CHAPTER 3

Green Growth and Equity in the Context of Climate Change

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3.1 Introduction

Green growth entails several different kinds of processes: conversion to low-carbon energy, climate resilience, and response to climate shocks. Equity implies a fair sharing of the costs, within and between countries. Equity issues have been considered in a number of ways, including implications of historic responsibility, development impacts of a carbon budget on developing countries, impacts on the poor and most vulnerable, consequences of a top-down global-benefit-oriented mitigation policy, and the implications of official development assistance (ODA) on climate finance. Fairness involves both helping to share the incremental costs of adaptation and mitigation, and compensating for damage incurred as the result of climate change. Both the mitigation and adaptation activities (and many actions involve both mitigation and adaptation) are costly. We should undertake them because the social costs of these actions are less than the social benefits they promise. Still, for developing countries, the costs are real and compound the ongoing challenges of economic development.

In the first section of the paper we explore some of the ways in which equity has been considered in climate change discussions. We discuss per capita emission rights approaches, and highlight key challenges in the application of equity in global climate change negotiations. In section 2 we briefly overview key approaches to carbon financing, focusing on some recent cost estimations of potential climate change impacts, as well as of projected needs for green growth programs. We highlight the diversity of estimates and present evidence on the apparent gulf between available public financing and green growth needs. In section 3 we turn to considerations of implementing green growth, focusing on building climate resilience and responding to climate shocks. Section 4 presents an approach to a global Green Fund that would receive assessed contributions of member countries and disburse grant and loan funds to low- and middle-income countries to enable them to pursue green growth programs.

3.2 Equity Considerations in Climate Change Discussions

Unlike in global discussions of sustainable development, in climate change negotiations equity concerns have received considerable attention. In the former, the emphasis was on the global responsibility on the part of developed countries to support sustainable development, rather than on equity between countries (World Commission on Environment and Development 1987). Equity is coming to be recognized as critical for the effective linking of environmental, economic, and social considerations, in order to achieve sustainable development (UNESCAP 2012, p. xv). Green growth strategies would help build a "green economy" while enhancing the earth's natural capital, and reducing ecological scarcities and environmental risks. However, it is also recognized that green growth strategies will not by themselves realize sustainable development. Social policies enhancing inclusion, and addressing poverty and the needs of disadvantaged and vulnerable groups are also important. Further, especially in the Asian context, the economic, social, and environmental dimensions need practical integration into systems of governance that promote equity—in resource use and in risk sharing, between and within countries, and both between and within generations. Equity in this expanded sense is the most critical consideration for the long-term sustainability and greater socioeconomic resilience of societies.

In the run up to the Rio+20 conference in 2012, a number of multilateral organizations, research institutes, advocacy organizations and governments pushed for the consideration of a "green economy" as a key framing for national development (UNEP 2011; HM Government 2012; Green Economy Coalition undated). In the United Kingdom government's submission to Rio+20, for example, it was stated that the green economy will "maximise value and growth across the whole economy, while managing natural assets sustainably" (p. 1). Equity considerations are noticeably absent. The emphasis instead is on economic growth and wealth creation while reducing environmental impacts, making efficient use of natural resources, reducing reliance on fossil fuels, improving preparedness for climate change impacts, and exploiting the comparative advantage of businesses for green goods and services. The apparent jettisoning of sustainable development in favor of the green economy has made some observers nervous. As Khor notes, the hard won gains of sustainable development (such as the sustainability principle, right to development, common but differentiated responsibilities, and international cooperation that recognizes the development needs of the South) should be preserved in considerations of green economy (UN-DESA 2011).

In the case of climate change, where the emission levels of developed countries are directly linked to changes in the climate, equity between countries has been seen as highly relevant in global negotiations. However, its formulation has been varied, and its application to realize the financing for implementation of climate policies on mitigation and adaptation action in developing counties has been highly uneven. In this section we provide an overview of some of the ways that equity has been considered. In the next section, we discuss global climate financing needs and its actual availability.

3.2.1 United Nations Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change (UNFCC) states that developed countries need to assume responsibilities to both reduce their own greenhouse gas (GHG) emissions, and to support efforts to reduce the vulnerabilities of developing countries to climate change risks. It is widely understood that rigorous implementation of a global carbon budget in the absence of a rapid transition to a low carbon economy would seriously constrain long-term development in developing countries. Equity considerations require financial and technological support and capacity development to developing countries to help them achieve development goals on a green growth path. Climate change policies are also expected to magnify the impacts of climate vulnerability, with some of the biggest impacts on poor people resulting less from the changing climate itself than from policies to mitigate climate change. Further, a rights-based approach has been used, focusing specifically on the needs of the most vulnerable groups, advocating that they receive preferential support. Climate and development justice requires that poor communities in developing countries, who will bear the brunt of climate change impacts while contributing very little to its causes, need the world's help first and foremost.

The climate system is a shared resource and its stability is affected by emissions of carbon dioxide and other greenhouse gases. The average temperature of the earth's surface has risen by 0.74 degrees Celsius (C) since the late 1800s and is expected to increase by another 1.8°C to 4°C by the year 2100 with massive environmental and socioeconomic implications for all of humanity (Solomon et al. 2007). While "greenhouse gases" in the atmosphere, especially carbon dioxide, methane, and nitrous oxide occur naturally, the principal reasons for higher emissions over the past 150 years are associated with industrialization activities: the burning of ever increasing quantities of petroleum and coal and land use changes. Almost two decades ago, many countries joined an international treaty—the United Nations Framework Convention on Climate Change (the Convention)—to begin to consider actions to reduce global warming and to cope with whatever temperature increases are inevitable.

Equity is given considerable attention in the Convention, as are the difficulties that countries (as parties to the Convention) would face in its realization. It notes that "the largest share of historical and current global emissions of greenhouse gases has originated in developed countries, that per capita emissions in developing countries are still relatively low and that the share of global emissions originating in developing countries will grow to meet their social and development needs,.." (UN 1992: 1). It continues: "[R]ecognizing further that low-lying and other small island countries, countries with low-lying coastal, arid and semi-arid areas or areas liable to floods, drought and desertification, and developing countries with fragile mountainous ecosystems are particularly vulnerable to the adverse effects of climate change,.." (UN 1992: 2) The Convention also recognizes "that all countries, especially developing countries, need access to resources required to achieve sustainable social and economic development and that, in order for developing countries to progress towards that goal, their energy consumption will need to grow taking into account the possibilities for achieving greater energy efficiency and for controlling greenhouse gas emissions in general, including through the application of new technologies on terms which make such an application economically and socially beneficial,.." (UN 1992: 3). The Convention notes that: "The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof." (UN 1992: 4)

The Convention's Principle 3 draws attention to equity issues in a number of ways. These include a focus on common but differentiated responsibilities and respective capabilities, the need for developed countries to take the lead in climate action, a focus on developing countries that are particularly vulnerable to climate change effects, and a recognition of the right of developing countries to development. The Convention clearly holds the industrialized countries responsible both for reducing global warming and for helping developing countries manage the impacts of global warming. However, it is in the identification of precise areas of responsibilities and in their resourcing that the equity framing begins to get diffuse, creating differences in interpretation and difficulties in being put into practice. The various proposals can be classified into two categories: resource sharing and effort sharing. The former, adopting an equal per capita approach to the sharing of the carbon budget, focuses mainly on GHG mitigation efforts. The effort sharing approaches focus on enabling development in developing countries in a carbon-constrained world. We examine a few of the more well known ones below.

The earth's atmosphere is considered a global commons, to be shared by industrialized and developing countries alike. Given the carbon-constrained nature of the atmosphere, global negotiations are intended to devise a fair means of sharing the total carbon budget. Industrialized countries have developed without having to internalize the costs of high levels of GHG emissions. With less than one fifth of the world's population, they are responsible for almost three-quarters of all historic emissions. On a per capita basis, their historical emissions are more than 10 times those of the developing countries. Developing countries, on the other hand, need to bear the cost of carbon emissions, while at the same time growing out of poverty (Adger et al. 2006). In climate negotiations, industrialized countries have tended to seek ways to lock in high amounts of emissions for themselves based on past emission levels, making carbon budget sharing highly inequitable (Actionaid 2007; Oxfam 2008). A per capita emission approach is seen as a fairer way forward. Variations in this approach include the following.

3.2.2 Per Capita Emission Rights Approach

The Agarwal and Narain equal per capita emission rights approach is premised on the rights to the atmospheric commons. It distinguishes between "luxury emissions" and "subsistence emissions." This allows the use of carbon (and other GHG sources) to fulfill basic human needs to be distinguished from that used to support luxurious lifestyles. All countries would be awarded emission allowances in proportion to their population, and would be free to trade them. The total number of allowances granted globally would steadily decrease along a path consistent with an agreed climate stabilization goal (Agarwal and Narain 1991).

