter and actions to promote climate resilience in chapter 3, we recognize multiple overlaps between them in policy areas ranging from forest protection to urban planning. Indeed, sustainable development policies often provide many benefits that include mitigation and adaptation, as well as other social, economic, and environmental objectives.

### Five Key Policy Areas to Promote Low-Carbon Pathways

Achieving adequate mitigation of emissions will depend on the ability of countries to adopt low-carbon development pathways. However, to generate international momentum and to contribute to greater well-being, especially among those who are most vulnerable or least well off, climate actions must also build capabilities. Our case studies fall into five key policy sectors: renewable energy deployment, carbon pricing, fossil-fuel subsidy reform, low-carbon transportation, and forest management. In each of the five policy areas, we found that, with effective policy design and sufficient enabling factors, climate action can build individual capabilities.

Case studies from developed and developing countries highlight the ways in which climate policies can affect capabilities and equity in a diverse set of circumstances. The lessons that emerge from these local and regional policy efforts suggest strategies for reorienting international policies to focus on enabling low-carbon climate policies that simultaneously enhance capabilities.

An overview of case studies is provided in Table 4.

We identified the linkages between each policy area and the equity concerns and current challenges or strategies for enhancing capabilities. In the last part of the chapter we identify possible roles for international policies and institutions in supporting concrete actions in this area.

Table 4 | **Five Policy Areas Drawn from Case Studies Focus on Low-Carbon Pathways**

POLICY AREA	FEATURED COUNTRIES
<b>Renewable energy deployment</b>	Bangladesh, India, United States (California), Denmark, Thailand
<b>Carbon pricing</b>	Ireland, India, United States (California)
<b>Fossil-fuel subsidy reform</b>	Indonesia, Iran
<b>Low-carbon transportation</b>	Colombia (Bogota), United Kingdom (London)
<b>Forest management</b>	Brazil, Ethiopia, Guatemala, Niger, Australia

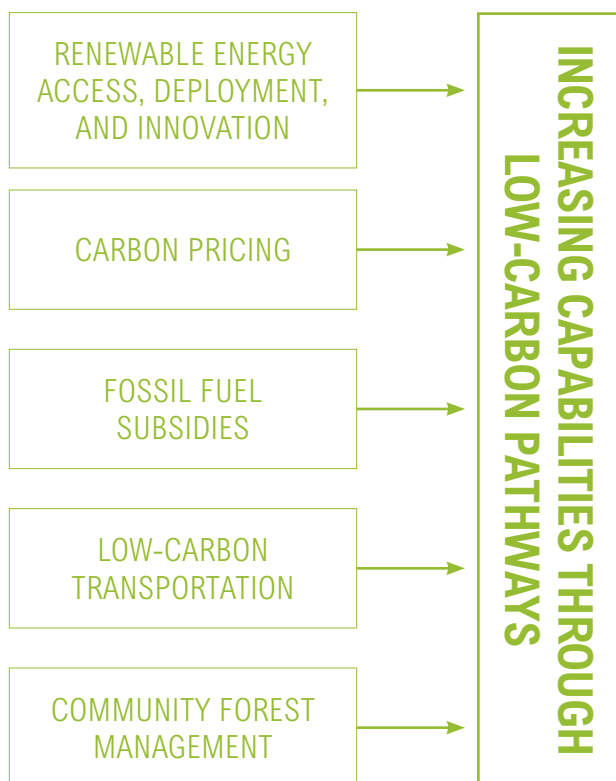
### Renewable Energy Access, Deployment, and Innovation

As the world faces growing energy demand, renewable energy must play an increasing role if climate stabilization goals are to be achieved. The energy sector accounted for about 60 percent of total global GHG emissions in 2012, and energy-related GHG emissions have been rising. Moreover, fossil fuels accounted for over 80 percent of global energy consumption in 2012 (IEA 2013a). Achieving the 2°C warming limit will require a profound transformation of energy systems through steep declines in carbon intensity across all sectors of the economy (IDDRI and SDSN 2014).

In spite of the dominance of fossil fuels, in 2010 an estimated 1.3 billion people did not have access to modern energy services, and almost 2.7 billion people relied on traditional biomass for cooking (IEA 2011). Over 95 percent of people without access to modern energy services live in developing countries, particularly in Sub-Saharan Africa and Asia, and roughly 84 percent live in rural areas (IEA 2011; Ballesteros et al. 2013). A capability perspective requires attention to both mitigation and energy access, and increasing renewable energy is a key strategy for achieving this.



Figure 5 | **Key Approaches for Building Capabilities through Low-Carbon Pathways**



### Renewable Energy and Capabilities

Access to reliable, safe, and affordable energy is an essential element in securing a range of capabilities. Increasing household electrification, especially if it replaces the use of traditional biomass, can significantly contribute to health and education and free up time for other pursuits (Torres-Duque et al. 2008; Fullerton, Bruce, and Gordon 2008; Palit and Chaurey 2011; Köhlin et al. 2011). Energy access at power levels sufficient for productive uses, such as in cottage industries, can also support local employment and financial well-being (EUEI and GIZ 2011).

In rural or remote regions, renewable electrification can be more cost effective than conventional grid extension and, in some situations, may be the only practical option. In 2010, the International Energy Agency (IEA) assessment of energy access suggested that the most cost-effective electrifica-

tion for 70 percent of rural, remote areas would be through off-grid or micro-grid systems, more than 90 percent of which would be powered by renewables (IEA 2011). For this reason, the IEA suggested that 64 percent of investment in energy access would have to go to off-grid and mini-grid solutions (primarily renewables) if universal energy access was to be achieved by 2030.

Renewable energy sources could offer long-term energy security and affordability benefits because they are insulated from world energy price increases and volatility. For instance, in Bangladesh, where 75 percent of rural people lack electricity, a public-private partnership is offering affordable solar electric systems for homes (Box 7).

## BOX 7 | RURAL ELECTRICITY ACCESS IN BANGLADESH

Electricity access has been increasing in Bangladesh, but roughly 47 percent of the population still lacked access (Hamid 2012; Urmee, Harries, and Schlapfer 2009; Kabir, Dey, and Faraby 2010), and roughly 75 percent of people in rural areas lacked access to energy (Hoque and Das 2013).

Over 80 percent of the country's electricity is generated with natural gas, but domestic supplies are insufficient to meet Bangladesh's current and growing demand for energy (Baten et al. 2009). As a result, Bangladesh imports fossil fuels, the cost of which strains the country's foreign reserves (Hamid 2012).

The Infrastructure Development Company Limited (IDCOL), a public-private entity, initiated a rural solar energy program, with funding from a variety of international development agencies, in 2002 (Urmee, Harries, and Schlapfer 2009; Kabir, Dey, and Faraby 2010). IDCOL works with partner organizations that interact directly with consumers. IDCOL provides a small subsidy and loan to partner organizations that, in turn, extend credit to people who buy their solar home systems. Partner organizations are incentivized to ensure their solar home systems are well-built and well-maintained (Kabir, Dey, and Faraby 2010; Arc Finance 2014). A typical solar home system costs \$155 and provides enough power for several lights and a television set (Hamid 2012; Kabir, Dey, and Faraby 2010). These systems reduced women's burdens in the household (for example, fetching water or cooking became much easier and less time-consuming with access to electricity). With time freed from household duties and electricity to light their homes after dark, women were also able to engage in income-generating activities such as sewing or poultry farming (Kabir, Dey, and Faraby 2010; Hoque and Das 2013; Hamid 2012).

Several factors contributed to the success of the program. These include:

- International financial support extended not only as a capital subsidy but also as low-interest loans that ultimately were extended to consumers.
- The "incentive structure" of the program, which ensured effective after-sales service of the systems.
- Adequate administrative support and oversight from IDCOL.
- Affordability of the products to consumers in terms of total costs and repayment schemes matching the structure of their income.
- Successful mobilization of partner social enterprises that rapidly expanded to reach millions of customers.

## Upfront costs

Renewables can present lower costs and more reliable energy than traditional fossil-based electricity sources, especially in the long run, but they usually require significant upfront investments that can limit access, especially to those who are least well off (IEA 2011). Small-scale energy entrepreneurs have developed creative financing for low-income households. Such innovations have included loans to traditionally "nonbanking" populations (Box 8), subsidy and loan combinations and pay-as-you go systems (Omwansa and Sullivan 2014). Key lessons from such efforts have included the importance of facilitating finance for

## BOX 8 | INNOVATIVE FINANCING FOR RURAL ELECTRICITY IN INDIA

Selco India, founded in 1995, is a for-profit organization that aims to provide electricity and, especially, lighting for India's rural and urban poor, mostly through photovoltaic solar power (Selco 2014). Selco uses a no-subsidy approach in which it helps arrange loans for poor customers who lack significant savings so they can pay for their lighting or energy supply themselves. Selco's products have benefited over half a million people in more than 80,000 households and, in 2005, Selco's revenue was US\$3 million (Bazilian et al. 2012), demonstrating the long-term viability of its financial model.

In one case, Selco worked with a female entrepreneur to provide portable lanterns for historically vulnerable tribes in the Kutch district of Gujarat. The tribes' location was too remote for members to take regular long trips to make loan payments. Instead, one loan to buy lanterns for all the tribal households was made to a single female entrepreneur, who then delivered the lanterns and made payments on the loan (Selco 2014). According to Selco, it is "essential to leverage the expertise of local financial institutions to make the initial cost of solar energy service affordable: not by lowering the capital cost but by creating financial products that match the cash flow of the client" (Selco 2014, 4–5).

Selco's innovative approach to financing is at least as important as its solar technology (Bazilian et al. 2011; IEA 2011). Selco's approach to expanding access to energy, particularly its financing innovations, demonstrates that it is possible to expand access to energy, even in remote, rural areas, without accelerating climate change.

very low-income or seasonally employed workers (and such facilitation includes capacity building within financial institutions), and understanding the finance opportunities of individuals and communities. Even with these systems, however, reaching very poor populations remains challenging. For instance, with pay-as-you-go systems, people living in poverty face the constant threat of disruptions to their energy supply.

Some developed countries have started programs to improve low-income households' access to renewable energy systems and employment opportunities. For example, the California Solar Initiative, which began in 2006, includes employment training in renewable energy and installation of renewables for low-income households (California Public Utilities Commission 2014) (Box 9).

Third-party power purchase agreements have been used to allow households to avoid upfront solar costs, although these agreements are aimed at consumers already capable of paying for grid electricity.

Finding ways to address upfront costs can expand access to the benefits of renewables at both the individual and national levels (which, in turn, provides a range of benefits important for individual capabilities, including improved air quality, energy security, and long-term price certainty). For example, in the face of a growing economy and limited domestic fossil fuel resources, Ghana has been attempting to expand its renewable energy capacity (Ghana 2011). This strategy includes developing the 155 megawatt Nzema concentrated solar power plant. However, finance has remained challenging and this project depends on significant overseas investment (Clover 2014). For countries with limited financial resources, there is a need for international support to overcome upfront costs of large-scale renewable energy deployment.

### Colocating renewable energy generation

Renewable energy systems, especially in large-scale deployments, can have disadvantages, such as noise from wind farms or the cost of new transmission lines from areas of high-wind-potential to areas of high population. Many renewables require large areas of land, which might be difficult and expensive to access, and renewable energy installations can

## BOX 9 | SOLAR POWER IN CALIFORNIA, USA

The falling cost of solar photovoltaic panels has made them economically competitive with electricity rates over the long run in some jurisdictions, and their installation can result in household economic savings. As of mid-2011, the majority of Californian residential solar photovoltaic installations are arranged through third-party companies in power purchase agreements. In these agreements, a third party owns and maintains the solar panels, and households commit to a long-term electricity price that is either competitive with, or slightly lower than their current price of electricity from the grid. These arrangements, and their potential for long-term household savings, have contributed to a doubling of installed Californian residential solar photovoltaic capacity between 2011 and 2013 (EIA 2014a). Power purchase agreements have allowed a greater diversity of people—including lower income people traditionally excluded from such long-term investments—to benefit from long-term solar power savings, while helping California meet its greenhouse gas emissions targets.

result in habitat loss—for example, in sensitive high-altitude slopes suitable for wind farms—or competitive use of agricultural land and water resources; for example, in areas used for biomass. In many cases, the communities most impacted by the development of renewable energy sources are not its final consumers. These inequities in distribution of the benefits and burdens of renewables can erode public support for renewables generation (Devine-Wright 2005; Wolsink 2007). Colocating the production and use of renewables, wide public engagement, and ensuring transparent economic benefit sharing from renewable production can erode some of these equity concerns. Renewable energy cooperatives represent an institutional innovation that has been proposed to connect costs and benefits of large-scale energy production and help to create a more equitable, and more publicly acceptable, model of renewable generation (see Box 10).

## BOX 10 | DENMARK'S WIND ENERGY COOPERATIVES

Wind power has a long history in Denmark, but the 1973 oil crisis stimulated interest in large-scale wind-energy production (Tranaes n.d.; Mendonça, Lacey, and Hvelplund 2009). The Danish government supported cooperatives through policies such as a 30 percent subsidy for new wind energy projects and feed-in tariff (FIT) policies (Mendonça, Lacey, and Hvelplund 2009).

Although communities in other countries often oppose new wind power projects because of visual and noise impacts, Danish communities have tended to support them. This is often attributed to the cooperative ownership structure, which tightens the relationship between benefits and burdens of renewable generation, and actively involves communities in energy decisionmaking. In a cooperative structure, those who have to bear the aesthetic and environmental burdens of wind power also receive financial or energy benefits from these projects. In addition, individuals have greater opportunities to participate in decisionmaking, which has reduced tensions about equity and generated wider support (Devine-Wright 2005; Sørensen, Hansen, and Larsen 2002).

### Equitable public finance to support renewables

The design of public policies to support renewables can effectively address equity concerns. For example, feed-in tariffs (FITs) have caused particular concern because they can cause electricity prices to rise due to less grid users—but grid infrastructure costs remaining static. Under a FIT scheme, producers of renewable sources of electricity are offered a long-term contract, which typically guarantees a set price, or a scheduled suite of prices, for the power they will produce and sell to the electrical grid. Low-income customers often are more affected by price increases because energy usually accounts for a larger proportion of their budgets. Low-income households, in some cases, also face higher energy needs because of poor quality housing and the use of older, less efficient appliances.

One of the important strategies for more equitable direction of public energy finance is to ensure that the needs of lowest income and most vulnerable populations are understood and taken into consideration during decisionmaking. This can take the form of needs-assessment or demand-characterization studies that specifically identify the most pressing needs and the resources and opportunities available to community members (see Box 11).



## BOX 11 | FEED-IN-TARIFF IN THAILAND

Facing a predicted doubling of energy demand within 20 years (Chrometzka 2014) and limited domestic fossil fuel resources, Thailand was one of the first Asian countries to pursue renewable energy development. In 2013, the country unveiled one of the region's most ambitious solar photovoltaic targets, aiming to produce 3,000 megawatts by 2021 (TSRM2013). Thailand initially included a feed-in tariff (FIT) featuring a generous premium for renewable energy, but this proved so attractive that it created a "solar gold rush" and more proposed capacity than expected. The Ministry of Energy became concerned that, if the government's official target of 500 megawatts were to be exceeded, there would be a sharp increase in the pass-through costs to consumers (Graecen and Tongsopit 2013).

To rebalance its policy and better direct the benefits of solar power generation to individual households and communities who had initially been excluded from the policy's benefits, the new FIT design includes explicit rates and targets both for residential rooftop solar, and community photovoltaic systems. Aims of this program include greater residential income-sharing benefits, in addition to higher employment and community financial benefits. Financing was provided through the Thai Village Fund (Tongsopit 2014; Chrometzka 2014). Extending the policy to the community was particularly designed to help individuals who could benefit only by participating as members of a group; the policy redesign demonstrated a strong desire to address some equity concerns of the original policy. However, funding, especially for the low-interest loans initially included in the community projects, has presented an ongoing challenge, and has slowed the roll-out of the program (TSRM 2014).

### Carbon Pricing

Climate change is partly a result of market failure. GHG emissions cause negative impacts but the costs of these impacts are excluded from the markets that created them. Thus individuals, companies, and countries have little financial incentive to reduce their emissions. Carbon pricing attempts to remedy this situation by assigning a price to GHG emissions, typically either through a carbon tax or by creating a cap-and-trade market.

Carbon pricing can aid mitigation and, if well designed, can provide positive benefits for consumers (Preston et al. 2013). There is a large potential for increased use of carbon pricing as a strategy for

achieving emission reductions and the associated monetary and nonmonetary co-benefits (World Bank and EcoFys 2013).

### Carbon Pricing, Co-benefits, and Capabilities

Carbon pricing shifts the incentive structure for routine economic decisions to support the mitigation efforts that will be required to protect long-term capabilities. As greenhouse gases tend to be emitted along with other pollutants, reducing emissions can also improve air quality and human health, which also contribute to human well-being. Low-income residents are particularly susceptible to poor air quality because many live near polluting industries, and because the health care costs of air pollution may be relatively more onerous. Environmental justice studies have consistently found that marginalized communities tend to have higher exposure to industrial pollutants, and are less likely to be meaningfully involved in local decisionmaking about facilities siting or management (Cole and Foster 2001; Bullard 1997).

Carbon pricing can also create benefits beyond climate change mitigation and improved air quality. Increased energy costs have systematically been linked to higher economy-wide energy efficiency (Grubb 2014). Over time, higher energy efficiency leads to significant savings. For instance, the Regional Greenhouse Gas Initiative trading scheme among power plants in the northeastern United States is expected to save the region over \$2 billion in lifetime energy costs (RGGI 2014). Increased efficiency can also help reduce national vulnerability to fuel-price volatility, a particular concern for many developing countries.

Carbon pricing, either as a tax or as a permit auction, can also generate government revenue for other national priorities. For example, the US\$1.7 billion in auction revenues generated by the Regional Greenhouse Gas Initiative in the United States since 2008 has funded energy efficiency and clean technology development, and reduced customers' electricity bills (RGGI 2014). In California, auction revenues support a range of services including community development and public transportation (California 2014). Similarly, the carbon tax in Ireland (Box 12) has allowed the government to minimize increases in income or employment taxes, which tend to slow economic recovery, while increasing resources for low-income residents (Convery, Dunne, and Joyce 2013).

## BOX 12 | IRELAND'S CARBON TAX

In late 2008, Ireland suffered a severe fiscal crisis and negotiated a bailout with the European Union and the International Monetary Fund. As part of its austerity measures, Ireland dramatically reduced expenditures and raised taxes. Ireland imposed a carbon tax of €15 per metric ton of CO<sub>2</sub> on transport fuels in late 2009 and then extended this tax to nontransport liquid fuels in 2010. In 2012, the tax increased to €20 per metric ton of CO<sub>2</sub> (Gargan 2012).

Between 2010 and 2012, the cumulative revenue from Ireland's carbon tax was €919 million. Although revenue from the tax provided only about 1 percent of the government's tax revenues, it constituted 12.4 percent of the increase in tax revenues demanded by the austerity agreements over this period (Convery, Dunne, and Joyce 2013). The carbon tax allowed the government to minimize increases in labor and income taxes and helped protect the economy and citizens from austerity measures. To address fuel poverty and equity concerns, the government set aside revenues to expand weatherization and energy efficiency programs for low-income residents (Convery, Dunne, and Joyce 2013). Populations who were considered especially vulnerable to price increases, and who had limited alternative options (for example, farmers) were given partial relief from their tax liability.

## Strategies for Equitable Carbon Pricing

Carbon pricing policies can have negative effects on the poor but, with careful design, they can achieve progressive impacts.

### Minimizing regressive impacts

Carbon pricing tends to increase energy prices, creating some equity challenges. People with lower incomes typically use less energy, but energy expenditures usually constitute a larger proportion of their budgets. Fortunately, carbon pricing need not be regressive. For instance, British Columbia's carbon tax provided income tax reductions to low-income residents to compensate them for increased energy prices (British Columbia 2009). A variety of compensation schemes can be used to make carbon pricing result in progressive outcomes (Preston et al. 2013).

Companies may also face unequal difficulties in the face of carbon pricing schemes. A common challenge, especially in some developing countries, is that energy entities can have a wide range of operating efficiencies. India's energy efficiency policy for industry assigned plant-specific targets, encouraging a process of long-term, system-wide efficiency gains without threatening local employment and development (Box 13).



## BOX 13 | INDIA'S PERFORM, ACHIEVE, AND TRADE SCHEME

India's Perform, Achieve, and Trade (PAT) scheme, conceived in 2008 and implemented in 2011, is the first market-based energy-efficiency trading scheme in a developing country (Singh 2013). The Indian government established the PAT scheme to improve energy security, reduce energy deficits, and make India's industries more competitive.

In the 478 facilities it covers, the scheme aims to reduce energy consumption by 4.8 percent, equivalent to about 6.6 million metric tons of oil (Diddi 2011; Singh 2013). Each facility receives an energy-consumption-reduction target. Each entity receives tradable-energy-savings credits if it achieves reductions beyond its target, and those that fall short must buy credits to make up the difference (Bureau of Energy Efficiency 2011).

Two relevant issues with equity implications are that industrial entities across India vary substantially in their energy efficiency, and employment is always of concern. Based on extensive workshops, meetings, and stakeholder consultations, it was decided to give each plant a unique energy-efficiency target based on its baseline energy usage to avoid severe hardship, and potential shutdown. A large number of national consultants were trained and supported to gather energy-use data from all plants. One important benefit of this scheme from a national capability perspective has been greater domestic capacity in energy-efficiency monitoring (Singh 2013).

From a capabilities perspective this case is interesting both because of the extensive efforts made to include stakeholders' perspectives about policy implications, and the way in which the specific circumstances of each installation were taken into account. Given the context of large variations in efficiency, the approach facilitated broad participation and attempted to limit targets that might have resulted in undesirable impacts for capabilities, such as sudden employment losses. Conversely, it remains possible that some communities will continue to face burdens from local air pollution associated with lower efficiency plants. It will be necessary to see how both efficiencies and community impacts change over time.

**Carbon pricing can generate economic benefits – including government revenue – that can be used to secure progressive outcomes. Revenue from carbon pricing can be used to reduce other specific taxes, or to reduce general taxation to spur aggregate economic growth (Sumner, Bird, and Smith 2009). Revenues can also be directed to communities with**

particular needs, in the form of cash transfers or in-kind provisions (for example, public transit or community development). The California cap-and-trade system (Box 14) explicitly sets aside 25 percent of the revenue to be used to benefit disadvantaged communities, almost half of which (10 percent of total revenues) must be invested directly in these communities while the rest can be used for investments elsewhere that benefit the community residents. This has resulted in investments in public transportation, local development, and weatherization for low-income residents' housing (California 2014).

## BOX 14 | CALIFORNIA'S GLOBAL WARMING SOLUTIONS ACT

The U.S. State of California aims to reduce its GHG emissions to 1990 levels by 2020. In 2006, California passed the Global Warming Solutions Act, which required the state to develop a scoping plan for emission reductions, identify and monitor statewide GHGs, establish a market-based system to achieve GHG reductions, create an economic and technical board, and create an environmental justice advisory board (California 2006). Based on its scoping plan, the state chose to use a cap-and-trade system to drive emission reductions.

Initially, the California system was second only to the European Union Emissions Trading Scheme in terms of the quantity of total emissions covered, though it has since been overtaken by the aggregate emissions coverage of China's five trading systems (Song and Lei 2014). The California system is designed to reduce emissions by 16 percent between 2013 and 2020 (California 2011). The program covers approximately 394 million tons of CO<sub>2</sub>, which represents approximately 85 percent of California's total CO<sub>2</sub> emissions.

Partly due to the advocacy of the environmental justice community, and the inclusion of an environmental justice advisory board, California's cap-and-trade program now aims to protect local communities' well-being. It requires that at least 25 percent of revenues be invested in projects that benefit disadvantaged communities, a portion of which must be spent directly in these communities (California 2012). Examples include investments in public transit, weatherization for low-income residents' housing, and advances in freight management to decrease local air pollution from freight hubs (California 2014).



### Distributing Nonmonetary Co-benefits

Carbon pricing can also lead to nonmonetary co-benefits. Some benefits, such as reduced air pollution and improved human health, emerge as byproducts of lower emissions, but permit systems can also be designed so that certain developments or social benefits are built into the definition of permits or offsets. For example, several pricing schemes have defined credits or offsets to include a range of development criteria. Some of these schemes exist in the voluntary carbon market (Gold Standard 2013), the Clean Development Mechanism, and REDD+.<sup>1</sup> In all these cases, permits or offsets were explicitly defined to include social and/or environmental benefits (Mathur et al. 2014).

### Fossil-Fuel Subsidy Reform

Fossil-fuel subsidies lead to higher GHG emissions and divert resources away from development priorities. According to the International Monetary Fund (IMF), all countries subsidize fossil fuels, although the form and size of subsidies vary considerably (IMF 2013, 201). The International Energy Agency (IEA) estimates that global pretax subsidies for the production and consumption of fossil fuels are

## BOX 15 | THE CHALLENGES OF MEASURING FOSSIL-FUEL SUBSIDIES

Two general types of fossil-fuel subsidy are pretax subsidies and tax subsidies. Pretax subsidies are typically consumer subsidies that reduce the price of fossil fuels directly. They are commonly measured by comparing domestic fossil-fuel prices to international fossil-fuel prices. Using this method, the International Energy Agency (IEA) estimated global subsidies at \$523 billion in 2011 (IEA 2012). Pretax subsidies are widely used, particularly in developing countries, to protect domestic consumers from high or volatile world energy prices.

Tax subsidies are common in producer states, including many developed countries, and often aim to support domestic oil and gas sectors. Tax subsidies are typically located upstream from direct consumers and can include a wide range of actions including in-kind support of oil and gas exploration, or accelerated depreciation for equipment or assets to minimize corporate tax liabilities. Tax subsidies can be more difficult to measure than pretax subsidies because they are more diverse and because the cost of tax subsidies includes broader fiscal implications of inefficient taxation. For example, a pretax subsidy calculation would not include the negative impacts of pollution, but a tax subsidy would. In a 2013 International Monetary Fund study, the calculation for tax subsidies includes a US\$25 per tonne of carbon emission as the social cost of carbon. When such impacts are included, the overall cost of tax and pretax subsidies is enormous—over \$1.9 trillion in 2011 by one estimate, or roughly 8 percent of total global government revenue (IMF 2013).

Because fossil-fuel subsidies take many forms, transparent measurement is extremely difficult, and data are missing for many countries (OECD 2011). Many governments do not have accurate information about their own fossil-fuel subsidies (IMF 2013; IEA 2011). It is even less likely that citizens and communities are aware of the costs of subsidies. Based on the idea that understanding subsidies increases public support for reforming them, several attempts at subsidy reform have featured public communication strategies. By extension, improving international transparency about subsidies should support national efforts to reform subsidies (Victor 2009a; OECD 2011).



approximately \$523 billion annually (IEA 2012). This figure is conservative and it could be much higher, depending on how subsidies are measured. The IEA also estimated that global removal of pretax fossil-fuel subsidies would reduce global CO<sub>2</sub> emissions by approximately 2 gigatons, or 4 percent of total emissions, annually (IEA 2012).

In 2009, leaders in the Group of 20 (G-20) committed to gradually phasing out subsidies but recognized that poor communities might still need assistance (G-20 2009). In 2011, the Asia-Pacific Economic Cooperation leaders followed suit and additionally promised to establish a voluntary reporting system for fossil-fuel subsidies (APEC 2011).

### Fossil-Fuel Subsidies and Capabilities

Fossil-fuel subsidies are important from a capabilities perspective because of their economy-wide effects and impacts on fossil-fuel use.

#### **Fossil-fuel subsidies divert money from development**

Fossil-fuel subsidies divert resources from other national priorities. For instance, Yemen's government spent over 20 percent of its budget on fossil-fuel subsidies in 2009—more than it spent on education, health, and social protection programs combined (Breisinger, Engelke, and Ecker 2011). Similarly, at the peak of global energy prices in 2008, Indonesia's government spent roughly 22 percent of its budget on consumer-oriented fossil-fuel subsidies (Mourougane 2010).

The most vulnerable members of society are likely to be the most dependent on public services in the face of climate change, so reduced public support for services like education, affordable public transit, and health care affects them—and their core capabilities—particularly strongly. At the same time, without clear increases in public supports and cash transfers, and active engagement of the public, subsidy removal is difficult because it can be seen as an erosion of support for the poor. Development and capabilities benefits must be apparent in subsidy reforms if they are to be successful. In Indonesia, attempts to eliminate energy subsidies raised strong opposition for many years (Box 16). Conversely, in Iran, a broad public communications campaign was a crucial element of the reform process (Box 17).

## **BOX 16 | INDONESIA'S ATTEMPTS TO PHASE OUT SUBSIDIES**

Indonesia first attempted fossil-fuel subsidy reforms after the 1997 Asian crisis, but the reforms were too sudden and sweeping, resulting in widespread political unrest (Beaton and Lontoh 2010). From 2000 to 2003, the Indonesian government continued its attempts to reduce subsidies, but problems with the compensation mechanisms and widespread political mistrust eroded public support. In 2005, the government attempted to reform subsidies again. The 2005 reform included a cash-transfer program, increased access to health care for poor households, and reduced school fees. Subsidies to large, industrial electricity consumers were also stopped (IMF 2013). However, even after these reforms, subsidies still cost Indonesia about 4.5 percent of its GDP. The remaining subsidies are regressive, and they have eroded utilities' ability to invest in electrification and other upgrades. This failure continues to contribute to energy access challenges, particularly in remote island areas (Chung 2013; Mourougane 2010).

New reforms were initiated in 2008, along with cash transfers, a food-security program, and support for education (Beaton and Lontoh 2010). However, by 2013, government spending on energy subsidies was again greater than its spending on health, education, housing, environmental protection, and social protection combined (Chung 2013), so the government initiated another round of reforms (EIA 2014b). Modeling has suggested that fully removing subsidies could dramatically increase GDP and reduce poverty (Mourougane 2010). Although phasing out subsidies remains a work in progress, Indonesia joined other G-20 countries in their pledge to achieve this goal. This case highlights the challenges of national subsidy reform: public acceptance and support is crucial and may be best generated through active involvement.

#### **Subsidies benefit middle- and upper-income people most**

Although subsidies are often implemented to protect the well-being of the poor, middle- and upper-income people have benefited most from fossil-fuel subsidies. One study of fossil-fuel subsidies in 20 countries in Africa, Asia, the Middle East, and Latin America found that only US\$3 out of every US\$100 reached the poorest 20 percent of the population (Arze del Granado, Coady, and Gillingham 2012).

These disparities across income groups hold even when the indirect benefits of lower fuel prices, such as lower food costs, are considered (Arze del Granado, Coady, and Gillingham 2012). This suggests that, while energy subsidies are often justified to protect the poor, other strategies would actually make more effective use of limited resources. The inequities inherent in fossil-fuel subsidies are easily observed: for example, over 44 percent of the money spent on petroleum-product subsidies in Africa goes to the top quintile, only 7 percent reaches the poorest quintile (Coady et al. 2010). However, although the poor gain relatively little from direct subsidies, the small benefit that subsidies provide remains crucial to them, especially if subsidies are targeted at cooking fuels such as kerosene. Additionally, the poor may be more dependent on public services, which, in turn, are eroded by the diversion of limited government revenues to fossil-fuel subsidies. Many countries that remove subsidies have tried to minimize the negative consequences of higher energy prices for low-income families by using cash-transfers or improving public services such as education or health care.

