

# The Greenhouse Development Rights Framework

The right to development in a climate constrained world

Revised second edition

**Paul Baer, Tom Athanasiou, Sivan Kartha and Eric Kemp-Benedict**





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The right to development in a climate constrained world  
A report by Paul Baer, Tom Athanasiou, Sivan Kartha, and Eric Kemp-Benedict  
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**A report by Paul Baer and Tom Athanasiou of EcoEquity and Sivan Kartha and Eric Kemp-Benedict of the Stockholm Environment Institute**

Revised second edition, November 2008



*Surjina from Bangladesh trains to become an electrician.*

## EDITORS' PREFACE

Imagine a world in which both the scandal of global poverty and the threat of climate change were taken seriously. In such a world, what action would be required to reduce the atmospheric concentration of greenhouse gases and hold global warming below 2 degrees Celsius above preindustrial levels while at the same time respecting the right of poor people to dignity, to human development, and to economic opportunity?

So constrained is the global carbon budget – global emissions must peak and start a precipitous decline in the next decade – that it is too late to talk of emissions reductions in Annex I countries alone. It is now necessary to secure significant cuts in emissions in the growing nations of the developing world. And yet, even in the burgeoning Chinese and Indian economies, there is still huge poverty. This is the crux of the current climate impasse.

Christian Aid, the Heinrich Böll Foundation, and the Stockholm Environment Institute are therefore proud to be associated with *The Greenhouse Development Rights Framework: The right to development in a climate constrained world* because it tackles this issue head on. It argues that while people remain poor, it is unacceptable and unrealistic to expect them to focus their valuable resources on the climate change crisis. And it draws the necessary conclusion – that others who are wealthier and have enjoyed higher levels of emissions already, must take on their fair share of the effort.

To be clear, this does not mean that the countries in which poor people live are not required to cut their emissions, but rather that the global consuming class – both within these countries and especially in the industrialized countries – are the ones who must pay.

The origin of this idea is the United Nations Framework Convention on Climate Change itself. The Convention states in article 3.1 that “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”. In article 3.4 it furthermore states, that “parties have a right to, and should, promote sustainable development”. The Greenhouse Development Rights Framework attempts to work this idea through in a manner that explicitly safeguards the right to development. It lays out and quantifies an effort-sharing framework that would logically follow from clear and defensible measures of responsibility and capability defined so as to preserve developmental equity.

The results are not wholly surprising. Nor, today, will they be wholly welcome. For the North / South breakthrough – the one that will make it possible to talk, openly and honestly, about the effort-sharing problem – has still not occurred. Yet, perhaps inconveniently but with an eye to the future, the GDRs approach is to be frank. It concludes that, were the negotiators to today divide the effort of an adequate global response in a fair way, fully a third of that effort would fall on the shoulders of the US and one-quarter more would go to the European Union. The poorest nations would,

of course, be free to focus their efforts on achieving their sustainable development goals. Those developing nations with sizable consuming classes of their own, despite being net receivers of mitigation finance, would still have to add more, in proportion to their own, small but growing obligations.

All this is easy to say, but very difficult to negotiate. While the South waits, still, for the North to take the lead, the North insists on formal southern commitments. Thus the international impasse.

In this context, the GDRs team, both the authors and their institutional supporters, will undoubtedly face questions about whether or not the GDRs proposition is politically realistic. After all, even after Bali, the international negotiations continue to be in a precarious condition, and the essential pre-requisite of any global deal is far from being universally acknowledged. What is needed now is a meaningful step, on the part of the industrialised countries, one that affirms their “dual obligation” to not only make major domestic cuts but also to make equally ambitious commitments to support international mitigation and adaptation. Were the North to take such a step, the impasse could be broken.

A climate change agreement stands a far greater chance of winning global support if the issue of sustainable human development is in its DNA. And this can only happen if a fair and adequate global effort sharing architecture that explicitly safeguards the right to development is on the table for all to see. *The Greenhouse Development Rights Framework: The right to development in a climate constrained world* fills that gap. That is why it has been received with such an overwhelming acceptance at the many presentations that have been given over the past months, after the first edition of this publication was presented in Bali. The positive response has created the need for a reprint. As some important updates were deemed necessary, we have opted for a new edition instead of a simple reprint. Indeed, this thoroughly revised second edition goes beyond the GDRs framework itself and gets to the heart of the global impasse by explicitly discussing the difficulties around differentiation, sequencing, and the trust-building period that will be needed if Copenhagen is to be a gateway into the necessary emergency mobilization.

We are convinced that while a vision of climate equity and a principle-based effort-sharing framework are crucial elements to move the debate forward, they are not enough. More is needed to overcome the current political impasse of the negotiations. The trust deficit between North and South must be recognised and understood, and the world must begin to take concrete steps towards climate equity in a way that also delivers real action given the urgency of the climate crisis. For that we need to be not only creative and cautious, but also sensible and courageous.

Christian Aid and the Heinrich Böll Foundation would like to offer profound thanks to Paul Baer and Tom Athanasiou of EcoEquity and Sivan Kartha and Eric Kemp-Benedict of the Stockholm Environment Institute for writing and refining this document, and being willing to take on board any number of suggestions and comments en route to publication.