3.2.3 Hybrid Contraction and Convergence Model

The hybrid contraction and convergence model was formulated by the Global Commons and presented at the second Conference of the Parties in 1996. The key idea is to help equalize GHG emissions per capita on a global scale, over time. In principle the rich would consume (gradually) far fewer resources per capita than before, while the poor would consume more than they have in the past, so that both groups can converge toward a common "fair share" level, which the planet can sustain (GCI 2008). The model envisages global emissions peaking and then gradually falling (contraction), while emission reduction would be achieved by limiting per capita emissions so they converge (convergence). It requires large cuts in per capita emissions for developed countries while allowing developing countries to continue growing their economies before they have to make cuts to reach equal per capita emissions. The "fair carbon emission per country" is calculated based on a total population cap for each country.

3.2.4 Equal Cumulative Per Capita Emission Rights Approach

The equal cumulative per capita emission rights approach extends the concept of equal per capita rights to cover the entire carbon budget from the industrial revolution onward, rather than limiting it to the near past (from the "Brazilian Proposal"—UNFCCC 1997; Bode 2004). The framing tries to account for the role of industrialized countries in emitting GHGs in the past 150 years. Such past emissions are expressed as a "carbon debt," to be used in calculating carbon budgets as negative allocations for the future. Many large developing countries, including the People's Republic of China (PRC) and India, have favored this approach, while making different assumptions about the year at which accounting of historical emissions begins.

3.2.5 Greenhouse Development Rights Framework

The most widely discussed effort sharing approach is the greenhouse development rights (GDR) framework (Baer et al. 2008). This is based upon national responsibility and capacity with respect to a "development threshold" that excuses the poor from any responsibility to bear the burdens of the climate transition. The majority of emission reductions required to prevent dangerous climate change must be made in the developed world in the coming decades. In the same period, developing countries require hugely expanded energy services to meet the developmental aspirations of their citizens. Historically, the expansion of energy services has always been accompanied by rising carbon emissions. The GDR framework proposes a climate regime structured to safeguard a right to development. It is a burden-sharing framework that defines national obligations, based on responsibility for the climate change problem and the capacity to solve it. Both are defined with respect to a "development threshold" that serves to relieve those individuals still striving for a decent standard of welfare (Kartha et al. 2009) from the costs and constraints of the climate crisis. By focusing on people rather than nation states, the GDR framework also helps focus on inequities within countries (such as the development needs of the poor in the industrialized countries).

In the remainder of this section we highlight some diverse issues that make the application of equity in climate change mitigation and adaptation so challenging, even when there is broad agreement on its need.

3.2.6 Distinguishing Impacts of Anthropogenic Climate Change

The Convention (unlike the International Panel on Climate Change, IPCC) focuses exclusively on the anthropogenic forcing of climate. Natural variability is of interest only to the extent that it is modified by the anthropogenic forcing. Developing countries seeking resources and technologies through the Convention for enhancing climate resiliency need to first show the "additional" nature of impacts from anthropogenic climate change. Climate science and associated vulnerability studies have not progressed to the extent that this is possible. Especially in the least developed countries (LDCs), climate variability continues to be a key driver of development risk. Does this mean that these countries should not be allowed to access Convention climate funds to manage climate risks?

Sustainable Development

The Convention is specific on the right of developing countries to sustainable development. However, for the purposes of identifying and costing technologies and practices, there is little guidance on what constitutes an acceptable level of sustainable development. This is complicated by the high diversity underlying ecosystems. Perhaps attainment of Millennium Development Goals (MDGs) or a certain level of development according to the Human Development Index could be considered as a proxy for sustainable development in climate finance calculations.

Per-Capita-Based Calculations

Per-capita-based formulations for making available funds for adaptation programs (or per capita emissions in the case of mitigation) in developing countries privilege larger and more populated countries. Smaller countries and those projected to face catastrophic changes to their ecosystems or territorial extents are not well served by such formulations.

Historical Start Date for Calculating Obligations

What start date should be used in calculating the obligation of industrialized countries for the existing atmospheric carbon stock? For "full" responsibility, the date should be farther back. How far back? Perhaps frameworks should differentiate "basic" from "luxury" historical emissions, with the latter identified for obligation calculations.

Share of the Positives of Industrialization

If carbon stock is the negative effect of industrialization, should the positives of industrialization (such as science, technology, medicine) and their benefits to developing countries also be accounted? This also raises intellectual property rights, since these are often controlled by the private sector, and have bedeviled international science and technology transfer efforts.

Policies for Tackling Mitigation

The literature points to the availability of a number of policy instruments for tackling GHG emissions, including carbon taxes, emission trading schemes, standards, and technology support. However, there are also a number of existing policies, with economy-wide implications, that make mitigation difficult. They include energy and agricultural subsidies, emissions from deforestation, and barriers to trade in emissions-reducing technologies. Equity considerations of policy changes are as important as devising cost-effective mechanisms.

Adverse Impacts of Climate Change Policy Response

There is growing concern that developing countries, and especially the poorer populations, may be adversely impacted less by the direct impacts of climate change than by the policy responses engendered in response to climate change. From 2005 to the middle of 2008, international prices of major food cereals surged upward, causing a major panic in food-importing countries. Along with a number of other causes, a major reason for the steep increase was the rise in energy prices, leading to a surge in demand for biofuels made from maize and oil seeds (Headey and Fan 2010). This has generated much discussion on the potential impacts of biofuels on long-term food security. The potential for adverse impacts on local communities from the Reducing Emissions from Deforestation and Forest Degradation (REDD)+ programs in areas of poor governance and uncertainty in access are other areas of high equity concern. Barr et al. (2009) note "inequitable distribution of REDD payments could increase disparities in the forestry sector, and could displace and impoverish forest-dependent peoples."

Governance of Diverse Stakeholders, Active Across Multiple Scales

Climate governance, from global to local levels, requires the working of a diversity of actors, from the purely private to the state. Rather than state-led efforts alone (the staple of development), there is increasing recognition that guided market-based approaches are required to tackle climate change and build climate resilience. In addition, the challenges of mitigation and adaptation need approaches to work across traditional boundaries imposed by the nation state, requiring a transnational governance architecture that is at the same time respectful of the nation state. The international climate change negotiations, being state-led, have yet to consider these governance challenges in-depth.

3.3 Low Carbon Financing: Impact Costs, Needs, and Availability

In this section we provide an overview of some recent cost estimations of potential climate change impacts, as well as some projected needs for adaptation and mitigation.[1] We highlight the high variance in the estimations as well as the gulf between the costs of climate change and public financing for adaptation and mitigation from the industrialized countries currently on the table. At the end of the paper, we propose a methodology and architecture for a global Green Fund to promote discussion.

[1] The climate change focus here precludes discussion of green economy transition cost estimates. Interested readers may consult the IEA Blue Map scenario and the UNEP green economy study for global green economy cost estimates.

3.3.1 Climate Change Impact Costs and Projected Needs for Adaptation and Mitigation

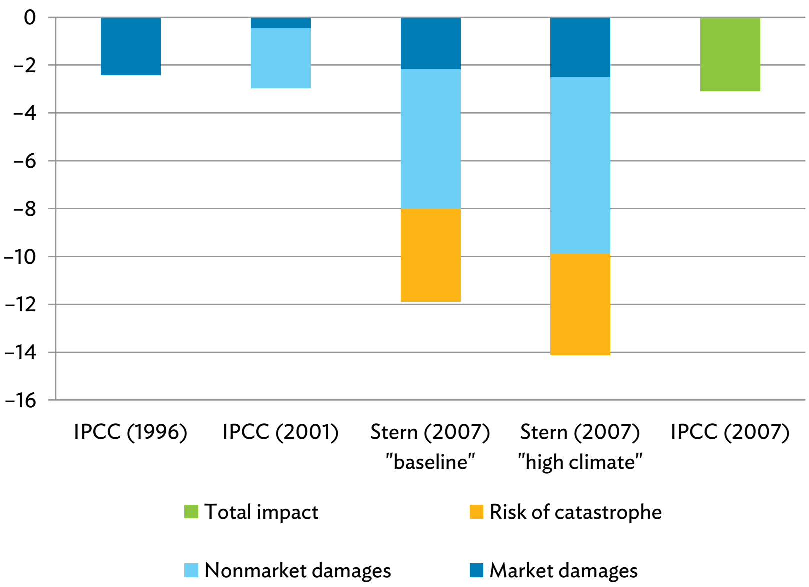
Costs of climate change have been calculated for overall impacts, for adaptation, and for mitigation activities. Cost estimates have rapidly evolved as understanding of complex systems and associated modeling capabilities have improved, along with further refinement in policy options. Despite these improvements, as we discuss below, significant variations in cost estimates remain. Some of the key reasons for the variations are in accounting for uncertainties (in projections of the GHG emission mix and GHG emission impacts on climate processes, especially on temperature and precipitation amounts and trends, and valuation), time horizons being considered (50, 80, or 100 years), and the aggregation of socioeconomic impacts (e.g., the mix of market and non-market, discount rates adopted). There are also large variations in the different general circulation models (GCMs) on the state(s) of the future climate. Averaging across the GCMs, as has been often done, does reduce the uncertainties. A significant potential source of variation in impacts and associated costs is the specific climate characteristic being considered. Calculations of temperature-driven impacts would be quite different from those derived from precipitation variations, leading to further uncertainties (and confusion).