### **Fossil-fuel subsidies impede energy efficiency and long-term growth**

Fossil-fuel subsidies can reduce energy efficiency and impede long-term growth. In parts of Sub-Saharan Africa, electricity production costs are extremely high and suppliers are often unable to fully recoup investments because of subsidized prices. Over time, this has led to insufficient invest-

ment in electricity infrastructure, which has exacerbated ongoing challenges to energy access, growth, and employment (IMF 2013). High subsidies also lead to energy inefficiency because prices are too low to encourage efficiency improvements or infrastructure reinvestments. High subsidies and inefficiency have been ongoing challenges in the Middle East and North Africa (Fattouh and El-Katiri 2013).

In fossil-fuel producing countries, subsidies lead to artificially low prices that can contribute to higher domestic consumption and foregone government revenue because fuel is consumed domestically instead of being exported. For example, Iran has become a net importer of gasoline (Hessari 2005), in part because of its high levels of subsidy and low levels of efficiency. Because domestic prices are subsidized, the country generates less revenue through domestic sales than they would if the same fuel were exported to the international market. Instead of generating revenue, gasoline imports have imposed a heavy financial burden on Iran, leaving less revenue for investments in other areas essential to capabilities. In general, evidence is growing that fossil-fuel subsidies impede long-term growth; studies of post-subsidy reform periods show higher rates of economic growth (Breisinger, Engelke, and Ecker 2011).

The Iranian case exemplifies a careful effort to protect well-being and long-term capabilities at the individual level during a major reform of fossil-fuel subsidies. The need for strong communications and banking systems were highlighted to facilitate such profound reforms.



## BOX 17 | IRAN'S SUBSIDY REFORM

In 2010, Iran embarked on the first major subsidy-reform program undertaken by an oil-exporting country. In 2008, the price of domestic (subsidized) gasoline was only 5 percent of the unsubsidized world price (Guillaume, Farzin, and Zytek 2011). As international oil prices skyrocketed, high domestic consumption resulted in lost export revenues and domestic production companies could barely cover their operating costs, let alone invest in efficiency improvements.

The 2010 Reform Act caused dramatic increases in retail prices for all energy

sources (Guillaume, Farzin, and Zytek 2011). A sevenfold price increase for petrol occurred overnight (See Table B17.3 for details). Initially, 50 percent of the revenues received through the reform were earmarked to compensate households. Each household received a designated bank account with a cash-transfer deposited in it before the price increase was announced. Simultaneously, the government spread information about the subsidy reform, and, to deter hoarding, the government publicized its stockpile of fuel that could be released into the market if necessary.

Despite the detailed planning, the Iranian reforms have faced significant challenges. It proved difficult to identify low-income households accurately and almost 80 percent of households received cash transfers, resulting in reduced revenue for the government. High inflation has since reduced the value of cash transfers, especially for Iran's poorest (Hassanzadeh 2012). A more targeted cash-transfer compensation program has been planned to help the least well off.

TABLE B17.3 | INCREASES IN GASOLINE PRICES FOLLOWING THE IRANIAN 2010 REFORM ACT

FUEL PRODUCT		PREREFORM PRICE (USD/LITER)	POST-REFORM PRICE (USD/LITER)		
			SUBSIDIZED	SEMISUBSIDIZED	FREE MARKET
Gasoline	Regular	0.10	0.10	0.40	0.70
	Premium	0.15	—	—	0.80
Diesel		0.02	—	0.15	0.35

In U.S.dollars, using 2010 conversion rates (~1 USD=0.0001 IRR)

### Low-Carbon Transportation Planning

Nearly all people depend on access to transportation to achieve a range of capabilities. Sustainable transportation policies can provide numerous benefits, simultaneously reducing carbon dioxide and other air pollutant emissions, reducing poverty, improving public health, and enhancing the overall resilience and adaptability of communities in the face of climate change. Increasing mobility and reducing CO<sub>2</sub> emissions need not be mutually exclusive goals; well-coordinated policies can lead to both low-carbon transitions in the transportation sector and greater access to mobility services.

### Transportation and Capabilities

A lack of mobility can reduce access to education, livelihoods, health care, public participation and social engagement, to name just a few of the capabilities at stake. For vulnerable groups, especially the poor, the lack of access to a reliable, efficient, and affordable means of transportation is a serious burden. Transportation was the second largest source of CO<sub>2</sub> emissions worldwide in 2012, accounting for almost a quarter of global CO<sub>2</sub> emissions from fuel consumption (IEA 2013b). Carbon dioxide emissions from transportation are growing at an average rate of 1.7 percent per year and,

following a business-as-usual scenario, are projected to increase by 70 percent by 2050 (United Nations 2013). Most of this increase is projected to come from developing countries, where rising vehicle ownership has increased CO<sub>2</sub> emissions from transportation by over 60 percent between 2000 and 2012 (United Nations 2013).

Rapid growth in automobile use has contributed to an estimated 1.24 million deaths per year. In 2012, road traffic fatalities were the leading cause of death for young people aged 15–29 and the eighth leading cause of death overall (WHO 2013). Cars and trucks emit fine particulate pollution, sulfur dioxide, black carbon, and other toxins (United Nations 2013). In the United States, for instance, levels of pollutants tend to be highest in low-income areas and children and the elderly are especially at risk from adverse health effects or death as a result of air pollution (Clark, Millet, and Marshall 2014).

Rapid growth in private vehicle use and poorly designed roads and public transportation systems have also led to congestion problems in major cities around the world (United Nations 2013). It has been estimated that congestion cost an estimated US\$101 billion globally in lost productivity and decreased fuel efficiency in 2010 (Replogle and Hughes 2012).

## Enhancing Capabilities through Low-Carbon Transportation

Increasing access to transportation is important to combating poverty and providing people with the means to seek better economic opportunities, but greater access cannot be achieved simply by building more roads. Poorly managed transportation systems can create health and safety risks for the people they are meant to serve, especially for lower income groups and other vulnerable populations. The traditional approach of building more roads and optimizing the movement of vehicles, as opposed to people and goods, has led to the exclusion of large groups of people (United Nations 2013). For many developed and rapidly developing countries, the costs created by carbon-intensive growth of the transportation sector have been damaging, especially in the cities where growth is centered. Increasing levels of motorization are harmful not only to public health, economic growth, and overall well-being but also to the climate system.

A low-carbon transportation sector focused on public transit offers a way to increase transportation—including for the poor—while avoiding the short and long-term negative implications of increased transportation emissions, road traffic accidents, and air pollutants. Several strategies have been pursued to achieve these aims.



## BOX 18 | BOGOTA'S BUS RAPID TRANSIT

Bogota's bus rapid transit (BRT) system, TransMilenio, is an example of how low-carbon transportation development can have positive impacts, both on GHG emissions and on the lives of a city's residents. With an estimated population of over 8 million in 2007, and a high population density, Bogota suffered from heavily congested roadways, high traffic fatalities, long commuting times, and severe air pollution (Turner, Kooshian, and Winkelman 2012). In conjunction with restrictions on car traffic and improved bicycling infrastructure, Bogota implemented the TransMilenio system to address these issues. A benefit of using a bus rapid transit was that it could be implemented less expensively than a comparable rail system.

This system has a daily ridership of 2 million people, and is the primary source of transportation for 30 percent of Bogota's residents (Bogotá Cómo Vamos 2013). The improved fuel economy of TransMilenio buses has also resulted in a 43 percent reduction in sulfur dioxide (SO<sub>2</sub>) an 18 percent reduction in nitric oxide and nitrogen dioxide (NO<sub>x</sub>), and a 12 percent reduction in particulate matter. Traffic injuries along the TransMilenio corridor were reduced by almost 40 percent and traffic fatalities were reduced by almost 50 percent compared with the pre-BRT system (Carrigan et al. 2013). Faster buses have contributed to a 32 percent decrease in travel time relative to the pre-BRT system for users (Echeverry, Ibanez, and Hillon 2004). The areas around the BRT corridor have benefited from increased property values and an 85 percent reduction in crime relative to the pre-BRT system because of increased lighting and security measures (Carrigan et al. 2013).

A 2013 analysis by EMBARQ found that lower-income residents most benefitted from the BRT, and ridership on the TransMilenio tends to be highest in lower-middle income groups (Carrigan et al. 2013). Feeder buses provide low-income neighborhoods with access to main trunk lines (Carrigan et al. 2013). However, the fare remains too expensive for many of Bogota's low-income residents. The Bogota government has considered subsidizing the fare price to make TransMilenio more practical for poorer residents, but instead provided a discounted fare during off-peak hours. This decision may help alleviate overcrowding during peak hours (Hutchinson 2011), but does not address the core equity concern of access for low-income riders facing temporal limits to affordable mobility.

### Increasing appropriate public transit

To curb motorization, especially in rapidly developing countries where both population and personal wealth are on the rise, a practical and attractive alternative to private vehicles must be available. Some national and local governments are choosing to reform their transportation sectors through policies that encourage public transportation use, limit the number of cars on the roads, support greater mobility and access for low-income and other marginalized groups, and create a safer and more pleasant travelling experience for everyone on the roads.

For instance, the bus rapid transit system in Bogota, Colombia (Box 18) has reduced air pollution, increased public transportation availability especially for lower-middle income groups, reduced transportation health and safety impacts, and resulted in economic benefits. An additional benefit of a bus rapid transit system is that it can be more cost-effective than rail-based systems.

### Appropriate pricing and policy signals

Another strategy for supporting low-carbon transportation development is to change underlying price structures and planning processes to discourage the growth of fossil-fuel based motorization. Such efforts can include explicit planning and land-use policies that prioritize low-carbon development or mechanisms such as congestion charges that can result in a range of benefits. For example, Istanbul's decision to pedestrianize part of its historic core resulted in decreased pollution but also contributed to economic growth from tourism.

In the United Kingdom, a congestion charge imposed on the central zone of London almost immediately resulted in a range of benefits: congestion, air pollution, emissions, and traffic accidents all decreased (Box 19). This policy also generated income, which supported public transit systems that are used particularly by low-income communities. This policy shift required minimal public investment, but did require a strong policy framework and relied on widespread public engagement and support.

## BOX 19 | LONDON'S CONGESTION PRICING SCHEME

Long travelling times, air pollution, noise, and high rates of traffic accidents were creating significant problems for Londoners. In 2003, the City of London implemented a congestion-pricing scheme within central London. Any vehicle entering the congestion area during peak hours is charged a fee. The fee was initially set at £5 and has since increased to £11.50 to compete with rising public transportation costs. Prior to implementation, the city government established demonstration projects, held public discussions, and publicized information about the charge on television and in newspapers.

By 2005, traffic in central London had decreased by 20 percent and congestion was reduced by 30 percent, with as many as 70,000 fewer vehicles within the congestion area relative to the precongestion tax period (Willumsen 2004). An estimated 50–60 percent of drivers switched to public transportation, 20–30 percent avoided the area, and others switched to carpooling and bicycles (Sadler n.d.). Journey times were reported to have decreased by 14 percent (Beevers and Carslaw 2005; Transport for London 2004). Meanwhile, CO<sub>2</sub> emissions decreased by almost 20 percent, and particulate matter and NO<sub>x</sub> decreased by 12 percent (Beevers and Carslaw 2005). Bus activity increased within the area but, thanks to improved fuel economy in London's new buses, emission levels did not increase correspondingly (Anas and Lindsey 2011).

About half the revenue from the scheme is used to improve public transportation, a service of particular importance to low-income groups (Road Traffic Technology n.d.). Early proposals to implement a carbon-emissions pricing scheme that included a £25 charge for high-emitting vehicles were rejected because the scheme would have had the greatest negative impact on families and small businesses (Tarry 2008).

### Community Forestry Management

Reducing greenhouse gas emissions caused by deforestation and forest degradation is central to climate change mitigation. More than 13 million hectares of forest are cleared every year, and forest loss and degradation are the source of 12 percent of all GHG emissions (Smith et al. 2014). Integrating forest management into climate policy action is an important mitigation strategy. However, access to forest benefits and meaningful engagement in forestry decisionmaking is essential for ensuring

the capabilities of current and future forest communities. When designed well, forestry and climate policy can enhance the capabilities of forest-dependent communities.

### Forests and Capabilities

As sources of livelihoods, food, energy, spiritual health, and shelter, as well as ecosystem services such as water and climate regulation, forests are essential to the capabilities of forest-dependent communities directly as well as to many others indirectly. The capabilities of those directly or indirectly connected to forests depend on access to forest benefits including timber and nontimber goods and services. In addition, for those living in and around forests, meaningful legal, political, social, and economic engagement in forest management is a core capability linked to social and political human rights. Participation is also a central strategy to achieve the range of other capabilities supported by access to forest benefits.

The importance of forest health to human capabilities extends beyond forest boundaries. For example, over 90 percent of Ethiopians rely on wood for fuel. By the early 2000s, fuelwood scarcity caused by deforestation had resulted in increased use of animal dung for fuel, with resulting decreases in agricultural productivity (Bishaw and Abdelkadir 2003). Household use of animal dung for fuel has also been linked to negative health impacts from indoor air pollution (Mudway et al. 2005). In addition, the health of regional watersheds is essential for the well-being of rural and urban populations—including those along the Amazon, the Nile, and the Mekong—and is intimately tied to forest vitality. In addition, forests act as a global sink for CO<sub>2</sub> emissions (or as a source, in the case of deforestation and degradation); forest health and regeneration are therefore key elements in climate mitigation and protection of a wide range of future capabilities.

### Enhancing Capabilities and Climate Action through Community Forestry

The close relationships between community capabilities, forest health, and decisionmaking authority led to a widespread interest in community forestry and indigenous peoples' rights that started in the 1970s and 1980s. Led by efforts in countries such as Brazil, Nepal, the Philippines, and India, it was

argued that strengthening community forest rights not only helps communities flourish by recognizing their customary rights to forests that they depend on, but also helps reduce deforestation and forest degradation. This theory has largely been borne out; it appears that community forestry both enhances community capabilities and mitigates climate change, provided that the community enjoys strong legal rights that are supported and protected by governments. Evidence from studies in Africa, Latin America, and Asia suggests that forests are healthiest when communities retain management authority over them (Blomley 2013; Hayes and Persha 2010; Persha, Agarwal, and Chhatre 2011). Several strategies have been used to increase capabilities and forest health, avoid emissions, and store carbon through community forestry.

### Legal Rights to Forests for Communities

Protecting forests by strengthening the rights of forest communities has been a central concern of forest communities in South America, Southeast Asia, and Africa. Evidence from a number of countries suggests that strengthening those legal protections can be vital both for enhancing equity and for mitigating climate change. For example, in Brazil, forest loss is significantly lower in legally recognized indigenous forests than outside them (RRI 2014) (Box 20). Similarly, recognition of legal land rights has been a crucial element in recent reforestation and community development successes in Ethiopia and Niger (RRI 2014).

## BOX 20 | BRAZIL'S INDIGENOUS COMMUNITY FORESTS

In Brazil, forests hold more than 63 billion metric tons of carbon, much of it stored in community forests, including legally recognized indigenous community forests (FAO 2010). Twenty-eight percent of Brazilian forest cover is government-recognized community forest (RRI 2014). Although several different types of legal rights for forest communities are recognized under Brazilian law, by far the largest legal category by area, is that of "Indigenous Lands," more than 300 of which have been legally recognized (Davis 2013). In Indigenous Lands, resident indigenous peoples have the legal right to manage the forest, exclude outsiders, and benefit sustainably. Forest loss has been 0.7 percent within Indigenous Lands compared with 7 percent outside them. From 2000–12, 27 times more CO<sub>2</sub> emissions were produced outside Indigenous Lands than within them (Stevens et al. 2014).

A recent study measuring forest carbon in Asia and Africa found that carbon storage in 30 community forests increased by 4.9 metric tons per hectare per year (on average) over three to four years (Skutsch and Solis 2011). Yet communities currently have official rights to only about one eighth of the world's forests (RRI 2014).



Figure 5 | Satellite-Detected Tree Cover Loss in Brazil, 2000-12, for Indigenous Lands in the Southwest of the Brazilian Amazon





Legal protections may also be needed to recognize the use-rights of communities to benefit from forest management. For instance, in Niger, the forest service stopped fining farmers who cut branches or otherwise managed trees on their farms, permitted farmers to harvest and sell timber from their trees, and allowed farmers to prevent others from cutting trees (WRI 2008). This legal change facilitated Niger's forest protection process. It has been demonstrated repeatedly that the right to use or harvest forest resources incentivizes communities to manage their forests sustainably (Seymour, La Vina, and Hite 2014).

### Supporting reforestation

Reforestation of degraded or deforested land offers substantial climate change mitigation benefits, and could directly increase capabilities of communities in the area. The benefits of reforestation have long been acknowledged, but policy efforts have not always been successful and communities have not always had the right incentives to empower them to undertake restoration.

An example of this emerges from Ethiopia. Ethiopia's forests once covered 30 percent of the country's land area but, by 2000, only 4 percent remained forested (Forest Trends 2013). In the 1980s, the Ethiopian government offered communities food for planting trees, but this approach proved ineffective partly because locals viewed reforestation as a punishment rather than an opportunity. When the government was overthrown, deforestation accelerated as people attempted to secure short-term economic gains from cutting down trees (Jones 2010).

More recently, the Ethiopian government has worked with nongovernmental organizations (NGOs), corporations, and the United Nations to protect and restore the country's forests, while enhancing the livelihoods of those who rely on them. By empowering local agropastoralists to secure their access and land rights, communities were given a more powerful incentive to protect the trees on their property (SOS Sahel 2008).

In addition to greater recognition of land-use rights, successful projects have also involved opportunities for local people to access resources—such as seedlings or specialized knowledge—that can

## BOX 21 | NIGER'S RECOGNITION OF COMMUNITY LAND AND FOREST RIGHTS

In Niger, policies that focused on farmers' right to manage trees on cropland have led to widescale reforestation. Historically, communities in Niger held customary rights to manage trees and forest resources. However, under colonial legal regimes, national policies and forest regulations placed trees under government ownership (including trees in cultivated fields). Government ownership of trees discouraged communities from managing them sustainably.

Beginning in the 1980s, Niger started strengthening community land and forest rights. Niger updated its Rural Code to recognize community land rights and provided training. Deforestation halted and reversed as farmers protected or planted roughly 200 million trees on 5 million hectares of land (WRI 2008).

Niger's policies have benefited farmers and bolstered their capabilities. Farmers' ability to steward their natural resources and enhance their livelihoods has grown significantly. According to one estimate, the policies and programs undertaken in Niger have generated about US\$900 million in annual economic benefits (Stevens et al. 2014). Community land rights policies reduced greenhouse gas emissions as well. Farmers' tree protection and planting has sequestered at least 30 million metric tons of carbon over the past 30 years (Stevens et al. 2014; WRI 2008).

generate long-term community benefits. Ethiopia's successful reforestation program included training for raising cash crop trees (for example, Australian eucalyptus, apple trees, and coffee trees), and using a crop calendar to enable year-round harvests (Ministry of Agriculture and Rural Development 2010; Jones 2010).

### Supporting local management

Community forestry is explicitly built on recognition of the importance of local management and decisionmaking for forest management. A remaining challenge, however, has been the limited resources of local communities to fully assume management. In some situations, there may be incomplete devolution of authority, while, in others, communities may lack training or adequate

## BOX 22 | COMMUNITY FOREST MANAGEMENT IN GUATEMALA'S MAYA BIOSPHERE RESERVE

Guatemala's contribution to global greenhouse gas (GHG) emissions is relatively small, but the country has established climate-change mitigation goals (Ministerio de Ambiente y Recursos Naturales 2009). Conversion of forest land to agricultural uses is a large source of Guatemala's GHG emissions, so the country aims to improve management of its forest resources (ALM 2009; Ministerio de Ambiente y Recursos Naturales 2009; Ministerio de Ambiente y Recursos Naturales 2001).

The Maya Biosphere Reserve, which occupies roughly 60 percent of the Petén region in northern Guatemala (Carr 2008), consists of three zones, which allow for different levels of human activity to protect both the forest and people's livelihoods (Hughell and Butterfield 2008). After extensive negotiations, the government granted 12 communities rights to manage land in the reserve. The primary product has been timber, though communities have started harvesting nontimber resources and exploring tourism. Communities have had to learn forest management, sometimes struggling to do so, and the distribution of benefits from community-based forestry concessions has been somewhat controversial. Some nonmembers claim that they have been partially excluded from benefits, but current members counter that their initial investments in managing their land justify their benefits (Taylor 2010).

Even though community-based forestry has been complicated by history, poverty, and competing interests, it has contributed to conservation of Guatemala's forest resources and better livelihoods for the country's residents (Bray et al. 2008). The international community helped Guatemala to set up the concessions for community-based forestry and could continue to help communities improve their forestry management capabilities and diversify their economic activities.

resources for long-term management (Charnley and Poe 2007). As demonstrated in the case of Guatemala's community forest concessions (Box 22), communities have had to learn how to sustainably manage timber and nontimber aspects of the forests for commercial use, which has proven difficult (Taylor 2010). Unequal access to training, community resources, and existing power dynamics can also contribute to uneven benefit sharing within community forest systems. In Guatemala,

## BOX 23 | AUSTRALIA'S INDIGENOUS PEOPLES MANAGE CONTROLLED BURNS

Australia's indigenous peoples historically used small fires to manage savanna land in the northern part of the country. European settlers displaced the indigenous peoples and discontinued their small burns. Over time, this contributed to increasingly damaging and uncontrollable wildfires, with as much as 69 percent of large ranchlands burned in dry seasons. In 2010, an indigenous corporation purchased land previously run as a pastoral station, and reinstated the tradition of small controlled burns. This change has limited wildfires to less than 3 percent of the property. Along with providing northern indigenous Australians a link to their cultural heritage and historical homeland, this project qualified as a national carbon-farming initiative. The sale of credits from this initiative supports further management of the property (Looker 2013).

this challenge confronted some community concessions, particularly those composed of new residents from other parts of the country (Charnley and Poe 2007). Careful attention to the provision of training, management capacity, and other resources is an important part of successfully supporting community forestry.

Key lessons for community forestry can also be taken from Australia's experience in supporting Indigenous peoples in traditional management of savanna land (Box 23). Encouraging traditional management methods and empowering communities through well-designed incentives can result in emissions reductions, and provide an ongoing and independent source of income that allows the community to assume full management responsibility.

### International Policy Strategies for Supporting Low-Carbon Pathways

Numerous opportunities exist to pursue low-carbon pathways while building capabilities. Many of these opportunities are at the national or local levels, but could be encouraged and supported through international action. This section draws on examples from the previous sections and recommends ways in which the international community could support these efforts. Because of overlaps among some of

the five policy sectors described earlier, the recommendations are grouped into four policy categories: equitable low-carbon energy policy; equitably shifting financial incentives; low-carbon transportation planning; and equitable forestry policy. An overarching category of recommendations focuses on supporting vulnerability assessments across all mitigation efforts. Several recommendations are cross-cutting, for instance, capacity building, and increases in financial support are required in all cases.

### Equitable Low-Carbon Energy Policy

The required energy transition will need to be supported by a suite of specific policies, including increasing electrification based on renewables, scaling up renewables' contribution to electricity grids, and pursuing energy efficiency across all sectors.

- Bilateral and multilateral finance providers should increase access to finance, credit or other targeted approaches to encourage renewable electrification and provide total energy solutions to nontraditional banking populations including women, the poor, and marginalized communities. Such approaches could include assistance to national lending agencies in the form of building capacity for dealing with non-traditional banking communities.
- There should be increased support from bilateral and multilateral finance providers to scale up of the use of renewables in countries with low access to electricity and for strengthened efficiency policies in countries with inefficient electricity grids. These efforts should include support for building the governance and policy enabling environments required to regulate and maintain renewable energy and efficiency programs.
- Bilateral and multilateral development agencies and finance providers should provide guidance and financial support to developing country governments to enable equitable energy policies.

International organizations and finance providers such as the Green Climate Fund, the World Bank, and the UNFCCC should facilitate lesson sharing among interested countries on feed-in tariff design and implementation, reducing the likelihood of unintended consequences for the most vulnerable.

### Equitably Shifting Financial Incentives

Shifting financial incentives to promote low-carbon pathways is essential for reaching mitigation goals. In addition, failing to shift incentives misses, or even undermines, the opportunities at hand to enhance the capabilities of people now and in the future. If designed well, shifting incentive structures through government policy could result in long-term benefits, and provide revenues that can be used to meet the needs of the most vulnerable and least well-off.

- Support should be provided by development finance institutions so that all countries are able to assess and publicly report their fossil-fuel subsidies and set targets for phasing out fossil-fuel subsidies. Phase-out should begin with reducing or eliminating subsidies that benefit the wealthiest individuals and communities and with the aim of providing resources to build the capabilities of the least well off, including their health, education, and capacity to adapt to climate impacts. A technical committee or subsidiary body to the UNFCCC could work with the IMF and others to develop guidance on how to assess and quantify subsidies.
- Multilateral and bilateral funders should provide the upfront finance needed to enable equitable fossil-fuel subsidy reform and equitable carbon-pricing policies. Such finance should be especially targeted to reduce the immediate impacts that confront poor populations.
- Funding and guidance should be provided for the development of strategies to implement fossil-fuel subsidy reform and carbon pricing in ways that support the capabilities of those who are least well off. International statements of support for carbon pricing, or efforts to promote international carbon markets, should also include commitments to equitable pricing.
- Equitable low-carbon plans should be mainstreamed into economic growth strategies developed by both national and international institutions.

- Capacity building and funding should be provided to support the domestic data collection and analysis that are required to assess the effects of fossil-fuel subsidy reform and carbon pricing on low-income and vulnerable populations.

### Supporting Equitable Low-Carbon Transportation

Affordable, low-carbon transportation is a central plank in shifting toward a low-carbon economy. Low-carbon transportation presents a significant mitigation potential and offers a range of benefits for equity and capabilities if well designed. These benefits include improvements in health and safety, mobility, access to employment, and financial savings. As highlighted in previous sections, infrastructure supporting low-carbon transportation requires significant upfront financial investment.

- Public international financial support for low-carbon infrastructure projects should be prioritized for projects that can demonstrate that low income, vulnerable or otherwise marginalized communities will benefit and not be negatively affected by the projects.
- National and subnational programmatic policies to support affordable low-carbon transportation should be scaled up, and programmatic plans that include strategies to ensure that co-benefits are made available to vulnerable or low-income communities should be prioritized.
- Support should be provided for impact assessments for low-carbon transportation to identify potential employment, displacements, or other impacts on low-income, vulnerable or informal populations. Support should also be provided to monitor unintended consequences as transport or building policies are implemented and once they are fully operationalized.
- Wherever possible an integrated planning approach should be used to assess and implement low-carbon transportation planning to ensure policies reinforce each other and do not lead to increased challenges for those who are least well off.

### Equitable Climate and Forestry Policy

Equitable forestry policy is a crucial part of international and national climate efforts. Discussions of equity already have contributed to the development of REDD and REDD+, and there are important safeguards being developed to help ensure that local communities benefit from climate policy and carbon offset arrangements. The nexus between community land rights and forest protection is an important area in which international institutions can help countries to undertake policies that enhance both climate action and capabilities. Support by international institutions and finance for efforts to strengthen community forest rights should be a fundamental element in policies and programs to reduce emissions from deforestation and forest degradation.

- Funders and other international institutions should facilitate policies and programs to strengthen communities' rights involving use of forest resources, management of forests, and access to the forest, and should support due process for decisions about forests.
- International institutions like the Global Environment Facility (GEF), and others with REDD+ experience, should help countries to set up concessions for community-based forestry in areas where communities commit to sustainably manage timber and other forest products.

### Vulnerability Assessments for All Low-Carbon Projects

It is important to acknowledge that all low-carbon policies could have differential impacts on capabilities. In order to ensure that the capabilities of those who are potentially most vulnerable— including women, indigenous peoples, youth, or other marginalized communities—are protected or improved, all projects should be subject to evaluation at the planning stage and monitoring during and after implementation. In addition, active stakeholder engagement and participation is an important strategy for ensuring that policies have beneficial impacts on vulnerable populations. Both of these policymaking elements require institutional capacity and resources.

- Capacity building and support should be provided to ensure that “before and after” vulnerability assessments and evaluations are carried out, to identify impacts on the capabilities of all affected groups.
- Support should be provided for participatory planning and stakeholder engagement in the development of mitigation policies across all sectors. International organizations could also engage in disseminating best practices for policy design and public engagement.

To generate international momentum and to contribute to greater wellbeing, especially among those who are most vulnerable or least well off, climate actions must also build capabilities.



# APPLYING THE CAPABILITIES APPROACH TO CLIMATE RESILIENCE, ADAPTATION, AND LOSS AND DAMAGE

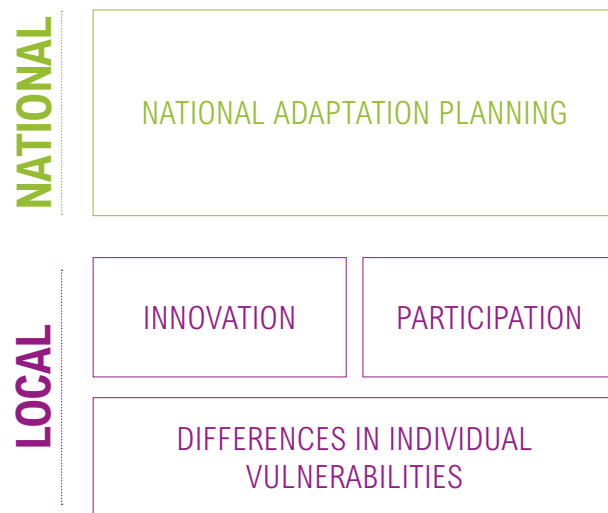
Through examining case studies from 11 countries, this chapter discusses the application of capabilities approach in understanding the challenge in the design and implementation of national and local adaptation policies and projects. This approach helps to understand the different types and levels of vulnerability and the importance of diverse and variable adaptation policies that can be designed through the participatory planning process. The international community can support these efforts through addressing the capacity needs of the most vulnerable to engage in the policymaking process and conducting research to inform long-term adaptation strategies.

As the impacts of climate change are increasingly felt, prioritizing action on adaptation becomes a pressing equity concern. If adequate action is not taken, the people most vulnerable to climate impacts and least able to adapt to them will face loss of their livelihoods and reduced social and economic opportunities.

At the same time, the fact that those hardest hit by climate change are often the least responsible for causing it raises significant equity issues. For some, including many coastal communities and small island developing states, the impacts may threaten their very existence. Meanwhile, the current and projected impacts have recently led to increasing calls for comprehensive action to address issues of loss and damage, those climate impacts to which adaptation is difficult or impossible.

In international efforts to address adaptation and resilience to climate change, much attention has been appropriately placed on addressing the needs of countries that are most vulnerable to climate change. However, identifying and addressing the needs of populations within countries, who are especially vulnerable to climate impacts, is also an essential task and is the focus of much of this chapter.

Figure 6 | **Strengthening Capabilities through Adaptation**



In this chapter, the report examines case studies, drawn from 11 countries, both developing and developed, highlighting the affect that vulnerability can have on capabilities, and how well designed policies targeting adaptation can build capabilities and the resilience of countries.





## A Capabilities Approach to Adaptation Requires Understanding, Participation, and Innovation

Applying a capabilities lens to adaptation and resilience (Box 24) serves as a reminder of the equity dimensions present in adaptation. Different populations are affected by climate change in varying ways and to differing degrees, often due to disparities in social and economic contexts and people's underlying capabilities. Moreover, climate policies themselves may not be designed in ways that take into account these diverse levels of capabilities. Just as with low-carbon development, a capabilities approach in the adaptation arena helps to identify policies that will enhance equity and build capabilities, as well as avoid unintended negative consequences, particularly for the least well off.