Barbara Unmüßig  
Member of the Executive  
Board  
*Heinrich Böll Foundation*

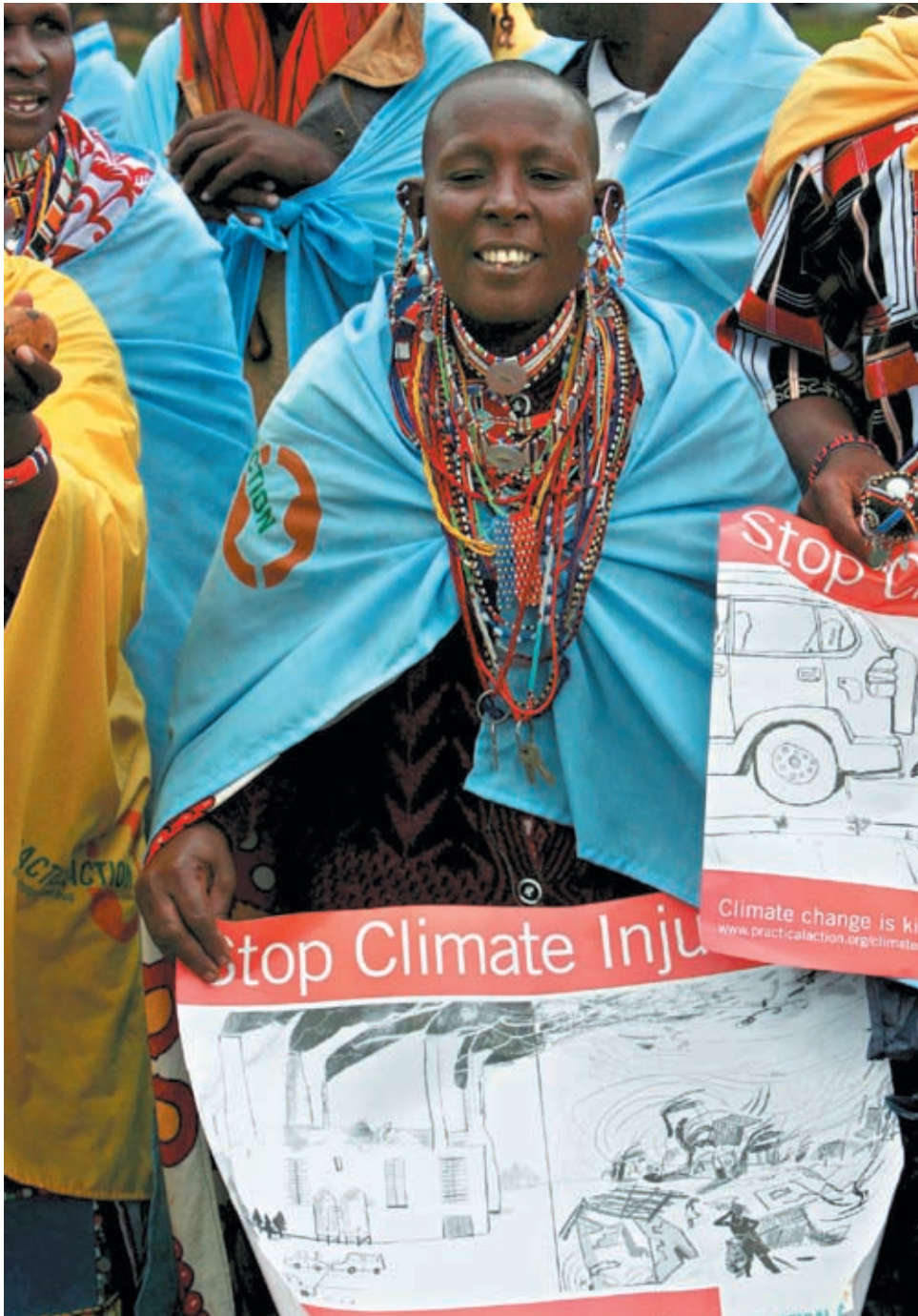
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*A Maasai woman dances while holding a banner saying “Stop climate injustice” at a demonstration in Nairobi, Kenya, on Saturday 11 November, 2006. More than 5.000 people braved the rain in support of initiatives to combat global warming, the first march of its kind to be held in Africa, coinciding with the United Nations Climate Change Conference being held in the country that year.*

## PREFACE TO THE SECOND EDITION

This second edition of *The Right to Development in a Climate Constrained World* is quite similar to the first, which was published in November of 2007. However, it contains a number of important changes. Many are localized matters of precision and style. But others are more significant:

The first of these significant changes has to do with our reference case projections. Earlier versions of the Greenhouse Development Rights (GDRs) framework relied heavily on two IPCC SRES scenarios (A1B and B1). A1B was taken as our “business and usual” case, and B1 was contrasted to it to estimate the size of the global “no-regrets” potential – the emission reductions that could be made for free, or indeed profitably. The SRES scenarios, however, have been overtaken by events; actual emission rates are overshooting even the most worrisome of the SRES cases. So, following current usage, we have abandoned them and taken the International Energy Agency’s 2007 World Energy Outlook reference projection as our new BAU case. Further, our new estimate of the global no-regrets potential is based on an influential McKinsey estimate, which is also based on the 2007 WEO reference case.

Even more critically, the GDRs system is now dynamic. Rather than calculating our key metric, the “Responsibility and Capacity Indicator” (RCI) on the basis of current national data (GDP, population, cumulative emissions), it calculates them on the basis of projections of those indicators, projections that are derived, as noted above, from the 2007 World Energy Outlook. Which is not to say that we consider the 2007 WEO reference case to be unproblematic, or in any way the last word. But, again, current usage supports its use, and it is quite sufficient to produce some intriguing and politically challenging results.

For example, there is the case of China. In 2007’s initial static analysis of the Greenhouse Development Rights approach, we calculated that China had a 7.0 percent share of the total global climate obligation to support an emergency global climate program of mitigation and adaptation. Today, in our dynamic calculations, that number has been replaced by a year-by-year series, which evolves as do China’s economy and emissions. China’s RCI increases from 5.5 percent (in 2010), to 10.4 percent (2020), to 15.3 percent (2030), reflecting the dynamic trend that China is expected to follow over the coming two decades.

We have also made several other smaller updates and changes:

■ Just after our initial (November 2007) publication, the World Bank released new income data and PPP (purchasing power parity) conversions, which revealed that earlier assessments of developing-country economies were significant overestimates. These are critical in the calculation of the Greenhouse Development Rights RCIs, and this new edition fully integrates these new data.

■ We have changed our treatment of “no-regrets” reductions. As before, the global theoretical potential (now as calculated by McKinsey Global Institute) is allocated

to countries in proportion to their share of global emissions. However, we no longer interpret their standard definition (zero or negative cost reductions, including co-benefits) to imply that all countries, whatever their level of development, should be obliged to achieve those reductions alone. Now, recognizing the importance of various non-cost-related barriers (e.g., structural, institutional, financial, and technological barriers) to achieving no-regrets reductions, we oblige countries to achieve only a specified fraction of their theoretical no-regrets potential. To keep things simple, and as a reasonable if crude estimate, we require Annex I countries to achieve 100 percent of their no-regrets potential. Non-Annex I countries – to account for the various obstacles impeding the capture of no-regrets options – are required to achieve only 50 percent of their no-regrets potential. The remainder is included in the global mitigation requirement that is allocated among countries according to capacity and responsibility. Since no-regrets mitigation potential is a relatively small fraction of the total amount of mitigation needed to reach the 2°C trajectory, the impact of this change is relatively minor.

■ We have modestly changed the value of the development threshold, from \$9,000 to \$7,500, that is, from 150 percent to 125 percent of the \$6,000 per annum income (PPP) that we take as defining the global poverty line. This lower figure was found, after further research, to be more closely consistent with national estimates (in China and India specifically) of the income level where poor people begin to enter the lower levels of the global consuming class. Which is to say, the level where they begin to have some small amount of discretionary income.