Impact Cost Estimates

Predicting the economic costs of climate change involves modeling a large number of variables. They include changes in emissions scenarios, projections of precipitation, temperature and sea levels, technology changes, population growth, and idealized levels of adaptation. Most integrated impacts cost assessments have used relatively simple models, using a single climate variable (generally global mean surface temperature), aggregating sectoral impact studies, and simplistic treatment of uncertainty such as of climate sensitivity and the potential irreversibility of impacts (Jamet and Corfee-Morlet 2009). Figure 3.1 illustrates significant variation in cost estimates, based on expected global temperature change, impact studies used, and inclusion of non-market and catastrophic event damages.

In addition to the variations across models and methodology, significant disparities are expected in impact costs across geographic regions. While some studies use sectoral analyses to illustrate differences across regions (such as Stern et al. 2006; Jamet and Corfee-Morlet 2009; UNDP 2007) others provide detailed analysis at a regional scale. Figures 3.2 and 3.3 show the application of multiple models to estimate impact costs for Africa and Southeast Asia, respectively

Figure 3.1: Estimates of the Global Damages of Climate Change
(% of world GDP)



IPCC = Intergovernmental Panel on Climate Change.

Note: IPCC estimates represent the consensus among experts of the impact of climate change. IPCC (1996) estimates only include market impacts. IPCC (2007) estimates are the average of the range of possible values quoted in the report (from 1% to 5%). The Stern "baseline" scenario produces an average mean warming of 3.9° relative to the preindustrial period in 2100 while temperature changes are pushed to higher levels in the Stern "high climate" scenario through the action of amplifying feedbacks in the climate system.

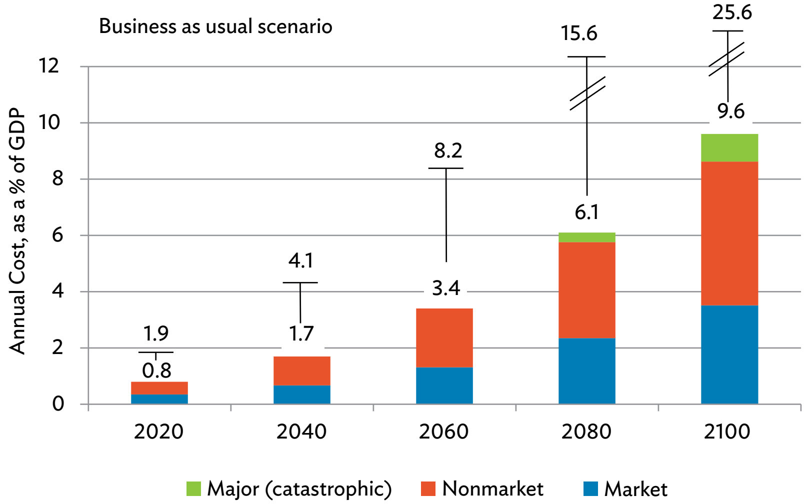
Source: Jamet and Corfee-Morlet(2009).

(Watkiss et al. 2010; ADB 2009). The latter study, of four countries in Southeast Asia, found significant gross domestic product (GDP) impacts over the coming decades. A recent study by Brown et al. (2010) finds that precipitation, rather than temperature, is the dominant influence on economic growth. Since estimations of climate change impacts on economic growth often use projected temperature changes, this finding suggests an underestimation of impacts.

Estimates of Adaptation Costs

Estimates of adaptation costs carry great uncertainty. Adaptation involves responding to context specificities of vulnerabilities and development risks. A number of criteria need to be considered in the

Figure 3.2: Equivalent Annual Cost of Climate Change in Africa, as a % of GDP

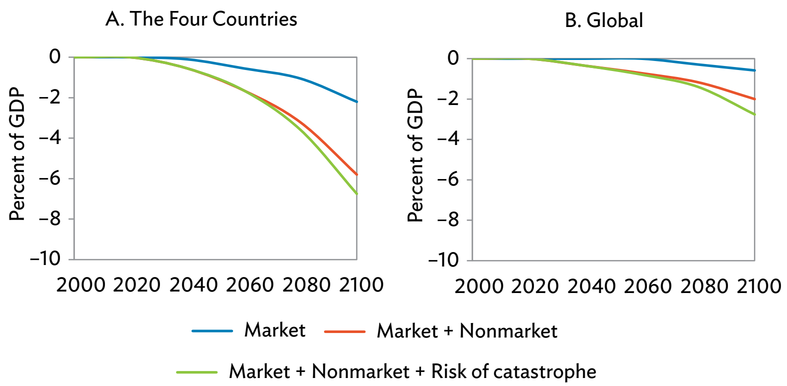


IPCC = Intergovernmental Panel on Climate Change.

Note: Using PAGE Model and the Business as Usual A2 IPCC emissions scenario. Shows 5% to 95% range.

Source: Stockholm Environment Institute, n.d.

Figure 3.3: Mean Impact of Climate Change on Southeast Asian Countries and at the Global Scale, as a % of GDP

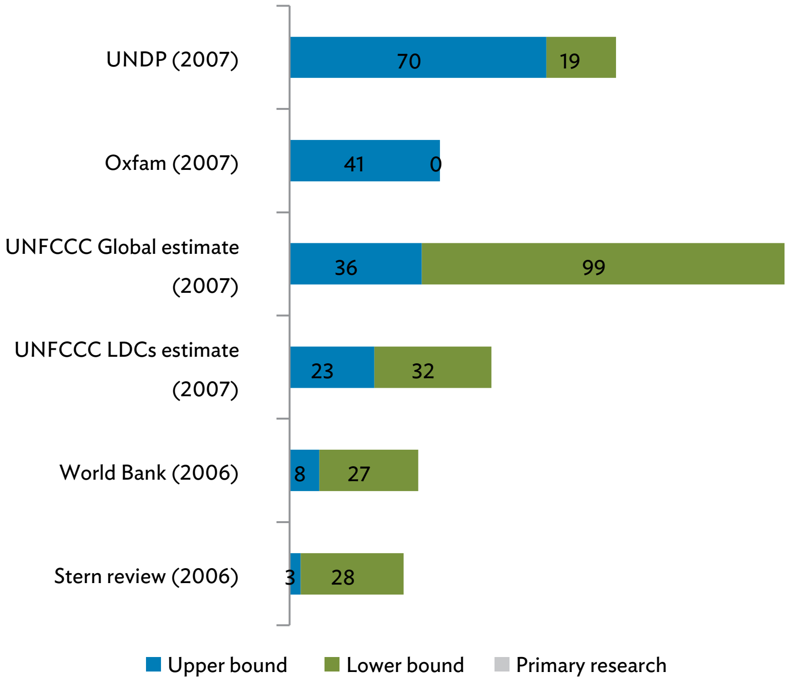


Note: Using a modified PAGE2002 Model and the BAU A2 IPCC emissions scenario. The four countries are Indonesia, Philippines, Thailand, and Viet Nam.

Source: ADB (2009).

planning and implementation of adaptation efforts, including economic benefits and their distribution, relation to development objectives, spillover effects, and capacities. Assessments at the global scale and across sectors are relatively recent, with two significant reports in 2006 (World Bank Investment Framework and the Stern Review) leading to a number of responses and revised estimates. The estimates of annual adaptation investments vary widely, even when the core methodology remains similar (Figure 3.4).