In this chapter we apply the capabilities approach as a lens to understand the challenges in the design and implementation of adaptation policies and projects. This lens:

- Highlights the importance of understanding differing types and levels of vulnerability, and incorporating that understanding into the design of adaptation policies;
- Shows that adaptation policies must be highly diverse and variable and based on inclusive and participatory planning processes that meet specific populations' needs;
- Supports the ability of the most vulnerable and least well off to pursue innovation in the design and implementation of adaptation policies and projects.

Each of these elements is examined using case studies from developed and developing countries, illustrating how an application of the capabilities approach supports the achievement of equity.

This chapter also highlights the importance of national adaptation planning that provides for a focus on the most vulnerable populations and ensures that capabilities are protected and strengthened through robust participatory plans based on inclusive participation.

## BOX 24 | ADAPTATION, VULNERABILITY, RESILIENCE, AND LOSS AND DAMAGE

Adaptation is defined as an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC 2007). Adaptive capacity has emerged as an important concept used to refer to the ability that individuals or communities have to adapt to the effects of climate change. Those with the greatest capabilities are most likely to have a range of resources and options available to take action, which can contribute to their adaptive capacity (WRI et al. 2011).

Vulnerability can be understood as a combination of individual or community sensitivity to a climate or nonclimate shock and their capacity to adapt to it. To reduce vulnerability to climate change, we must focus on building capabilities and adaptive capacity. Similarly, the reduction of capabilities through climate impacts or inequitable climate policies could increase vulnerability.

Resilience is the ability of a community to resist, absorb, and recover from the effects of hazards in a timely and efficient manner, preserving or restoring its essential basic structures, functions, and identity (UNISDR 2009). Stemming from analyses of ecosystems (Holling 1973) and applied in disaster management (World Bank and GFDRR 2013), resilience has been used to describe the characteristics that enable communities to deal with large shocks—both climate and nonclimate related—without suffering significant losses or being fundamentally altered.

Loss and damage have usually been viewed as the entire range of damage and permanent loss associated with climate impacts that can no longer be avoided through mitigation and for which adaptation is difficult or no longer possible. Increasingly, the relationship between mitigation, adaptation, and loss and damage is being seen as more complex, highlighting the role that each plays in influencing the other. The loss and damage attributable to climate change is expected to increase over time due to increases in frequency and magnitude of extreme weather events, as well as impacts of slow-onset events.

The analysis in this chapter ultimately supports the conclusion that, despite the highly context-specific nature of adaptation, important lessons can be drawn from diverse experiences that can inform both national and international action and ultimately build capabilities and achieve equity.



enhancing equity for those who are most vulnerable. Adaptation processes in line with development strategies that reduce vulnerabilities and increase people's adaptive capacity in a broad sense would bring immediate benefits as well as strengthen people's ability to deal with future threats (Burton et al. 2002; Huq et al. 2003; Adger et al. 2007).

Responses to climate impacts in coastal Bangladesh demonstrate the ways in which physical climate impacts can intersect with different levels of capabilities, and without well-designed policy interventions, exacerbate existing inequalities (Box 25).

The importance of considering differing types and levels of vulnerability is especially stark in efforts to build resilience in the agriculture sector, particularly in poorer rural communities. Agriculture is central to many people's livelihoods, particularly in developing countries, where it constitutes approximately 29 percent of GDP and employs 65 percent of the population (Campbell et al. 2011).

### Capabilities Reduce Vulnerability

Multiple and overlapping factors shape each person's capabilities and, as a result, influence their vulnerability to climate impacts. Gender, economic resources, physical ability, age, and ethnicity are just some of the factors that combine to make it more or less difficult for individual people to build their capabilities. Some of these factors may be equally experienced by all members in a specific community or locality, but some of them will not. For instance, gender norms about access to education or to financial resources such as credit will shape the capabilities of men and women differently.

Individuals or communities with a broader range of capabilities may have reduced vulnerability because they have access to more resources or abilities to deal with potential climate impacts. Effective adaptation policies must be sensitive to and address these differences in vulnerability and capabilities, including by avoiding approaches that exacerbate existing vulnerabilities. Policies and projects that are designed to respond to the differentiated nature of capabilities and vulnerabilities, and that also deliberately aim to build capabilities, can be highly effective in building adaptive capacity and

### BOX 25 | SHRIMP FARMING IN SOUTHEAST BANGLADESH

A combination of factors, including sea level rise and the consequent salt-water intrusion, combined with an absence of any effective government water management programs and an attractive market for shrimp, prompted an increase in shrimp farming and other types of aquaculture by larger landowners, replacing the rice and vegetable farms along the coast.

This shift—a form of adaptation that maintained or enhanced their capabilities—was facilitated by large landowners' greater adaptive capacity, in this case access to land and finance. However, this option was not available to poorer households, and their capabilities have been diminished as salinization increased and land became unsuitable for farming or other uses. Poorer villagers also face decreasing access to natural resources that, in the past, provided the rural population with materials for fuel, fodder, building, and food. Unlike wealthier community members, they may not have other means—such as access to finance—to get these necessities (Pouliotte, Smit, and Westerhoff 2009).

## BOX 26 | ADAPTATION CHALLENGES FOR FARMERS IN UGANDA

Most Ugandans have only short-term adaptation strategies that will be ineffective at dealing with long-term changes to the climate (Caffrey et al. 2013; Berman, Quinn, and Paavola 2014; Hisali, Birungi, and Buyinza 2011). To survive shocks, households employ the following strategies: drawing down savings, borrowing money, reducing consumption (sometimes withdrawing children from education), selling assets (such as livestock), increasing labor (sometimes with children), and migrating (Berman, Quinn, and Paavola 2014; Hisali, Birungi, and Buyinza 2011).

Most of these strategies have the disadvantage that they offer only short-term relief. Moreover, relatively disadvantaged households in Uganda can find it difficult, or even impossible, to use them. Education, wealth, age, gender, access to markets, access to credit, and land tenure all affect households' access to certain adaptation strategies. For example, households with higher education levels are better able to diversify their income sources. Access to credit allows households to avoid drawing down savings (Hisali, Birungi, and Buyinza 2011; Caffrey et al. 2013; Berman, Quinn, and Paavola 2014). Because of prevailing gender roles, women have relatively fewer employment opportunities, less time to seek employment, and might have fewer employable skills (Hisali, Birungi, and Buyinza 2011).

Uganda can improve its resilience to climate change by increasing farmers' access to credit, increasing labor productivity in agriculture (through investment in research and agricultural extension), improving access to markets, developing new crop varieties, increasing farmer groups' capacity to work with each other and national initiatives, and investing in other sectors such as public health and education (Hisali, Birungi, and Buyinza 2011; Caffrey et al. 2013; Berman, Quinn, and Paavola 2014).

**The connection between nutrition and livelihoods is particularly close for the rural poor, many of whom depend on subsistence agriculture (Campbell et al. 2011). As a source of food and livelihood, agriculture supports many other capabilities, such as access to education and shelter. However, there are substantial variations in the vulnerability and capabilities of communities facing potential climate impacts to agriculture. For instance, as shown in the case of Uganda (Box 26), disparities in access to credit and education shape the options farmers have when addressing climate risks.**

Identifying the most vulnerable populations or communities, particularly by looking at the intersection of physical climate impacts and social vulnerability, is among the most important challenges in developing adaptation policies and climate risk management systems. Studies identifying climate hazards and social vulnerability are typically conducted separately, but these approaches can be integrated. For example, a study of coastal areas in the United States (Box 27) examined both the potential impact of natural hazards and the populations most likely to be negatively affected because of their social and economic characteristics (Oxfam 2009). Understanding vulnerability has significant potential for improving planning and decisionmaking, particularly in order to design policies that actively build the capabilities of vulnerable

## BOX 27 | SOCIAL VULNERABILITY INDEX IN THE SOUTHEAST UNITED STATES

The Social Vulnerability Index (SoVI) was developed by the University of South Carolina and applied with Oxfam America to climate-change-related hazards. The SoVI statistically examines the underlying social and demographic characteristics of various populations and how they intersect with climate-change-related hazards.

The study used a series of maps that overlay climate-change-related hazards with social vulnerability. The maps identified hotspots in the southeastern United States at significant risk in the face of four climate-change-related hazards: drought, flooding, hurricane force winds, and sea level rise.

To determine social vulnerability, the SoVI uses 32 variables to define the multiple dimensions of social vulnerability; eight components account for most of the variation in social vulnerability in the study: wealth, age, race, gender, ethnicity, rural farm populations, special needs populations, and employment status. Roughly 80 percent of all U.S. counties that experience persistent poverty (defined as a county in which at least 20 percent of the population experiences poverty for three decades or more) lie within this region (Oxfam 2009).

From these data, it was possible to determine not only where social vulnerability is concentrated in the region but also which areas are most vulnerable to which climate-change-related hazards.

## BOX 28 | BANGLADESH'S COMPREHENSIVE DISASTER MANAGEMENT PROGRAMME

The population of Bangladesh is particularly vulnerable to natural disasters, especially those occurring near coasts, because two thirds of the population live at or below an elevation of five meters (Bangladesh 2009). Given the country's vulnerability, the Government of Bangladesh has developed a Comprehensive Disaster Management Programme (CDMP) and a National Plan for Disaster to respond to disasters and protect the most vulnerable members of its society.

Women are exposed to additional risks that are not experienced by men, before, during and after natural disasters. Women, for example, are discouraged from learning to swim. They are less likely to have access to the knowledge networks available to men about impending floods or storm surges (Reid 2014). They face sexual abuse in shelters that are set up after natural disasters. If disasters damage sanitation and drinking water infrastructure, women face harassment and attacks when they seek privacy to relieve themselves and when they travel great distances for safe drinking water (Department of Women's Affairs 2012). Girls are also less likely than boys to pursue primary education after disasters (UNISDR 2011; Department of Women's Affairs 2012).

Recognizing this level of vulnerability, Bangladesh addresses some of these issues in its disaster planning. In the first phase of the CDMP (2004–09), Bangladesh created the Disaster Management Information Centre; mapped hazards, risks, and vulnerabilities; and trained public officials (WRI et al. 2011). In the second phase (2010–14), Bangladesh identified linkages among stakeholders, levels of government, approaches to disaster-risk reduction, and approaches to climate-change adaptation. One of these linkages was the Department of Women's Affairs in the Ministry of Women and Children, which was involved in developing nationwide Disaster Risk Reduction strategies and, with support from the CDMP, is working to find culturally appropriate solutions. National disaster planners are incorporating gender concerns into overall planning, and the Ministry of Women and Children is mainstreaming these strategies into its regular projects through a number of initiatives that range from the high level (creating networks with disaster risk experts) to the practical (teaching staff and partners how to swim).

communities. It provides a critical first step toward developing informed hazard-reduction strategies and improving resilience of the most vulnerable.

Recognition of the differences in vulnerabilities and capabilities in the face of climate shocks, such as extreme weather events, can be incorporated into adaptation planning. A key example emerges from Bangladesh's continued efforts to build greater resilience in the face of tropical storms, cyclones, and flooding (Box 28). A key part of this effort has been the development of comprehensive disaster management programs that have incorporated recognition of the differentiation of populations in storm-sensitive areas. For instance, such efforts have included recognition of gender differentiation in terms of vulnerability to nonclimate risks, such as gendered harassment or social norms that prohibit girls from learning to swim, and the intersection of these with extreme weather events (WRI et al. 2011).

### Adaptation Projects Need Participatory Design

Designing effective and long-term adaptation responses requires understanding the pathways that people are currently pursuing toward greater well-being, and ensuring that interventions are aligned and ultimately support these goals. A capabilities approach enables policymakers to do this, as well as to identify the specific opportunities and barriers that make their ability to achieve well-being more or less successful. From this perspective, a capabilities approach draws attention to local contexts, suggesting that each adaptation project or need must be designed with inclusive participation by those affected by climate impacts, particularly the most vulnerable.

This is illustrated by two cases in Vietnam, both involving adaptive attempts to protect coastlines through mangrove restoration (Box 29). Unanticipated side effects were experienced in the northern project, because of a failure to incorporate the priorities of the communities they intended to protect (Bruun and Casse 2013). By contrast, in the southern project, the recognition of inclusive processes to design and implement mangrove restoration ultimately resulted in the achievement of not only increased adaptive capacity but also long-term social and economic opportunities for all members of the community.

In both cases, the national government, local governments, and international NGOs implemented the restoration projects (WRI et al. 2011; Osbeck et al. 2010). While healthy mangroves can be a solution to both climate- and nonclimate-related problems, they take time to grow, and cannot be used immediately for aquaculture or seafood collection until the forests are somewhat mature (Osbeck et al. 2010). The involved parties needed to remain engaged over a long time before the majority of the benefits of the projects were realized.

Both the Vietnam cases highlight the importance of building adaptation planning around local contexts and inclusive participation. In the Vietnamese cases the ability to engage and benefit all community mem-

bers—including the poorest—was crucial to success. By not fully understanding the local reality that poorer families had to have access to marine resources in mangroves, the northern adaptation scheme actually resulted in a loss of capabilities for some.

Slow-onset impacts of climate change, like sea level rise, threaten to break down individual and community capabilities over time. Attempts to address slow-onset events must not ignore the more immediate needs of communities, lest the intended beneficiaries lose capabilities through adaptation interventions. Such losses are important to acknowledge on their own, but also can fuel local opposition to adaptation attempts.

## BOX 29 | VIETNAM'S MANGROVE RESTORATION

Vietnam has an extensive coastline, more than 3,000 kilometers long, with two important river deltas that contain most of the country's arable land (Bruun and Casse 2013). The country is therefore very susceptible to sea level rise, storm surges, and saltwater intrusion. One way Vietnam is protecting its coastline and crops is through mangrove forest restoration. Mangrove forests buffer coastlines and coastal communities against severe weather and storm surges (IFRC 2014); they also sequester carbon and provide a rich habitat for biodiversity. War and economic development projects (for example, for aquaculture) have led to the loss of 80 percent of the country's original mangrove forests since the 1950s (Tai et al. 2009).

Different policy approaches to mangrove restoration were taken in different parts of the country. In the north, mangrove-planting projects were given protected status, which prevented local communities from using those portions of coastline for shrimp harvesting and other seafood collection. Local communities were hired to plant and protect the

mangroves but, once funding ended, the local people stopped protecting the mangroves, in part because they were opposed to the monoculture approach of the restoration (WRI et al. 2011; Osbeck et al. 2010).

In the south, however, efforts were made to incorporate the poverty alleviation concerns of local communities alongside coastline protection. This inclusive approach was especially successful in places where mangrove restoration was coupled with social services and infrastructure projects, and where the legal classification of the forests did not prohibit local communities from using the areas sustainably (WRI et al. 2011; Osbeck et al. 2010). At least 8,960 hectares have been replanted since 1994 (IFRC 2014, 4), and sea dikes and private property have been significantly better protected following mangrove restoration (IFRC 2014, 5–6).

In the northern projects, the relatively wealthy benefited most from the mangrove restoration because the projects increased their political and managerial power. The poorest people

were most dependent on the mangroves, but lost access to the rich marine life attracted to the mangrove forests, which represented an important supplement to their diets (Hue 2005). As a result they actually lost capabilities through the attempted adaptation project.

Both approaches, in the north and the south, also had very different effects on the livelihoods of men and women. Shrimp farmers are more likely to be men, so protecting the mangrove forests from commercial farming reduced men's ability to practice aquaculture for commercial gain. Women, conversely, are more likely to collect seafood such as clams and oysters that thrive in mangrove forests to provide for their families or to sell. In protected mangroves, they were not always permitted to collect those species, so an important source of calories or household income was no longer available (Osbeck et al. 2010). These patterns serve as an illustration of the importance of taking differential vulnerabilities and capabilities in specific locations into account when designing adaptation policies.

## BOX 30 | INCREASING AWARENESS OF COASTAL IMPACTS IN AUSTRALIAN COASTAL COMMUNITIES

Although coastal communities in Australia were aware of the changing climate and the likely local impacts of sea level rise and increased extreme weather events, there was a limited awareness of how they would affect the local commercial and recreational fishing, marine tourism, and aquaculture.

In response, an online planning tool was developed by Murdoch University, the University of Tasmania, and the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

The tool was based on three case studies that included different geographical features and populations to draw out key lessons on how each coastal town dealt with the effects of climate change in the marine environment (Coastal Climate Blueprint 2014).

Based on the information gathered from these case studies and the framework for vulnerability established by the Intergovernmental Panel on Climate Change, coastal communities across Australia are now able to determine their community's vulnerability to the effects of climate change in the marine environment. Based on a questionnaire identifying exposure to climate change risks and the community's natural, human, social, financial, and physical capital that may be useful in avoiding or mitigating those risks, an overall score is provided representing the vulnerability of a particular community (Coastal Climate Blueprint 2014).

This relatively simple tool enables communities that may have little to no expertise in climate science and vulnerability risk assessments, to understand their strengths and weaknesses in the face of marine climate change and prepare for future changes in climate and sea life.

Adaptation efforts that focus on the provision of knowledge and capacity building to the communities themselves are likely to be more successful in building resilience across both social and economic contexts. An example of this is an online planning tool developed in Australia to assist coastal communities determine their climate change vulnerability

and put in place long-term, locally appropriate plans for the future (Box 30). Local communities with increased capacity are empowered to make informed decisions about how to adapt to locally specific climate change threats.

Applying the capabilities approach to climate change strongly emphasizes the need to ensure that vulnerable populations are included in research on climate impacts and adaptation responses. Men and women play different roles in society and can bring different sets of resources, capacities, and knowledge, as well as different needs and requirements, to initiatives for climate change adaptation. Furthermore, there is increasing recognition of the value of indigenous knowledge in improving observations of climate change and its impacts, and for the assessment of impacts, vulnerability, and adaptation, particularly in vulnerability assessments (UNFCCC 2013a).

The Arctic Council's Arctic Climate Impact Assessment (ACIA 2005) is an example of a successful approach to combining indigenous traditional knowledge with western science that resulted in the incorporation of a broad set of observations from indigenous peoples with a regional assessment of the impacts of climate change in the Arctic. Indigenous traditional knowledge was incorporated into all aspects of the assessment and highlighted in the resulting report. Such extensive collaboration led to a more robust knowledge base on the impacts of climate change on the Arctic (UNFCCC 2013a). Indigenous and scientific knowledge strengthened each other; for example, indigenous knowledge was able to help explain how caribou migrations may be triggered by seasonal cues, such as day length, air temperature, or ice thickness, strengthening the assessments of biologists (Thorpe et al. 2001; as quoted in ACIA 2005). In cases where indigenous and scientific observations conflicted, new research opportunities were identified for assessing environmental change, deepening insights into the nature and impacts of environmental change (UNFCCC 2013a).

In Uganda, a project was proposed under the country's national adaptation program of action to include indigenous knowledge in development of the program (Box 31).

## BOX 31 | UGANDA'S USE OF INDIGENOUS TRADITIONAL KNOWLEDGE IN ITS NATIONAL ADAPTATION PROGRAMME OF ACTION

One of the projects proposed by Uganda in its national adaptation program of action (NAPA) was the indigenous knowledge and natural resources management project. The project was designed to deepen the understanding of indigenous knowledge and its potential use for strengthening adaptation. In particular, the NAPA highlighted that a “lack of frameworks... coupled with total disregard of indigenous knowledge due to misconception and disrespect of cultural values” had resulted in a lack of research in the area (Uganda 2007). During the NAPA consultation process, indigenous practices were discussed, including the use of water harvesting and seeds to purify water in times of water scarcity and the need to understand traditional food preservation techniques to increase food security (UNFCCC 2013a).

### Capabilities Foster Innovation Needed to Adapt

A capabilities approach emphasizes that people can, and do, make decisions and seek strategies that improve their overall well-being. Applying this principle to the concept of adaptation and resilience requires policies and projects to support innovation. Through innovation, people are more likely to find solutions that are both efficient and effective and locally relevant. Such bottom-up approaches will provide more lasting adaptive responses than will comparable top-down approaches.

This concept is rooted in a broader theme seen throughout this report—that the ability of the individual to innovate is underpinned by larger systems. Access to new ideas and new technologies and financial resources varies widely but is essential for innovation (Rogers 2003). From an equity perspective, it is critical to ensure that particularly vulnerable people have the resources they need to innovate, and sufficient basic social safety to allow them to attempt something new. This often requires improved access to finance for traditionally nonbanking populations, and specialized capacity building and support for women and youth.

### Innovation in agriculture

Innovation is particularly important in agriculture. Adequate food is a basic human need; in the coming decades, agricultural production will have to rise to meet the demand of increasing populations, compounded by the growing popularity of meat-intensive diets (Campbell et al. 2011; Godfray et al. 2010; Anwar et al. 2013). Adaptation policies must promote innovation by farmers in new techniques, planting times, and seed varieties. Of critical importance is that all farmers and landholders have the opportunity to innovate and do not face financial barriers. Unless climate adaptation policies specifically aim to be inclusive, well-off farmers are more likely to benefit, while others remain vulnerable. Farmers' wealth and farm size affect their ability to experiment with new practices because wealthier farmers can more easily set aside a portion of their plots to try out new methods (Tambo and Abdoulaye 2012).

For example, in Tanzania, smallholders with capital, including assets such as livestock, and direct access to extension service information, were more likely to experiment with drought-resistant maize varieties than were farmers without these resources (Westengen and Brysting 2014). Government intervention can assist in the process, providing seed finance to entrepreneurs and therefore encouraging other institutions to follow. In Zimbabwe, the United Nations Development Programme (UNDP) helped kick start seed multiplication businesses promoting climate-change-resilient seeds (UNDP 2014d). According to a report by International Development Research Centre, “seed funding might lead to debt finance, including from local commercial banks” (Tippmann et al. 2013). Supporting innovation in this way ensures that sources of livelihoods are climate-change resilient from the start, more efficiently combining climate and development objectives. These examples illustrate the role of locally driven innovation and the importance of directing global innovation toward the need of vulnerable populations. Although it was farmers themselves who experimented and developed new agricultural systems, the drought-resistant seeds and additional extension service information stems from broader social investments in research and development.

Innovation is essential, but access to the tools of innovation may be linked to the same factors that drive differentiated vulnerability and capabilities broadly.

For instance, access to key resources for agricultural innovation, such as land and credit, are highly gender-related in many countries (Demetriades and Esplen 2009; Ashby et al. 2012). Access to information can also be unequal. Gender-bias in government institutions may restrict women's access to agricultural extension services, which improve agricultural productivity in general, as well as in the face of climate change in particular (Swarup et al. 2011). Women are also likely to be engaged in many other activities, including child and elder care responsibilities, and thus may have fewer chances to build savings to withstand climate-change-related financial shocks (Demetriades and Esplen 2009). Climate change adaptation and mitigation interventions that are sensitive to gender tend to perform better (Ashby et al. 2012), as the case study of China demonstrates (Box 32).

A capabilities approach to examining innovation in the adaptation context highlights the importance of broader systems in supporting those capabili-

ties that enable individuals to innovate and adapt. Strategies to support adaptation and resilience must therefore prioritize funding pilot studies and providing access to credit for early adopters.

Similarly, some innovations extend beyond the scale of the individual and stem from the cooperation of larger entities such as NGOs, governments, or the private sector. The development of a "system of rice intensification" is an example of an attempt to harness the innovation of these players and direct it toward efforts to build capabilities of communities by improving labor efficiency, adding to soil health, and increasing yields (Box 33). Importantly, this process recognizes that providing technological improvements alone is not enough: capacity building and appropriate local engagement is essential. Adaptation must be designed to respond to the diversity of actual needs, desires, and ongoing efforts of communities trying to protect and improve their well-being.

## BOX 32 | CHINA'S APPROACH TO FARMING IN A DRY REGION

China has pursued government-led projects to improve farmers' climate resilience. Roughly one third of China's agricultural land is in the Huanghe, Huaihe, and Haihe River Plain (3H Plain), which produces half of China's grain (Dan et al. 2012; Wang and Li 2010). However, the 3H Plain lacks water resources (Dan et al. 2012).

In 2004, China initiated a regional project with the objective of improving agricultural production by addressing water scarcity in the 3H Plain. The project had a budget of US\$463 million, financed by the World Bank, and the organizing agency was the Ministry of Finance's State Office of Comprehensive Agricultural Development (CAD). In 2006, the program introduced measures specifically aimed at adapting to climate change (for example, introducing drought- and pest-resistant crop varieties) using a US\$5 million investment from the Global Environment Facility (WRI et al. 2011).

Farmers were initially reluctant to adopt new crop varieties, but they were persuaded after they experienced higher yields. Project organizers helped create water-user groups, which enabled them to disseminate information about water-efficient practices. Irrigation infrastructure was improved, which made more water available for crop production. Water-user groups took over the operation and maintenance of facilities constructed during the project. The project benefits could then be sustained after the project formally ended because affected citizens were engaged in its success. Women received particular attention. For example, a gender trust fund was created to finance training programs specifically for women (WRI et al. 2011; Wang and Li 2010).

China's program improved agricultural production in the 3H Plain and simultaneously made agricultural production more resilient to climate change (Wang and Li 2010). An extreme

drought struck part of the 3H Plain in early 2009, but farmers weathered it well because of the improved irrigation, better water management practices, and drought-resistant crop varieties (WRI et al. 2011).

The project's success was, at least in part, the result of the integrated approach adopted by CAD, its collaboration with scientists, and incorporation of farmers' views. CAD coordinated activities among Chinese government agencies in different sectors and at different levels of government. This integrated approach helped bring people with relevant expertise and authority into the project to achieve its goals. The organizers also worked with scientists to evaluate initial efforts and demonstration projects and then incorporate results from those evaluations into future project work. Finally, farmers' views were elicited through a survey to shape project activities in accordance with their needs and attitudes (Wang and Li 2010).



## BOX 33 | SYSTEM OF RICE INTENSIFICATION

A System of Rice Intensification (SRI) is an agroecological approach that focuses on better husbandry of rice crops. The concept is that changes in how rice is planted by hand will result in higher yields, require fewer inputs such as seeds, and lower methane gas emissions from paddies. Such an approach addresses food shortage issues, increases opportunities for small-scale farmers to become involved, increases profitability, and reduces emissions (Oxfam 2014; Global Commission on the Economy and Climate 2014).

Oxfam started working on SRI in 2000 and has since expanded its programs to 12 countries in Asia, West Africa, and Latin America and the Caribbean (Oxfam 2014). As of 2013, over 1.5 million smallholder farmers in groups supported by Oxfam's partners in Cambodia, Sri Lanka, and Vietnam had benefited from SRI, using both local and improved varieties of rice (Oxfam 2014). Widespread adoption of SRI has led to increases in yields in addition to improved soil ecosystems after each season of SRI practice, ultimately improving the capability of farmers to achieve social and economic well-being (Global Commission on the Economy and Climate 2014).

The same husbandry principles are applied to new crop rotations, such as potatoes in Vietnam. Rice straw and stubble are used as a mulch bed, which, as it gradually decomposes, improves the soil structure for the next rice crop. Farmers have saved between 28 and 47 percent in terms of labor, while gaining improvements of between 8 and 25 percent in yields and earning additional income of \$480–950 per hectare (Oxfam 2014). They are also increasingly adopting complementary technologies such as handheld rotary weeders, which not only improve efficiency but also address concerns over women's labor. Successful scaling up of these innovations requires an enabling policy environment, particularly in terms of building human capital and empowering communities.

SRI is currently being practiced in over 50 countries and is promoted by organizations such as the International Fund for Agricultural Development (IFAD), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the U.S. Agency for International Development (USAID), the Asian Development Bank (ADB), the Food and Agriculture Organization of the United Nations (FAO), and the World Bank (Oxfam 2014).



### Innovations in health care

The impacts of climate change on health will depend on many factors, many of which are directly related to capabilities, such as the effectiveness of a community's public health and safety systems to address or prepare for the risk and the behavior, age, gender, and economic status of individuals affected. Current estimates indicate that the impacts could extend to approximately 250,000 additional deaths per year between 2030 and 2050 as a result of heat exposure in elderly people (38,000), diarrhea (48,000), malaria (60,000), and childhood undernutrition (95,000) (WHO 2014).

Applying a capabilities approach highlights the role that innovation could play in both the prevention of these impacts and continued efforts to develop better strategies for dealing with neglected tropical diseases as well as the development of broad social systems such as early warning systems for events such as heat waves or malarial outbreaks. This has been seen in Botswana, through the creation of effective early warning systems, developed from methods historically used in agriculture, that have led to decreased vulnerability and improved human well-being (Box 34).

## BOX 34 | ADVANCE WARNING SYSTEMS FOR MALARIA IN BOTSWANA

Botswana reduced its number of malaria cases by 98 percent between 2008 and 2012, from 17,886 cases in 2008 to 311 cases in 2012, and reduced the deaths from malaria from 12 in 2008 to just three in 2012 through an innovative program that adapted a weather early warning system (Simon et al. 2013).

Malaria is caused by parasites that are transmitted to people through the bites of infected mosquitos. The disease is preventable and curable, but still kills approximately 627,000 people every year, the majority being children under five in Africa (WHO 2013). The distribution of malaria is strongly affected by climate and its transmission tends to occur in warm, humid areas where water can collect (WHO 2009). Advances in prevention and control measures have significantly reduced the malaria burden in many places, but some experts fear that climate change might impede that progress as changing temperatures and rainfall patterns expand the ranges of infected mosquitos, spreading the disease to additional parts of the world (Smith et al. 2014).

In Botswana, the outbreak of malaria is seasonal and tends to follow rainy periods. Using climate-forecasting data, previously used only in the agricultural sector, Botswana's National Malaria Control Programme can now map probability distributions of the risk of malaria. Predictions of malaria incidence can be made up to four months in advance (Thomson et al. 2006). This advance warning can give governments and healthcare institutions increased time to prepare and take preventative measures such as spraying insecticides, distributing bed nets, and distributing antimalarial drugs.

Understanding one of the risks most pertinent for well-being in the face of climate change impacts, and identifying the opportunity to innovate with existing data and methodologies, enabled Botswana to develop an early warning system which is more efficient, effective, and locally applicable. It has allowed for more targeted interventions and, in conjunction with improved prevention measures, helped the country significantly reduce its malaria burden.

## Using Capabilities to Strengthen National Adaptation Planning

Adaptation planning is an issue of extreme importance to those who are least well off or most vulnerable to climate change. The capabilities of future generations in vulnerable areas are likely to depend on robust and forward-looking adaptation planning. To ensure integration across portfolios and alignment with funding mechanisms and regulatory regimes—such planning should be focused at the national level. However, many vulnerable and marginalized communities—which include future generations—have limited or no capacity to engage in policymaking, particularly at the national and regional levels, thus they may be overlooked if their needs are not explicitly included in planning.

The design of national planning processes for climate change adaptation must include strong mechanisms for public engagement to protect the most vulnerable segments of societies and help build their capabilities. Marginalized groups and the least well off must be represented in policymaking (Foti and de Silva

## BOX 35 | WHAT ARE NAPS AND NAPAS?

A national adaptation plan (NAP) is a process by which a country can develop and implement a long-term plan for national adaptation in a way that is fully integrated with broader development plans and sectoral strategies and institutions. The UNFCCC has produced technical guidelines to help countries develop their plans, but the process for developing NAPs is highly flexible and can be designed for specific country contexts.

By contrast, a national adaptation program of action (NAPA) is a process for least developed countries to identify priority activities that respond to their urgent and immediate needs to adapt to climate change—those for which further delay would increase vulnerability and/or costs at a later stage.