■ We have changed the formula that we use to calculate the combined “Responsibility and Capacity Indicator” (RCI). We now use a simple weighted sum,  $RCI = aC + bR$ , in which the weights  $a$  and  $b$  sum to 1 and are set to 0.5 and 0.5 in the indicative case. The change simplifies things, and makes the behavior of the RCI more reasonable for outlier countries, but for most countries it changes little.

■ The calculations at the heart of the GDRs framework are now produced by a calculator that is available online. Using this calculator, you can experiment with changes to the critical parameters, particularly the development threshold, and the relative weighting of capacity and responsibility. We will continue to develop the calculator, adding the ability to alter the global emissions trajectory, the start date for responsibility calculations, the “progressivity” of the effective responsibility and capacity tax, and other parameters. Go to <http://www.GreenhouseDevelopmentRights.org/Calculator> for instructions to access the online system.

■ Most of the charts have been rescaled to a 2030 time horizon, with special attention to 2020. Longer term projections are unacceptably problematic, and in any case we wish to emphasize 2020, which has emerged as the key near-term benchmark in climate policy discussions.

■ Finally, our discussion of the political landscape has been significantly updated to account for developments in Bali and those since then, and in particular to much more carefully analyze the sequencing problems that a framework like GDRs presents. Simply put, GDRs is not based upon “annexes” – lists of countries with particular levels of development and, thus, particular kinds and levels of emission reduction commitments. Rather, it is based upon a responsibility and capacity index that assigns obligations to both developed and developing countries using the same formula, arraying countries along a single scale. Given the inertia of the current Annex

structure and the lack of trust between North and South, there will likely need to be a transitional period (perhaps consisting of a short second commitment) that builds North / South trust while, at the same time, implementing significant climate action and evolving toward a principle-based approach. Section 6 is the place to find these changes in our political analysis.

All of these points are discussed in more detail and noted in the main body of the text. Note, too, that other changes are also planned. In particular, we have plans to upgrade our responsibility calculations to take account of the emissions “embodied” in international trade.

Note also that the extensive technical appendices that, in the first edition, were part of this book are now online. See <http://www.GreenhouseDevelopmentRights.org/Appendices>.





*Flooding is a major problem for the people of El Molino Sur in Matagalpa, central Nicaragua. Here they are building up the local river bank, to protect their homes during the wet season.*

# The Greenhouse Development Rights Framework

## The Right to Development in a Climate Constrained World\*

### Abstract

*This paper argues that an emergency climate stabilization program is needed, that such a program is only possible if the international effort-sharing impasse is decisively broken, and that this impasse arises from a severe, but nevertheless surmountable, conflict between the climate crisis and the development crisis.*

*It argues, further, that the best way to break the international climate impasse is, perhaps counter-intuitively, by expanding the climate protection agenda to include the protection of developmental equity, which can and should be specified in terms of the UNFCCC's notion of "common but differentiated responsibilities and respective capabilities."*

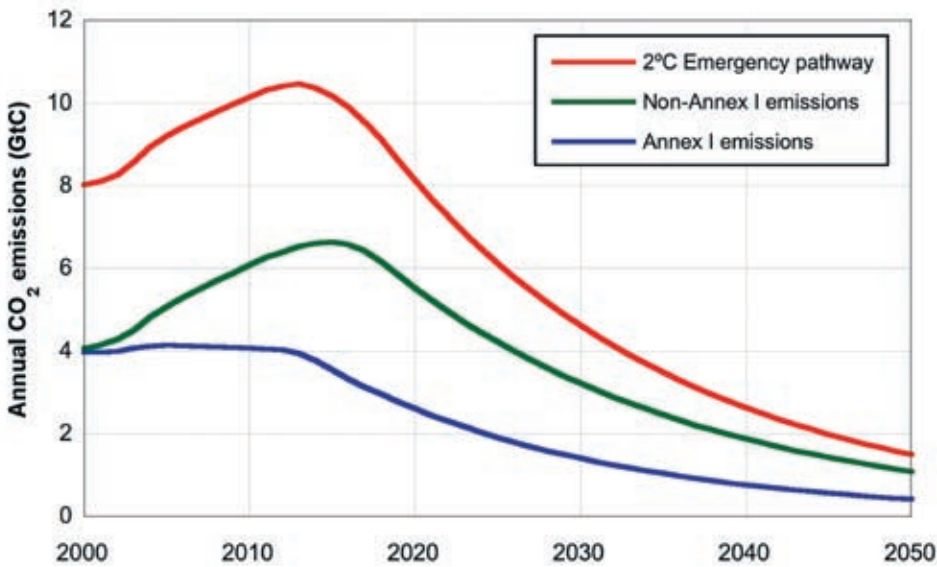
*The Greenhouse Development Rights (GDRs) framework does exactly this, in the context of an extremely ambitious emission reduction pathways designed to hold global warming below 2° C. It defines national responsibility and capacity, and assesses national climate obligations, in a manner that relieves from the costs and constraints of the climate crisis those individuals who are still striving for a decent standard of welfare – represented by a "development threshold" defined at an income level modestly above a global poverty line. Moreover, it takes intra-national income disparities formally into account, stepping beyond the usual practice of relying on national per-capita averages, which fail to capture either the true depth of a country's developmental need or the actual extent of its wealth. By so doing, it provides us with a reference framework by which we can coherently estimate comparability of effort, across nations and regions and across disparate effort-sharing regimes.*

*The GDRs framework, in other words, is designed to demonstrate how a global emergency mobilization to stabilize the climate can be pursued while, with equal deliberateness, safeguarding the right of all people to reach a dignified level of sustainable human development. We present in this paper an exposition of the GDRs framework and indicative quantification of its implications.*

\* The principal authors of this report are Paul Baer and Tom Athanasiou of EcoEquity and Sivan Kartha and Eric Kemp-Benedict of the Stockholm Environment Institute. Please cite as: P. Baer, T. Athanasiou, S. Kartha, and E. Kemp-Benedict, "The Greenhouse Development Rights Framework, Second Edition," November 2008. Correspondence to [authors@ecoequity.org](mailto:authors@ecoequity.org). See [www.GreenhouseDevelopmentRights.org](http://www.GreenhouseDevelopmentRights.org).

# Executive summary

A warming of 2°C over pre-industrial temperatures has been widely endorsed as the maximum that can be tolerated or even managed. Yet even as the emerging science<sup>1</sup> increasingly underscores how extremely dangerous it would be to exceed 2°C, many people are losing all confidence that today's inertial, politics-bound societies will be able to prevent such a warming. Our quite different conclusion is that the 2°C line can indeed be held, but that doing so demands a sharp break with politics as usual. Accordingly, we follow the science, defining a global emissions objective – a “2°C emergency pathway” – that preserves a real chance of holding the 2°C line, and then setting out to straightforwardly assess the strategies that will be necessary to do so. More specifically, since carbon-based growth is no longer a viable option in either the North or the South, we set out to assess the problem of rapid decarbonization in a world sharply polarized between North and South and, on both sides, between rich and poor.