Figure 3.4: Adaptation Cost Estimates Based on Various Methodologies

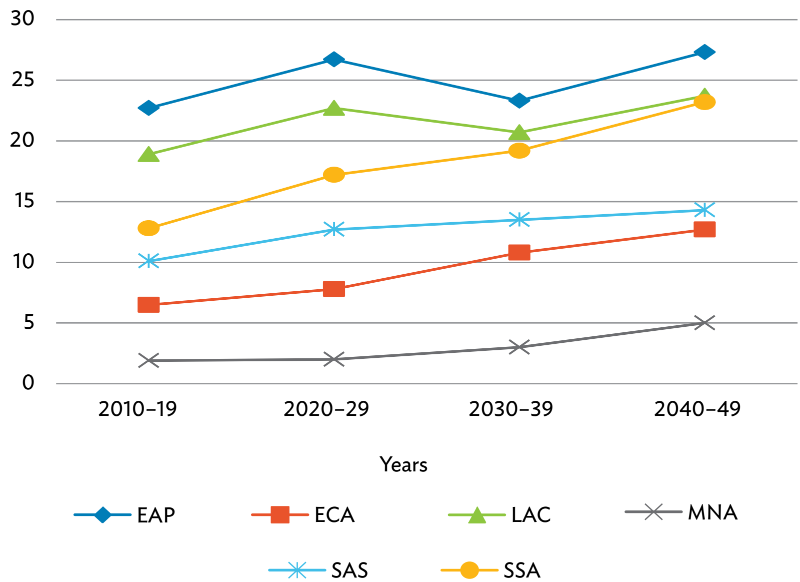


Source: ECA (2009).

The UNDP 2007 Human Development Report suggests that donor countries will need to increase adaptation financing to $86 billion annually by 2015 (with $44 billion to "climate-proof" development investments, $40 billion to adapt poverty reduction activities, and $2 billion to strengthen disaster response). A number of critiques have been leveled against the climate change cost estimate literature. While some raise concerns about the limited treatment of uncertainty or the vast array of adaptation options (Parry et al. 2009), others note "issues of double counting, and scaling up to global levels from a very limited (and often very local) evidence base" (Agrawala and Fankhauser 2008: 77).

More recently, the World Bank completed an Economics of Adaptation to Climate Change study (World Bank 2010a). In addition to country-level adaptation cost analyses and better cost estimates, the study uses two models to create future climate scenarios: a drier scenario, developed at the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO), which results in lower adaptation costs, and a wetter scenario, developed by the US National Center for Atmospheric Research (NCAR), which leads to high adaptation costs, largely due to sharply higher infrastructure costs (Figure 3.5). These two scenarios capture in some ways the potential range of costs. The total estimated costs for 2010–2050 using the CSIRO model are approximately 14% less than those using the NCAR model.

Figure 3.5: Total Annual Cost of Adaptation for the National Center for Atmospheric Research Scenario, by Region and Decade ($ billions at 2005 prices, no discounting)



EAP = East Asia and Pacific, ECA = Europe and Central Asia, LAC = Latin America and Caribbean, MNA = Middle East and North Africa, SAS = South Asia, and SSA = Sub-Saharan Africa.
Source: World Bank (2010a).

Estimates of Mitigation Costs

Cost projections for mitigation vary significantly depending on the greenhouse gas stabilization target, desired stabilization year, emission reduction strategies employed, population and economic growth assumptions, and climate model. The IPCC review (2007) suggested mitigation costs by 2030 would range from -0.6% to 3% of GDP, relative to baseline emission scenarios, depending on the stabilization target (see Table 3.1).

Table 3.1: Estimated Global Macroeconomic Cost Estimates of Mitigation Scenarios in 2030 and 2050

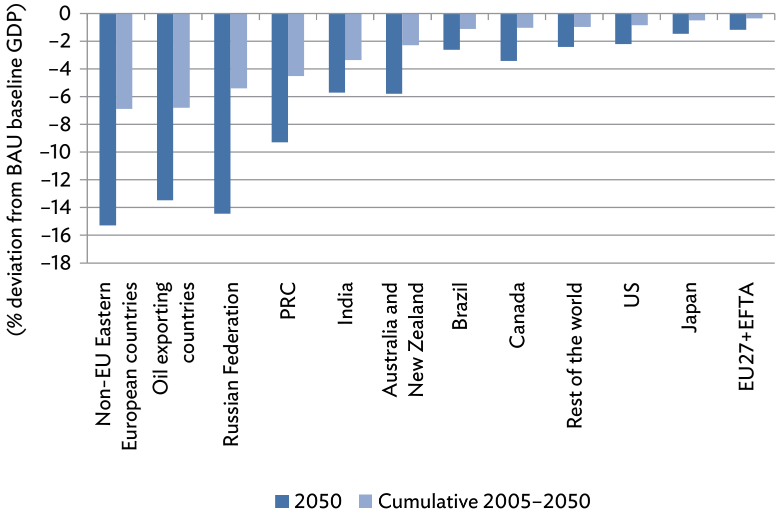
Stabilization levels (ppm CO_2-eq)	Median GDP reduction[a] (%)		Range of GDP reduction[b] (%)		Reduction of average annual GDP growth rates (%)[c,e]	
	2030	2050	2030	2050	2030	2050
445–535[d]	Not available		<3	<5.5	<0.12	<0.12
535–590	0.6	1.3	0.2 to 2.5	Slightly negative to 4	<0.1	<0.1
590–710	0.2	0.5	-0.6 to 1.2	-1 to 2	<0.06	<0.05

Notes from original figure: Costs are relative to the baseline for least-cost trajectories toward different long-term stabilization levels. Values given in this table correspond to the full literature across all baselines and mitigation scenarios that provide GDP numbers. a) Global GDP based on market exchange rates. b) The 10th and 90th percentile range of the analyzed data are given where applicable. Negative values indicate GDP gain. The first row (445–535 ppm CO_2-eq) gives the upper bound estimate of the literature only. c) The calculation of the reduction of the annual growth rate is based on the average reduction during the assessed period that would result in the indicated GDP decrease by 2030 and 2050, respectively. d) The number of studies is relatively small and they generally use low baselines. High emissions baselines generally lead to higher costs. e) The values correspond to the highest estimate for GDP reduction shown in the third column.

Source: IPCC (2007).

Some studies break these costs down by region and country. Figure 3.6 reveals the significant variation across countries and country groups given a set of Organisation for Economic Co-operation and Development (OECD) modeled policies to achieve a stabilization target of 550 ppm. Using the 2009 pledges (Copenhagen Accord), with the aim of limiting average global temperature increase to 2ºC, an OECD study estimates that, while Annex I countries could lose 0.3% of GDP by 2020 due to the pledges, introducing a carbon pricing and trading system could lead to GDP increases of more than 1% in 2020, amounting to more than $400 billion (Delink et al. 2010).

Figure 3.6: Costs from Stabilizing Long-Run Greenhouse Gas Concentration at 550 ppm Across Regions



BAU = business as usual; EU = European Union; EFTA = European Free Trade Association.

Note: Scenario "550ppm-base" (Scenario A) and "2050" denotes the cost as a percentage of GDP in 2050 relative to BAU baseline. "Cumulated 2005–2050" denotes the cumulated costs over 2005–2050 and represents the gap (in %) between the (undiscounted) sum of annual GDPs over 2005–2050 in the "550ppm-base" scenario and the corresponding sum in the BAU scenario.

Source: OECD (2009).

Some studies vividly illustrate the critical role played by policy instruments at the international, national, and sectoral levels (see OECD 2009; McKinsey 2009). Table 3.2 provides a summary of incremental annual cost estimates of mitigation in dollar terms and the upfront investment necessary to enable mitigation activities.

3.3.2 Available Public Finance for Mitigation and Adaptation

The previous discussion provided an overview of the costs of potential impacts of climate change, and the financial needs for adaptation and mitigation. We now briefly discuss the public climate financing that is currently being discussed—both financing that has been pledged or committed and financing that is now in the planning stages (such as that arising from the Copenhagen Accord).

Table 3.2: Incremental Mitigation Costs and Associated Financing Requirements for a 2°C Trajectory: What Will Be Needed in Developing Countries by 2030? (constant 2005 $)

Model	Mitigation cost	Financing requirement
IEA ETP		564
McKinsey	175	563
MESSAGE		264
MiniCAM	139	
REMIND		384

Note from original table: Sources: IEA ETP: IEA (2008c); McKinsey: McKinsey & Company (2009) and additional data provided by McKinsey (J. Dinkel) for 2030, using a dollar-to-euro exchange rate of $1.25 to €1; MESSAGE: IIASA (2009) and additional data provided by V. Krey; MiniCAM: Edmonds and others (2008) and additional data provided by J. Edmonds and L. Clarke; REMIND: Knopf and others (forthcoming) and additional data provided by B. Knopf. Both mitigation costs and associated financing requirements are relative to a business-as-usual baseline. Estimates are for the stabilization of greenhouse gases at 450 ppm CO_2e, which would provide a 40%–50% chance of staying below 2°C warming by 2100. "Mitigation cost" refers to the incremental annual costs, while "Financing requirement" is the upfront investment necessary to enable the mitigation activities.