Together, both processes enable Parties to the Convention to plan for both short- and long-term effects of climate change in a way that is both action-oriented and country-driven. Both NAPs and NAPAs are determined according to national circumstances.

2010). To participate in environmental decisions, poor and marginalized people need access to information and decisionmaking. Barriers to their access to policymaking and appropriate ways to insure their inclusion are presented in Table 5.

The UNFCCC has developed two mechanisms to help Parties to the Convention plan for both short- and long-term effects of climate change: national adaptation plans (NAPs) and national adaptation programs of action (NAPAs) (Box 35). To ensure that adaptation planning processes, including the development of NAPs and NAPAs, protect vulnerable segments of the population, governments should first identify the groups who are likely to be impacted by a given problem or policy and ensure that their perspectives and input are included in the planning process (Box 36). Applying a capabilities approach emphasizes the importance of allowing individuals to determine which capabilities are essential to their well-being and taking a proactive role in the planning process. Robust arguments can be made for the effectiveness of such an approach,



Table 5 | **Barriers to Access to Policymaking for the Poor and Policy Responses**

BARRIER	POLICY RESPONSE
Lack of legal criteria for enhanced engagement	Identify the poor and establish criteria to ensure enhanced access
Literacy: Basic reading skills; ability to understand technical content; language	Use the appropriate form: ensure that information around decisions and opportunities to influence decisions for the environment matches the technical understanding, literacy levels, and native languages of the poor
Access to communication channels: Poor physical access to information technology such as internet, papers, television, radio, texting	Use the appropriate channels: ensure that information relevant to decisions and opportunities to influence decisions about the environment are communicated through channels used by the poor
Cost: Official fees; travel; foregone work; time constraints; cost of childcare; corruption	Reduce costs: remove barriers, reduce official fees, and provide subsidies for participation
Exposure to risk from participating: Personal risk (physical or psychological intimidation); property risk (threat of expropriation, burglary, etc.)	Defend the individuals and organizations that promote access
Official documentation: Lack of legal identity; burden of proof	Remove legal barriers of standing and evidence
Cultural context: Expectations about who has a “voice”; meaningfulness of participation	Build capacity and raise awareness, make the voice of the poor influential

Source: Foti and de Silva (2010, 16).

based on the principle that people are more likely to participate if they believe that their input will be influential (Foti and de Silva 2010). The earlier public engagement starts, the more likely it is to influence the outcome of a given policy planning process (WRI et al. 2011).

A central tenet of the capabilities approach is the recognition that every human being is best able to decide for him or herself what it means to have achieved a state of well-being. Applying this philosophy to planning strongly supports public participation, bottom-up governance and a broad institutional/programmatic approach, as opposed to narrowly targeted, top-down adaptation mechanisms.

Locally designed and compiled adaptation plans, such as those in Nepal and Pakistan, provide excellent examples of planning processes aimed at ensuring a decentralized and bottom-up planning process. They are focused on local adaptation needs and concepts of well-being, but they are also designed to feed into top-down national planning processes. Local adaptation plans of action (LAPAs) take a “vulnerability first” approach to climate change adaptation, and can be contrasted with national adaptation programs of action (NAPAs) in their bottom-up, local approach, despite being often funded through similar institutions and mechanisms.

## BOX 36 | NEPAL'S NAPA AND CLIMATE VULNERABILITY INDEX

Climate change poses a significant threat to livelihoods in Nepal. Temperatures have been rising since the 1960s with an average increase of 0.004–0.006°C every year. Rainfall is becoming increasingly erratic, with longer dry periods and wetter, more intense monsoons (Selvaraju 2014). Reduced rainfall and glacial melt are contributing to lower water tables, reduced river flows, landslides, and flooding. More than two-thirds of agricultural land in Nepal is rainfed, thus more erratic rainfall will have negative impacts on crop yields (World Bank 2014a).

In September 2010, the Nepalese government submitted a national adaptation program of action (NAPA) to the UNFCCC that identified several climate resilience projects. To develop its NAPA, Nepal identified current and future threats from climate change. The plan proposed how to combat them through six sectoral themes (water and energy, agriculture, forests and biodiversity, public health, urban settlements, and disaster risk reduction), and three crosscutting themes (livelihoods and governance, gender, and social inclusion) (Dixit 2012).

The government commissioned a vulnerability index to quantify the climate vulnerability of Nepal's 75 districts and to prioritize the country's most vulnerable communities. Environmental stressors caused in part by climate change (for example, forest fires, landslides, floods, and biodiversity loss) were compared with adaptive capacity indicators (for example, poverty levels, literacy levels, access to irrigation technologies, and access to drinking water) to determine overall vulnerability (Ministry of Environment 2010). The vulnerability index guided the identification and prioritization of adaptation needs in Nepal's NAPA.

Nepal's NAPA process focused on gathering information on climate, community characteristics, and vulnerability at the local level (Dixit 2012). Nepal sent more than 60 government officials from different ministries to participate in consultations with villagers, village development committee officials, government agencies, and civil society representatives. These officials were tasked with collecting information on both climate impacts for each sectoral

theme in ecological regions, and on existing coping strategies used in each transect region (Dixit 2012).

To inform the public, Nepal's government created a website with information on climate change and ongoing adaptation activities. The government also staged events in rural areas to encourage climate change awareness (NCKMC 2014). Adaptation projects will address the need for climate resilient modifications for roads and bridges, water supply and sanitation, irrigation, urban development, flood protection, glacier lake outburst floods, sand mining, and education (Nepal 2014).

Financing for the development of Nepal's NAPA, and for the projects the country hopes to initiate, was provided by a number of multilateral donors, including the Least Developed Country Fund (LDCF), the United Nations Development Programme, and the British and Danish governments (Dixit 2012).

## BOX 37 | NEPAL AND PAKISTAN'S LOCAL ADAPTATION PLANS OF ACTION

Nepal developed local adaptation plans of action (LAPAs), compiled at the local level by multistakeholder teams, including vulnerable communities. The development of LAPAs was in response to perceived shortcomings of the UNFCCC's national adaptation program of action (NAPA) process undertaken by Nepal in 2010. Despite successfully integrating vulnerability assessments and prioritizing adaptation projects accordingly, the national plan was still seen, as being an overly broad, top-down estimation that did not adequately capture local needs. Since the impacts of climate change dramatically changed from one village to the other, a top-down process such as a NAPA was considered ill-equipped to cater for meeting local needs (Chaudhury et al. 2014).

During the Nepal NAPA consultation process, suggestions were made by participants to localize a NAPA, generating the idea of a concurrent planning process or LAPA. In 2011,

the Government of Nepal approved the National Framework on LAPA, becoming the first country to formalize LAPA as a national planning framework.

With LAPAs, Nepal hopes to use a national framework that integrates top-down with bottom-up approaches, mainstreams adaptation into development planning at both the national and local levels, encourages participation, identifies local adaptation needs, and strengthens institutional mechanisms for ensuring coordinated adaptation responses (Chaudhury et al. 2014; Wiseman and Chhetri 2011). Various national and local agencies are linked for the delivery of adaptation resources, with projects that will lessen the impacts of climate change on vulnerable communities and help them build the capacity to tackle future impacts (Chaudhury et al. 2014). So far, 70 LAPAs have been completed and a further 30 are under development (Chaudhury et al. 2014).

In 2012, Pakistan introduced its own version of the LAPA, at a project level, through the Climate Leadership for Effective Adaptation and Resilience (CLEAR) project undertaken by Leadership for Environment and Development (LEAD) Pakistan, a nonprofit organization (Chaudhury et al. 2014). Pakistan's approach to developing LAPAs demonstrates the ability of a local, bottom-up process to be tailored to targeted groups. Pakistan uses LAPAs to focus planning efforts on the most vulnerable districts in the southern part of the country prone to floods, cyclones, and drought. CLEAR is taking a decentralized bottom-up approach by engaging local partner organizations from the inception of the process to develop the LAPAs to address the impacts of the most pressing climate change challenges relevant to local communities. LEAD facilitates the process by creating an enabling environment and providing technical backstopping.



## BOX 38 | BOLIVIA'S PARTICIPATORY APPROACH TO ADAPTATION

Bolivia contributes only a small fraction of global GHG emissions (roughly 0.3 percent), so it focuses its efforts more on climate change adaptation than on mitigation. To reduce its vulnerability to climate change, Bolivia has undertaken a series of community-based adaptation (CBA) projects in conjunction with local and national nongovernmental organizations, United Nations Volunteers, and the United Nations Development Programme. It is funded through the Global Environment Facility's Small Grants Programme. (UNDP 2014a; State of Bolivia 2012).

Participatory approaches are required in all Bolivia's climate change adaptation actions (State of Bolivia 2012, 48). Accordingly, Bolivia prioritized its adaptation projects based, in part, on participatory consultations (Devisscher and Smith 2008). Bolivia employs a participatory approach across all six of its CBA projects, to "strengthen the communities' resiliency to climate change through awareness-raising workshops and capacity-building activities on natural resource management" (UNDP 2014b, 2).

Bolivia's indigenous population participates in a CBA project to reduce deforestation by sustainably harvesting forest products (State of Bolivia 2012). Another CBA project, which aims to protect water resources for irrigation and drinking water, includes communities in the process of identifying "alternatives for the establishment and location of irrigation systems" (UNDP 2014c, 2).

Bolivia is now one of 10 countries, including Bangladesh, Guatemala, Jamaica, Kazakhstan, Morocco, Namibia, Niger, Samoa, and Vietnam, that implement projects integrating the concept of CBA in conjunction with UNDP (UNDP 2014c, 2). UNDP's support of community-based projects seeks to enhance the resiliency of small, highly vulnerable communities and the ecosystems on which they rely, to climate change impacts. It aims to create small-scale policy laboratories and generate knowledge about how to achieve adaptation at the local level (UNDP 2014c, 2).

**Community-based adaptation (CBA) recognizes that small communities are likely to be the most affected by climate change impacts, least equipped to adapt to these changes but best placed to determine locally appropriate long-term plans. CBA recognizes that all people play an essential role in planning,**

implementing, monitoring, and evaluating solutions to adaptation. Bolivia (Box 38) has used the CBA model to inform its adaptation planning, integrating it into its national development planning. Bolivia's example demonstrates that ensuring extensive public engagement in the policymaking process and investing in improved methods of communication can build interconnectedness among communities, which, in itself, strengthens adaptive capacity.

By providing opportunities for the development of such social resources, governments can facilitate coordination and cooperation among communities, enable collective action to provide safety nets in times of crisis, and develop mechanisms to share other forms of capital (WRI et al. 2011).

Because local adaptation plans and vulnerability assessments will need to be embedded in larger national strategies, it is also important to think

## BOX 39 | THE NETHERLANDS LOOKS AT LOCAL APPROACHES TO ADAPTATION

Because much of the Netherlands lies below sea level, the country has a long history of adapting to encroaching seas and flooding. Without the country's series of massive dikes, areas below sea level would be permanently flooded, and 60 percent of the country—home to 10 million people—would be threatened by storm surges (Germanwatch 2004).

The Dutch government is integrating its adaptation policies with spatial planning policies. Integration has required it to coordinate adaptation projects with local and municipal authorities. For example, Rotterdam Climate Initiative works with nongovernmental organizations and the regional and municipal authorities in Rotterdam to make the city more climate resilient (Rotterdam Climate Initiative 2013). Projects undertaken include the augmentation and maintenance of flood prevention systems on rivers and coasts (OECD 2013).

The Dutch Ministry of Infrastructure and Environment has identified local authorities, businesses, knowledge institutions, and consumers, as well as locally focused entrepreneurs and civil society organizations, as key partners in developing local approaches to adaptation (Dutch Ministry of Infrastructure and the Environment 2014).

about the relationship between scales. The Netherlands has attempted to link scales directly and has built its national adaptation plan around local and municipal authorities (Box 39).

By focusing national adaptation planning around the experiences and needs of local communities, the Netherlands expects to be more able to develop long-term strategies that will protect the population and generate momentum across all the relevant stakeholders.

## Building International Support for Climate Resilience, Adaptation, and Loss and Damage

This section builds on the lessons identified in the previous sections and recommends ways in which the international community could help support and scale up these efforts.

### Addressing the Needs of the Most Vulnerable

Vulnerable communities have limited capacity to engage in policymaking, and they risk being overlooked if their needs are not explicitly included in planning. To meet their needs, international support should enable countries to establish decisionmaking processes that ensure the participation of all members of the community, particularly those most vulnerable and least represented in formal decisionmaking structures. Such support must recognize that specialized efforts will need to be invested in engaging particular communities, including women, indigenous peoples, people with disabilities, youth and the elderly, and others. The development of national adaptation plans is a particularly important area for support, but support must also be directed toward planning efforts at regional or local levels.

- Support and capacity building from bilateral and multilateral finance sources should enable NAPs to focus on particularly vulnerable populations and the needs of future generations within countries. Outreach and participation will help to ensure substantial input to the NAPs by those populations, but efforts should be made to increase community or locally based adaptation methods into national planning processes.

- Regional organizations or agencies should incorporate the adaptation planning of their member countries into their development or adaptation strategies. Where appropriate, communities whose ethnic ties or pastoral lifestyles cross national boundaries might benefit from adaptation planning at the regional level involving more than one country.
- The UNFCCC should provide guidance on creating a vulnerability screen for use within NAPs that would identify communities with particular vulnerability. This screen could address a range of factors contributing to vulnerability including gender, income disparities, cultural and social marginalization, and legal status.
- The UNFCCC should encourage the development of LAPAs in conjunction with NAPS and NAPAs, and provide guidance to promote best practice and participatory approaches, which focus on the needs of the most vulnerable communities.
- Financial support from multilateral and bilateral sources must be designed to ensure that it reaches local communities and targets the most vulnerable. Financing mechanisms must be designed to enable projects to be implemented by the most vulnerable and disadvantaged countries and communities, tailoring approaches to context-specific needs, and capitalizing on communities' values and strengths.
- Financial support from multilateral and bilateral sources should support sustained, long-term (10 years or more) monitoring focused on the impacts of adaptation efforts on vulnerable populations. Also, national communications to the UNFCCC can be used to identify relevant information about particularly vulnerable groups and populations and include long-term monitoring of adaptation activities and program-wide impacts on capabilities.
- Financial support from multilateral or bilateral sources should have social and environmental safeguards ensuring that the most vulnerable or marginalized are not negatively affected by adaptation finance.

- Efforts to assess potential impacts on social or cultural capabilities should be included in vulnerability and impact assessments for sector-specific policymaking. Mapping the social support systems of communities, particularly the most vulnerable, can provide insight into where climate impacts or poorly designed climate policies are most likely to hinder those support systems.

### Research is Needed for Long-Term Adaptation Strategies

Despite the importance of resilience and adaptation strategies, current research efforts are not adequate to inform effective policy design and plan for longer-term demand. For instance, very few in-depth long-term evaluations of adaptation efforts have been conducted or widely disseminated. Similarly, several key sectors for vulnerable populations, including climate-resilient agriculture and affordable climate-resilient and low-carbon building, remain underresearched globally. Greater efforts to channel and leverage international research activities are needed to draw sufficient attention to these systematically underexamined areas. It is also essential that such research be conducted with vulnerable communities to ensure that it resonates with their core needs and builds on existing practices and knowledge.

- Research funders, including bilateral, multilateral and private foundation funders, should set aside resources specifically targeted at research with particularly vulnerable populations. The benefits of such research must flow to these communities.
- Research activities with a focus on the coproduction of knowledge with vulnerable communities and populations including women and indigenous communities should seek to respect and take account of existing knowledge to ensure that outcomes are appropriate and effective.
- Financial support from multilateral and bilateral sources should support knowledge generation of climate risks, through prioritizing projects that enable risk management tools to be developed for those regions or countries most vulnerable.
- As part of its assessment reports, the IPCC should systematically identify and communicate research gaps with special attention to those research areas particularly relevant for the least well off or most vulnerable. Such areas include research specifically exploring affordable climate-resilient building, climate-resilient agriculture, disaster planning and recovery, and long-term loss and damage assessments.
- Assessments of adaptation policy actions should be systematically collected and distributed by the UNFCCC Adaptation Committee to spread effective practices and avoid repetition of policy choices with unintended consequences for the most vulnerable.

### Loss and Damage Are Likely

The IPCC has recently acknowledged the limits of adaptation, by asserting that “greater rates and magnitude of climate change increase the likelihood of exceeding adaptation limits” and that “residual loss and damage will occur from climate change despite adaptation and mitigation action” (Klein et al. 2014, 903). Knowledge of such limits is therefore important not only to “inform the level and timing of mitigation needed” but also to inform decisionmakers on how best to cope with the residual impacts of loss and damage. The IPCC has gone further to state that insufficient responses to emerging impacts are already eroding the basis for sustainable development (Klein et al. 2014, 903).

Action must be taken to plan for the effects of slow-onset climate impacts and the increased probabilities of high-impact climate-related events. It is possible that long-term development of capabilities, such as educational opportunities and economic diversification, could reduce the likelihood of serious loss in vulnerable communities. Strategic, long-term thinking about equitable approaches to loss and damage will necessarily be community specific, and entail considerable planning and option exploration.

### **National loss and damage scoping studies can help with planning**

Building on international experience with the creation of national adaptation plans, vulnerable countries should be supported to create and submit “national loss and damage scoping studies” that



assess long-term effects of climate change. These studies should identify specific loss and damage concerns with particular attention to the most vulnerable and least well off communities. Like the NAPs, these scoping studies should empower local communities and national governments to design appropriate responses to profound climate impacts. They should also have a future-oriented component that identifies potential threats and challenges from climate change, and lays out potential strategies for building capabilities and options over the long-term.

The goal of the scoping studies is to identify particular concerns; build capacity for identifying and evaluating site-specific loss and damage considerations; and start a process of long-term planning and strategizing to address loss and damage as equitably as possible. Over time, these studies could also provide a basis for requesting and distributing support.

- Countries should be supported in conducting national loss and damage scoping studies, similar to the current NAP process. Scoping studies should have a future-oriented component that seeks to find opportunities and strategies for enhancing long-term capabilities. This future-oriented component could build on several possible techniques, including participatory visioning and futures scenario building and assessment. These strategies should explicitly lay out how they will build capabilities and address the vulnerability of particular groups to loss and damage.
- Support should be made available for the initial scoping study and to establish relevant baseline and iterative monitoring focused on particularly vulnerable and marginalized communities, including the least well off and future generations. Planning should also be started for financing to address impacts identified through monitoring.
- National loss and damage scoping studies should be used to inform decisions about financial support for loss and damage.

Identifying the most vulnerable populations or communities, at the intersection of physical climate impacts and social vulnerability, is among the most important challenges in developing adaptation policies and climate risk management systems.

#### **Coordinate multilateral efforts**

In 2015, several other global processes of direct relevance to loss and damage will reach important milestones. They include the Hyogo Framework for Action under the United Nations Office for Disaster Risk Reduction (UNISDR), and the Nansen Initiative on disaster-induced crossborder displacement. The UNFCCC should seek to coordinate loss and damage efforts with these initiatives. For example, the Hyogo Framework priorities and the Nansen Initiative principles should influence the frameworks used to structure national loss and damage scoping studies. To the extent possible, scoping studies and future reporting to the loss and damage mechanism should build on reports to the Hyogo Framework to prevent unduly burdensome reporting requirements on vulnerable countries.



# CLIMATE EQUITY, CAPABILITIES AND THE 2015 AGREEMENT

This chapter uses the capabilities approach to establish a framework to address equity in the 2015 agreement through determining the content of countries' intended nationally determined contributions and the agreement itself. The capabilities approach becomes useful in designing and evaluating country contributions by defining and establishing basic guidelines for equitable climate change response. In terms of the international agreement, this approach helps to identify pathways to enhance capabilities and achieve equity at the national level through multiple elements of the 2015 agreement.

The new international climate agreement to be concluded at the end of 2015 is a critical opportunity to make significant progress toward the goal of minimizing the risks of climate change. Ideally, the 2015 Agreement would establish a framework that facilitates rapid and ambitious mitigation efforts, effectively supports adaptation and address loss and damage from climate impacts in the short term, and lays a foundation for deeper action on all fronts to protect future generations. Chapters 2 and 3 identified a range of ways that the international community could support domestic actions that build capabilities while addressing climate action.

In this section we focus on the opportunity to address equity in the 2015 Agreement. Equity has always been central to international policy efforts, and as noted earlier, the UNFCCC mandate to reach a 2015 Agreement that is “applicable to all Parties” and is also “under the Convention” has further emphasized the equity questions facing parties. Without an effective approach to equity, the 2015 Agreement is unlikely to build the necessary consensus to enable strong and ambitious commitments, and may not be concluded at all.

Two core processes toward the proposed 2015 Agreement present opportunities for addressing equity, both of which can be advanced based on an understanding of capabilities. The first is the process of determining the content of countries’ intended NDCs. The second is determining the content of the agreement as a whole.

In forming the 2015 Agreement, the capability approach stresses the importance of prioritizing the identification of concrete pathways of achieving climate action and well-being. As seen in Chapters 2 and 3, designing and implementing climate actions that build capabilities requires a range of resources and commitments. Mitigation objectives, adaptation and loss and damage, finance, capacity building, technology, and transparency and accountability are all essential elements of climate action, and thus all must be reflected in the 2015 Agreement. For each of these elements, recognizing the relationships between climate action and capabilities is a central tool for using the 2015 Agreement to advance transformative changes toward human well-being and equity in a context of climate change.

## Consider Equity in Formulating Nationally Determined Contributions

In the 2015 negotiations, intended NDCs form the central mechanism for determining and communicating national commitments to climate action.

Determining what types of actions individual countries will take and how much they will do—both in terms of the aggregate level of action undertaken by UNFCCC Parties and in terms of countries’ national levels of action—is a core equity issue. A capabilities approach is useful in this conversation because it establishes basic guidelines about what an equitable response to climate change would look like in the aggregate. In addition, using the concept of respective capabilities can provide a framework that informs how each country’s contributions should be determined according to equity.

The process for setting those contributions is a hybrid one, combining national proposals for actions with the overarching framework of the Convention.

The process will begin by those Parties ready to do so, communicating their intended NDCs to the UNFCCC Secretariat by the first quarter of 2015 and those remaining at least “well in advance” of COP 21 (UNFCCC 2013b). In accordance with the decision made by the Parties in Warsaw, the information that Parties may provide with their intended NDCs was agreed upon at COP 20 in Lima (UNFCCC 2014). While the provision of this information is not mandatory, Parties did agree an indicative list of information that could form the basis of Parties’ intended NDCs. Of particular relevance, is the invitation in paragraph 14 for Parties to include how it “considers that its intended nationally determined contribution is fair and ambitious, in light of its national circumstances, and how it contributes towards achieving the objective of the Convention as set out in its Article 2” (UNFCCC 2014).

Despite many Parties pushing for a formal review and assessment phase to follow communication of the intended NDCs (see, for example, Africa Group 2013; Africa Group 2014; Mexico 2014; CAN International 2013), no ex ante assessment was agreed in the Lima Call for Climate Action (UNFCCC 2014).

In light of both decisions at COP 20, as countries formulate their intended NDCs, this report proposes that a core bundle of national capabilities should be central to the factors used to define and evaluate the equity of countries' contributions. These national capabilities, described in Chapter 1 and building off the capabilities approach developed throughout this report, can be used to put into practice and enhance the respective capabilities aspect of the CBDR-RC principle in the Convention. National capabilities can be useful as a means to consider the degree to which countries are able to take climate action and to identify opportunities for climate action to contribute to domestic development priorities.

Capabilities need not become the sole framework for pursuing climate equity. Responsibility for climate change, including historical responsibility, remains fundamental to shaping global climate efforts. It is also relevant because of the role that emissions have played in causing significant climate impacts and affecting the capabilities of countries and particularly vulnerable populations.

Accordingly, we propose that intended NDCs be formulated and evaluated in terms of the following factors:

- Emissions responsibility, including historical, current, and projected emissions both in per capita and aggregate terms
- National capabilities, including:

- human development;
- economic capacity, including consideration of the relative costs of climate action and the economic benefits from taking climate action;
- resilience to climate impacts, including physical security and capacity to adapt in the face of climate change; and
- governance capacity and social support structures

The level of these four country capabilities can be assessed using specific quantitative and qualitative metrics, shown in Table 6 below and introduced earlier in Chapter 1, Table 3. These metrics can help assess the relative strength of different countries' capabilities to determine the level and types of action they could take. Using capabilities in this way reflects the many dimensions of equity and expressly acknowledges the differences among countries, though differences between developed and developing countries are still quite evident. Together with emissions indicators, these indicators can be instructive in assessing the degree and types of actions that countries can undertake. Although incorporating these indicators should not provide an exact answer to the question of what type and level of action a country should take, it can help provide the basis for a constructive examination and decision making process regarding intended NDCs.

Table 6 | **Proposed National Capabilities and Potential Metrics**

NATIONAL CAPABILITY	POTENTIAL METRICS
<b>Human development</b>	Human Development Index (health and education), national poverty burden, energy access, Gender Inequality Index
<b>Economic capacity</b>	Gross Domestic Product (GDP), GDP per capita, employment, debt ratio, internal access to credit, relative costs of climate action, economic benefits from climate action
<b>Resilience to climate impacts</b>	Aggregate vulnerability metrics, qualitative acknowledgment of cultural or other vulnerabilities; identification of specific physical vulnerabilities
<b>Governance capacity and social support structures</b>	Accessibility of judiciary, regulatory abilities, qualitative assessment of governance strengths and needs, health care and educational systems

When communicating their intended NDCs in accordance with the requirements of the Lima Call for Climate Action, Parties should explain how their countries' proposed actions compare with other countries' in terms of equity, based on the factors and indicators described earlier. This consideration of equity should be undertaken together with assessment of the countries' technical and economic opportunities for mitigation action and how the countries' actions contribute to the collective global goal of keeping temperature rise below 2° C.

Along with other upfront information, such as that regarding sectors and gases covered in emissions plans, countries should indicate the specific criteria and factors they use in determining the equitability of their contribution, as well as how the contribution fits into a global level of ambition to reduce emissions. (Levin et al. 2014).

### Formulating Policies and Actions in National Contributions

Incorporating equity factors into the formulation and assessment of intended NDCs, both during 2015 as well as in the 2015 Agreement, can help determine the type and level of contributions a country should make.

### Mitigation in Intended Nationally Determined Contributions

In the case of mitigation, this approach would suggest that developed countries and others with the most robust capabilities should take on emission reduction targets that clearly link to the global stabilization levels required to avoid further climate impacts. To reach the level of ambition needed, targets would have to provide for absolute, economy-wide emissions reductions, while they could also include specific long-term goals such as phase-outs of GHGs.

WRI's CAIT Equity Explorer tool (Box 40) allows comparison of countries by climate, economic, and resilience indicators to show the relative level of action countries could take in each area.

For those countries that have the ability to do so, based on their capabilities, GHG reduction targets should be put forward. However, to take account of policy effects on those who are least well off domestically, targets can be less comprehensive—such as emissions intensity targets or emission peak dates—and will need to be pursued equitably in a domestic context. Efforts should be taken to avoid future emissions and enable long-term emission reductions. For this reason, policies that include building low-carbon infrastructure—including energy



infrastructure—and developing robust land-use management may be particularly appropriate.

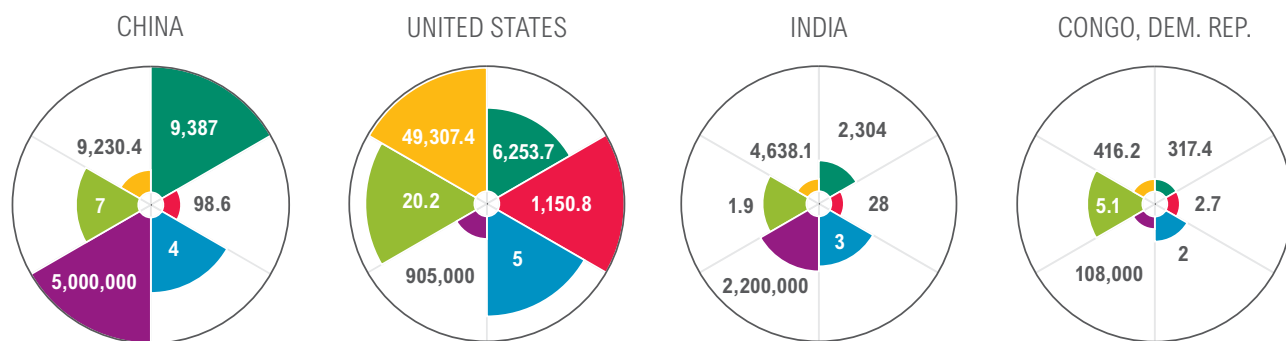
Countries with the lowest capabilities should focus on seeking opportunities for climate actions that contribute to national capabilities. This might include efforts to support renewable energy electrification, or to enable community forest management. Of course, the overarching requirement of sufficient mitigation to protect future capabilities means that in all cases, countries should commit to an increasingly ambitious type and level of contribution; there should be no backsliding from previous types of commitments such as economy-wide, absolute emissions targets. Table 7 suggests a spectrum approach to determine the type of extent of mitigation contribution that could be proposed by a range of country Parties.

## BOX 40 | CAIT EQUITY EXPLORER

The World Resources Institute has created an online tool, the CAIT Equity Explorer that can be used to examine a wide range of equity factors in national dialogues and decisionmaking processes on intended nationally determined contributions, as well as by UNFCCC Parties and stakeholders during the review and assessment phase of these contributions. Tools such as the CAIT Equity Explorer can assist countries and other stakeholders in assessing and comparing the implications of using different dimensions of equity within intended national contributions.

The factors incorporated in the equity explorer include emissions, development, vulnerability, relative costs of action, and benefits of action. It integrates indicators graphically and enables users to choose the factors they would like to consider and compare countries' profiles based on these indicators. In general, the greater the area covered in each radar chart, the greater level of action a country could undertake. As the examples below highlight, choosing different indicators provides different perspectives on relative equity among countries.

Figure 7 | WRI's CAIT Equity Explorer Tools Compares Countries by Climate Indicators



### INDICATORS

**GHG Emissions-Per Capita 2010 with LUCF** (tCO<sub>2</sub>e Per Capita)

**GEG Emissions: Total 2010 without LUCF** (MtCO<sub>2</sub>e)

**CO<sub>2</sub> Emissions – Per Capita 1850–2010** (tCO<sub>2</sub> Per Capita)

**GDP Per Capita 2010** IntI\$(2011) Per Capita

**Capacity to Adapt to Climate Impacts 2010** (On a Scale of 1-5)

**Co-Benefit of Action: Air Pollution Reduction** (People)

Source: Adapted from CAIT Equity Explorer, World Resources Institute.

Table 7 | **Examples of Potential National Contributions for Countries with High, Medium, and Low Capabilities**

	<b>DEVELOPED COUNTRIES AND OTHERS WITH HIGH CAPABILITIES</b>	<b>COUNTRIES WITH MID-LEVEL CAPABILITIES</b>	<b>COUNTRIES WITH LOW CAPABILITIES</b>
<b>NATIONAL MITIGATION TARGET</b>	Absolute, economy-wide targets that clearly contribute to global climate stabilization and consistently deepen current targets	Mitigation targets that enable long-term emission reductions, such as peak years for emissions or emissions intensity targets, while taking account of national capabilities	
<b>EXAMPLES OF SPECIFIC NATIONAL MITIGATION POLICIES</b>	Deep economy-wide reductions facilitated through fossil-fuel subsidy reforms, carbon pricing, GHG phase outs, land-use management and/or other policies	Policies tied to sectors with greatest possibility for emissions reductions with attention to capabilities. These policies could include long-term low-carbon shifts in energy systems, land-use management, and/or other policies	Highly country specific plans dependent on capabilities needs and opportunities, with a focus on policies that build capabilities
<b>POLICY PLANS SHOULD CLEARLY IDENTIFY</b>	Specific policies, programs and/or projects to be undertaken in line with above policies	Specific policies, programs and/or projects to be undertaken in line with above policies	Specific policies, programs and/or projects focused on building capabilities and undertaken in line with national strategies and plans

Source: Adapted and modified from Höhne, Ellermann, and Li 2014.