**Figure ES1: The South's Dilemma.** The red line shows the 2°C Emergency Pathway, in which global CO<sub>2</sub> emissions peak in 2013 and fall to 80 percent below 1990 levels in 2050. The blue line shows Annex I emissions declining to 90 percent below 1990 levels in 2050. The green line shows, by subtraction, the emissions space that would remain for the developing countries.

A simple thought experiment, illustrated in this first figure, makes the situation clear. In this figure, we show a scientifically realistic assessment of the size of the remaining global carbon budget (the 2°C emergency pathway, shown in red), along with the portion of that budget that the wealthy Annex I countries would consume even if they undertake bold efforts to virtually eliminate their emissions by 2050 (as shown in blue). Doing so reveals, by subtraction, the alarmingly small size of the

<sup>1</sup> T. M. Lenton, H. Held, E. Kriegler, et al. (2008): “Tipping Elements in the Earth’s climate system,” *Proceedings of the National Academy of Sciences*. 105 (6): 1786–93. Cambridge.



carbon budget (shown in green) that would remain to support the South's development.

A few details only make the picture starker:

■ The efforts implied by this 2°C emergency pathway are heroic indeed. Global emissions peak in 2013 and decline to 80 percent below 1990 levels by 2050, such that CO<sub>2</sub> concentrations can peak below 420 ppm and then begin to fall.<sup>2</sup> Yet even this would hardly mean that we were “safe.” We would still suffer considerable climate impacts and risks, and a roughly 15–30 percent probability of overshooting the 2°C line.<sup>3</sup> This is what the IPCC would refer to as a trajectory that was “likely,” but not “very likely” to keep warming below 2°C.

■ The Annex I emission path shown here is more aggressive than even the most ambitious of current EU and US proposals. It has emissions declining at nearly six percent annually from 2013 onwards, and ultimately dropping to a near-zero level. It is a tough prospect, and if it is politically plausible at all, it is just barely so.

■ Yet the space remaining for the developing world would still be extremely constrained. In fact, developing-country emissions would still have to peak only a few years later than those in the North – before 2020 – and then decline by nearly six percent annually through 2050. This would have to take place while most of the South's citizens were still struggling in poverty and desperately seeking a significant improvement in their living standards.

It is this last point that makes the climate challenge so daunting. For the only proven routes to development – to water and food security, improved health care and education, and secure livelihoods – involve expanding access to energy services, and, given today's inadequate, expensive, low-carbon energy systems, and the South's limited ability to afford them, these routes inevitably threaten an increase in fossil fuel use and thus carbon emissions. From the South's perspective, this pits development squarely against climate protection. Even with the minimal Millennium Development Goals being treated as second-order priorities, the developing countries are quite manifestly justified in fearing that the larger development crisis, too, will be treated as secondary to the imperatives of climate stabilization. The level of international trust is very low indeed and, all told, the situation invites global political deadlock.

Despite progress at the margins, the climate negotiations are moving far, far too slowly. It is unlikely that we will be able to act, decisively and on the necessary scale, until we openly face the big question: What kind of a climate regime can allow us to bring global emissions rapidly under control, even while the developing world vastly scales up energy services in its ongoing fight against endemic poverty and for human development?

## The development threshold

Development is more than freedom from poverty. The real issue is a path beyond poverty to dignified, sustainable ways of life, and the right to such development must

2 See Meinshausen (2006), or Baer and Mastrandera (2006). For the latest evidence that concentrations need to drop even below 350 ppm CO<sub>2</sub>, see Hansen (2008).

3 For details, see Baer and Mastrandrea (2006).

be acknowledged and protected by any climate regime that hopes for even a chance of success. The bottom line in this very complicated tale is that the South is neither willing nor able to prioritize rapid emission reductions over development – not while it must also seek an acceptable level of improvement in the lives of its people – and that the key to climate protection is the establishment of a global climate policy framework in which it is not required to do so.

The Greenhouse Development Rights framework (GDRs) is, accordingly, designed to protect the right to sustainable human development, even as it drives rapid global emission reductions. It proceeds in the only possible way, by operationalizing the official principles of the UN's Framework Convention on Climate Change, according to which states commit themselves to “protect the climate system ... on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities.”

As a first step, the GDRs framework codifies the right to development as a “development threshold” – a level of welfare below which people are not expected to share the costs of the climate transition. This threshold, please note, is emphatically not an “extreme poverty” line, which is typically defined to be so low (\$1 or \$2 a day) as to be more properly called a “destitution line.” Rather, it is set to be higher than the “global poverty line,” to reflect a level of welfare that is beyond basic needs but well short of today's levels of “affluent” consumption.

People below this threshold are taken as having development as their proper priority. As they struggle for better lives, they are not similarly obligated to labor to keep society as a whole within its sharply limited global carbon budget. In any event, they have little responsibility for the climate problem (the approximately 70 percent of the population that lives below the development threshold is responsible for only about 15 percent of all cumulative emissions) and little capacity to invest in solving it. People above the threshold, on the other hand, are taken as having realized their right to development and as bearing the responsibility to preserve that right for others. They must, as their incomes rise, gradually assume a greater fraction of the costs of curbing the emissions associated with their own consumption, as well as the costs of ensuring that, as those below the threshold rise toward and then above it, they are able to do so along sustainable, low-emission paths. Moreover, and critically, these obligations are taken to belong to all those above the development threshold, whether they happen to live in the North or in the South.

The level where a development threshold would best be set is clearly a matter for debate. We argue that it should be at least modestly higher than a global poverty line, which is itself about \$16 per day per person (PPP adjusted).<sup>4</sup> This figure derives from an empirical analysis of the income levels at which the classic plagues of poverty – malnutrition, high infant mortality, low educational attainment, high relative food expenditures – begin to disappear, or at least become exceptions to the rule. So, taking a figure 25 percent above this global poverty line, we do our “indicative” calculations