Source: World Bank (2010b).

Attention is drawn here to the findings of the UN High Level Advisory Group on Climate Change Financing (AGF 2010). Following the Copenhagen Accord, a UN Advisory Group on Climate Change Financing was established by the UN Secretary General to identify potential sources of finance in order to mobilize $100 billion per year by 2020. Four potential types of finance were analyzed, including public sources for grants and highly concessional loans (including carbon taxation and auctioning of emission allowances, removal of fossil fuel subsidies, other new taxes such as a financial transaction tax, and general public revenues through direct budget contributions), development-bank-type instruments, carbon market finance, and private capital. A substantial share of the revenues was considered likely to remain in developed countries. Carbon prices of $20–$25 per ton of CO_2 equivalent in 2020 were used in calculating potential revenues.

A range of $81 billion–$91 billion was identified as being available annually for "international climate action" in 2020. This is broken down as follows:

- $30 billion annually from auctions of emission allowances and domestic carbon taxes in developed countries (at 10% of total revenues);

- $10 billion annually from redeployment of fossil fuel subsidies in developed countries or from a financial transaction tax;
- $10 billion annually from international transportation (allocating between 25% and 50% of total carbon pricing revenues);
- $10 billion to $20 billion annually from private net capital flows (allocating 10% of total revenue);
- $10 billion annually from carbon market flows (from a likely total of $30 billion to $50 billion); and
- $11 billion net flows from multilateral development banks.

The findings seem to reflect a group consensus, with no major breakthroughs. The revenue streams identified are quite modest. Further, follow up actions on the report seem uncertain. The UN Secretary General writes in the foreword "I hope Governments respond positively to the Advisory Group's findings, and I encourage other key stakeholders, including civil society and the business community, to give this report full consideration" (AGF 2010: 2).

Most available public climate finance is for mitigation activities (e.g., energy and transportation, with forestry recently included in the mix). Other than a few bilateral programs (and with the exception of the extremely modest Adaptation Fund), funds are managed by multilateral development banks (MDBs) with a smaller number by other multilateral institutions. A handful of donor governments provide the bulk of the climate funds (Tables 3.3 and 3.4). While developing country governments and other accredited institutions are eligible to apply for funding, there seems to be a wide diversity in requirements along with time-consuming and multistep processes. While this is generally a hallmark of public finance institutions, the particular nature of uncertain and context-driven specificities of climate resilience and green growth seem to have further reinforced the tendency. It is perhaps not surprising that LDCs and low-income countries are often frustrated in accessing the very finds that ostensibly have been set aside specifically for them. While most funds are open to supporting programs ranging from the multiregional to the local, most efforts seem to be at the subnational scale, often within a strong sectoral orientation (e.g., agriculture, health, water, energy, and transport). Programs tackling systemic climate change impacts that cascade across multiple spatial scales and administrative levels are a rarity, donor rhetoric not withstanding. Access to the global best science and technology on green growth issues is not systematically organized. Programs managed by bilateral organizations and multilateral organizations (with the exception of MDBs that seem to depend to a greater extent on internal staff resources) appear to depend more on project-defined consulting, often from the private sector with the rules of engagement privileging "value for money." Such an approach seriously undermines the ability of developing countries to access the best and most relevant science. "Commodifying" science also disables the free exchange of project experience and best and worst practices. Most project and program reports (at least those publicly available to developing country stakeholders) glow about their "successes."

A key issue with respect to climate change funding is its relation to official development assistance. As discussed earlier, UNFCCC principles require that funding is distinguished from development funds, and must be accounted for as "additional" to overseas development assistance (ODA) already being provided to developing countries. The equity issues underlying this distinction—namely, that the burden of addressing climate change should fall on industrialized countries that bear primary responsibility for the problem—are quite valid. However, this has often resulted in awkward calculations. In the case of the Global Environment Facility, funding required for "adaptation" is separated from that required for "development," despite their interconnectedness. In the Fast Start Finance pledges, for example, it is not clear how much of Japan's pledge under the Cool Earth initiative is new and additional.

There are also a number of other questions at hand: how much of the pledged funds are "re-routed" ODA? A relative drop in ODA would have serious implications, especially for the LDCs. Another issue is "conditionalities." Since climate funds are a result of the "common but differentiated responsibility" principle laid out in the UNFCCC, the nature of the conditionality between donor and recipient countries would need to be markedly different (relative to ODA).

For the purposes of discussion, at the end of this paper we suggest one approach for a global Green Fund—based on a carbon levy and with assessments paid by member countries determined according to each country's CO_2 emissions and GDP per capita. Perhaps the time is now ripe to distill a similar regional approach that exploits the many potential revenue flows for climate change financing, while mindful of global flows of technology, capital, and political will.

Table 3.3: Climate Change Financing

Name	Funding sources	Management entities	Eligibility	Implementation levels	Pathways to access funds	Volume of funds
Adaptation Fund	From sales of CDM projects' certified emissions reductions (CERs); Donor governments (Spain, Germany, Sweden..)	Adaptation Fund Board, World Bank as trustee	Developing country parties to the Kyoto Protocol that are particularly most vulnerable	National, subnational, community	Through National Implementing Entity (e.g., Environment Ministry) or multilaterals (e.g., UNDP, WFP)	$310 million pledge, $225 million deposits
Climate Investment Funds - Strategic Climate Fund - Clean Technology Fund)	Donor government (majority from UK, Japan, US, and Germany)	Multilateral development banks (World Bank, AfDB, ADB, IDB, and EBRD)	Countries eligible for Official Development Assistance (ODA) based on OECD/DAC guideline, with an active MDB country program	Regional, national, sub-national, and private sector	National governments submit country investment strategies/ plans with MDB	SCF – $1.891 billion pledged, $1.150 billion deposits CTF – $4.399 billion pledge, $2.558 billion deposits
GEF Funds - Trust Fund Climate Change Focal Area (TF) - Special Climate TF - National government contributions (SCCF) - Least Developed Countries Fund (LDCF)	TF - National government contributions (large amounts to overall fund from US, Japan and Germany) SCCF - National governments (majority from Germany, Norway, US, and UK) LDCF - National governments (majority from Germany, US, Denmark, and Canada)	GEF with World Bank as trustee	TF - UNFCCC criteria / eligibility to receive funds through World Bank or UNDP SCCF - Non-Annex 1 countries eligible. Emphasis on most vulnerable countries in Africa, Asia, and the SIDS LDCF - The 49 LDC parties to UNFCCC	TF - Global, regional, national and sub-national SCCF - National governments, with subnational project activities LDCF - National planning (preparation of NAPA), with sub-national and community implementation	National Project Proponent requests assistance of GEF implementing agency (e.g., UNDP, ADB). For SCCF, activities must focus on 'additional costs' imposed by climate change on the development baseline	TF – $2.17 billion pledges, $1.886 billion deposits SCCF – $180 million pledges, $143 million deposits LDCF – $324 million pledges, $253 million deposits

continued on next page

Table 3.3 continued

Name	Funding sources	Management entities	Eligibility	Implementation levels	Pathways to access funds	Volume of funds
UN Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN–REDD)	EU and donor governments (Norway)	UNEP and FAO with UNDP as Administrative Agent	National programs in 13 countries and additional regional programs for knowledge sharing	Global, regional, national, and subnational	National governments work with UN Country Team to establish National REDD Steering Committee.	$150.8 million pledges, $97 million deposits
Copenhagen Accord instruments - Green Climate Fund (GCF), currently in development - Fast-Start Financing (FSF)**	GCF – Donor governments (not finalized) FSF - Donor governments (Japan, US, France, UK)	GCF – World Bank, interim trustee FSF – Donor government agencies	Developing country governments, some through multilateral institutions	GCF – Not finalized FSF – Global to community, with focus on national	GCF – ($100 billion in 2020) - Not yet finalized FSF - Varies, depending on donor country	GCF – ($100 billion in 2020) - Not finalized FSF - $30 billion pledges, $621 million delivered.
Climate funds as part of bilateral aid package	Donor governments	Donor governments	Various – Donor country criteria	Varies	Some have independent mechanisms: e.g., Hatoyama Initiative (Japan), International Climate Fund (UK), International Climate Initiative (Germany), Global Climate Change Initiative (US), MDG Achievement Fund (Spain).	Difficult to calculate given plethora of initiatives, and some with overlaps
Global Climate Change Alliance	European Union, EC Fast Start Funding, Donor governments (Ireland, Sweden)	EuropeAid	Support to 18 most vulnerable developing countries, and general dialogue support to others	Regional, national, and subnational	Developing country governments/ NGOs	