As seen in Table 7, in addition to signaling levels of effort internationally, defining their intended NDCs, and reporting on the level of fairness and ambition, provides countries with an opportunity to formulate climate actions that are deliberately designed to build the capabilities of the least well off and most vulnerable from the bottom-up. In the case of low-carbon development, the types of low-carbon policies highlighted in Chapter 2 could form the basis of policies and measures that countries include in their intended NDCs, such as those listed in Box 40.

**Including adaptation in intended NDCs**

From a capabilities perspective, mitigation is not the only dimension that should be included in intended NDCs. If the goal of intended NDCs is to create a mechanism capable of identifying policy efforts and encouraging consistently deeper national action sufficient to avoid negative climate impacts for current and future generations, then adaptation should also be included. This also

Responsibility for climate change, including historical responsibility, remains fundamental to shaping global climate efforts.



## BOX 41 | POSSIBLE EQUITABLE CLIMATE POLICIES FOR NATIONAL CONTRIBUTIONS

Examples of policies countries might put forth in their intended nationally determined contributions that incorporate equitability include:

- Equitable fossil-fuel subsidy reform with use of fiscal savings for social benefits such as health and education
- Carbon pricing systems designed equitably and with use of revenues for social benefits
- Renewable energy policies, including feed-in tariffs and off-grid distributed renewable systems, designed to expand energy access and address equity concerns
- Sustainable transport efforts focused on meeting transportation access needs for the least well off
- Community forest rights policies and programs that enable reductions in deforestation
- Adaptation planning processes that highlight the needs and interests of the most vulnerable populations, including vulnerability screens that take into account differing capabilities

reflects the position of a number of developing country Parties, who are strongly in favor of adaptation being equally reflected (Environmental Integrity Group 2014; Mexico 2014).

Given that many countries' long-term adaptation plans are not complete, fully incorporating adaptation may be pragmatically difficult for many Parties at this stage. However given the importance of adaptation to capabilities, the intended NDCs could still provide Parties an opportunity to present their adaptation planning processes, needs, and contributions. Adaptation contributions could largely focus on the national strategy and planning processes for adaptation (such as to formulate NAPs), rather than prematurely attempting to articulate specific actions or outcomes. Parties could include information about timelines, ministries involved, and sectors and geographies covered in the NAPs planning process in each country. Following 2015, as countries more fully formulate their NAPs and

other adaptation strategies, they could augment their future adaptation contributions with more specific information and plans.

### Financing nationally determined contributions

Similarly, given that pursuing equitable climate policies—for either mitigation or adaptation—may require additional financing, a capabilities approach would support the inclusion of finance for intended NDCs to the extent that it is needed for particular policy shifts. For instance, implementing equitable fossil-fuel subsidy reform may require an initial financial investment that countries could note in their proposed contribution.

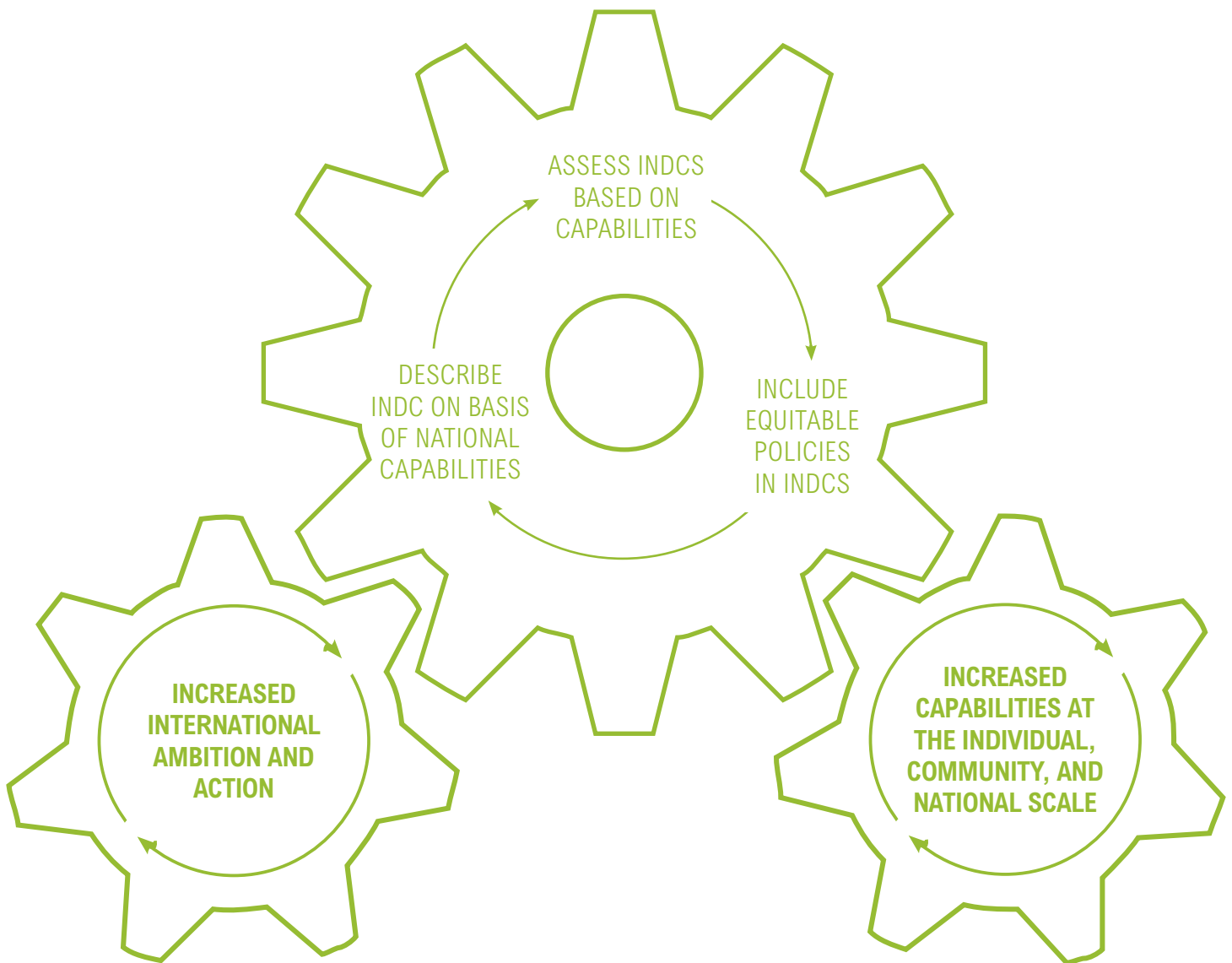
Various UNFCCC Parties have suggested that contributions from developing country Parties should be enabled and supported by finance from developed country Parties and that intended NDCs should reflect the need for and provision of finance (Least Developed Countries 2014; South Africa 2014). Particularly for countries with limited capabilities, the proposed national contributions are an opportunity to highlight their needs for support tied to specific policy issues identified as useful both for climate action and for improving well-being. One approach to addressing this link to finance would be for developing countries to indicate those activities and measures they will undertake unconditionally, without support, and those that will require international support.

Presenting their contributions in this way would enable developing countries to assess and communicate their capabilities and the degree to which support, including finance and capacity building, is needed to bolster those capabilities.

### Assessing Countries' Intended Nationally Determined Contributions

As discussed earlier, equity demands adequate global mitigation and sufficient adaptation to avoid further climate-induced reductions in capabilities, also requiring that climate actions protect or enhance the capabilities of those who are least well off or most vulnerable. Together these requirements provide basic guidance for sufficient global action in the aggregate over time. Although each country will determine its own contribution, the capabilities approach insists that sufficient global action is a

Figure 8 | **Using the INDC process to build long-term capabilities and drive greater international ambition and action**



core requirement for equity. Reviews and synthesis of the intended NDCs, undertaken either by civil society or the UNFCCC Secretariat, must therefore not only consider the range of respective capabilities and responsibilities, but must also evaluate them in the aggregate against global needs.

In whatever manner a review process is undertaken, a capability approach suggests that a robust assessment is needed to consider whether countries' contributions are equitable in relation

to one another, as well as how far they go in meeting collective goals of keeping global temperature rise below 2°C. Following the absence of a formal ex ante assessment process in the Lima Call for Climate Action, ensuring that the review process includes a rigorous aggregate assessment will require contributions from outside the UNFCCC, such as those from civil society or research institutions or by an international body such as the United Nations Environment Programme.

## Promoting Capabilities through Multiple Elements of the 2015 Agreement

As shown in Chapters 2 and 3, achieving sufficient climate action that protects and builds capabilities in the long run necessarily requires a wide range of political, institutional, and financial support. These needs cut across all elements of the 2015 Agreement. While the intended NDCs are a central tool for defining and communicating country contributions, each of the broader elements of a 2015 agreement—including mitigation, adaptation, finance, technology, transparency and accountability, and capacity building—play a role in creating a foundation for climate action that will achieve climate stabilization and protect or enhance capabilities in the long term. This section uses the capabilities approach as a lens to identify what would be required to promote the long-term goals of the UNFCCC in each of these key elements of a 2015 Agreement, both the resulting legal text as well as any accompanying decisions of the COP.

### Focus Adaptation Policies on the Most Vulnerable Populations

As described in Chapter 3, the need to adapt to the effects of climate change and address impacts on the most vulnerable populations is a central equity concern. A capabilities approach highlights the role that well-designed adaptation policies can play in protecting and increasing the well-being of those populations. The Convention recognizes the importance of adaptation for human well-being (UNFCCC 1992). In recent years, the Cancun Adaptation Framework and the process for developing national adaptation plans have underscored the importance of an emphasis on building resilience to climate impacts, especially in an integrated fashion with broader development objectives (UNFCCC 2011a; LDC Expert Group 2012).

The Cancun Adaptation Framework provides that “[E]nhanced action on adaptation should be undertaken in accordance with the Convention, should follow a country driven, gender-sensitive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities, and ecosystems, and should be based on and guided by the best available science, and, as appropriate, traditional and indigenous knowledge, with a view to integrating adaptation into relevant social, economic and environmental policies and actions, where appropriate” (UNFCCC 2010, sec. II, para. 12).

The negotiation process for the 2015 Agreement, including accompanying COP decisions, provides an opportunity to build on this framework by promoting accelerated implementation of adaptation action, with a central focus on particularly vulnerable populations. To drive this implementation and send clear long-term policy signals to key actors—including national and local governments, international institutions, the private sector and civil society—the 2015 Agreement should include a long-term adaptation goal that focuses attention on the most vulnerable populations and the need to undertake adaptation in ways that address their basic capabilities (Okereke, Baral and Dagnet 2014).

Effectively pursuing this goal will depend on widening the use of vulnerability assessments that address the intersection of climate impacts with economic, social, gender, and other factors. NAPs, other adaptation plans, and adaptation finance strategies will need to use these types of assessments to prioritize pathways for addressing impacts on the most vulnerable. This will require attention to a wide range of development priorities—including health, habitation, and water—and attention to the ways in which adaptation must be integrated with overarching development strategies and plans.

As Chapter 3 described, adaptation approaches must be highly specific to particular localities and populations, and effective adaptation planning and assessment processes require participatory processes and local engagement. Therefore, the 2015 Agreement should emphasize the importance of participatory approaches and ensure that countries receive the support needed, including finance and technical assistance, to undertake this engagement. While developing countries are clearly the focus for most of this effort, adaptation and resilience building also should address the effects of climate change on particularly vulnerable populations in developed countries.

Finally, the 2015 Agreement should also explicitly acknowledge the inherent relationship between the level of mitigation pursued by countries and the resulting effects on capabilities as emissions rise and climate change accelerates. To put this recognition into practice, the agreement should include a process to assess the degree to which the need for adaptation measures will be affected by the expected level of mitigation that countries will

undertake and the temperature trajectory that will result. In addition, the agreement should provide for an assessment of the extent to which adaptation efforts underway are successfully addressing existing and projected adaptation needs. Such assessment processes can be part of the regular cycles of action in the agreement, and Parties should be encouraged in future cycles to submit descriptions of their adaptation efforts informed by NAPs and other national adaptation plans as those reach completion (Morgan, Dagnet, and Tirpak 2014).

Specific recommendations for building capabilities through adaptation and resilience in the 2015 Agreement process:

- The Parties to the UNFCCC should use the 2015 Agreement to reaffirm and further implement key provisions in the Cancun Adaptation Framework, which states that adaptation “should follow a country driven, gender-sensitive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities, and ecosystems.”
- The 2015 Agreement should include an adaptation goal that emphasizes the need to undertake adaptation and build resilience for the most vulnerable populations. The agreement should encourage all countries, including developed countries, to develop adaptation and resilience strategies for their most vulnerable populations.
- The 2015 Agreement should explicitly recognize the relationship between the level of global mitigation effort and the adaptation response needed and assess the resulting adaptation need on a regular basis.
- The 2015 Agreement should emphasize the importance of participatory planning approaches in developing NAPs and other adaptation plans, to ensure substantial input by those populations that are most vulnerable and least represented.
- The 2015 Agreement should ensure that support and capacity building will enable developing countries to continue to develop NAPs and other adaptation strategies in conjunction with other development strategies, including regular updates on a nationally determined schedule.
- To address adaptation needs, the 2015 Agreement should support shifting international public finance to a fully balanced allocation so that adaptation receives an equal level of funding compared with mitigation.
- Countries’ national communications to the UNFCCC provide an opportunity for developing countries to identify and communicate the needs of specific populations.

Loss and damage caused by climate change impacts is already being experienced and, even with significant mitigation efforts, more impacts will occur based on already emitted GHGs (IPCC 2013). Addressing loss and damage is essential in an equitable climate regime because of the unequal impacts that will be faced by the most vulnerable, despite their having contributed the least emissions. One of the key outcomes of COP 19 in Warsaw was the establishment of an international mechanism to address loss and damage experienced by developing countries. The Warsaw International Mechanism for Loss and Damage (Loss and Damage Mechanism) was established under the Cancun Adaptation Framework and is intended to examine and find ways to address climate-related extreme and slow-onset events occurring or likely to occur in developing countries that are particularly vulnerable to the adverse effects of climate change (UNFCCC 2013b).

- The 2015 Agreement should emphasize the need for cooperation toward achieving universal access to climate information, including early-warning systems, weather stations, and agriculture-relevant climate information.
- The COP should provide guidance to the governing bodies of the Loss and Damage Mechanism, the Technology Mechanism and the Financial Mechanism of the UNFCCC should be encouraged to look for opportunities to support countries with lower capabilities to access innovative information technologies necessary to support vulnerable populations.
- The COP should support the development of national loss and damage scoping studies, highlighting the importance of addressing loss and damage through a permanent but dynamic

process in countries. These scoping studies would assess the current and future impacts of climate change leading to loss and damage and approaches to deal with those effects in each country.

- The COP should recognize the need for collaboration and coordination among the Loss and Damage Mechanism and other United Nations disaster risk reduction programs, such as the Hyogo Framework for Action under the United Nations Office for Disaster Risk Reduction and the Nansen Initiative on disaster-induced cross-border displacement.

### Target Finance to Build Capabilities

Climate finance will be essential to the task of undertaking equitable climate action in line with a capabilities approach. To support capabilities, and address equity in climate finance, the 2015 Agreement can play three key roles:

- Create the post-2020 framework necessary to generate the level of finance and investment needed to pursue low-carbon development and to build resilience and adapt to climate impacts, based on countries' capabilities
- Send a strong policy signal to financial institutions that finance and investment should be directed toward equitable climate action that builds capabilities, such as those policies described in Chapters 2 and 3, and that finance should be accessible to those who are least well off and most vulnerable
- Promote the alignment of development finance with climate objectives to ensure that development priorities are implemented in a way that builds capabilities in a changing climate.

### Generating the finance and investment needed

The recent report of the Global Commission on the Economy and Climate demonstrated that climate action can provide substantial economic benefits. With US\$90 trillion set to be invested globally in urban, land-use, and energy infrastructure in the next 15 years, numerous opportunities are available to advance low-carbon development at relatively low cost, including in countries with lower levels of

capabilities (Global Commission on the Economy and Climate, 2014).

Yet for many developing countries, upfront investment to pursue low-carbon pathways will still be necessary; the investment needed to achieve the level of mitigation and adaptation necessary to protect future generations from the impacts of climate change is several orders of magnitude larger than what current financial flows, public and private, can provide. It has been estimated that between now and 2050, developing countries alone will require an additional \$531 billion per year of investment in energy supply and demand technologies to keep average global temperature rise below 2°C (Polycarp, Brown, and Fu-Bertaux 2013). Climate finance flows to developing countries currently total \$165 billion annually, though only \$34 billion of that total comes from developed countries (Climate Policy Initiative 2014).

Financial support is needed to enable the kinds of policies described in Chapters 2 and 3. In many cases, shifts to low-carbon energy, transport, and infrastructure and the implementation of effective adaptation and resilience actions will require significant upfront investment. However, many of the countries in which these efforts will be necessary will be unable to finance them directly. Addressing these finance needs so that those countries with less robust national capabilities can take climate action will depend on the new international agreement catalyzing a scale-up of various types of finance in the post-2020 timeframe. The financial pathways needed to support the commitments made under the 2015 Agreement include direct international grants, concessional and nonconcessional lending, guarantees to reduce the risk in innovative investments, and the involvement of the private sector, including small and medium enterprises.

To ensure that finance is available to enhance the capabilities of countries and communities, the 2015 Agreement must create a new framework for post-2020 climate finance. The goal agreed to at Copenhagen and Cancun to mobilize \$100 billion in climate finance annually by 2020 sets an important initial benchmark for the 2015 Agreement to use as a floor for climate finance in the post-2020 period. The 2015 Agreement can also set another key marker for post-2020 finance by identifying targets for future replenishment of the Green Climate Fund.

Beyond these essential elements to set a foundation on finance, the 2015 Agreement should also link post-2020 finance to developing countries' identification of the finance needed to achieve the nationally determined contributions they put forward. Developing country Parties should explicitly be given an opportunity in their intended NDCs to identify two sets of policies and actions. The first will include the level of ambition committed to on the basis of existing domestic resources and the second, acknowledging the importance of capabilities, will identify the increased ambition achievable with international support. To enable these countries to build their capabilities and take the enhanced action, finance commitments in the 2015 Agreement should be linked to the needs expressed in the intended NDCs, including a mechanism to ensure that those finance and investment needs will be met.

To meet these financial commitments, developed countries remain responsible for supporting developing countries to undertake climate action, as laid out in Article 4 of the UNFCCC, and clearly continue to have a lead responsibility for finance. Nonetheless, given the shifting global economic landscape, applying a capabilities approach to climate finance supports recognition in the 2015 Agreement of the full range of global climate financial flows, not just from developed to developing countries. Given their growing capabilities, many developing countries with relatively robust capabilities are indicating their readiness to make

financial commitments, either to support significant South-South financial flows or to contribute to the capitalization of the Green Climate Fund (see, for example, Mexico 2014; Marshall Islands 2014; South Africa 2013; China 2014).

A recurrent theme throughout this report has been the need for adequate climate finance, beyond existing North-South flows, to provide the upfront finance needed to drive equitable climate policies. Providing the opportunity for all Parties to contribute is an important first step. The 2015 Agreement can create the framework for post-2020 climate finance, by recognizing a range of financial contributions, including quantitative pledges, targets, and actions, as well as qualitative commitments on domestic policies and programs aimed at mobilizing climate finance. All Parties should be encouraged to contribute to the global discussion on climate finance through indicating their intention as to finance in their intended NDCs, recognizing its importance to building capabilities and achieving equity.

It is becoming apparent that despite best efforts to increase global public finance, even ambitious targets will fall short of the level of finance needed to shift investments and keep global temperatures below 2°C. The 2015 Agreement must therefore play a key role in creating a 2020 framework that supports and guides long-term involvement of the private sector in climate finance, particularly including businesses in developing countries. From



a capabilities and equity perspective, this calls for not just an increase in private-sector investment, but a focus on ensuring that such investment is directed toward building the capabilities of the least well off and most vulnerable. This presents a particularly unique challenge given the difficulties in directing private finance and putting safeguards in place.

The 2015 Agreement, therefore, has a dual role in promoting equitable private finance. First, it should galvanize support to ensure public funding flows are directed, where appropriate, toward leveraging private-sector investment. The Parties should agree on the importance of directing such support toward sectors that provide opportunities to build capabilities. Critically, the Parties should highlight the importance of financing developing-country businesses—especially reducing risk for small and medium enterprises—as a way to support innovation and build capabilities. Second, it must also highlight the importance of targeting public funding toward projects for which private funding is likely to remain scarce: historically, adaptation and resilience projects in low-income countries (which receive just 2.5 percent of foreign direct investment to developing countries). While concessional lending and leveraging the private sector may be appropriate for developing countries that have greater capabilities, those with lower capabilities may still require substantial grant-based finance.

### **Directing the finance to build capabilities**

The challenge for climate finance goes much further than just finding more money; it is also fundamentally a governance challenge. Tackling climate change will require transformational approaches that accelerate the shift to low-carbon pathways and bolster climate resilience in ways that are also fully integrated with efforts to build capabilities and enhance equity. The 2015 agreement can play an important role by providing guidance to multilateral and bilateral finance institutions, including the GCF, to focus attention on these types of policies.

This includes ensuring that finance and investment is available for the types of climate actions described in Chapters 2 and 3 of this report. A range of financial instruments should be provided to enable developing countries to pursue low-carbon policies that take equity into account and help build capabilities, such as those described earlier involving fossil-fuel subsidy reform, carbon pricing, renewable energy provision, sustainable transport and community forest protection (Polycarp, Brown, and Fu-Bertaux 2013).

At the same time, finance should be provided for adaptation focused on building the resilience of the most vulnerable populations and taking into account the social and economic contexts that affect capabilities and vulnerability.



In addition, those requiring finance in many policy areas are likely to be “nontraditional” recipients, including women, low-income people, indigenous peoples and otherwise vulnerable or marginalized communities. As highlighted in this report, individuals within these communities have the potential to develop effective and locally appropriate solutions but first require access to finance. Financial institutions should enable these communities to access funds and enable them to innovate, take risks and build locally appropriate enterprises to drive solutions essential to building capabilities and the achievement of equity.

The orientation of international public finance can also play a critical role in leveraging domestic support to enable institutional capacity building and buy-in within countries. Thinking more broadly about the role of climate finance in increasing capabilities supports a model of climate finance that supports full recipient country ownership. Accordingly, finance must be prioritized toward readiness and capacity-building strategies that build long-term national and subnational institutions and systems (Polycarp, Brown, and Fu-Bertaux 2013).

This also includes delivering and implementing climate finance in line with national low-carbon and adaptation strategies and plans, as well as providing support for developing and updating those plans as needed. In addition, a capabilities approach entails providing support for government capacity to develop and oversee policies, build linkages among ministries and with local government, and engage the private sector and civil society. To achieve this, continued support will be essential for finance mechanisms that enable countries to steer the strategic direction of finance implementation, including national finance strategies, and to have direct access to finance.

### **Aligning development finance with climate objectives**

In addition to leveraging “new and additional” finance and increasing the accessibility of climate finance, the 2015 Agreement provides the opportunity to further align existing development finance with climate objectives. To date, financing for climate and development has been institutionally fragmented despite significant overlaps in investment needs.

Close to one quarter of all development assistance currently goes to sectors that are highly relevant to climate change because they are highly climate sensitive or offer sizeable mitigation opportunities: \$11.4 billion of total overseas development assistance in 2011 was for the energy sector, \$10.7 billion for agriculture, and \$12.6 billion for transport (OECD 2014).

As the climate changes, development aid must take into account climate impacts and hazards and plan accordingly, particularly to build the long-term capabilities of individuals and communities. Aligning development finance would not entail shifting funds from development to climate purposes, but rather investing those funds in ways that ensure that both development aims and climate objectives are met. For instance, investments in the water sector or agriculture can be made with climate resilience embedded. Infrastructure investments can be made in ways that encourage low-carbon approaches and also help ensure resilience.

Key recommendations for a proposed framework within the 2015 Agreement to ensure that climate finance is adequate, addresses equity considerations, and incorporates an emphasis on capabilities are:

- The 2015 Agreement should link the finance to be provided in the post-2020 period with the finance needs communicated in developing countries’ national plans and intended NDCs to strengthen their capabilities.
- The 2015 Agreement should provide for and recognize financial contributions coming from a range of countries, including developing countries in a position to do so based on their capabilities.
- The 2015 Agreement should also urge that adaptation and climate resilience finance be directed toward the most vulnerable populations, possibly by using social and economic vulnerability criteria.
- The COP should emphasize the importance of integrating considerations of climate risk and vulnerability assessments into future development aid. Furthermore, it should highlight the importance of developing guiding principles



for international development finance, which explicitly consider linkages to climate finance and harmonization of approaches.

- The COP should emphasize the importance of providing support for country readiness and the development of long-term national institutions and strategies as a way to enhance national capabilities.
- In providing guidance to the Green Climate Fund and Global Environment Facility, the COP should emphasize the need to support countries to undertake equitable climate policies, such as those involving fossil-fuel subsidy reform, carbon pricing, sustainable transport, and renewable energy deployment. The COP should also highlight the need for climate finance to be accessible to nontraditional banking populations including the poor, women, and other marginalized groups.

### Build Capacity to Strengthen Capabilities

Many governments in countries where capabilities are limited are still unable to undertake the analysis, planning, and coordination they need to formulate and undertake climate actions (UNFCCC 2014). Moreover, the private sector and civil society often require training and technical assistance to effectively pursue low-carbon and climate-resilient activities. Many factors have contributed to the absence of effective capacity building, including a lack of long-term funding and commitment by financial institutions and governments (GEF 2013).

Given the ongoing concerns about capacity building, addressing the need for enhanced capacity is a fundamental condition for success in the effort to shift to low-carbon and climate-resilient economies and for building the capabilities of countries. Robust capacity-building efforts can further the integration of a capabilities approach across all elements of the 2015 Agreement. The agreement provides the opportunity to address the obstacles to effective capacity building and build greater international consensus and consistency in funding and commitment.

To meet these objectives, the 2015 Agreement should establish a dedicated capacity building facility (Morgan, Dagnet, and Tirpak 2014). The facility

would act as a focal point to design, coordinate, support, and manage all capacity building activities under the UNFCCC. This would include support for capacity to:

- Design and implement climate policies and programs, including both low-carbon pathways and climate resilience
- Collect and assess climate data and information, including emissions data, climate impacts, effects of climate policies, and implications on capabilities, particularly for the most vulnerable and least well off
- Coordinate effectively across ministries and among levels of government
- Engage with and ensure inclusive participation of civil society, including the most vulnerable and least well off populations
- Engage with private sector, including small and medium enterprises.

In addition, Parties should agree to provide capacity building through bilateral programs across all areas of the agreement, including mitigation, adaptation, technology, and transparency and accountability. The agreement should also welcome capacity building and cooperation among developing countries to enable shared learning and technical assistance.

### Use Innovative Technologies to Build Capabilities

The availability of technology is often highly relevant to building capabilities and undertaking effective and equitable climate action. The dissemination and use of low-carbon and climate-resilient technologies and practices can be essential to the ability of countries with limited capabilities to take action. The Convention requires Annex II Parties to “take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly to developing countries to enable them to implement the provisions of the Convention” (UNFCCC 1992, Article 4.5).

In 2010, COP 16 in Cancun established the UNFCCC Technology Mechanism, consisting of two

bodies, the Technology Executive Committee (TEC) and the Climate Technology Center and Network (CTCN) (UNFCCC 2010). The Technology Mechanism's mandate is geared toward fostering innovation and technology development as opposed to a limited focus on technology transfer. It is intended to promote innovation of environmentally sound technologies and their diffusion through cooperation and international partnerships and by enhancing the ability of developing countries to maintain, operate, and adapt technologies. However, the Technology Mechanism has been constrained in achieving its mandate largely by funding limitations (Gehl Sampath, Mugabe, and Barton 2012).

In 2013, the UNFCCC Secretariat surveyed the technology needs of developing countries. For adaptation, crop management was a priority, including technologies for crop improvement, new varieties, and drought-resistant, saline-tolerant and short-maturing varieties (UNFCCC 2013a). Mitigation technologies prioritized included renewable energy technologies such as solar electricity, biomass, and biogas, followed by efficient lighting and wind turbines.

Technologies can be particularly important to enable the most vulnerable and least well off to take action (OECD/IEA 2010). As described in Chapter 2, distributed solar energy technologies have enabled communities lacking access to grid-based electricity to achieve improvements in health and increased economic opportunities for both men and women. In many instances, such as with rice cultivation, an innovative practice does not require sophisticated technology but may require significant research concerning its efficacy and feasibility (Oxfam 2014). Furthermore, important technological innovations for a particular locality may involve a focus on dissemination of indigenous practices that have fallen into disuse. Applying a capabilities approach to understanding technological needs forces a broader understanding of technology transfer that highlights the importance of supporting research, fostering innovation, and identifying and implementing locally appropriate technology or know-how.

The ability of developing countries to “leapfrog” technology innovation and adopt the most innovative practices depends on technological absorption

capacities and government intervention that may not be in place (Gallagher, Holdren, and Sagar 2006). Successful technology projects carefully select the appropriate technology to transfer, taking into account the local reality into which the technology will be transferred and understanding the capabilities of the potential end users. Successful implementation will contribute to developing the country's capacity to adopt further technological developments. This approach can enhance capabilities and enable countries to “assess the need, select, import, assimilate, adapt and develop the appropriate technologies” (Kathuria 2002).

From a capabilities perspective, the 2015 Agreement can play an essential role by emphasizing the need to build the capabilities and absorptive capacity of countries so that they can deploy and use innovative technologies. In particular, attention must be paid to the implications of specific innovative technologies for the least well off and most vulnerable populations. Innovations must be designed, for example, to allow communities without energy access to adopt renewable energy on a broader basis, such as through the use of improved battery storage technology (Alliance for Rural Electrification 2013). The 2015 Agreement should empower creation of a dedicated facility for joint research, development, and deployment (RD&D) programs with an emphasis on technologies that can be used by particularly vulnerable or marginal populations.

Recommendations aimed at enhancing the role of the Technology Mechanism to achieve equitable and appropriate technology diffusion to those most vulnerable and least well off include the following:

- The Technology Mechanism should be anchored in the 2015 Agreement, ensuring enhanced action on technology development and transfer within the ambit and objectives of the agreement.
- The Technology Mechanism should be explicitly empowered to create an RD&D facility with a focus on fostering innovative technologies aimed at the most vulnerable and least well off.
- The 2015 Agreement should emphasize the importance of undertaking readiness work, assisting the recipient country to assimilate potential

technologies in a way that builds its long-term capabilities and enables new technology to be widely adopted.

- The COP should explore ways to link the Technology Mechanism and the Green Climate Fund to ensure adequate funding for the deployment of innovative technology and the dissemination of underused indigenous technologies.