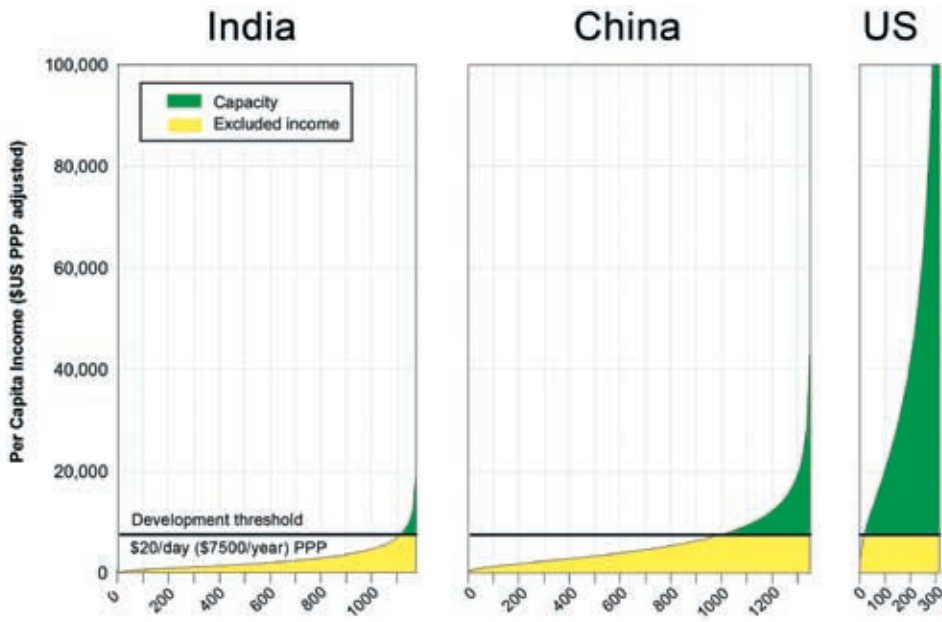
4 L. Pritchett (2003 and 2006). Pritchett concluded that the use of this line “is justifiable, more consistent with international fairness, and is a better foundation for the World Bank's organizational mission of poverty reduction” and that “If the poverty line were defined as the level of income at which people typically achieve acceptable levels of the Millennium Development Goal indicators (such as universal primary school completion), it would be set at about [\$16] a day.”

relative to a development threshold of \$20 per person per day (\$7,500 per person per year). This income also reflects the level at which the southern “middle class” begins to emerge.

**National obligations and the “Responsibility Capacity Index”**

Once a development threshold has been defined, logical and usefully precise definitions of capacity and responsibility follow, and these can then be used to calculate the fraction of the global climate burden that should fall to any given country. This is true, moreover, however large that fraction may be, and however it is conceived: an ecological debt, an obligation to invest in the low-carbon transition, a responsibility to support resilience-building among vulnerable communities.

Capacity – by which we mean income not demanded by the necessities of daily life, and thus available to be “taxed” for investment in climate mitigation and adaptation – can be straight-forwardly interpreted as total income, excluding income below the development threshold. This is illustrated in figure ES2, which shows the development threshold (a horizontal line at \$7,500) as it crosses the national income distribution lines and splits their populations into a poorer portion (to the left) and a wealthier portion (to the right). This crossing makes it easy to compare both the heights of wealth and the depths of poverty in different countries, and also graphically conveys each country’s capacity (the green area), which we define as the income that the wealthier portion of the population has above the development threshold.



**Figure ES2: Capacity: income above the development threshold.** These curves approximate income distributions within India, China, and the United States. Thus, the green areas represent national incomes above the (\$20 per person per day, PPP) development threshold – our definition of national capacity. Chart widths are scaled to population, so these capacity areas are correctly sized in relation to each other. Based on projected 2010 data.

A nation's aggregate capacity, then, is defined as the sum of all individual income, excluding income below the threshold. Responsibility, by which we mean contribution to the climate problem, is similarly defined as cumulative emissions since 1990, excluding emissions that correspond to consumption below the development threshold. Such emissions, like income below the development threshold, do not contribute to a country's obligation to act to address the climate problem.

Thus, both capacity and responsibility are defined in individual terms, and in a manner that takes explicit account of the unequal distribution of income within countries. This is a critical and long-overdue move, because the usual practice of relying on national per-capita averages fails to capture either the true depth of a country's developmental need or the actual extent of its wealth. If one looks only as far as a national average, then the richer, higher-emitting minority lies hidden behind the poorer, lower-emitting majority.

These measures of capacity and responsibility can then be straightforwardly combined into a single indicator of obligation, in a "Responsibility Capacity Index" (RCI). This calculation is done for all Parties to the UNFCCC, based on country-specific income, income distribution, and emissions data. The precise numerical results depend, of course, on the particular values chosen for key parameters, such as the year in which national emissions begin to count toward responsibility (we use 1990, but a different starting date can certainly be defended) and, especially, the development threshold, which defines the overall "progressivity" of the system. The results also evolve over time – as the following table shows, the global balance of obligation in 2020, or 2030,<sup>5</sup> can be expected to differ considerably from that which exists today.

What's most important is that the GDRs framework lays out a straightforward operationalization of the UN's official differentiation principles, and that it does so in a way that protects the poor from the burdens of climate mobilization. Beyond that, the values of specific parameters can be easily adjusted and should certainly be debated; all of them, of course, would have to be negotiated.<sup>6</sup>

Still, for all that, our indicative calculations are chosen to be instructive. Looking at just the 2010 numbers, for example, they show that the United States, with its exceptionally large share of the global population of people with incomes above – and generally far above – the \$20-per-day development threshold (capacity), as well as the world's largest share of cumulative emissions since 1990 (responsibility), is the nation with the largest share (33.1 percent) of the global RCI. The European Union follows with a 25.7 percent share; China, despite being relatively poor, is large enough to have a rather significant 5.5 percent share, which puts it even with the much smaller but much richer country of Germany; India, also large but much poorer, falls far behind China with a mere 0.5 percent share of the global RCI.

5 Our projections are based on the International Energy Agency's *World Energy Outlook 2007* reference case projections.

6 To experiment with the sensitivity of our results, relative to alternative parameterizations, see the online GDRs calculator at <http://www.GreenhouseDevelopmentRights.org/Calculator>.

GDRs results for representative countries and groups							
	2010					2020	2030
	Population (percent of global)	GDP per capita (\$ US PPP)	Capacity (percent of global)	Responsibility (percent of global)	RCI (percent of global)	RCI (percent of global)	RCI (percent of global)
<b>EU 27</b>	7.3	30,472	28.8	22.6	25.7	22.9	19.6
<b>EU 15</b>	5.8	33,754	26.1	19.8	22.9	19.9	16.7
<b>EU +12</b>	1.5	17,708	2.7	2.8	2.7	3.0	3.0
<b>United States</b>	4.5	45,640	29.7	36.4	33.1	29.1	25.5
<b>Japan</b>	1.9	33,422	8.3	7.3	7.8	6.6	5.5
<b>Russia</b>	2.0	15,031	2.7	4.9	3.8	4.3	4.6
<b>China</b>	19.7	5,899	5.8	5.2	5.5	10.4	15.2
<b>India</b>	17.2	2,818	0.7	0.3	0.5	1.2	2.3
<b>Brazil</b>	2.9	9,442	2.3	1.1	1.7	1.7	1.7
<b>South Africa</b>	0.7	10,117	0.6	1.3	1.0	1.1	1.2
<b>Mexico</b>	1.6	12,408	1.8	1.4	1.6	1.5	1.5
<b>LDCs</b>	11.7	1,274	0.1	0.04	0.1	0.1	0.1
<b>Annex I</b>	18.7	30,924	75.8	78.0	77	69	61
<b>Non-Annex I</b>	81.3	5,096	24.2	22.0	23	31	39
<b>High-income</b>	15.5	36,488	76.9	77.9	77	69	61
<b>Middle-income</b>	63.3	6,226	22.9	21.9	22	30	38
<b>Low-income</b>	21.2	1,599	0.2	0.2	0.2	0.3	0.5
<b>World</b>	100	9,929	100%	100%	100%	100%	100%