Source: Individual fund websites, www.climatefundsupdate.org, www.faststartfinance.org

Table 3.4: "New and Additional"—Fast Start Funds (2010–2012)

Party	Pledged for 2010–2012 ($ million)	Requested / committed for 2010–2011 ($ million)	Funding Areas	Geographic focus (in addition to global)
European Commission	215	72	2010: Adaptation €25 million Mitigation €18 million, REDD+ €7 million	Africa, Asia, Pacific SIDS
Belgium	215	57	2010: Adaptation €10 million, Capacity building €2 million; Renewable energy €20 million Sustainable forests /REDD+: €10 million	Africa
Denmark	231	53	2010: Adaptation and Capacity Building 48% Mitigation 52%	Africa, SIDS
Finland	157	35	2010: Adaptation 35%, Mitigation 53% REDD+12%	Africa and some efforts SE Asia
France	1,804	601	2010–2012: Adaptation 20%, Mitigation 60%REDD+ 20%	Africa, Asia
Germany	1,804	510	2010-2012: Adaptation 35%, Energy-related mitigation and REDD €350 million	All regions
The Netherlands	444	NA	2010–2012: Mitigation At least €280 million	Not specified
Spain	537	192	2010–2012: REDD 20%, Adaptation at least 45% in 2010	Africa
Sweden	1,145	165	2010: Mitigation €59 million, Adaptation €347 million, REDD €11 million	Africa
United Kingdom	2,454	929	2010–2012: Adaptation 50%, Mitigation 50% and REDD	Not specified
Australia	640	648	2010–2012: Adaptation 52%, Low Emission Growth 24%, REDD+ 24%	SIDS
Canada	414	400	2010: Adaptation 35% Mitigation 65%	SIDS and Africa
Japan	15,000	7,200	Adaptation 3% Mitigation >95% (REDD+ $223 million)	Africa, SIDS and LDCs in Asia
Norway	1,000	382	2010 Mainly REDD+	Not specified
Switzerland	159	162	2010: Adaptation 40% Mitigation 60%	Not specified
US	1,705	1,704	2010: Adaptation 35%, Clean Energy 45% Sustainable landscapes 20%	Not specified

REDD = Reduced Emissions from Avoided Deforestation, SIDS = Small Island Development States.

Note: Funds with total pledges of more than $150 million for 2010–2012 are listed here.

Sources: www.climatefundsupdate.org; www.faststartfinance.org; http://www.wri.org/publication/summary-of-developed-country-fast-start-climate-finance-pledges

3.4 Implementing Green Growth: Some Observations on Building Climate Resilience and Responding to Climate Shocks

Adaptation to climate risks requires consideration of a continuum of risks across critical time scales—covering seasons, years, and decades. Adaptation involves building climate resilience in sectors and social economic systems as well as responding to climate shocks. We highlight here some of the critical issues involved in their practice.

3.4.1 Toward Practice of Climate Risk Management

Limitations of Current Risk Management Efforts

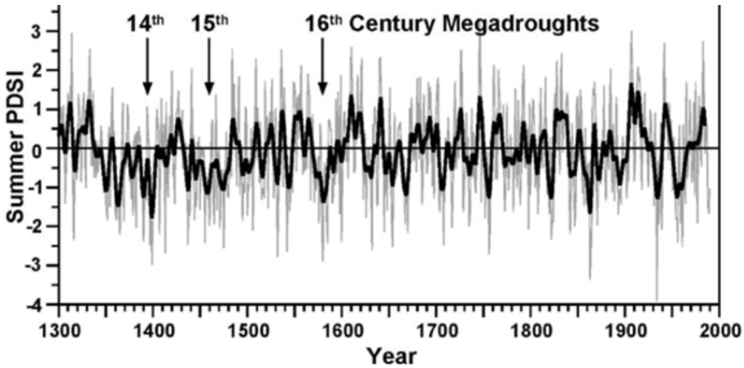
Managing current climate risks establishes a sound base for adaptation to climate change. However, as noted elsewhere, it does not by itself form the entirety of activities needed for adaptation for several reasons (Someshwar 2008):

Effective management of current climate risks is still an emerging field. Innovation and strategic demonstration are needed. While indigenous coping strategies are valuable and need to be better appreciated, most societies are still far from successfully managing current climate risks. Famines and floods associated with the El-Niño Southern Oscillation (ENSO) cycle continue to affect millions of people worldwide, and countries continue to operate only in a reactive mode.

"Static" accounting of climate. In development programs, climate tends to be accounted for in a static rather than a dynamic mode. In common with farming communities, policies and plans of governments are based on an understanding of immediate past climate. Observed climate data, generally for the past 30 years, is used to calculate key statistics of weather and climate—average conditions, maxima and minima of temperature and precipitation across seasons, anomaly content and timing (e.g., onset delays, dry or wet spell lengths and breaks, timing and intensity of frost). Climate-dependent environmental information such as stream flow and aquifer recharge capacities is also based on immediate past climate.

Limits of systems resiliency. An appreciation of the limits of climate buffering of cities and regions from current planning and infrastructure systems is badly needed. It requires a thorough examination of variability characteristics (at weather and climate scales) that underlie infrastructure systems and resource transfer agreements (Someshwar 2010). Decisions and policies on future resource availability typically use statistical averages of past years. For example, the Colorado Water Compact of 1922 used average flows of the preceding 30 years to design water allocations (Figure 3.7). A more historically informed view tells us that the design period was "above normal." Systems should hence be prepared to handle more years of water scarcity in the future.

Figure 3.7: Colorado Water Compact of 1922



PDSI = Palmer Drought Severity Index.

Source: Drawn from Goddard et al. Near Term Climate Change: IRI-PRED Priority Area presentation (2010), based on Stahle et al., 2007.

Limits of responding to climate "surprises." When climate anomalies occur, plans are in place to manage impacts of climate "surprises." The success of many governments in Asia in preventing famines, despite deep and widespread droughts, is mainly due to policies based on the internalizing of variability in the immediate past climate in the policy-making process (Kaosa-ard and Rerkasem 2000). However, the approach of using deterministic information to mobilize action—launching emergency food security operations after a drought has occurred, for example (p.11)—means that institutions are not geared to handle uncertain forecasts. As Miles et al. (2006) observe, "Despite the increasing predictability of climate … Every empirical study conducted to date has shown that climate forecasts are not used to their full potential." While disaster response efforts will still be needed, managing (future) uncertainty requires an appreciation of potential risks and the adoption of anticipatory risk management, prior to actual impacts.

Climate is not the only dynamic element that communities and nation states need to respond to. Demographic pressures that intensify resource demands, declining terms of trade for cereal production and natural resources, rapid urbanization, societal upheavals due to religious, sectarian and class differences, are some of the dominant dynamic drivers of development. In designing systems for managing the impacts of climate change it is important to consider non-climate shocks and or trends as well. For many existing climate-sensitive systems, such as water supply systems, changing demands from population growth and higher levels of per capita demand often impose higher burdens than those due to changes in the climate. This is especially the case in the near term (to about 30 years) in rapidly growing regions of the world (such as cities in Asia). Often, discussions of adaptation seem oblivious to the real world non-climate shocks that systems must respond and "adapt" to.

Effectively managing shorter-term climate risks does not always translate to building effective long-term resilience. The amplitude, pace and frequency of hazards in future may be quite different from those experienced by societies in the recent past. Adaptation measures undertaken for today's hazards may well be insufficient, and in some cases may even compound risks from more intense and frequent hazards. Climate change is also expected to bring new kinds of hazards for which societies have no prior experience, such as from sea level rise and glacial melting.

Need for Improved Climate Risk Management

From the point of view of adaptation to climate change, managing current climate risks is important for at least two reasons. First, the operational use of strategies and programs that build resilience to current climate hazards (such as floods, droughts, and heat waves) can be applied to climate change risks since they are heightened variations of past climate anomalies. Second, stronger climate resilience helps countries realize a higher level of socioeconomic development, affording social and economic climate buffers at household, community and societal levels. A specific application of this method can be seen in the work of the Earth Institute in Indonesia to help reduce the risk of peat forest fires in Central Kalimantan (Someshwar et al. 2010). The methodology, valid for a range of low- and medium-income countries, involves the following:

- **Spatial analysis of historical and current climate impacts,** integrating climate and socioeconomic data to arrive at past and current impacts;

- **Estimations of ranges of future climate conditions** and their reliability, using past climate data as well projections to identify ranges of uncertainty, including sea level rise and frequencies of extreme events;
- **Assessment of likely impacts on development from a changing climate,** derived by stakeholders placing estimates of future climate risks in the context of policies and development plans over the next 30 years, with a particular emphasis on planned policy initiatives to help achieve selected MDGs; and
- **Identification of a suite of anticipatory risk management considerations in each country** to address priority risk areas.