### Focus Transparency and Accountability on Capabilities

Transparency and accountability are essential for a climate agreement capable of tracking progress and deepening climate action over time. Identifying and reporting information on national emissions, on the effect of mitigation policies, and on financial flows can provide an important means of building trust and enabling cooperative action among countries. The 2015 Agreement provides an opportunity to establish a goal for a post-2020 measurement, reporting, and verification (MRV) framework that moves toward more uniform MRV and facilitates the evaluation of progress on climate action. It can also help in providing increased data and information about the ways in which climate policies directly affect capabilities in a country.

Despite the importance of implementing a comprehensive system for MRV, however, the success of MRV largely depends on the governance capabilities of the Parties. Parties must have sufficient technical expertise available, be capable of conducting assessments, and have the institutional capacity to effectively manage these processes. Without sufficient resources, MRV requirements are likely to encumber already stretched governance systems in many countries. Such differences in national governance capabilities means that attempts to include comprehensive MRV systems in the 2015 Agreement must factor in the time and resources necessary to support MRV across diverse national circumstances.

The framework for MRV that emerged from COP 15 in Copenhagen and COP 16 in Cancun provided for differentiation between developed and developing countries – “international assessment and review” for developed countries and “international consultation and analysis” for developing countries (UNFCCC 2009; UNFCCC 2010). While this differentiated approach addressed the different capabilities and national circumstances of developing and developed countries, it has not yet achieved a more robust common transparency and MRV framework. A stepwise approach to implementing a common framework for all countries is needed, so that developing countries



with greater capabilities adopt these standards earliest. Successful implementation will also depend on enhancing the capacity of developing countries, particularly their governance systems, so that they are able to effectively participate in MRV.

Meanwhile, greater transparency regarding emissions and finance can enable increased participation and engagement in climate policy by civil society and the private sector, thereby building a country's overall capabilities and strengthening its ability to undertake greater climate action. For example, calls for transparency about fossil-fuel subsidies have partially been driven by the idea that awareness will generate interest and political support for subsidy reform (Victor 2009b).

Effective transparency systems can be important for designing, implementing, and evaluating climate policies that protect or enhance capabilities. If properly directed and resourced, measurement and reporting can address the effects of climate policies on the capabilities of vulnerable or poor populations, including the benefits of well-designed policies. Capabilities should be included in the suite of metrics countries are encouraged to track and report on. Over time, measuring and track-

ing the relationships between climate policies and the enhancement of specific capabilities will yield important insights about what actually improved well-being and what does not. Including capabilities in the suite of metrics routinely gathered may require additional support for countries with limited governance capacity.

- The 2015 Agreement should create a stepwise approach leading to a common MRV framework, with developing countries with the greatest capabilities adopting the standards first.
- Support should be provided to developing countries to build their national capabilities and adopt a common framework for MRV.
- The 2015 Agreement should provide guidance and ensure support so that developing countries monitor and report on the ways in which climate policies have affected the capabilities of the most vulnerable and least well off.
- The agreement should also encourage public access to and dissemination of information, as well as support to enable that provision of information (Dominican Republic et al. 2014.)



- The agreement should also encourage countries to report on current policy environments, especially on their levels of fossil-fuel subsidies. Countries can identify prospective ways to reform those policies that would both achieve climate objectives and build capabilities, while they can also seek support for implementation of those reforms.

### Set an Equitable Long-Term Mitigation Goal

While intended NDCs provide an essential mechanism for making mitigation commitments in the 2015 Agreement, they do not create a long-term objective for the emissions reductions required for achieving equity. Some countries have proposed that the 2015 Agreement include a collective long-term trajectory for emissions reductions or specific mitigation actions (UNFCCC 2014b). To be successful, a long-term goal needs to address capabilities and equity concerns.

Expressing such a goal as a mitigation objective, and not only as a temperature threshold, can help countries identify specific policies and investments that will contribute to sufficient climate action and enable countries to ensure that transformation will have benefits for capabilities. For example, the 2015 Agreement could incorporate a collective global trajectory for emissions reduction or specific mitigation actions capable of achieving the level of emission reductions needed for climate stabilization, such as phasing out GHG emissions or shifting to predominantly renewable energy in the second half of the century (Box 42). Using a capabilities lens to inform such a goal would require a focus on policies that can also build capabilities, such as using renewable energy to increase access to electricity.

In setting such a goal, there must also be a recognition that countries with differing capabilities may have to proceed at different paces. A phased approach would allow countries to take action at different dates based on their capabilities, while investment and technology development, cooperation, and transfer would be essential to enabling their action. Finance and other support, including capacity building, will also be needed to help countries with lower capabilities protect or enhance the opportunities of those who are least well off and may be affected by these policies.

## BOX 42 | CARBON BUDGETS AND MITIGATION ACTIONS

As the most recent Intergovernmental Panel on Climate Change (IPCC) report shows, keeping global temperature rise below 2°C means that only a limited amount of total greenhouse gases can be emitted into the atmosphere. The total amount of carbon dioxide that can be emitted is approximately 1,000 PgC, and between 1870 and 2011 the world had already emitted 515 PgC (Collins et al. 2014). The reality of this carbon budget means that countries must take action that will substantially reduce emissions below that total level to avoid catastrophic climate change.

Many proposals have been made for how the carbon budget might be divided equitably among countries in order to set country-specific emissions reduction objectives. While it is clearly essential to recognize the overall limits on emissions and to assess who should undertake what levels and types of emissions reductions, avoiding catastrophic climate change can also be framed in terms of the low-carbon transformations that are needed to achieve adequate mitigation. Doing so can focus attention on the role of those transformational actions in building capabilities.

For example, the IPCC has suggested that staying below 2°C requires a substantial increase in low-carbon energy supplies. Low-carbon energy, which currently accounts for 30 percent of electricity production, would have to increase to more than 80 percent by 2050 (Bruckner et al. 2014). Achieving this level of low-carbon energy can be undertaken largely through widespread deployment of renewable energy, which can also provide significant equity and capability benefits.

Focusing the question of climate action on the mitigation actions can help concentrate attention on the capabilities that such actions build and how they can be built.

To ensure that a long-term mitigation goal takes into account the capabilities of those who are most vulnerable or least well off, this long-term goal should include:

- A phased approach so that countries would set a date for phasing out GHG emissions or phasing in predominantly renewable energy based on their level of national capabilities.

- Increased emphasis on technology development, cooperation, deployment, and transfer so that countries with limited capabilities would be able to take on these goals and benefit from increased capabilities through the deployment of new technologies.
- Support for countries with lower capabilities to conduct vulnerability assessments and identify specific strategies to avoid unintended consequences of rapid mitigation transitions.

### Cycles of Climate Actions Build Capabilities

There is increasing support among the Parties in the UNFCCC that a set of cycles of action should be included in the 2015 Agreement. These cycles would facilitate a process of increasing ambition at regular intervals over time (such as every five years) (UNFCCC 2014b). As emphasized throughout this report, the effects of climate change are already growing, and actions taken to date will not prove adequate to keeping temperature rise below the 2°C threshold agreed at COP 16 in Cancun (IPCC 2013; UNEP 2013). From an equity perspective, the 2015 Agreement must establish a foundation for deeper action on all fronts to protect capabilities for current and future generations.

To meet these challenges in the long-term, the 2015 Agreement must not only provide a clear and binding process for increasing ambition, but a mechanism for reviewing and assessing action across all its elements (Morgan, Dagnet, and Tirpak 2014). The agreement should provide for global assessments of progress to date and action needed to strengthen the multiple dimensions of climate action that affect capabilities: mitigation, adaptation, and support (including finance, technology, and capacity building). In addition to assessing progress at the aggregate level, these cycles should include assessments of countries' actions to date, their future needs and opportunities for specific mitigation and adaptation actions, and their required levels of support to undertake that action.

A specific technical process within the UNFCCC, such as within the Subsidiary Body on Scientific and Technical Advice (SBSTA) or a technical panel, should be established to agree on equity criteria that can be used to assess proposed national contributions after 2015. These criteria should include

the national capabilities indicators proposed in this report, but could also include other indicators, such as responsibility metrics. This process to agree on criteria would need to be concluded several years before the next cycle of commitments commences; if the cycles are in five year intervals, that process would need to conclude by 2017 or 2018.

The indicators used to assess national capabilities (see Tables 3 and 7) could further strengthen this review process by evaluating countries' national capabilities, the impacts of climate change on capabilities, and the implications of climate action for those capabilities. Repeatedly returning to these core indicators will facilitate the evaluation of progress over time, ensure that contributions are dynamic and reflect changes in national capabilities, and maintain pressure to consistently increase ambition until levels that ensure climate stabilization and human well-being are reached.

Moreover, to inform the design and implementation of policies that actively contribute to well-being, each of the review cycles must include an analysis of what has actually been accomplished. Again, drawing on insights from Chapters 2 and 3, specific mitigation and adaptation policies should be assessed with an eye to their effect on actual capabilities. Best practices that facilitate greater well-being, especially of those who are most vulnerable or least well off should be particularly supported.

As noted elsewhere in this report, measuring and tracking vulnerabilities and capabilities is important for both mitigation and adaptation policies. Ensuring that a review process reflects the effects on actual well-being during implementation processes would be greatly facilitated by ongoing monitoring of policy implications for individuals and communities targeted by such policies. Including these assessments in the review process would facilitate national and international learning about best practices and opportunities for designing and implementing climate actions that increase well-being in the long term.

How to sequence and organize these cycles of review is a key issue. Because the issues of mitigation, adaptation, and finance are likely to remain distinct under the 2015 Agreement, conducting separate, but connected, reviews may be one

pragmatic approach. Each issue could be reviewed in ways that enables it to build on the other issues and reflects the connections between them. For example, while mitigation goals may be best addressed within a distinct assessment, adaptation and finance needs are intimately connected to mitigation progress and cannot be identified until emission trajectories are clarified. Working through these issues in an iterative manner through the review cycles would allow each to be informed by action in the other areas.

### Achieving Equity in the 2015 Agreement from a Capabilities Perspective

This report has presented specific strategies that can be used to enhance equity and capabilities through climate action at the national level, along with the ways in which international action can support those approaches. The 2015 Agreement can facilitate these strategies and policies and enable climate action and equity to go hand in hand. Achieving success will depend on recognizing and addressing the central role of capabilities—ensuring that adequate mitigation and adaptation are undertaken with capabilities at the core, providing adequate finance aimed at building capabilities, and integrating equity and capabilities into areas such as transparency and accountability and technology. This will enable the 2015 Agreement to support and facilitate capabilities at the national level across a range of climate policy areas and provide a new model for equity, one that can move past debates to success.

The new international climate agreement can facilitate strategies and policies that enable climate action and equity to go hand in hand.





# CAPABILITIES AND LONG-TERM CLIMATE TRANSFORMATION

As climate impacts continue to increase, a new perspective and narrative that promotes equity in the context of climate change is needed. The capabilities approach provides a framework to formulate national climate policies and strategies that build the capabilities of individuals, communities, and nations. This approach can link national level efforts to international level commitments to generate the momentum and long-term commitment necessary to shift economies to low-carbon pathways and achieve human well-being.

As we move toward a world of unavoidable climate impacts, the need for transformational climate policy has become increasingly apparent. Shifting economies to low-carbon pathways and building the long-term resilience of communities are essential challenges. Addressing these challenges in an equitable way presents the international community with an even greater challenge, but one that is needed to build the necessary consensus for action.

The capabilities approach can provide a much needed new perspective and narrative for building equitable climate action. A focus on capabilities enables progress to be evaluated in terms of the concrete effects of climate policy on human well-being. These effects can encourage proactive approaches to policymaking that emphasize the tangible benefits of taking action—a key factor in mobilizing and achieving long-term transformation.

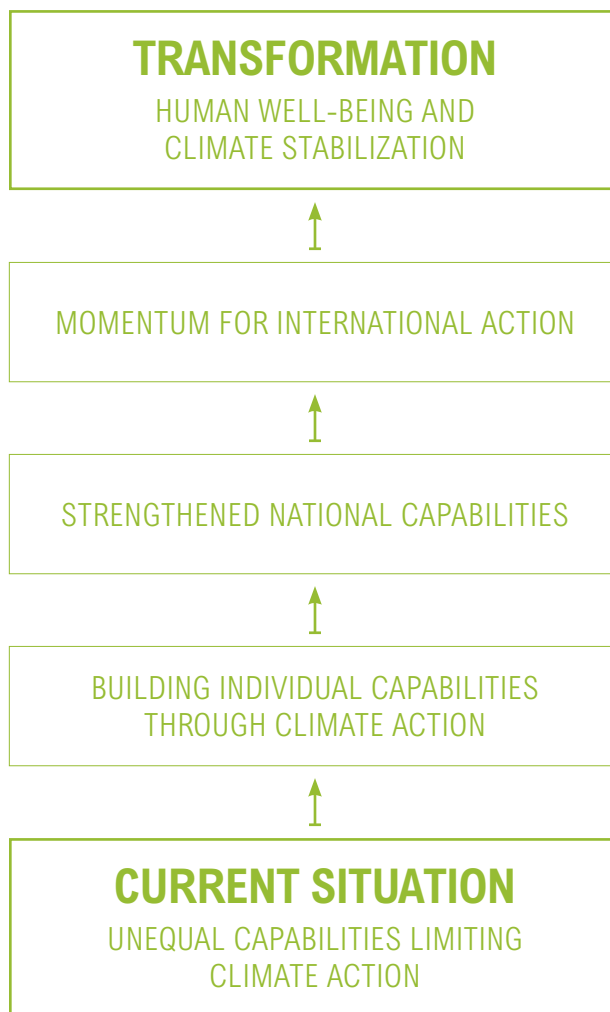
Figure 2 illustrates how the capabilities approach can provide a pathway to support and accelerate the goal of climate policy transformation. The figure underscores the ways in which capabilities are relevant at multiple levels and can build from one to the next—from individuals and communities to nations to the globe.

The lowest level of the diagram reflects the equity challenge currently presented by the unequal capabilities of individuals, communities, and nations. To address this challenge, the first level of action focuses on the importance of committing to climate action that also builds the capabilities of individuals and communities. As highlighted in Chapters 2 and 3, this approach is essential to developing equitable policy, but alone it is unlikely to move us toward transformational goals.

The next level in the figure focuses on the broader, more systemic aspects of capabilities at the national level. Strengthening the capabilities of individuals and communities can provide a foundation for building the key capabilities of countries, which can be enhanced through effective climate policies. Finally, at the highest level in the figure, the capabilities approach builds on action at the community and national levels to generate the momentum needed for achieving low-carbon and climate-resilient transformation at a global scale.

Until now, the equity debate at the international level has relied on abstract frameworks concerning the roles played by nations. There are good reasons

Figure 9 | Long-Term Climate Transformation



for this approach, since any attempt at creating an international regime to combat climate change and keep global warming within certain limits requires ways to compare countries and the actions they take.

But this approach can also miss the ways in which well-designed climate action affects—and can benefit—the lives of people. Attention to capabilities will help maintain a focus on the need to consistently ensure climate policy itself enhances and improves human well-being and builds toward transformational action at a global scale.

A new narrative for equity is needed that can help move us toward stronger climate action. By focusing on the concrete opportunities and benefits that climate action is able to provide, this narrative can enable the fundamental transformation that will improve peoples’ lives and meet the global challenge posed by climate change.

## REFERENCES

- ACIA (Arctic Climate Impact Assessment). 2005. *Impacts of a Warming Arctic: Arctic Climate Impacts Assessment*. Cambridge, UK: Cambridge University Press.
- Adger, W. Neil, Shardul Agrawala, M. Monirul Qader Mirza, Cecilia Conde, Karen O'Brien, Juan Pulhin, Roger Pulwarty, Barry Smit, and Kiyoshi Takahashi. 2007. "Assessment of Adaptation Practices, Options, Constraints and Capacity." In *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden, and C. E. Hanson, 717–43. Cambridge, UK: Cambridge University Press. <http://www.ipcc-wg2.gov/AR4/website/17.pdf>.
- Africa Group. 2013. "Submission by Swaziland on Behalf of the African Group under Workstream I of the ADP." Government of Swaziland, Mbabane. [http://unfccc.int/files/documentation/submissions\\_from\\_parties/adp/application/pdf/adp\\_african\\_group\\_workstream\\_1\\_20131008.pdf](http://unfccc.int/files/documentation/submissions_from_parties/adp/application/pdf/adp_african_group_workstream_1_20131008.pdf).
- Africa Group. 2014. "Submission by Sudan on Behalf of the Africa Group: Elements of the Draft Negotiation Text under the ADP." Government of Sudan, Khartoum. [http://unfccc.int/files/bodies/application/pdf/adp\\_w1\\_elements\\_africangroup.pdf](http://unfccc.int/files/bodies/application/pdf/adp_w1_elements_africangroup.pdf).
- AILAC (Independent Association of Latin America and the Caribbean). 2014. "Submission on the Ad Hoc Working Group on the Durban Platform (ADP)." AILAC, Santiago, Bogotá, San José, Guatemala City, Panama City and Lima. [https://unfccc.int/files/documentation/submissions\\_from\\_parties/adp/application/pdf/adp2.4\\_submission\\_by\\_ailac\\_20140310.pdf](https://unfccc.int/files/documentation/submissions_from_parties/adp/application/pdf/adp2.4_submission_by_ailac_20140310.pdf).
- Algeria. 2014. "National Submission on Elements of the 2015 Outcome." Government of Algeria, Algiers. [http://unfccc.int/files/documentation/submissions\\_from\\_parties/adp/application/pdf/algeria\\_adp\\_submission.pdf](http://unfccc.int/files/documentation/submissions_from_parties/adp/application/pdf/algeria_adp_submission.pdf).
- Alliance for Rural Electrification. 2013. "Best Practices of the Alliance for Rural Electrification." Alliance for Rural Electrification, Brussels. [http://www.ruralelec.org/fileadmin/DATA/Documents/06\\_Publications/ARE\\_Best\\_Practises\\_2013\\_FINAL.pdf](http://www.ruralelec.org/fileadmin/DATA/Documents/06_Publications/ARE_Best_Practises_2013_FINAL.pdf).
- ALM (Adaptation Learning Mechanism). 2009. "Guatemala." ALM, United Nations Development Programme, New York. <http://www.adaptationlearning.net/guatemala/profile>.
- Anas, Alex, and Robin Lindsey. 2011. "Reducing Urban Road Transportation Externalities: Road Pricing in Theory and in Practice." *Review of Environmental Economics and Policy* 5 (1): 66–88.
- Anwar, Muhuddin Rajin, De Li Liu, Ian Macadam, and Georgina Kelly. 2013. "Adapting Agriculture to Climate Change: A Review." *Theoretical and Applied Climatology* 113 (1-2): 225–45. doi:10.1007/s00704-012-0780-1.
- APEC (Asia-Pacific Economic Cooperation). 2011. "APEC 2011 Leader's Declaration: The Honolulu Declaration toward a Seamless Regional Economy." APEC, Singapore. [http://www.apec.org/meeting-papers/leaders-declarations/2011/2011\\_aelm.aspx](http://www.apec.org/meeting-papers/leaders-declarations/2011/2011_aelm.aspx).
- Arc Finance. 2014. "Going 'All In' on Solar Finance: How IDCOL Incubates a Growing Industry in Bangladesh." April 2, Blog. <http://arcfinance.org/blog/going-all-in-on-solar-finance-how-idcol-incubates-a-growing-industry-in-bangladesh/>.
- Arze del Granado, Francisco Javier, David Coady, and Robert Gillingham. 2012. "The Unequal Benefits of Fuel Subsidies: A Review of Evidence for Developing Countries." *World Development* 40 (11): 2234–48. doi:10.1016/j.worlddev.2012.05.005.
- Ashby, J., P. Kristjanson, P. Thornton, B. Campbell, S. Vermeulen, and E. Wollenberg. 2012. "CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS): CCAFS Gender Strategy." CGIAR Research Program on Climate Change, Agriculture and Food Security. Copenhagen, Denmark. <http://library.cgiar.org/bitstream/handle/10947/2788/CGIAR%20Research%20Program%20on%20Climate%20Change,%20Agriculture%20and%20Food%20Security%20%28CCAFS%29%20-%20Gender%20Strategy.pdf>.
- Australia. 2014. "Submission to the Ad-Hoc Working Group on the Durban Platform for Enhanced Action (ADP) on the 2015 Agreement." Government of Australia, Canberra. [http://unfccc.int/files/bodies/application/pdf/australia\\_s\\_submission\\_to\\_the\\_ad-hoc\\_working\\_group\\_on\\_the\\_durban\\_platform\\_for\\_enhanced\\_action\\_\(adp\).pdf](http://unfccc.int/files/bodies/application/pdf/australia_s_submission_to_the_ad-hoc_working_group_on_the_durban_platform_for_enhanced_action_(adp).pdf).
- Ballesteros, Athena, Emily Norford, Tom Nagle, Logan Yonavjak, and Susan Alzner. 2013. "Implementation Strategies for Renewable Energy Services in Low-Income, Rural Areas." World Resources Institute, Washington, DC. [http://www.wri.org/sites/default/files/pdf/implementation\\_strategies\\_renewable\\_energy\\_services\\_low\\_income\\_rural\\_areas.pdf](http://www.wri.org/sites/default/files/pdf/implementation_strategies_renewable_energy_services_low_income_rural_areas.pdf).
- Bangladesh. 2009. "Bangladesh Climate Change Strategy and Action Plan." Ministry of Environment and Forests, Government of the People's Republic of Bangladesh. Dhaka, Bangladesh.
- BASIC ExpertGroup (Brazil, South Africa, India, and China). 2011. *Equitable Access to Sustainable Development: Contribution to the Body of Scientific Knowledge*. BASIC Expert Group, Beijing, Brasilia, Cape Town and Mumbai. [http://www.erc.uct.ac.za/Basic\\_Experts\\_Paper.pdf](http://www.erc.uct.ac.za/Basic_Experts_Paper.pdf).
- Baten, Zunaid, Emran Md Amin, Anika Sharin, Raisul Islam, Shahriar A. Chowdhury, et al. 2009. "Renewable Energy Scenario of Bangladesh: Physical Perspective." In *Developments in Renewable Energy Technology (ICDRET), 2009 1st International Conference on the Developments in Renewable Energy Technology*, Dhaka, Bangladesh, 17–19 December 2009, 1–5. Institute of Electrical and Electronics Engineers. [http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=5454220](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=5454220).

- Bazilian, Morgan, Patrick Nussbaumer, Christine Eibs-Singer, Abeeku Brew-Hammond, Vijay Modi, Benjamin Sovacool, Venkata Ramana, and Peri-Khan Aqrabi. 2012. "Improving Access to Modern Energy Services: Insights from Case Studies." *The Electricity Journal* 25 (1): 93–114. doi:10.1016/j.tej.2012.01.007.
- Bazilian, Morgan, Patrick Nussbaumer, Giorgio Gualberti, Erik Haites, Michael Levi, Judy Siegel, Daniel M. Kammen, and Joergen Fenhann. 2011. "Informing the Financing of Universal Energy Access: An Assessment of Current Financial Flows." *The Electricity Journal* 24 (7): 57–82. doi:10.1016/j.tej.2011.07.006.
- BBC News. February 13. [http://news.bbc.co.uk/2/hi/uk\\_news/england/london/7242445.stm](http://news.bbc.co.uk/2/hi/uk_news/england/london/7242445.stm).
- Beaton, Christopher, and Lucky Lontoh. 2010. "Lessons Learned from Indonesia's Attempts to Reform Fossil Fuel Subsidies." International Institute for Sustainable Development, Winnipeg, Canada.
- Beevers, Sean D., and David C. Carslaw. 2005. "The Impact of Congestion Charging on Vehicle Emissions in London." *Atmospheric Environment* 39 (1): 1–5. doi:10.1016/j.atmosenv.2004.10.001.
- Berman, Rachel J., Claire H. Quinn, and Jouni Paavola. 2014. "Identifying Drivers of Household Coping Strategies to Multiple Climatic Hazards in Western Uganda: Implications for Adapting to Future Climate Change." *Climate and Development*, 1–14. doi:10.1080/17565529.2014.902355. [Doesn't appear to have a volume or issue no. It looks like it published online independent of any specific volume and issue]
- Bishaw, Badege, and Abdu Abdelkadir. 2003. "Agroforestry and Community Forestry for Rehabilitation of Degraded Watersheds on the Ethiopian Highlands." International Conference on Development Studies in Ethiopia, Addis Ababa, Ethiopia, 11-12 July 2003. [http://scholarworks.wmich.edu/africancenter\\_icad\\_archive/78/](http://scholarworks.wmich.edu/africancenter_icad_archive/78/).
- Blomley, Tom. 2013. "Lessons Learned from Community Forestry in Africa and their Relevance for REDD+ Report," Prepared for USAID by TetraTech and Forest Carbon, Markets and Communities Program. Arlington, VA: USAID. [http://www.fcmcglobal.org/documents/CF\\_Africa.pdf](http://www.fcmcglobal.org/documents/CF_Africa.pdf).
- Blue Energy. 2012. "Africa's Largest Solar (PV) Power Plant | Blue Energy." <http://www.blue-energyco.com/africas-largest-solar-pv-power-plant/>.
- Bogotá Cómo Vamos. 2013. "Bogotá Cómo Vamos: Encuesta de Percepción Ciudadana Bogotá 2013." Bogotá Cómo Vamos, Bogotá. <http://bogotacomovamos.org/documentos/encuesta-de-percepcion-ciudadana-2013>. Bolivia. 2012. "Plurinational State of Bolivia Second National Communication: Executive Summary." State of Bolivia, La Paz. [http://www.undp-alm.org/sites/default/files/downloads/bolivia-second\\_national\\_communicationexec\\_sum\\_2009.pdf](http://www.undp-alm.org/sites/default/files/downloads/bolivia-second_national_communicationexec_sum_2009.pdf).
- Bray, David Barton, Elvira Duran, Victor Hugo Ramos, Jean-Francois Mas, Alejandro Velazquez, Roan Balas McNab, Deborah Barry, and Jeremy Radachowsky. 2008. "Tropical Deforestation, Community Forests, and Protected Areas in the Maya Forest." *Ecology and Society* 13 (2): 56.
- Breisinger, Clemens, Winifred Engelke, and Olivier Ecker. 2011. "Petroleum Subsidies in Yemen: Leveraging Reform for Development." IFPRI Discussion Paper 01071. International Food Policy Research Institute, Washington DC. <http://www.ifpri.org/sites/default/files/publications/ifpridp01071.pdf>.
- British Columbia. 2009. "Tax Cuts Funded by the Carbon Tax." Province of British Columbia, Victoria. [http://www.fin.gov.bc.ca/tbs/tp/climate/tax\\_cuts.htm](http://www.fin.gov.bc.ca/tbs/tp/climate/tax_cuts.htm)
- Bruckner, Thomas, Igor Alexeyevich Bashmakov, Yacob Mulugetta, Helena Chum, Angel de la Vega Navarro, James Edmonds, Andre Faaij, et al. 2014. "Energy Systems." In *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by O. Edenhofer, R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx. Cambridge U.K: Cambridge University Press.
- Bruun, Ole, Thorkil Casse. On the Frontiers of Climate and Environmental Change, edited by Ole Bruun and Thorkil Casse. Environmental Science and Engineering. Berlin: Springer. <http://link.springer.com/10.1007/978-3-642-35804-3>.
- Bullard, Robert D. 1997. *Unequal Protection: Environmental Justice and Communities of Color*. San Francisco: Sierra Club Books.
- Burchardt, Tania. 2004. "Capabilities and Disability: The Capabilities Framework and the Social Model of Disability." *Disability & Society* 19 (7): 735–51. doi:10.1080/0968759042000284213.
- Bureau of Energy Efficiency. 2011. "PAT Consultation Document." Ministry of Power, Government of India, New Delhi. [http://beeindia.in/NMEEE/PAT%20Consultation%20Document\\_10Jan2011.pdf](http://beeindia.in/NMEEE/PAT%20Consultation%20Document_10Jan2011.pdf).
- Burton, Ian, Saleemul Huq, Bo Lim, Olga Pilifosova, and Emma Lisa Schipper. 2002. "From Impacts Assessment to Adaptation Priorities: The Shaping of Adaptation Policy." *Climate Policy* 2 (2): 145–59.
- Caffrey, Patricia, Timothy Finan, Sylwia Trzaska, David Miller, Rita Laker-Ojok, and Samuel Huston. 2013. "Uganda Climate Change Vulnerability Assessment Report." U.S. Agency for International Development, Washington, DC. <http://community.eldis.org/.5b9bfce3/ARCC-Uganda%20VA-Report.pdf>.
- California. 2006. Assembly Bill 32: Global Warming Solutions Act. Legislative Assembly of the State of California. [http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab\\_0001-0050/ab\\_32\\_bill\\_20060927\\_chaptered.pdf](http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf).
- California. 2011. "California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms." Subchapter 10 Climate Change, Article 5, Sections 95800 to 96023, Title 17, Article 5 California Code of Regulations. State of California.