**Table ES1: Percentage shares of total global population, GDP, capacity, responsibility, and RCI for selected countries and groups of countries. Based on projected emissions and income for 2010, 2020, and 2030. (High-, Middle-, and Low-income Country categories are based on World Bank definitions as of 2006. Projections based on International Energy Agency World Energy Outlook 2007.)**

As the table shows, the global balance of obligation changes over time, as differing rates of national growth change the global income structure. The results are most obvious, and startling, in the projected change in China's share of the total RCI, which – reflecting its extremely rapid growth and the increasing number of Chinese people who are projected to enjoy incomes above the development threshold – nearly triples (from 5.5 percent to 15.3 percent) in the two decades from 2010 to 2030.

These figures, again, illustrate the application of the GDRs framework by way of a particular choice of key parameters. Note that in this indicative calculation, we have made the rather conservative assumption that all income (and all emissions) above the development threshold count equally toward the calculation of an individual's RCI. This amounts to a “flat tax” on capacity and responsibility. However, it might be more consistent with widely shared notions of fairness for RCI to be defined in a more “progressive” manner. That is, an individual's millionth dollar of income might contribute more to their RCI than their ten-thousandth dollar of income. A more progressive formulation of RCI would shift more of the global obligation to wealthy individuals and wealthy countries.

However, regardless of the particulars of any example quantification, the GDRs framework – or any approach to differentiating national obligations that is designed to ensure a meaningful right to development – would be a real game changer. For one

thing, it would allow us to objectively and quantitatively estimate national obligations to bear the efforts of climate protection (obligations to support adaptation as well as obligations to mitigate) and to meaningfully compare obligations even between wealthy and developing countries. Using the terminology of the Bali Roadmap, it would allow us to gauge the “comparability of effort” across countries.

Admittedly, this will be seen as a dangerous idea. It betokens a world beyond the Annex I / non-Annex I divide, in which debates about whether Singapore or South Korea should “graduate to Annex I” would no longer be relevant; both would simply be countries – along with the rest – with obligations of an appropriate scale, as specified by their RCIs. But it is also a liberating idea. It defines and quantifies national obligations in a way that explicitly safeguards a meaningful right to development. It accepts the developing-country negotiators’ claim that they can only accept a regime that protects development, and just as importantly it tests the willingness of the industrialized countries to step forward and offer such a regime.

### **Operationalizing the GDRs framework**

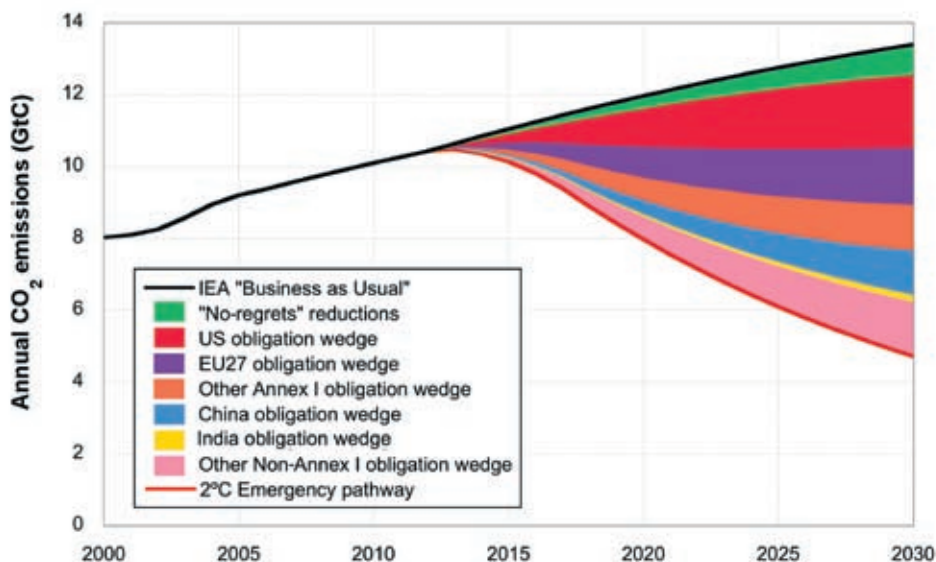
How might such obligations be operationalized? Consider two complementary examples. First, imagine a single grand international fund to support both mitigation and adaptation – akin to, say, the Multinational Climate Change Fund proposed by Mexico. The RCI could serve as the basis for determining each nation’s obligatory financial contribution to that fund. So, for example, if the 2020 climate transition funding-requirement amounted to a trillion dollars (roughly 1 percent of the projected 2020 Gross World Product), then in 2020, the United States, with about 29 percent of the global RCI, would be obligated to pay \$290 billion. Similarly, the European Union’s share would be about \$230 billion (23 percent of the global RCI), China’s share would be about \$100 billion (10 percent), India’s share would be \$12 billion (1.2 percent), and so on. The RCI, in effect, serves as the basis of a progressive global “climate tax” – not a carbon tax, per se, but a responsibility and capacity tax.

Second, we can approach the effort-sharing problem not by way of national financial obligations, but rather by way of national emission reduction obligations, in the style of Kyoto’s national targets. Thus, we can compare a global reference trajectory to the rapidly declining 2°C emergency pathway, a comparison that allows us to straightforwardly calculate the total amount of mitigation (in, say, gigatons of carbon – GtC) that is needed globally in any given year. Applying the GDRs framework, national reductions obligations are then defined as shares of the global mitigation requirement, which is allocated among countries in proportion to their RCIs. The United States, for example (see figure ES3), is projected to have a 2020 reduction obligation equal to about 29 percent of the roughly 3.7 GtC of mitigation that will then be needed. In general, each country is given an emission target equal to its reference trajectory<sup>7</sup> minus its proportional share of the global mitigation requirement.