3.4.2 Engaging the Form and Function of Policy Making for Climate Resiliency

Departures from historic climate averages due to long-term anthropogenic changes to the global climate system pose critical management challenges to agencies and institutions. When the very basis for the climate and environmental characterizations that underpin resource availability and their management (for example, reductions in return periods of drought and floods, major alterations in the spread and timing of the Asian monsoon systems, alterations in the hydrology of river basins) is being altered by climate change, planning and management need to be reimagined. The extensive and deep nature of potential changes calls for a large-scale shift away from (current) reactive climate management and toward anticipatory risk management.

Many adaptation programs are less based on development aspirations of communities and policy makers than on long-term development scenarios characterizing a more or less uniform future. The approach can be defended perhaps over the very long term, given the apparent economic "convergence" of societies. However, this does not mean ignoring the diversity in country situations of the drivers of vulnerability. Green growth needs to be built on localized aspirations of long-term development. Regional development, for example, is realized by plans with a time horizon of about 20 to 30 years. Infrastructure, land use, housing, and alternate growth centers need to be planned for. In investigating the socioeconomic future of a place, we need to consider the available development plans as a starting point in order to arrive at likely estimates of specific place-based development futures. Spatial modeling of environmental, socioeconomic, market and policy variables will be needed in the context of the economic future laid out in the development plan.

Uncertainties in characterizing future climate and development futures require systematic engagement with a critical body of key development stakeholders in the country. This will help leverage expert opinion, experience and intuition, permitting use of the limited available information in order to develop forecasts of development. Such an approach requires analyses of the policy, institutions, and decision landscapes characterizing socioeconomic development in each country, leading to the identification of a matrix of institutions that are currently critical for disaster risk reduction and climate risk management, a typology of policies that are considered critical to manage disaster and climate risks, a typology of vulnerable geographies (highland, coastal, delta, and riverine systems, for example), and the nature of institutions and development policies needed to build resilience to emergent climate risks. Scenarios developed in a participatory mode, including use of Delphi techniques, can yield invaluable insights on current and past development trends, policies, and trajectories.

3.4.3 Risk Management Institutions in Practice

The interdisciplinary nature of policy development is both a strength and a weakness. It is a strength because it affords a chance to draw on the insights of a number of disciplines such as economics, sociology, history, and political science. It is a weakness since it prevents the development and use of common shared standards. Given the dominance of economics, many climate-resilient policies are evaluated solely for their efficiency, optimization, marginal cost, and marginal utility. Power relations and the risk averseness of institutions that influence their functioning and efficacy, to name two issues, are rarely studied.

Governance institutions are struggling to keep pace with complex and fast-changing ground realities. The nature of many risks—including those related to climate—is dynamic, the result of many factors that are themselves undergoing change. For example, in urban areas in many Asian countries, increased frequency of flooding cannot be solely attributed to a changing climate. Wetland loss, a greater paved area, ever growing landfills to accommodate waste, groundwater extraction, and other factors all figure in the calculation. Climate change adds a new layer of complexity, and uncertainty. In this light, it is all the more urgent to develop scientific and institutional capacity to enable managers to understand and make use of risk management approaches and tools (see discussion on risk transfer mechanisms below). Adaptation programs that recognize institutional issues tend to focus on facilitating the creation of an evidence base of climate impacts, enhancing data availability, and training on tools and methods for better management of climate risks. A minority of programs also attempt to engage institutions across individual operations by creating new coordinating entities, often with limited success. A smaller number attempt to refocus agencies by reengineering incentives that are at the very core of institutional productivity and efficacy. Political economy considerations that govern institutional efficacy are often ignored in climate change adaptation efforts.

Regional Risk Transfer and Insurance Mechanisms

Natural disasters can result in crippling financial and human losses. National governments typically bear the greatest costs and responsibilities in managing recovery efforts. While many developing countries often receive emergency relief funds and donor aid for recovery efforts, they are either insufficient or arrive too slowly. Many governments also require immediate funds to continue functioning. Sovereign insurance options typically require evidence of loss, which can cause significant delays. Depending on the risk profile of the country, premium rates for individual country insurance policies can be prohibitively expensive. Regional catastrophe risk insurance facilities are a recent innovation, and aim to provide immediate resources and liquidity following a disaster, expedite payments by relying on predefined indexes of events and losses, diversify the overall risk portfolio by aggregating risk spatially (e.g., across countries), and improve premium stability through guaranteed donor capital, reinsurance protection, and capital market investments.

The Caribbean Catastrophe Risk Insurance Facility (CCRIF) is often cited as a good model for similar entities in other regions, including in Asia. Contributions from donor governments, the World Bank, and the Caribbean Development Bank coupled with membership fees paid by the 16 government members helped create a Multi-Donor Trust Fund at CCRIF.[2] Originally designed to cover hurricane and earthquake events, the facility may also cover excess rainfall events in the near future. In order to expedite payouts, CCRIF uses parametric triggers based on a suite of independently verified catastrophe risk models.[3] Low and stable premiums are afforded by pooling risks. Since it is highly unlikely that all member countries would be affected by major anomalies in the

[2] For details, see www.ccrif.org and World Bank. 2010. *A Review of CCRIF's Operation after Its Second Season.* Washington, DC.

[3] Input parameters have been developed for exposure, vulnerability, damage, and losses for each hazard type. Public sources are used for data to run the models after a disaster event. By using public information and predefined parameters, the facility is able to avoid reliance on loss adjusters, reduce delays, and eliminate subjective loss assessment.

same year, the diversified regional risk portfolio reduces reinsurance costs. Importantly, CCRIF funds are not intended to cover all losses in the event of a catastrophe; the payout is only meant to provide short-term liquidity for disaster response and basic government functions. For 2007–2014, the total payout amount was around $35 million for 12 events, of which 9 were cyclone and monsoon trough system related.[4]

CCRIF is serving as a model for similar efforts in development in other regions. These include:

- The Inter-American Development Bank and the reinsurance company Swiss Re launched the Regional Insurance Facility for Central America or RIFCA (Inter-American Development Bank 2011). This is intended to complement the IDB's Contingent Credit Facility, which finances loans up to $100 million per country for natural disasters.
- The Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) is a joint effort by the World Bank, ADB, and the Pacific Islands Applied Geoscience Commission (SOPAC), with funding by the Government of Japan and the World Bank's Global Facility for Disaster Reduction and Recovery. The goals of PCRAFI is to provide the Pacific island countries with disaster risk modeling and assessment tools, and to engage in a dialogue with them on integrated financial solutions for the reduction of their financial vulnerability to natural disasters and to climate change.[5]
- At the 2010 Ministerial Conference on Disaster Risk Reduction in Africa, ministers recommended that the African Union Summit "explore the feasibility of continental financial risk pooling in working towards the creation of an African-owned Pan African disaster risk pool" (UNISDR Secretariat—Africa 2010).
- In April 2011, ASEAN Finance Ministers tasked their insurance officials "to explore risk financing options and mechanisms that can be developed as part of the regional framework for disaster management and disaster risk reduction" (ASEAN 2011). ASEAN, World Bank, and UNISDR followed up by jointly hosting the ASEAN Disaster Risk Financing and Insurance Forum in November 2011.[6]

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4 See http://www.ccrif.org/content/about-us.

5 See http://pcrafi.sopac.org.

6 See http://www.worldbank.org/en/news/press-release/2011/11/08/world-bank-gfdrr-asean-and-unisdr-cooperate-to-strengthen-fiscal-resilience-to-natural-disasters.

- ADB is pursuing parallel efforts to create regional disaster risk solutions in Indonesia, the Philippines, and Viet Nam, including the possible use of parametric triggers for insurance or contingent credit mechanisms (ADB 2011).

While the insurance mechanisms discussed so far focus on addressing disaster impacts for national level governments, the South East Europe and Caucuses Catastrophe Risk Insurance Facility Project (SEEC CRIF) of the World Bank is pursuing a different model.[7] The project supports countries in the region to join and benefit from the Europa Reinsurance Facility (Europa Re), with the goal of increasing the number of individuals and small and medium enterprises (SMEs) insured by the private insurance market against catastrophic risks. While countries are the top-level participants in the facility, the ultimate beneficiaries are individuals and small and medium-sized enterprises (SMEs). Europa Re and the SEEC CRIF were partly, though not explicitly, motivated by climate change risks.