- California. 2012. California Global Warming Solutions Act of 2006: Greenhouse Gas Reduction Fund." Chapter 830, Senate Bill No. 535. Legislative Assembly of the State of California.
- California. 2014. "California State Budget 2014 - 15." <http://www.ebudget.ca.gov/FullBudgetSummary.pdf>.
- California Public Utilities Commission. 2014. "CSI Single Family Affordable Solar Homes (SASH) Program." <http://www.cpuc.ca.gov/PUC/energy/Solar/sash.htm>.
- Campbell, Bruce, Wendy Mann, Ricardo Meléndez-Ortiz, Charlotte Streck, and Timm Tennigkeit. 2011. "Addressing Agriculture in Climate Change Negotiations: A Scoping Report." CGIAR, Montpellier, France. <http://dspacetest.cgiar.org/bitstream/handle/10568/10306/climateAgriculture.pdf>.
- CAN (Climate Action Network) International. 2013. "Submission to ADP Chairs on Workstream 1: Post-2020." Climate Action Network International, Beirut. <http://unfccc.int/resource/docs/2013/smsn/ngo/307.pdf>.
- Carr, David L. 2008. "Farm Households and Land Use in a Core Conservation Zone of the Maya Biosphere Reserve, Guatemala." *Human Ecology* 36 (2): 231–48. doi:10.1007/s10745-007-9154-1.
- Carrigan, Aileen, Robin King, Juan Miguel Velasquez, Matthew Raifman, and Nicolae Duduta. 2013. "Social, Environmental and Economic Impacts of BRT Systems: Bus Rapid Transit Case Studies from Around the World" EMBARQ, Washington, DC. <http://www.embarq.org/research/publication/social-environmental-and-economic-impacts-bus-rapid-transit>.
- Charnley, Susan, and Melissa R. Poe. 2007. "Community Forestry in Theory and Practice: Where Are We Now?." *Annual Review of Anthropology* 36 (1): 301–36. doi:10.1146/annurev.anthro.35.081705.123143.
- Chaudhury, Abrar, Chase Sova, Tahir Rasheed, Thomas F. Thornton, Prajwal Baral, and Anam Zeb. 2014. "Deconstructing Local Adaptation Plans for Action (LAPAs): Analysis of Nepal and Pakistan LAPA Initiatives." Working Paper 67. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2496968&download=yes](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2496968&download=yes).
- China. 2014. "China's Submission on the Work of the Ad Hoc Working Group on Durban Platform for Enhanced Action." Government of China, Beijing.
- Chrometzka, Thomas. 2014. "Tapping Thailand's Solar Potential." Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). <http://www.giz.de/fachexpertise/downloads/2014-en-chrometzka-pep-infoveranstaltung-netzgeb-pv-indonesien-thailand.pdf>.
- Chung, Rae Kwon. 2013. "Fuel Subsidy Reform in Indonesia." World Bank Institute, KDI School of Public Policy and Management, Washington DC and Seoul, Republic of Korea. <http://www.kdevelopedia.org/mnt/idas/asset/2013/11/14/DOC/PDF/04201311140129007072935.pdf>.
- Clark, David. 2006. "The Capability Approach: Its Development, Critiques and Recent Advances." Global Poverty Research Group, Institute for Development Policy and Management, University of Manchester, Manchester, UK. <http://www.gprg.org/pubs/workingpapers/pdfs/gprg-wps-032.pdf>.
- Clark, Lara P., Dylan B. Millet, and Julian D. Marshall. 2014. "National Patterns in Environmental Injustice and Inequality: Outdoor NO<sub>2</sub> Pollution in the United States." *PLoS ONE* 9 (4).
- Climate Policy Initiative. 2014. "The Global Landscape of Climate Finance 2014". Climate Policy Initiative, San Francisco. <http://climatepolicyinitiative.org/wp-content/uploads/2014/11/The-Global-Landscape-of-Climate-Finance-2014.pdf>.
- Clover, Ian. 2014. "Ghana Finalizes Plans for 155 MW Solar Park." *Pv Magazine*. March 4, 2014. [http://www.pv-magazine.com/news/details/beitrag/ghana-finalizes-plans-for-155-mw-solar-park\\_100014400/](http://www.pv-magazine.com/news/details/beitrag/ghana-finalizes-plans-for-155-mw-solar-park_100014400/).
- Coady, David, Robert Gillingham, Rolando Ossowski, John Piotrowski, Shamsuddin Tareq, and Justin Tyson. 2010. "Petroleum Product Subsidies: Costly, Inequitable, and Rising." SPN/10/05. IMF Staff Position Note. International Monetary Fund, Washington DC. <http://www10.iadb.org/intal/intalcdi/PE/2010/04806.pdf>.
- Coastal Climate Blueprint. 2014. "Coastal Climate Blueprint." <http://coastalclimateblueprint.org.au/>. Cole, Luke W., and Sheila R. Foster. 2001. *From the Ground Up: Environmental Racism and the Rise of the Environmental Justice Movement*. New York University Press.
- Collins, Matthew, Reto Knutti, Julie Arblaster, Jean-Louis Dufresne, Thierry Fichefet, Pierre Friedlingstein, Xuejie Gao, William J. Gutowski Jr., Tim Johns, Andrew J. Weaver and Michael Wehner. 2014. "Long-Term Climate Change Projections, Commitments and Irreversibility." In *Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, U. K.: Cambridge University Press.
- Convery, Frank, Louise Dunne, and Dierdre Joyce. 2013. "Ireland's Carbon Tax and the Fiscal Crisis: Issues in Fiscal Adjustment, Environmental Effectiveness, Competitiveness, Leakage, and Equity Implications." OECD Working Paper 59. Organisation for Economic Cooperation and Development, Paris.
- Cuba. 2014. "Submission by Cuba on the Elements of the 2014 Outcome." Government of Cuba, Havana. [http://unfccc.int/files/documentation/submissions\\_from\\_parties/adp/application/pdf/adp2-5\\_submission\\_by\\_cuba\\_20140603.pdf](http://unfccc.int/files/documentation/submissions_from_parties/adp/application/pdf/adp2-5_submission_by_cuba_20140603.pdf).
- Dan, Li, Jinjun Ji, Zhenghui Xie, Feng Chen, Gang Wen, and Jeffrey E. Richey. 2012. "Hydrological Projections of Climate Change Scenarios over the 3H Region of China: A VIC Model Assessment." *Journal of Geophysical Research* 117 (D11). doi:10.1029/2011JD017131.
- Davis, Danielle C. 2013. "Land in the Second Decade: The Evolution of Property Rights and the Energy Industry in the United States and Brazil." *Energy Law Journal* 34: 667–86.

- Demetriades, Justina, and Emily Esplen. 2009. "The Gender Dimensions of Poverty and Climate Change Adaptation." *IDS Bulletin* 39 (4): 24–31. doi:10.1111/j.1759-5436.2008.tb00473.x.
- Department of Women's Affairs. 2012. "Disaster Risk Reduction Plan." Ministry of Women and Children Affairs, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh.
- Devine-Wright, Patrick. 2005. "Beyond NIMBYism: Towards an Integrated Framework for Understanding Public Perceptions of Wind Energy." *Wind Energy* 8 (2): 125–39. doi:10.1002/we.124.
- Devisscher, Tahia, and Ben Smith. 2008. "Bolivia Climate Screening." weADAPT, Stockholm. <http://weadapt.org/knowledge-base/national-adaptation-planning/bolivia-climate-screening>.
- Diddi, Saurabh. 2011. "Presentation at Capacity Building Program on Preform, Achieve and Trade Mechanism." presented at the Capacity Building Program, Mumbai and New Delhi, August 2-12, 2011.
- Dixit, Aarjan. 2012. "Case Study: Information Use in Nepal's National Adaptation Programme of Action." Issue Brief. World Resources Institute, Washington, DC. [http://www.wri.org/sites/default/files/pdf/information\\_use\\_in\\_nepals\\_national\\_adaptation\\_programme.pdf](http://www.wri.org/sites/default/files/pdf/information_use_in_nepals_national_adaptation_programme.pdf).
- Dominican Republic, Argentina, Belize, Benin, Burkina Faso, Chile, Colombia, et al. 2014. "Submission on the Structure of the Elements of the 2015 Agreement." Santo Domingo, Dominican Republic. [http://www4.unfccc.int/submissions/Lists/OSPSubmissionUpload/39\\_99\\_130591411922727038-Education%20Submission%20V1.pdf](http://www4.unfccc.int/submissions/Lists/OSPSubmissionUpload/39_99_130591411922727038-Education%20Submission%20V1.pdf).
- Dutch Ministry of Infrastructure and the Environment. 2014. "Climate Agenda: Resilient, Prosperous and Green." The Dutch Ministry of Infrastructure and the Environment, The Hague. <http://www.government.nl/files/documents-and-publications/reports/2014/09/24/climate-agenda-resilient-prosperous-and-green-summary/climate-agenda-resilient-prosperous-and-green.pdf>.
- Echeverry, Juan Carlos, Ana Maria Ibanez, and Luis Carlos Hillon. 2004. "The Economics of TransMilenio, a Mass Transit System for Bogotá." Universidad de los Andes, Bogotá.
- EIA (Energy Information Agency). 2014a. "Most New Residential Solar PV Projects in California Program Are Not Owned by Homeowners." U.S. EIA, Washington DC. <http://www.eia.gov/todayinenergy/detail.cfm?id=12991>.
- EIA. 2014b. "Indonesia Overview: U.S. Energy Information Administration Report." <http://www.eia.gov/countries/analysisbriefs/Indonesia/indonesia.pdf>.
- Environmental Integrity Group. 2014. "EIG's Views on the Elements of the 2015 Agreement". Environmental Integrity Group, Vaduz. Mexico City, Monaco, Seoul, and Bern. [http://unfccc.int/files/documentation/submissions\\_from\\_parties/adp/application/pdf/adp2-5\\_submission\\_by\\_eig\\_20140605.pdf](http://unfccc.int/files/documentation/submissions_from_parties/adp/application/pdf/adp2-5_submission_by_eig_20140605.pdf).
- EUEI (European Union Energy Initiative) and GIZ. 2011. "Productive Use of Energy - PRODUCE - A Manual for Electrification Practitioners." EUEI. [http://www.euei-pdf.org/sites/default/files/files/field\\_pbldctn\\_file/EUEI%20PDF\\_Productive%20Use%20Manual\\_2011\\_EN.pdf](http://www.euei-pdf.org/sites/default/files/files/field_pbldctn_file/EUEI%20PDF_Productive%20Use%20Manual_2011_EN.pdf).
- FAO (Food and Agriculture Organization of the United Nations). 2010. *Global Forest Resources Assessment 2010*. Rome: FAO. <http://www.fao.org/docrep/013/al464E/al464E.pdf>.
- Fattouh, Bassam, and Laura El-Katiri. 2013. "Energy Subsidies in the Middle East and North Africa." *Energy Strategy Reviews*, 2 (1): 108–15. doi:10.1016/j.esr.2012.11.004. Fleurbaey, M., S. Kartha, S. Bolwig, Y.L. Chee, Y. Chen, E. Corbera, F. Lecocq, et al. 2014. "Chapter Four: Sustainable Development and Equity." In *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by O. Edenhofer, R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, et al. Cambridge, U.K.: Cambridge University Press.
- Forest Trends. 2013. *Ethiopia: Mapping REDD+ Finance Flows 2009-2012. REDD National Report*. Forest Trends, Washington DC. [http://www.forest-trends.org/documents/files/doc\\_4197.pdf](http://www.forest-trends.org/documents/files/doc_4197.pdf).
- Foti, Joseph, and Lalanath de Silva. 2010. "A Seat at the Table: Including the Poor in Decisions for Development and Environment". World Resources Institute, Washington, DC. [http://www.wri.org/sites/default/files/pdf/a\\_seat\\_at\\_the\\_table.pdf](http://www.wri.org/sites/default/files/pdf/a_seat_at_the_table.pdf). Fukuda-Parr, Sakiko. 2003. "The Human Development Paradigm: Operationalizing Sen's Ideas on Capabilities." *Feminist Economics* 9 (2-3): 301–17. doi:10.1080/1354570022000077980.
- Fullerton, Duncan G., Nigel Bruce, and Stephen B. Gordon. 2008. "Indoor Air Pollution from Biomass Fuel Smoke Is a Major Health Concern in the Developing World." *Transactions of The Royal Society of Tropical Medicine and Hygiene* 102 (9): 843–51. doi:10.1016/j.trstmh.2008.05.028.
- G-20 (Group of 20) . 2009. "G 20 Leader's Statement: The Pittsburgh Summit." [https://www.g20.org/sites/default/files/g20\\_resources/library/Pittsburgh\\_Declaration\\_0.pdf](https://www.g20.org/sites/default/files/g20_resources/library/Pittsburgh_Declaration_0.pdf).
- Gallagher, Kelly Sims, John P. Holdren, and Ambuj D. Sagar. 2006. "Energy-Technology Innovation." *Annual Review of Environmental Resources* 31: 193–237.
- Gargan, Eric. 2012. "Reflections on the Implementation of the Carbon Tax in Ireland." *Energy and Environmental Taxation Fiscal Policy Division, Department of Finance, Government of Ireland, Dublin*. [http://www.nesc.ie/assets/files/downloads/project\\_climate%20change/ucd\\_workshop/ericgargan.pdf](http://www.nesc.ie/assets/files/downloads/project_climate%20change/ucd_workshop/ericgargan.pdf).
- GEF (Global Environment Facility). 2013. "Capacity Development Study - CB2." GEF, Washington DC. <http://www.thegef.org/gef/sites/thegef.org/files/Docs/CB2%20Study-Final%20Report%20December19-FINAL.pdf>.

- Gehl Sampath, P. J. Mugabe, and J. Barton. 2012. "Realizing the Potential of the UNFCCC Technology Mechanism." International Centre for Trade and Sustainable Development, Geneva. <http://www.ictsd.org/downloads/2012/05/realizing-the-potential-of-the-unfccc-technology-mechanism.pdf>.
- Germanwatch. 2004. "Sea-Level Rise in Bangladesh and the Netherlands: One Phenomenon, Many Consequences." Germanwatch, Bonn, Germany. <http://germanwatch.org/download/klak/fb-ms-e.pdf>.
- Ghana. 2011. Renewable Energy Act 2011: Act 832. Parliament of the Republic of Ghana. <http://energycom.gov.gh/files/RENEWABLE%20ENERGY%20ACT%202011%20%28ACT%20832%29.pdf>.
- Global Commission on the Economy and Climate. 2014. The New Climate Economy. The Global Commission on the Economy and Climate. <http://newclimateeconomy.report/misc/downloads/>.
- Godfray, H. C. J., J. R. Beddington, I. R. Crute, L. Haddad, D. Lawrence, J. F. Muir, J. Pretty, S. Robinson, S. M. Thomas, and C. Toulmin. 2010. "Food Security: The Challenge of Feeding 9 Billion People." *Science* 327 (5967): 812–18. doi:10.1126/science.1185383.
- Gold Standard. 2013. "The Gold Standard Principles." <http://www.goldstandard.org/wp-content/uploads/2013/08/The-Gold-Standard-Principles-FINAL-270513.pdf>.
- Graecen, Chris, and Sopitsuda Tongsovit. 2013. "An Assessment of Thailand's Feed-in Tariff Program." *Renewable Energy* 60: 439–45.
- Grubb, Michael. 2014. *Planetary Economics: Energy, Climate Change and the Three Domains of Sustainable Development*. 1st edition. New York: Routledge.
- Guillaume, Dominique M., Mohammad Reza Farzin, and Roman Zyteck. 2011. "Iran: The Chronicles of the Subsidy Reform." International Monetary Fund, Washington DC.
- Hamid, Muhammad Riazul. 2012. "Photovoltaic Based Solar Home Systems—Current State of Dissemination in Rural Areas of Bangladesh and Future Prospect." *International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering* 2 (2): 745–49.
- Hassanzadeh, Elham. 2012. "Recent Developments in Iran's Energy Subsidy Reforms." IISD Global Subsidy Initiative. International Institute for Sustainable Development, Winnipeg, Canada.
- Hayes, Tanya, and Lauren Persha. 2010. "Nesting Local Forestry Initiatives: Revisiting Community Forest Management in a REDD+ World." *Forest Policy and Economics* 12 (8): 545–53.
- Hessari, F. A. 2005. "Sectoral Energy Consumption in Iran." *Renewable and Sustainable Energy Reviews* 9 (2): 203–14. doi:10.1016/j.rser.2004.03.002.
- Hisali, Eria, Patrick Birungi, and Faisal Buyinza. 2011. "Adaptation to Climate Change in Uganda: Evidence from Micro Level Data." *Global Environmental Change* 21 (4): 1245–61. doi:10.1016/j.gloenvcha.2011.07.005.
- Höhne, Niklas, Michel den Elzen, and Donovan Escalante. 2013. "Regional GHG Reduction Targets Based on Effort Sharing: A Comparison of Studies." *Climate Policy* 14 (1): 122–47.
- Höhne, Niklas, Christian Ellermann, and Lina Li. 2014. "Intended Nationally Determined Contributions under the UNFCCC." Discussion Paper. Ecofys, Cologne. <http://www.ecofys.com/files/files/ecofys-giz-2014-intended-nationally-determined-contributions-under-unfccc.pdf>.
- Höhne, Niklas, Hanna Fekete, Christian Ellermann, and Sandra Freitas. 2014. "Differentiated Mitigation Commitments in a New Climate Agreement." LDC (Least Developed Countries) Paper Series. Ecofys, Utrecht. <http://www.ecofys.com/files/files/ldc-ecofys-2014-update-differentiated-commitments.pdf>.
- Holling, C. S. 1973. "Resilience and Stability of Ecological Systems." *Annual Review of Ecology and Systematics* 4 (January): 1–23.
- Hoque, S. M., and Barun Kumar Das. 2013. "Analysis of Cost, Energy and Emission of Solar Home Systems in Bangladesh." *International Journal of Renewable Energy Research (IJRER)* 3 (2): 347–52.
- Hue, Le Thi Van. 2005. "Local Participation in Integrated Coastal Zone Development in Giao Lac and Phuoc Son: A Comparative Case Study." *People and the Sea III*, Amsterdam, Netherlands, Center for Maritime Research, University of Amsterdam, 7–9 July 2005.
- Hughell, Dave, and Rebecca Butterfield. 2008. "Impact of FSC Certification on Deforestation and the Incidence of Wildfires in the Maya Biosphere Reserve." Rainforest Alliance, New York. [http://www.rainforest-alliance.org/forestry/documents/peten\\_study.pdf](http://www.rainforest-alliance.org/forestry/documents/peten_study.pdf).
- Huq, Saleemul, Atiq Rahman, Mama Konate, Youba Sokona, and Hannah Reid. 2003. "Mainstreaming Adaptation to Climate Change in Least Developed Countries (LDCs)." International Institute for Environment and Development, London. <http://pubs.iied.org/pdfs/9219IIED.pdf>.
- Hutchinson, Alex. 2011. "The Good, The Bus, The Ugly." *The City Fix*. Blog. July 14. <http://thecityfix.com/blog/transmilenio-the-good-the-bus-and-the-ugly/>.
- IDDRI (Institute for Sustainable Development and International Relations), and SDSN (Sustainable Development Solutions Network). 2014. "Pathways to Deep Decarbonization." IDDRI and SDSN, Paris. [http://www.iddri.org/Publications/Rapports-and-briefing-papers/DDPP\\_2014%20report.pdf](http://www.iddri.org/Publications/Rapports-and-briefing-papers/DDPP_2014%20report.pdf).
- IEA (International Energy Agency). 2011. *World Energy Outlook 2011: Energy for All—Financing Access for the Poor*. Paris: Organisation for Economic Co-operation and Development / IEA. [http://www.iea.org/media/weowebiste/energydevelopment/weo2011\\_energy\\_for\\_all.pdf](http://www.iea.org/media/weowebiste/energydevelopment/weo2011_energy_for_all.pdf).
- IEA. 2012. "World Energy Outlook 2012." Paris: Organisation for Economic Cooperation and Development / IEA. [http://www.iea.org/publications/freepublications/publication/WE02012\\_free.pdf](http://www.iea.org/publications/freepublications/publication/WE02012_free.pdf).

IEA. 2013a. "Redrawing the Energy and Climate Map." [http://www.iea.org/publications/freepublications/publication/WEO\\_Special\\_Report\\_2013\\_Redrawing\\_the\\_Energy\\_Climate\\_Map.pdf](http://www.iea.org/publications/freepublications/publication/WEO_Special_Report_2013_Redrawing_the_Energy_Climate_Map.pdf).

IEA. 2013b. *CO<sub>2</sub> Emissions from Fuel Combustion: Highlights (2013 Edition)*. Paris: Organisation for Economic Cooperation and Development / International Energy Agency. [http://www.iea.org/publications/freepublications/publication/CO<sub>2</sub>EmissionsFromFuelCombustionHighlights2013.pdf](http://www.iea.org/publications/freepublications/publication/CO2EmissionsFromFuelCombustionHighlights2013.pdf).

IFRC (International Federation of Red Cross and Red Crescent Societies). 2014. *Mangrove Plantation in Viet Nam: Measuring Impact and Cost Benefit*. Hanoi: IFRC. Accessed July 11. [http://www.ifrc.org/Global/Publications/disasters/reducing\\_risks/Case-study-Vietnam.pdf](http://www.ifrc.org/Global/Publications/disasters/reducing_risks/Case-study-Vietnam.pdf).

IMF (International Monetary Fund). 2013. "Energy Subsidy Reform: Lessons and Implications." IMF, Washington DC. <http://www.imf.org/external/np/pp/eng/2013/012813.pdf>.

IPCC (Intergovernmental Panel on Climate Change). 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, edited by M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden, and C. E. Hanson. Cambridge, UK: Cambridge University Press. [http://www.ipcc.ch/publications\\_and\\_data/publications\\_ipcc\\_fourth\\_assessment\\_report\\_wg2\\_report\\_impacts\\_adaptation\\_and\\_vulnerability.htm](http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg2_report_impacts_adaptation_and_vulnerability.htm).

IPCC. 2013. "Summary for Policymakers." In *Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, edited by Thomas F. Stocker, D. Qin, G.-K. Plattner, Melinda Tignor, Simon K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, and P.M. Midgley. Cambridge, U.K.: Cambridge University Press. [http://www.climatechange2013.org/images/report/WG1AR5\\_SPM\\_FINAL.pdf](http://www.climatechange2013.org/images/report/WG1AR5_SPM_FINAL.pdf).

IPCC. 2014. "Summary for Policy Makers." In *Climate Change 2014: Impacts, Adaptation, and Vulnerability*. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, edited by C.B Field, D.J. Barros, K.J. Dokken, K.J. Mach, M. D. Mastrandrea, T.E. Bilir, M Chatterjee, et al. Cambridge, U.K.: Cambridge University Press.

Japan. 2014. "Ad Hoc Working Group on the Durban Platform for Enhanced Action." Government of Japan, Tokyo. [http://www4.unfccc.int/submissions/Lists/OSPSubmissionUpload/106\\_99\\_130577729021556446-ADP\\_submission\\_October\\_2014.pdf](http://www4.unfccc.int/submissions/Lists/OSPSubmissionUpload/106_99_130577729021556446-ADP_submission_October_2014.pdf).

Jones, Sam. 2010. "Reforestation Boosts Ethiopian Economy." *Green Futures*, 78. <http://www.forumforthefuture.org/greenfutures/articles/reforestation-boosts-ethiopian-economy>.

Kabir, Md Ashfanor, Himadri Shekhar Dey, and Hasan Mohammad Faraby. 2010. "Microfinance: The Sustainable Financing System for Electrification and Socio-Economic Development of Remote Localities by Solar Home Systems (SHSs) in Bangladesh." In *Systems Conference, 2010 4th Annual IEEE*, 82–85. International Institute of Electrical and Electronics Engineers, New York. [http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=5482477](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=5482477).

Kathuria, Vinish. 2002. "Technology Transfer for GHG Reduction: A Framework with Application to India." *Technological Forecasting and Social Change* 69 (4): 405–30.

Klein, R. J. T., G. F. Midgley, B. L. Preston, M. Alam, F. G. H. Berkhout, K. Dow, and M. R. Shaw. 2014. "Adaptation Opportunities, Constraints, and Limits." In *Climate Change 2014: Impacts, Adaptation, and Vulnerability*. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel of Climate Change, edited by C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, et al., 899–943. Cambridge, U.K.: Cambridge University Press.

Klinsky, Sonja, and Harald Winkler. 2014. "Equity, Sustainable Development and Climate Policy." *Climate Policy* 14 (1): 1–7. doi:10.1080/14693062.2014.859352.

Köhlin, Gunnar, Erin O. Sills, Subhrendu K. Pattanayak, and Christopher Wilfong. 2011. *Energy, Gender and Development: What Are the Linkages? Where Is the Evidence?*. Policy Research Working Paper 5800. Washington, DC: The World Bank. <http://openknowledge-worldbank-org/bitstream/handle/10986/3564/WPS5800.pdf>.

"Kyoto Protocol to the United Nations Framework Convention on Climate Change." Kyoto: UNFCCC. UNFCCC. 2009. "Copenhagen Accord." In *FCCC/CP/2009/L.7*. Copenhagen: UNFCCC. <http://unfccc.int/resource/docs/2009/cop15/eng/l07.pdf>.

Least Developed Countries Expert Group. 2012. "National Adaptation Plans: Technical Guidelines for the National Adaptation Plan Process." United Nations Climate Change Secretariat, Bonn, Germany. [http://unfccc.int/files/adaptation/cancun\\_adaptation\\_framework/application/pdf/naptechguidelines\\_eng\\_high\\_\\_res.pdf](http://unfccc.int/files/adaptation/cancun_adaptation_framework/application/pdf/naptechguidelines_eng_high__res.pdf).

Least Developed Countries. 2014. "Submission by Nepal on Behalf of the Least Developed Countries Group on the ADP Co-Chairs' Non Paper of 7 July 2014 on Parties Views and Proposal on the Elements for a Draft Negotiating Text". Least Developed Countries, Kathmandu. [http://www4.unfccc.int/submissions/Lists/OSPSubmissionUpload/39\\_99\\_130584499817551043-Submission%20by%20Nepal%20ADP\\_21%20Oct%202014.pdf](http://www4.unfccc.int/submissions/Lists/OSPSubmissionUpload/39_99_130584499817551043-Submission%20by%20Nepal%20ADP_21%20Oct%202014.pdf).

Levin, Kelly, David Rich, Jared Finnegan, and Yamide Dagnet. 2014. "Ex-Ante Clarification, Transparency, and Understanding of Intended Nationally Determined Mitigation Contributions." Working Paper. World Resources Institute, Washington, DC. <http://www.wri.org/sites/default/files/WRI-WP-national%20contributions-v5.pdf>.



- Like-Minded Developing Countries. 2014a. "Submission on Elements of the 2015 Agreed Outcome." Government of Saudi Arabia, Government of Ecuador, Government of El Salvador, Government of Mali. [http://unfccc.int/files/documentation/submissions\\_from\\_parties/adp/application/pdf/adp\\_lmhc\\_ws1\\_20140309.pdf](http://unfccc.int/files/documentation/submissions_from_parties/adp/application/pdf/adp_lmhc_ws1_20140309.pdf).
- Like-Minded Developing Countries. 2014b. "Elements for a Draft Negotiating Text of the 2015 ADP Agreed Outcome of the UNFCCC." Government of Malaysia, Kuala Lumpur. [http://unfccc.int/files/documentation/submissions\\_from\\_parties/adp/application/pdf/adp2-5\\_submission\\_by\\_malaysia\\_on\\_behalf\\_of\\_the\\_lmhc\\_crp.pdf](http://unfccc.int/files/documentation/submissions_from_parties/adp/application/pdf/adp2-5_submission_by_malaysia_on_behalf_of_the_lmhc_crp.pdf).
- Looker, Michael. 2013. "Farming Carbon with Fire: Helping Northern Australia Restore Natural Burn Patterns." The Nature Conservancy. Talk. Blog. January 17. <http://blog.nature.org/conservancy/2013/01/17/farming-carbon-with-fire-helping-northern-australia-restore-natural-burn-patterns/>.
- Marshall Islands. 2014. Submission to the Ad-Hoc Working Group on the Durban Platform for Enhanced Action (ADP). Majuro: Government of the Marshall Islands. [http://www4.unfccc.int/submissions/Lists/OSPSubmissionUpload/39\\_99\\_130583616736939645-ADP%20Ambition%20submission%20FINAL.pdf](http://www4.unfccc.int/submissions/Lists/OSPSubmissionUpload/39_99_130583616736939645-ADP%20Ambition%20submission%20FINAL.pdf).
- Mathur, Vivek N., Stavros Afionis, Jouni Paavola, Andrew J. Dougill, and Lindsay C. Stringer. 2014. "Experiences of Host Communities with Carbon Market Projects: Towards Multi-Level Climate Justice." *Climate Policy* 14 (1): 42–62. doi:10.1080/14693062.2013.861728.
- Mendonça, Miguel, Stephen Lacey, and Frede Hvelplund. 2009. "Stability, Participation and Transparency in Renewable Energy Policy: Lessons from Denmark and the United States." *Policy and Society* 27 (4): 379–98. doi:10.1016/j.polsoc.2009.01.007.
- Mexico. 2014. "2015 Agreement: Indicative Elements for a Legally Binding Instrument (LBI)." Government of Mexico, Mexico City.
- Ministerio de Ambiente y Recursos Naturales. 2001. "República de Guatemala: Primera Comunicación Nacional Sobre Cambio Climático." Ministerio de Ambiente y Recursos Naturales, Guatemala City. <http://unfccc.int/resource/docs/natc/guanc1.pdf>.
- Ministerio de Ambiente y Recursos Naturales. 2009. "Política Nacional de Cambio Climático." Ministerio de Ambiente y Recursos Naturales, Guatemala. [http://www.marn.gob.gt/documentos/novedades/politica\\_cc.pdf](http://www.marn.gob.gt/documentos/novedades/politica_cc.pdf).
- Ministry of Agriculture and Rural Development. 2010. Sustainable Land Management Technologies and Approaches in Ethiopia. Edited by Daniel Danano Dale. Addis Ababa: The Federal Democratic Republic of Ethiopia.
- Ministry of Environment. 2010. "Climate Change Vulnerability Mapping." Government of Nepal, Kathmandu.
- Morgan, Jennifer, Yamide Dagnet, and Dennis Tirpek. 2014. "Elements and Ideas for a 2015 Paris Agreement." WRI Report. World Resources Institute, Washington, DC.
- Mourougane, Annabelle. 2010. "Phasing Out Energy Subsidies in Indonesia." OECD Economics Department Working Papers 808. Organisation for Economic Cooperation and Development, Paris. [http://www.oecd-ilibrary.org/economics/phasing-out-energy-subsidies-in-indonesia\\_5km5xvc9c46k-en](http://www.oecd-ilibrary.org/economics/phasing-out-energy-subsidies-in-indonesia_5km5xvc9c46k-en).
- Mudway, Ian S., Sean T. Duggin, Chandra Venkataraman, Gazala Habib, Frank J. Kelly, and Jonathan Grigg. 2005. "Combustion of Dried Animal Dung as Biofuel Results in the Generation of Highly Redox Active Fine Particulates." *Particle and Fibre Toxicology* 2 (6): 1–11.
- Müller, Benito, and Lavan Mahadeva. 2013. "The Oxford Approach: Operationalizing the UNFCCC Principle of 'Respective Capabilities.'" Paper EV 85. Oxford Institute for Energy Studies, Oxford, U.K. [http://www.oxfordclimatepolicy.org/publications/documents/OIES\\_Mueller\\_Mahadeva\\_final.pdf](http://www.oxfordclimatepolicy.org/publications/documents/OIES_Mueller_Mahadeva_final.pdf).
- NCKMCC (Nepal Climate Change Knowledge Management Center). 2014. "Building Climate Change Awareness in Nepal's Remote Area." Nepal Climate Change Knowledge Management Center. <http://www.climatenepal.org.np/main/?p=research&sp=onlinelibrary&opt=detail&id=563>.
- Nepal. 2014. "Government and Climate Scientists to Assess New Method to Project Climate Change in Nepal's Districts | PPCR." Pilot Program for Climate Resilience, Ministry of Science, Technology and Environment, Government of Nepal. April 17. <http://ppcr.moste.gov.np/news/government-and-climate-scientists-to-assess-new-method-to-project-climate-change-in-nepals-districts/>.
- Ngwadla, Xolisa. 2013. "Equitable Access to Sustainable Development: Relevance to Negotiations and Actions on Climate Change." Mitigation Action Plans & Scenarios (MAPS), Cape Town, South Africa. [http://www.mapsprogramme.org/wp-content/uploads/EASD-Relevance-to-negotiations\\_Paper.pdf](http://www.mapsprogramme.org/wp-content/uploads/EASD-Relevance-to-negotiations_Paper.pdf).
- Ngwadla, Xolisa, and Lavanya Rajamani. 2014. "Operationalising an Equity Reference Framework in the Climate Change Regime: Legal and Technical Perspectives." Research Paper, Mitigation Action Plans & Scenarios (MAPS), Cape Town, South Africa. [http://www.mapsprogramme.org/wp-content/uploads/Paper\\_Operationalising-ERF.pdf](http://www.mapsprogramme.org/wp-content/uploads/Paper_Operationalising-ERF.pdf).
- Norway. 2014. "Building the 2015 Agreement – Mitigation and Transparency Elements." Government of Norway, Oslo. [http://unfccc.int/files/bodies/application/pdf/norway\\_submission\\_adp\\_-\\_mitigation.pdf](http://unfccc.int/files/bodies/application/pdf/norway_submission_adp_-_mitigation.pdf).
- Nussbaum, Martha. 2003. "Capabilities as Fundamental Entitlements: Sen and Social Justice." *Feminist Economics* 9 (2-3): 33–59. doi:10.1080/1354570022000077926.
- Nussbaum, Martha. 2009. "The Capabilities of People with Cognitive Disabilities." *Metaphilosophy* 40 (3-4): 331–51. doi:10.1111/j.1467-9973.2009.01606.x.
- OECD (Organisation for Economic Co-operation and Development). 2011. "Inventory of Estimated Budgetary Support and Tax Expenditures for Fossil Fuels." OECD, Paris. <http://www.oecd.org/site/tadffss/48805150.pdf>.