Distributing the global mitigation requirement in this way yields some striking results. For one thing, it demonstrates that a major commitment to North-South cooperation – including financial and technological transfers – is an inevitable part

7 The reference trajectory is essentially a business-as-usual trajectory, including some “no-regrets” options.





**Figure ES3: Total global mitigation requirement, divided into “national obligation wedges.”** The widths of the wedges reflect the shares of the global mitigation burden that would be borne by particular nations (or groupings) in proportion to their share of the total global RCI.

of any viable climate stabilization architecture. This is because the national mitigation obligations of the high-RCI countries of the North vastly exceed the reductions they could conceivably make at home. In fact, by 2030, their mitigation obligations will typically come to exceed even their total domestic emissions! Which is to say that wealthier and higher-emitting countries would be given “negative allocations,” as is necessary in order to open enough atmospheric space for the developing world.<sup>8</sup>

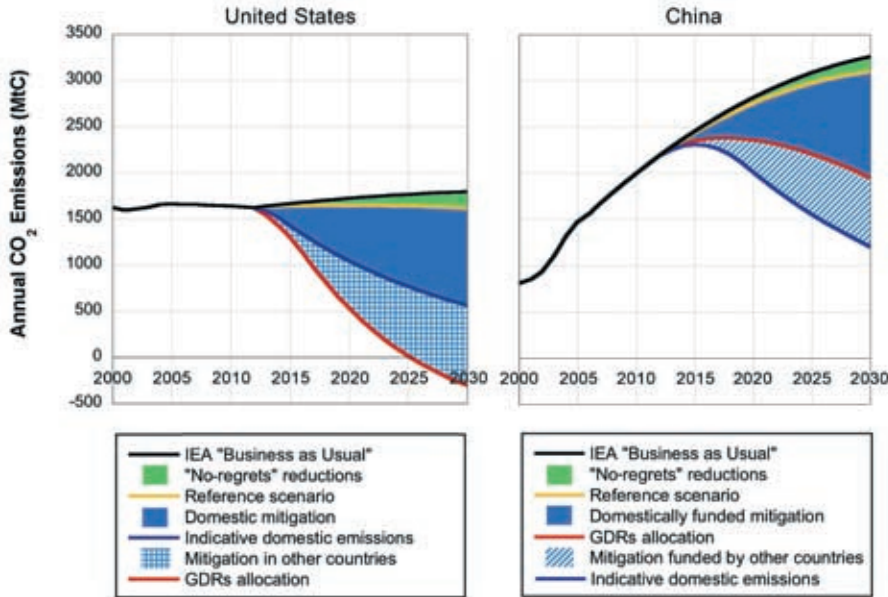
Thus, (see figure ES4), US emissions are projected in its reference case to be about 1640 megatons of carbon (MtC) in 2020, yet in that same year its overall emission reductions obligation would be about 1080 MtC. This implies a 60-percent reduction target relative to 1990 levels, which grows to more than 100 percent by 2030. Obviously, not all of these reductions can be realized at home. The rest the United States must make in other countries, by way of reductions that are “supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner.”<sup>9</sup>

This situation reflects both the nature of national obligations and the obvious truth of the greenhouse world: Even if the wealthy countries reduce their domestic emissions to zero, they must still enable large emission reductions elsewhere – in countries that lack the capacity (and responsibility) to reduce emissions fast enough and far enough, at least without significant assistance from others. Which is to say

- <sup>8</sup> Incidentally, this kind of negative allocation can never arise under Contraction and Convergence style trajectories, wherein high-emitting countries are only required to transition from their high grandfathered allocations down toward the global per-capita average. Greenhouse Development Rights, it should be said, evolved from Contraction and Convergence, the most well-known of the per-capita rights approaches.
- <sup>9</sup> The Bali Action Plan, Decision 1/CP.13 para 1(b)ii.

that much of the mitigation that takes place within southern countries must be enabled by the North.

Here, we show domestic reductions that, though extremely ambitious (the US share of the same rapidly declining trajectory illustrated for Annex I in the first figure above), still satisfy only about half of the United States' total obligation. The remainder, about 500 MtC of reductions in 2020, must be made in other countries. In contrast, China, obligated to 2020 reductions of about 380 MtC, would be able to make them all domestically, even as another large quantity of reductions within China – about 350 MtC in 2020 in this indicative calculation – would be enabled and supported by other high-RCI countries.



**Figure ES4: US (left) and Chinese (right) obligations.** No-regrets reductions (zero or negative cost) are shown in green. For the United States (left panel), indicative domestic reductions are in blue, with additional, internationally discharged reduction obligation shown with blue hatching. For China (right panel), its domestic mitigation obligation is in blue, while mitigation in China that is funded by other countries is shown with blue stripes.

Thus, in developing countries, domestic obligations are coupled with the (typically larger) international obligations of other countries to ensure that development can proceed along a decarbonized pathway.

## Toward a new political realism

It is, of course, easier to agree to principles than it is to operationalize them, and the Framework Convention's principles of "common but differentiated responsibilities and respective capabilities" are no exception. Moreover, operationalization is bound to be particularly difficult if – as the GDRs analysis shows – it requires powerful countries to accept large obligations, and to commit to making large international financial and technology transfers.



Yet it is time to be frank. The large international transfers implied by the GDRs analysis are primarily consequences of the stringency of the emergency 2°C transition that the GDRs approach seeks to drive forward. Were we to run the same analysis with a much weaker temperature target, the results would be far less daunting. Which is to say that the size of the financial and technology transfers implied by the GDRs analysis are in large part consequences of the North's past emissions – the very emissions that left us, today, scrambling to find developmental space for the South.

Moreover, Bali clearly revealed the South's unremitting insistence on linking international financial and technology transfers and the “nationally appropriate mitigation actions by developing country parties” that are now so critically and manifestly necessary. There is simply no longer any way to responsibly deny this linkage, not even in the United States, where talk of such transfers, and in particular of America's obligation to fund a large fraction of them, is widely seen as an explosive threat to critical domestic action. In this context, the GDRs approach may actually be quite helpful, because it stresses the need for a system in which it is not “the North,” but rather the affluent and consuming classes worldwide that bear the efforts of the climate transition.

This reframing is not merely ethical. For while commitments from the South's consuming classes are certainly appropriate for reasons of elementary justice, the politics are yet more pressing. To be blunt, it is extremely unlikely that the working consensus needed in the North – a consensus to pay its “fair share” of the world's total mitigation and adaptation costs – could ever emerge if the wealthy minority in India and China and other developing nations are not also paying their fair shares. The GDRs framework is, above all else, an effort to transparently specify what those “fair shares” would be, and to do so in a manner that acknowledges and respects a meaningful right to development.