The Horn of Africa Risk Transfer for Adaptation (HARITA) project, Oxfam and Swiss Re along with International Research Institute for Climate and Society for Climate and Society of the Earth Institute as a technical partner have successfully applied an index-based weather insurance scheme at the farm level to help farmers smooth risks and access credit. It is now being scaled up across the region in partnership with the World Food Program.[8]

3.4.4 Building Urban Climate Resiliency

The year 2007 marked the first time in history that over one-half of the world's population lived in urban places. By 2030, 60% of the world's population—almost 5 billion people—will live in cities. By mid-century the forecast is for two of every three people to be living in urban places. In Asia alone, 1 billion more people will live in cities in 2030 than in 2005. By 2015, there will be 22 mega-cities with populations of 10 million or more; 12 of these will be in Asia.

In most developing and some industrialized countries, urban areas are already stretched, due to population growth, in-migration, increasing per capita demands on precious resources such as land and water and

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[7] See https://www.thegef.org/gef/content/regional-southeastern-europe-and-caucasus-catastrophe-risk-insurance-facility-crif.

[8] See http://www.oxfamamerica.org/issues/private-sector-engagement/weather-insurance.

on urban service systems such as transport and health, in combination with the rapidly deteriorating condition of the infrastructure due to ageing. Cities in both developing and industrialized countries are also marked by deep inequalities, with the poor living in marginalized areas where water, sanitation, and housing infrastructure is almost non-existent and access to other forms of infrastructure-dependent services such as transport, health, and education is severely limited. Ecosystems supporting current urban areas are already under stress.

Infrastructure is one of the defining features of urban life and landscapes, and plays a critical role in shaping social resilience as well as the economic dynamism of cities. Infrastructure reflects the choices that governments make, both economically and socially, and provides insight into issues of equity, governance, and the strength of local institutions. Fast paced growth, both in terms of spatial area and resource demands, will outstrip the capacity of existing infrastructure to provide water, sanitation, and transportation, and will strain the carrying capacity of ecosystem services.

It is already hard to argue that urban development in Asia in the 21st century is sustainable. When we overlay climate hazards, their situation is even more acute.[9] Thus, even as urban growth exacerbates existing vulnerabilities under current climate conditions, decision makers must also grapple with an uncertain future climate. The patterns of inequitable development that characterize much of the present growth in urban areas in Asia are likely to be exacerbated by such changes. Pressures may include increased flooding and storms in coastal areas, where many cities are experiencing rapid population growth, and increased frequency of breakdown in vital urban infrastructure as a result of climate anomalies, in the context of increased fiscal pressure on urban policy makers to reduce GHG emissions and "go green." Rather than being centers of innovation and engines of compact and efficient economic growth and well being, the impacts of a changing climate could well propel the cities of the global South into increasing poverty and endemic strife.

Cities are enormously important as engines of economic and social growth, especially for the low- and middle-income countries

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9 The lack of climate-smart infrastructure is not just a problem in the global South—it is endemic in the industrialized countries as well. New York, for example, is struggling to adapt current infrastructure to the future effects of floods and storms, and to better plan future infrastructure projects. The transit, water supply, and sanitation infrastructure, among others, are all extremely vulnerable to the effects of climate change and the city is ill-equipped to handle even today's severe weather events, let alone increased severity and frequency of storms and sealevel rise in the future.

of the global South. Careful planning and investment will be required to realize their potential, particularly if it is to be achieved without increased inequities. Urban climate resilience efforts require a problem-driven approach that takes into account the historic evolution of the cities, the sociocultural fabric of city making, economic inequities, and institutional decision making. All too often urban adaptation efforts focus solely on climate as the dominant driver of urban economic and social risk. Urban mitigation efforts, on the other hand, focus exclusively on GHG emission reductions in transportation, building efficiency and energy generation sectors. Green growth efforts need to inform better urban governance and management and finance, and to enable economic growth with equity—a set of converging goals along with GHG emission reductions and the creation of climate resilient cities.

3.4.5 On the Architecture of Green Growth Governance

The emphasis in global negotiations has been on making climate change financing from the North available for adaptation and mitigation programs in the South. Given the poor demonstration record of many developed countries in fulfilling their stated commitments, such an emphasis is very appropriate. The global and regional architecture of finance utilization are also very significant. It has been assumed that the selected administrative agent (such as a multilateral institution) would impose its administrative and fiscal management on the climate fund.

The limited absorptive capacity of developing countries for the effective use of climate finance is a serious concern. One response on the part of the donors has been to exercise more control on all aspects of the program, often deploying consultants from developed countries. While this may make for more effective projects, overall it perpetuates poor capacities in developing countries. Project-based capacity building efforts are simply not sufficient.

Many green growth efforts are consciously aligned to respond to demands of the developing country clients. Unfortunately, the clients are often not able to access the full range of scientific and technological options available globally, nor to fully assess their fit in the local socioeconomic and environmental context. Also, access to knowledge alone does not promise that the right choices will be made. Scientific and technical expertise, independent of the donors, needs to be made available to developing country clients, along with the long-term programs to build their capacity.

3.5 The Green Fund: An Approach Based on the Principles of "Common but Differentiated Responsibilities" and Equity

Purpose: The Green Fund will receive assessed contributions of member countries and will disburse grant and loan funds to low-income and middle-income countries to pursue programs of climate-change mitigation and adaptation.

Duration: The Green Fund will operate until the sustainable reduction of GHG emissions is sufficient to meet the objectives of the UNFCCC. This is targeted to occur no later than 2050.

Members: All signatories of the UNFCCC are members of the Green Fund.

Governance: The governing board will include two representative countries of each regional development bank. Each bank will select its representatives according to procedures set by the governing boards of the respective banks. The representatives will serve for 2 years. At least one of the two countries sending representatives will be a recipient country of the Green Fund. Each bank will have a non-voting representative, as will relevant UN agencies.

Funding: The Green Fund will be funded by assessments paid by member countries. Assessments will be determined according to each country's CO_2 emissions and the country's GDP per capita (World Bank Atlas method). The formula is as following for country i:

Assessment (i) = CO_2 Emissions (i) x CO_2 Assessment Rate x GDP Factor (i)

The assessment rate is expressed in \$/tons of CO_2

The GDP Factor is as follows:

High-income country (>\$12,276): 1.0

High middle-income country (\$3,976–\$12,275): 0.5

Low middle-income country (\$1,006–\$3975): 0.25

Low-income country (<\$1,005): 0.0

Table 3.5: Illustration of Proposed Green Fund Assessment Rates

Country	CO_2 emissions (million tons per year)	GDP/capita Ranking	GDP Factor	Total Assessment (at $2/ton)	Assessments as % of GDP (PPP equivalent)
PRC	7,710	Upper Middle-Income	0.5	$7.7 billion	0.08%
India	1,602	Lower Middle-Income	0.25	$0.8 billion	0.05%
Mozambique	2.35	Lower Income	0	0	0
United Kingdom	520	Higher Income	1	$1.0 billion	0.05%
United States	5,420	Higher Income	1	$10.8 billion	0.07%

Source: Authors.

Consider the illustration in Table 3.5 for an assessment rate of $2 per ton, based on national CO_2 emissions in 2010 from the consumption of energy resources.

The assessment rate will be fixed every 5 years to produce the targeted funding stream. Note that a modest assessment rate will produce significant revenues for the Green Fund, at very low cost to the consumer. A $1 levy per ton produces $24 billion worldwide. The implied levy per gallon of gasoline is 0.9 US cents for high-income countries, as shown in Table 3.6. (To convert to cents per liter, multiply cents per gallon by 0.26.)

Table 3.6: Potential Green Fund Revenues Based on CO_2 Levy

$/ton of CO_2	Total Green Fund Revenues Worldwide	Cents Per Gallon in Low-Income Countries	Cents Per Gallon in Low Middle-Income Countries	Cents Per Gallon in Upper-Middle Income Countries	Cents Per Gallon in High-Income Countries
1	$24 billion	0	0.2	0.4	0.9
2	$42 billion	0	0.4	0.9	1.8
3	$72 billion	0	0.7	1.3	2.6
4	$96 billion	0	0.9	1.8	3.5

Source: Authors.

Disbursements: All low-income countries will be eligible for grant financing from the Green Fund. Middle-income countries will be eligible for loan financing on the terms of the respective MDBs.

Criteria: The Green Fund will finance both mitigation and adaptation projects, 50% to each category. Each multilateral development bank will set guidelines for the suitability of projects, based on criteria including cost effectiveness, social equity, and environmental impacts.

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