OECD. 2013. "The Netherlands: Climate Change Impacts on Water Systems." OECD, Paris. <http://www.oecd.org/env/resources/Netherlands.pdf>.

OECD. 2014. "Aid (ODA) by Sector and Donor [DAC5]." OECD StatExtracts. <http://stats.oecd.org/Index.aspx?QueryId=42232&lang=en#>.

OECD/IEA (Organisation for Economic Co-operation and Development/International Energy Agency). 2010. "Energy Poverty: How to Make Modern Energy Access Universal? Special Early Excerpt of the World Energy Outlook 2010 for the UN General Assembly on the Millennium Development Goals." OECD/IEA, Paris. [http://www.se4all.org/wp-content/uploads/2013/09/Special\\_Excerpt\\_of\\_WEO\\_2010.pdf](http://www.se4all.org/wp-content/uploads/2013/09/Special_Excerpt_of_WEO_2010.pdf).

Omwansa, Tonny K, and Nicholas P Sullivan. 2013. "Prepaid & Pay-as-You-Go Models for Asset Financing Analysis of Mobile-Money Business Models for Kickstart (irrigation Pumps) and M-KOPA (solar Panels) in Kenya." University of Nairobi. Accessed July 11 at <http://erepository.uonbi.ac.ke/handle/11295/36056>. [Not a dissertation]

Osbeck, Maria, Neil Powell, Åsa Gerger Swartling, and M. Hoang. 2010. "Reconciling the Multiple Dimensions Rural Livelihoods in Mangrove Systems in the Red River Delta." In Stakeholder Agency in Rural Development Policy: Articulating Co-Governance in Vietnam. Hanoi: International Center for Research in Agroforestry, Nairobi.

Oxfam, "Exposed: Social Vulnerability and Climate Change in the US Southeast." Oxfam, Boston.

Oxfam. 2014. "Building a New Agricultural Future: Supporting Agro-Ecology for People and the Planet." Oxfam, Oxford. <http://www.oxfam.org/sites/www.oxfam.org/files/ib-building-new-agricultural-future-agroecology-280414-en.pdf>.

Palit, Debajit, and Akanksha Chaurey. 2011. "Off-Grid Rural Electrification Experiences from South Asia: Status and Best Practices." Special Issue on off-Grid Electrification in Developing Countries 15 (3): 266–76. doi:10.1016/j.esd.2011.07.004.

Persha, Lauren, Arun Agarwal, and Ashwini Chhatre. 2011. "Social and Ecological Synergy: Local Rulemaking, Forest Livelihoods, and Biodiversity Conservation." *Science* 331 (6024): 1606–8.

Polycarp, Clifford, Louise Helen Brown, Xing Fu-Bertaux. "Mobilizing Climate Investment: The Role of International Climate Finance in Creating Readiness for Scaled-up Low-Carbon Energy." World Resources Institute, Washington, DC. <http://www.wri.org/publication/mobilizing-climate-investment>.

Pouliotte, Jennifer, Barry Smit, and Lisa Westerhoff. 2009. "Adaptation and Development: Livelihoods and Climate Change in Subarnabad, Bangladesh." *Climate and Development* 1 (1): 31–46.

Preston, Ian, Vicki White, James Browne, Simon Dresner, Paul Ekins, and Ian Hamilton. 2013. "Designing Carbon Taxation to Protect Low-Income Households." Joseph Rowntree Foundation, York, U.K.. <http://www.jrf.org.uk/sites/files/jrf/carbon-taxation-income-full.pdf>.

Rajamani, Lavanya. 2006. *Differential Treatment in International Environmental Law*. Vol. 175. Oxford: Oxford University Press.

Rajamani, Lavanya. 2012. "The Changing Fortunes of Differential Treatment in the Evolution of International Environmental Law." *International Affairs* 88 (3): 605–23.

Reid, Hannah. 2014. *Climate Change and Human Development*. London: Zed Books.

Replogle, Michael, and Colin Hughes. 2012. "Moving toward Sustainable Transport." In *State of the World 2012: Moving Toward Sustainable Prosperity*. World Watch Institute.

RGGI (Regional Greenhouse Gas Initiative). 2014. "Regional Investment of RGGI CO<sub>2</sub> Allowance Proceeds, 2012." RGGI, New York. <http://www.rggi.org/docs/Documents/2012-Investment-Report.pdf>.

Road Traffic Technology. n.d. "Central London Congestion Charging, England, United Kingdom." Road Traffic Technology. <http://www.roadtraffic-technology.com/projects/congestion/>.

Robeyns, Ingrid. 2003. "Sen's Capability Approach and Gender Inequality: Selecting Relevant Capabilities." *Feminist Economics* 9 (2-3): 61–92. doi:10.1080/1354570022000078024.

Robeyns, Ingrid. 2005. "The Capability Approach: A Theoretical Survey." *Journal of Human Development* 6 (1): 93–117. doi:10.1080/146498805200034266.

Robeyns, Ingrid. 2006. "The Capability Approach in Practice." *The Journal of Political Philosophy* 14 (3): 351–76. doi:10.1111/j.1467-9760.2006.00263.x.

Rogers, Everett. 2003. *Diffusion of Innovations*. 5th Ed. New York: Free Press.

Romani, Mattia, James Rydge, and Nicholas Stern. 2012. "Recklessly Slow or a Rapid Transition to a Low-Carbon Economy? Time to Decide." Policy paper. Centre for Climate Change Economics and Policy; Grantham Research Institute on Climate Change and the Environment, London. <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/03/transition-low-carbon-economy.pdf>.

Rotterdam Climate Initiative. 2013. "Rotterdam: Climate Change Adaptation Strategy." Rotterdam Climate Initiative, Rotterdam. [http://www.rotterdamclimateinitiative.nl/documents/Documenten/20121210\\_RAS\\_EN\\_Ir\\_versie\\_4.pdf](http://www.rotterdamclimateinitiative.nl/documents/Documenten/20121210_RAS_EN_Ir_versie_4.pdf).

RRI (Rights and Resources Initiative). 2014. "What Future for Reform? Progress and Slowdown in Forest Tenure Reform since 2002." RRI, Washington, DC. [http://www.rightsandresources.org/wp-content/uploads/RRI4011D\\_FlagshipMAR2014r13B.pdf](http://www.rightsandresources.org/wp-content/uploads/RRI4011D_FlagshipMAR2014r13B.pdf).

Sadler, Lucy. n.d. "Detailed Assessment London Congestion Charging". United Kingdom Department for Environment, Food & Rural Affairs, London. [http://uk-air.defra.gov.uk/assets/documents/reports/cat09/0505171128\\_London\\_Congestion\\_Charge\\_Detailed\\_Assessment.doc&sa=U&ei=jP3DU-WpApCA7QanmYHYCA&ved=0CAUQFjAA&client=internal-uds-cse&usq=AFQjCNGSAMcTbZ1RtO-xw17UCPwQiLXUFA](http://uk-air.defra.gov.uk/assets/documents/reports/cat09/0505171128_London_Congestion_Charge_Detailed_Assessment.doc&sa=U&ei=jP3DU-WpApCA7QanmYHYCA&ved=0CAUQFjAA&client=internal-uds-cse&usq=AFQjCNGSAMcTbZ1RtO-xw17UCPwQiLXUFA).

- Selco. 2014. "Access to Sustainable Energy Services via Innovative Financing: 7 Case Studies." Selco, Bangalore, India. Accessed June 15 at [http://www.selco-india.com/pdfs/selco\\_booklet\\_web.pdf](http://www.selco-india.com/pdfs/selco_booklet_web.pdf).
- Sen, Amartya. 1999. *Development as Freedom*. Oxford, U.K.: Oxford University Press.
- Seymour, Frances, Tony La Vina, and Kristen Hite. 2014. "Evidence Linking Community Land Tenure and Forest Condition: An Annotated Bibliography." Climate and Land Use Alliance, San Francisco, CA. [http://www.climateandlandusealliance.org/uploads/PDFs/Community\\_level\\_tenure\\_and\\_forest\\_condition\\_bibliography.pdf](http://www.climateandlandusealliance.org/uploads/PDFs/Community_level_tenure_and_forest_condition_bibliography.pdf).
- Simon, Chihanga, Kentse Moakofhi, Tjantilili Mosweunyane, Haruna Baba Jibril, Bornapate Nkomo, Mpho Mottaleng, Davies Sedisa Ntebela, Emmanuel Chanda, and Ubydul Haque. 2013. "Malaria Control in Botswana, 2008–2012: The Path towards Elimination." *Malaria Journal* 12 (458). doi:10.1186/1475-2875-12-458.
- Singh, Neelam. 2013. "Creating Market Support for Energy Efficiency: India's Perform, Achieve and Trade Scheme." Climate and Development Knowledge Network, London. [http://r4d.dfid.gov.uk/PDF/Outputs/CDKN/India-PAT\\_InsideStory.pdf](http://r4d.dfid.gov.uk/PDF/Outputs/CDKN/India-PAT_InsideStory.pdf).
- Skutsch, Margaret, and Silvia Solis. 2011. "How Much Carbon Does Community Forest Management Save?" In *Community Forest Monitoring for the Carbon Market: Opportunities Under REDD*. London: Earthscan.
- Smith, K. R., A. Woodward, D. Campbell-Lendrum, D. D. Chadee, Y. Honda, Q. Liu, J. M. Olwoch, B. Revich, and R. Sauerborn. 2014. "Human Health: Impacts, Adaptation, and Co-Benefits." In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel of Climate Change*, edited by C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, et al., pp. 709–54. Cambridge, U.K.: Cambridge University Press.
- Smith, Pete, Mercedes Bustamante, Helal Ahammad, Harry Clark, Hongmin Dong, Elnour Abdalla Elsidig, Helmut Haberl, et al. 2014. "Agriculture, Forestry and Other Land Use (AFOLU)." In *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by O. Edenhofer, R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel, and J.C. Minx. Cambridge U.K.: Cambridge University Press.
- Song, Ranping, and Hongpeng Lei. 2014. "Emissions Trading in China: First Reports from the Field." World Resources Institute, Washington DC. <http://www.wri.org/blog/2014/01/emissions-trading-china-first-reports-field>.
- Sørensen, Hans Christian, Lars Kjeld Hansen, and Jens HM Larsen. 2002. "Middelgrunden 40 MW Offshore Wind Farm Denmark—Lessons Learned." In *Realities of Offshore Wind Technologies, Case: Middelgrunden, Orkney, October 2002*. Gaithersburg, Maryland: Ocean Renewable Energy Coalition. <http://www.oceanrenewable.com/wp-content/uploads/2007/03/middelgrundendenwindlessonspok02.pdf>.
- SOS Sahel. 2008. *SOS Sahel Ethiopia Fact Sheet*. Fact Sheet. SOS Sahel, Oxford, U.K. [http://www.sahel.org.uk/documents/SOSSahelEthiopiaFactsheet\\_Jan2008.pdf](http://www.sahel.org.uk/documents/SOSSahelEthiopiaFactsheet_Jan2008.pdf).
- South Africa. 2013. "South African Submission on Mitigation under the Ad Hoc Working Group on the Durban Platform for Enhanced Action." Government of South Africa, Pretoria. [http://unfccc.int/files/documentation/submissions\\_from\\_parties/adp/application/pdf/adp\\_south\\_africa\\_workstream\\_1\\_mitigation\\_20130930.pdf](http://unfccc.int/files/documentation/submissions_from_parties/adp/application/pdf/adp_south_africa_workstream_1_mitigation_20130930.pdf).
- Stevens, Caleb, Robert Winterbottom, Jenny Springer, Katie Reyntar. "Securing Rights, Combating Climate Change: How Strengthening Community Forest Rights Mitigates Climate Change." World Resources Institute, Washington, DC.
- Sumner, Jennifer, Lori Bird, and Hillary Smith. 2009. "Carbon Taxes: A Review of Experience and Policy Design Consideration: Technical Report NREL/TP - 6A2 - 47312." National Renewable Energy Laboratory, Washington DC. <http://www.nrel.gov/docs/fy10osti/47312.pdf>.
- Swarup, A., I. E. M. Dankelman, K. Ahluwalia, and K. Hawrylysgym. 2011. "Weathering the Storm: Adolescent Girls and Climate Change 2011." Edited by Sharon Goulds. Plan International, Woking, Surrey, UK. <http://www.plan-uk.org/resources/documents/35316>.
- Switzerland. 2014. "Elements of the 2015 Agreement - Switzerland's Views." Government of Switzerland, Bern. [http://unfccc.int/files/bodies/application/pdf/elements\\_of\\_the\\_agreement\\_adp\\_ws1\\_switzerlands\\_views.pdf](http://unfccc.int/files/bodies/application/pdf/elements_of_the_agreement_adp_ws1_switzerlands_views.pdf).
- Tai, Nguyen Van, Kim Thi Thuy Ngoc, Phan Tuan Hung, and Nguyen Thi Ngoc Anh. 2009. "Viet Nam Assessment Report on Climate Change." Institute of Strategy and Policy on Natural Resources and Environment, Hanoi, Vietnam. <http://www.unep.org/climatechange/adaptation/ScienceandAssessments/VietnamAssessmentReport/tabid/29576/Default.aspx>.
- Tambo, Justice Akpene, and Tahirou Abdoulaye. 2012. "Climate Change and Agricultural Technology Adoption: The Case of Drought Tolerant Maize in Rural Nigeria." *Mitigation and Adaptation Strategies for Global Change* 17 (3): 277–92. doi:10.1007/s11027-011-9325-7.
- Taylor, Peter Leigh. 2010. "Conservation, Community, and Culture? New Organizational Challenges of Community Forest Concessions in the Maya Biosphere Reserve of Guatemala." *Journal of Rural Studies* 26 (2): 173–84. doi:10.1016/j.jrurstud.2009.09.006.
- Thomson, M. C., F. J. Doblas-Reyes, S. J. Mason, S. J. Connor, T. Phindela, A. P. Morse, and T. N. Palmer. 2006. "Malaria Early Warnings Based on Seasonal Climate Forecasts from Multi-Model Ensembles." *Nature* 439: 576–79. doi:10.1038/nature04503.
- Thorpe, Natasha, Naikaka Hakongak, Sanra Eyegetok, and Kitikmeot Elders. 2001. "Thunder on the Tundra : Inuit Qaujimatjuqangit of the Bathurst Caribou." Tuktuk and Nogak Project, Government of Nunavut, Cambridge Bay, NU, Canada. Tippmann, Robert, Ali Agoumi, Louis Perroy, Marianna Doria, Sabine Henders, and Rokia Goldmann. 2013. "Assessing Barriers and Solutions to Financing Adaptation Projects in Africa." Report. International Development Research Centre (IDRC), Ottawa. <http://hdl.handle.net/10625/51972>.

Tongsopit, Sopitsuda. 2014. "Thailand's Feed-In Tariff for Solar Power: Calculation, Impacts and Future Directions." Energy Research Institute, Chulalongkorn University, Bangkok. [http://www.esi.nus.edu.sg/docs/default-source/event/sopitsuda\\_thailandssolarfit.pdf?sfvrsn=2](http://www.esi.nus.edu.sg/docs/default-source/event/sopitsuda_thailandssolarfit.pdf?sfvrsn=2).

Torres-Duque, C., D. Maldonado, R. Perez-Padilla, M. Ezzati, G. Viegi, and on behalf of the Forum of International Respiratory Societies (FIRS) Task Force on Health Effects of Biomass Exposure. 2008. "Biomass Fuels and Respiratory Diseases: A Review of the Evidence." *Proceedings of the American Thoracic Society* 5 (5): 577–90. doi:10.1513/pats.200707-100RP.

Tranaes, Flemming. n.d. "Danish Wind Energy Co-Operatives." SPOK, Copenhagen, Denmark. [http://www.spok.dk/consult/reports/danish\\_wind\\_energy.pdf](http://www.spok.dk/consult/reports/danish_wind_energy.pdf).

Transport for London. 2004. "Impacts Monitoring - Second Annual Report." Transport for London, London. <https://www.tfl.gov.uk/cdn/static/cms/documents/impacts-monitoring-report-2.pdf>.

TSRM (Thai Solar Roadmap). 2013. "Summary of Thailand's Current Policy to Support Solar Power." Thai Solar PV Roadmap, Bangkok. <http://thaisolarpvroadmap.org/wordpress/wp-content/uploads/2013/07/Summary-of-Thailand-2013-Solar-Policy.pdf>.

TSRM. 2014. "Community Solar Incentives in Thailand Stall Over Funding Hurdle." Thai Solar Road Map, Bangkok. <http://thaisolarpvroadmap.org/wordpress/wp-content/uploads/2014/05/Community-Solar-Incentives-in-Thailand-Stall-Over-Funding-DisputeAPR2014.pdf>.

Turner, Michael, Chuck Kooshian, and Steve Winkelman. 2012. "Case Study: Colombia's Bus Rapid Transit (BRT) Development and Expansion." Center for Clean Air Policy, Washington, DC. <http://www.ccap.org/docs/resources/1080/Colombia-case%20study-final.pdf>.

United Nations. 1948. "The Universal Declaration of Human Rights." United Nations General Assembly, New York.

United Nations. 2013. "Creating Universal Access to Safe, Clean and Affordable Transport." United Nations, New York. <http://sustainabledevelopment.un.org/content/documents/1158SLoCaT.pdf>.

UNDP (United Nations Development Programme). 2014a. "Community-Based Adaptation: Bolivia." UNDP, New York. Accessed July 17 at <http://www.undp-alm.org/projects/spa-community-based-adaptation-bolivia>.

UNDP. 2014b. "Community-Based Adaptation Fast Facts: Bolivia, Adapting to Climate Change through Water Resource Management and Afforestation in the Battalas Municipality." Accessed August 1 at <http://www.undp-alm.org/resources/project-brief-fact-sheet/cba-bolivia-batallas-fast-facts>.

UNDP. 2014c. "CBA Bolivia - ICO - Project Proposal." Accessed August 1 at <http://www.undp-alm.org/resources/pifs/cba-bolivia-ico-project-proposal-es-en-summary>.

UNEP (United Nations Environment Programme). 2013. *The Emissions Gap Report: A UNEP Synthesis Report*. Nairobi: UNEP. <http://www.unep.org/pdf/UNEPemissionsgapreport2013.pdf>.

UNFCCC (United Nations Framework Convention on Climate Change). 1992. "United Nations Framework Convention on Climate Change." <http://unfccc.int/resource/docs/convkp/conveng.pdf>.

UNFCCC. 2011a. "Part Two: Action Taken by the Conference of the Parties at Its Sixteenth Session." In FCCC/CP/2010/7/Add.1. Cancun: UNFCCC. <http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf#page=2>. ———. 2011a. "Part Two: Action Taken by the Conference of the Parties at Its Sixteenth Session." In FCCC/CP/2010/7/Add.1. Cancun: UNFCCC. <http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf#page=4>.

UNFCCC. 2011b. "Report of the Conference of the Parties on Its Seventeenth Session, Held in Durban from 28 November to 11 December 2011. Addendum. Part Two: Action Taken by the Conference of the Parties at Its Seventeenth Session. Decisions Adopted by the Conference of the Parties." In FCCC/CP/2011/9/Add.1. UNFCCC, Durban. <http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf>.

UNFCCC. 2013a. "Third Synthesis Report on Technology Needs Identified by Parties Not Included in Annex I to the Convention." In FCCC/SBSTA/2013/INF.7. Warsaw: UNFCCC. <http://unfccc.int/resource/docs/2013/sbsta/eng/inf07.pdf>.

UNFCCC. 2013b. "Report of the Conference of the Parties on Its Nineteenth Session, Held in Warsaw from 11 to 23 November 2013. Addendum. Part Two: Action Taken by the Conference of the Parties at Its Nineteenth Session." In FCCC/CP/2013/10/Add.1. Warsaw: UNFCCC. <http://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf>.

UNFCCC. 2014. "Synthesis Report on the Implementation of the Framework for Capacity-Building in Developing Countries." In FCCC/SBI/2014/2. Bonn, Germany: UNFCCC. <http://unfccc.int/resource/docs/2014/sbi/eng/02.pdf>.

UNFCCC. 2014b. "Non-Paper on Elements for a Draft Negotiating Text: Updated Non-Paper on Parties' Views and Proposals, Ad Hoc Working Group on the Durban Platform for Enhanced Action." UNFCCC. <http://unfccc.int/resource/docs/2014/adp2/eng/11nonpap.pdf>.

UNISDR (United Nations International Strategy for Disaster Reduction). 2009. "2009 UNISDR Terminology on Disaster Risk Reduction." Geneva, United Nations International Strategy for Disaster Reduction. [http://www.unisdr.org/files/7817\\_UNISDRterminology-English.pdf](http://www.unisdr.org/files/7817_UNISDRterminology-English.pdf).

UNISDR. 2011. "2011 Global Assessment Report on Disaster Risk Reduction: Revealing Risk, Redefining Development." Geneva, United Nations International Strategy for Disaster Reduction. <http://www.preventionweb.net/english/hyogo/gar/2011/en/home/index.html>.

United States. 2014. "U.S. Submission on Elements of the 2015 Agreement." Government of the United States, Washington. DC:[http://unfccc.int/files/documentation/submissions\\_from\\_parties/adp/application/pdf/u.s.\\_submission\\_on\\_elements\\_of\\_the\\_2105\\_agreement.pdf](http://unfccc.int/files/documentation/submissions_from_parties/adp/application/pdf/u.s._submission_on_elements_of_the_2105_agreement.pdf).

Urmee, Tania, David Harries, and August Schlapfer. 2009. "Issues Related to Rural Electrification Using Renewable Energy in Developing Countries of Asia and Pacific." *Renewable Energy* 34 (2): 354–57. doi:10.1016/j.renene.2008.05.004.

Victor, David. 2009a. "The Politics of Fossil-Fuel Subsidies." IISD Global Subsidy Initiative. International Institute for Sustainable Development, Winnipeg, Canada.

Wang, Lanying, and Qun Li. 2010. "China's Agricultural Development: Adaptation in Action—World Resources Report Case Study." In *World Resources Report 2010-2011*. World Resources Institute, Washington, DC. [http://www.wri.org/sites/default/files/uploads/wrr\\_case\\_study\\_china\\_agriculture.pdf](http://www.wri.org/sites/default/files/uploads/wrr_case_study_china_agriculture.pdf).

Weiss, Edith Brown. 1990. "Our Rights and Obligations to Future Generations for the Environment." *American Journal of International Law*, 198–207.

Westengen, Ola T., and Anne K. Brysting. 2014. "Crop Adaptation to Climate Change in the Semi-Arid Zone in Tanzania: The Role of Genetic Resources and Seed Systems." *Agriculture & Food Security* 3 (1): 3. doi:10.1186/2048-7010-3-3.

WHO (World Health Organization). 2009. *Protecting Health from Climate Change: Connecting Science, Policy and People*. Geneva: WHO. [http://whqlibdoc.who.int/publications/2009/9789241598880\\_eng.pdf?ua=1](http://whqlibdoc.who.int/publications/2009/9789241598880_eng.pdf?ua=1).

WHO. 2013. *Global Status Report on Road Safety 2013*. Geneva: World Health Organization.

WHO. 2014. *Quantitative Risk Assessment of the Effects of Climate Change on Selected Causes of Death, 2030s and 2050s*. Geneva: WHO. [http://apps.who.int/iris/bitstream/10665/134014/1/9789241507691\\_eng.pdf?ua=1](http://apps.who.int/iris/bitstream/10665/134014/1/9789241507691_eng.pdf?ua=1).

Willumsen, Luis. 2004. "London Congestion Charging and Urban Tolling in Chile." Presented at the I. European Transport Conference, Strasbourg, Germany, October 6-8, 2004, . <http://www.piarc.org/ressources/documents/318,6,3-Willumsen-0405C11.pdf>.

Winkler, Harald, and Lavanya Rajamani. 2013. "CBDR&RC in a Regime Applicable to All." *Climate Policy* 14 (1): 102–21.

Wiseman, Katie, and Raju Pandit Chhetri. 2011. "Minding the Money: Governance of Climate Change Adaptation Finance in Nepal." Oxfam International, Kathmandu.

Wolsink, Maarten. 2007. "Wind Power Implementation: The Nature of Public Attitudes: Equity and Fairness Instead of 'Backyard Motives.'" *Renewable and Sustainable Energy Reviews* 11 (6): 1188–1207. doi:10.1016/j.rser.2005.10.005.

World Bank. 2010. *World Development Report 2010: Development and Climate Change*. Washington, DC: World Bank. <http://siteresources.worldbank.org/INTWDR2010/Resources/5287678-1226014527953/WDR10-Full-Text.pdf>.

World Bank. 2014a. "Nepal: Irrigation and Water Resource Management." April 11. World Bank, Washington DC. <http://www.worldbank.org/en/results/2014/04/11/nepal-irrigation-and-water-resource-management>.

World Bank. 2014b. "Poverty Overview." World Bank. October 8. <http://www.worldbank.org/en/topic/poverty/overview>.

World Bank and EcoFys. 2013. "Mapping Carbon Pricing Initiatives: Developments and Prospects 2013." World Bank and EcoFys, Washington, DC. <http://www.ecofys.com/files/files/world-bank-ecofys-2013-mapping-carbon-pricing-initiatives.pdf>.

World Bank and Global Facility for Disaster Reduction and Recovery (GFDRR). 2013. "Building Resilience: Integrating Climate and Disaster Risk into Development." World Bank, Washington, DC. [http://www.worldbank.org/content/dam/Worldbank/document/SDN/Full\\_Report\\_Building\\_Resilience\\_Integrating\\_Climate\\_Disaster\\_Risk\\_Development.pdf](http://www.worldbank.org/content/dam/Worldbank/document/SDN/Full_Report_Building_Resilience_Integrating_Climate_Disaster_Risk_Development.pdf).

WRI (World Resources Institute). 2008. *World Resources 2008: Roots of Resilience - Growing the Wealth of the Poor*. Washington, DC: World Resources Institute. <http://www.wri.org/publication/world-resources-2008>.

World Resources Institute, United Nations Development Programme, United Nations Environment Programme, and World Bank. 2011. *World Resources 2010–2011: Decision Making in a Changing Climate—Adaptation Challenges and Choices*. Washington, DC: World Resources Institute. [http://www.wri.org/sites/default/files/pdf/world\\_resources\\_report\\_2010-2011.pdf](http://www.wri.org/sites/default/files/pdf/world_resources_report_2010-2011.pdf).

WWF (World Wildlife Fund). 2013. "Meeting Renewable Energy Targets: Global Lessons from the Road to Implementation." WWF, Washington, DC. [http://awsassets.panda.org/downloads/wwf\\_report\\_setting\\_and\\_meeting\\_renewable\\_energy\\_targets\\_lessons\\_learned\\_1.pdf](http://awsassets.panda.org/downloads/wwf_report_setting_and_meeting_renewable_energy_targets_lessons_learned_1.pdf).

## ENDNOTE

1. Reducing Emissions from Deforestation and Forest Degradation (REDD) is an effort to create a financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development. "REDD+" goes beyond deforestation and forest degradation, and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.

## ACKNOWLEDGMENTS

We would like to thank the many people who contributed to the ideas and discussions that have shaped the report. We greatly appreciate the guidance and earlier reviews provided by Jennifer Morgan, Manish Bapna, Heather McGray, Athena Ballesteros, Kitty van der Heijden, Yamide Dagnet, Helen Mountford, Peter Veit, Ranping Song, Alex Doukas, Robin King, Caleb Stevens, Apurba Mitra, Bharath Jairaj, Taryn Fransen, Free de Koning, Lily Odarno, Ferzina Banaji, Rhys Gerholdt, Lawrence MacDonald, and Tesfay Woldemariam.

Special thanks go to WRI's office of the Vice President of Science & Research, particularly Janet Ranganathan, Daryl Ditz, and Allison Meyer, who assisted us tirelessly through the publication process. Further thanks go to Carni Klirs, Hyacinth Billings, Polly Ghazi, Emily Matthews, and Mary Paden for their invaluable editorial and design support.

We are also grateful to the following external experts for sharing their expertise and feedback, though responsibility for the final product rests fully with the authors and WRI: Tara Shine, Lavanya Rajamani, Ana Toni, Saleemul Huq, Jose Garibaldi, Vice Yu, and Jared Finnegan.

Finally, we would like to thank Mary Robinson and the Mary Robinson Foundation – Climate Justice for our partnership on climate justice and equity issues.

## ABOUT THE AUTHORS

**Sonja Klinsky** is an Assistant Professor in the School of Sustainability at Arizona State University

Contact: [sonja.klinsky@asu.edu](mailto:sonja.klinsky@asu.edu)

**David Waskow** is the Director of the International Climate Initiative in WRI's Climate Program

Contact: [dwaskow@wri.org](mailto:dwaskow@wri.org)

**Wendi Bevins** contributed to the report in her capacity as a Research Analyst in WRI's Climate Program

Contact: [wendi.bevins@gmail.com](mailto:wendi.bevins@gmail.com)

**Eliza Northrop** is a Research Analyst in WRI's Climate Program

Contact: [enorthrop@wri.org](mailto:enorthrop@wri.org)

**Robert Kutter** is a researcher, editor, and the founder of Kutter Consulting

Contact: [contact@kutterconsulting.com](mailto:contact@kutterconsulting.com)

**Laura Weatherer** is an Intern in WRI's Climate Program

Contact: [lweatherer@wri.org](mailto:lweatherer@wri.org)

**Paul Joffe** is Senior Foreign Policy Counsel in WRI's Climate Program

Contact: [pjoffe@wri.org](mailto:pjoffe@wri.org)

## PHOTO CREDITS

Cover photo, pg. 27, 32, 40, Abbie Traylor-Smith / Panos Pictures / Department for International Development; table of contents, tschuma417; pg. iv, Timothy Mwaura; pg. vi, Georgina Smith / CIAT; pg. 7, Julien Hameis; pg. 9, BAIF; pg. 10, Iona Soulsby / MAP-Indonesia; pg. 12, 93, J Hansen / CCAFS; pg. 13 (center), 71, Simone D McCourtie / World Bank; pg. 13 (right), 22 (left), Neil Palmer / CIAT; pg. 15, Matthieu Young; pg. 18, C Schubert / CCAFS; pg. 21, Nugroho Nurdikiawan Sunjoyo / World Bank; pg. 22 (center), JC McLwaine / UN Photo; pg. 23, Nonie Reyes / World Bank; pg. 31, Rafiqur Rahman Raqu / Department for International Development; pg. 35, Tomas Munita / CIFOR; pg. 38, Asian Development Bank; pg. 42, Ollivier Girard / CIFOR; pg. 44, Jervis Sundays / Kenya Red Cross Society; pg. 46, Madhav Pai; pg. 49, sehroiber; pg. 56, Ricky Martin / CIFOR; pg. 58, Kate Evans / CIFOR; pg. 60, Capt. Peter Shinn / DVIDSHUB; pg. 67, Tri Saputro / CIFOR; pg. 69, Jim Winstead; pg. 76, Jalam Garowe / UNDP Somalia; pg. 80, European Commission DG ECHO; pg. 88 (left), joiseyshowaa; pg. 89 (center), bertknot; pg. 89 (right), Beatrice Murch; pg. 94, Farhana Asnap / World Bank; pg. 98, Richard Nyberg / USAID.





WORLD  
RESOURCES  
INSTITUTE

10 G STREET NE  
SUITE 800  
WASHINGTON, DC 20002, USA  
+1 (202) 729-7600  
[WWW.WRI.ORG](http://WWW.WRI.ORG)

ISBN 978-1-56973-864-1