Still, one can reasonably ask if an approach like GDRs, which compounds the climate challenge with the development challenge and by so doing makes it even more overwhelming, is at all politically realistic. Our response is that the GDRs framework can outline our proper destination, but that the sense of a destination is not enough. We need also a way forward, and, in particular, some guidance on how, exactly, we are to break the political impasse that keeps us from moving forward with the necessary alacrity. Which is to say that the problem of realism, and of the negotiations, is, essentially, a sequencing problem. The real question is: What comes next? The problem here is not just the obscure nature of fair effort-sharing in an unfair world, it is the lack of trust that bedevils us as we try to figure it out.

This trust deficit is so large and deep-rooted that it effectively rules out the simplest and most attractive way forward, in which the North and the South each straightforwardly commits to carry its “fair share” of the climate burden. How, to begin with the North, could this ever be possible, given its suspicion of any agreement that would have it provide large-scale financial and technological support to the South, “measurable, verifiable and reportable” or not? When it questions the South's ability to effectively absorb such support, and to ensure its productive use in fighting climate change? When it stubbornly doubts that the South is committed to solving the climate problem, and fears the lock-in of an architecture in which the emerging powers of the South forever free-ride on Annex I efforts? When, perhaps

most critically, such fears as these provide it with a ready-made menu of justifications for protracting its own free riding?

The South, for its part, is unlikely to soon accept obligations of a GDRs scale, even if they are defined in a principle-based way that genuinely safeguards its right to development. For the South's distrust is rooted in the North's repeated failure to meet its UNFCCC and Kyoto commitments to provide technological and financial support for both mitigation and adaptation, and beyond these, its protracted history of bad-faith negotiations in all sorts of other multilateral regimes (the trade and intellectual property negotiations come particularly to mind). The South fears, in particular, that if it were to accept its fair share of the climate burden, the North's negotiators would take unfair advantage of its flexibility, holding it hostage to its newly-made commitments while continuing to dodge their own. This is simply too big a risk to take. Fossil fuels have driven development to this point, and the countries of the South are not about to sign away their right to follow along this proven pathway, not without the North's demonstrated willingness to help chart out, and indeed pave, an alternative course.

In this context, there is only one alternative to continued impasse: a brief but relatively formal trust-building period – and this is exactly what we should aim to win in Copenhagen. Such a trust-building period must start as soon as possible – the remaining years of the Kyoto Protocol's first commitment period must inevitably be seen as part of it – and it should not drag on farther than, say, an additional three years. That would take us to 2015, which will be very late in the game indeed, if we actually intend to bend the global emissions curves downward rapidly enough to hold the 2°C line.

This trust-building period should not be thought of as more time lost, for the simple reasons that action, and preparation for further action, are the only really viable foundations for trust-building. During this period, then, both the North and the South would have to take bold steps, and thus build the political foundations of a subsequent era of much more unified and ambitious action. What kind of action? Here there is much to say, but the key is that expectations of the South would obviously be of a different nature than expectations of the North. Regarding the North, anything less than explicit and legally-binding commitments – both to ambitiously pursue domestic reductions and to greatly scale up support for mitigation and adaptation in developing countries – would be seen as a failure to seriously invest in repairing the trust deficit. But in the South, voluntary action must be sufficient for now, and in so far as the South was “committed” to such action, its commitment would be entirely *de facto*.

That said, we can still expect developing countries to begin to put real mitigation measures into effect, and, in countries with significant responsibility and capacity, we can expect these be of a significant scale. Indeed, this seems to be the emerging trend. In South Africa, and South Korea, in India and in China, national action plans are enumerating the details of mitigation programs that will go forward without northern assistance, though in every case it is clear that such assistance will have to be forthcoming before action will grow to the necessary scale.

In this regard, it is important to emphasize that the mitigation efforts that the South would be implementing during the trust-building phase – that is, its no-regrets options, additional mitigation with MRV support, and then some further volun-

tary mitigation – could be pursued in a manner that draws no resources whatsoever from citizens living below the development threshold, and hopefully even benefits them. Which is to say that the necessary mitigation measures could be implemented without compromising any sustainable development priorities, providing only that countries are willing to pass on the costs to their consuming classes, rather than their poor.

In the meanwhile, there will be another challenge. A trust-building period would be characterized, above all, by a widespread, extremely watchful expectation that countries contribute in rough accordance with their responsibility and capacity, defined in globally acceptable terms. After all, weak action on the part of countries that should be taking strong action would be corrosive. It would be seen by all as evidence that the consensus for a global solution is failing to materialize. As such, it would only harden the natural inclination, shared by all countries, to invest in protecting their own rather than preserving the commons. Which is to say that the great shift we now need – from “what’s in it for us?” to “how can we help?” – will only be possible in a world where, implicitly or explicitly, the shared background of the negotiations is that fairness is the common goal.

Now, in particular, it is critical to lay the groundwork for a common global understanding of “comparability of effort,” and for assessing it in a coherent and transparent manner. In fact, during any meaningful trust-building period, practical ways of understanding, assessing, and explaining comparability of effort would have to emerge – visibly and publicly – as major building blocks of the future regime. In particular, framework proposals like Greenhouse Development Rights, or proposals based on the UNFCCC’s official equity principles, will have to be developed, deliberated, and vetted to the point where they can effectively and legitimately be used as guides to comparability, guides that can be used to aggregate and compare efforts across a wide variety of national circumstances and commitment types.

This has implications. In particular, it means that the populations of the North must come, somehow, to an understanding of the rich / poor division that defines our times, and to its implications for their own role in solving the climate problem, and for the roles of others. For it is not enough for the rich to reduce their own emissions; they must also help to launch a global transition to a low-carbon world, and they must help the poor adapt to the inevitable changes that await them. If flexible and de facto commitments are to be the vehicles by which the developing countries enter the climate regime, then it will be quite essential that these are understood – across nations and classes and even in the United States – as being just and proper. It is action and not legal commitments that matter, and people must learn to make the necessary distinctions.

# 1 Introduction to the GDRs framework

The climate crisis is upon us. Indeed, it is long past time for an emergency global mobilization to stabilize the climate and minimize the now inevitable destruction. Most all of us know this, yet despite our knowledge, the pace of our response has been profoundly inadequate. Nor can this reticence be entirely attributed to the intransigence of the Bush Administration and its allies. There are deeper problems as well, and it is long past time for them to take center stage. This chapter thus begins with two assertions about the climate challenge and the global climate policy impasse that must be broken if we are to face it successfully.

First, the science now tells us that we are pushing beyond “dangerous anthropogenic interference with the climate system,” and are on the verge of committing to catastrophic interference. Yet, even the more aggressive of today’s “realist” scenarios accept a significant likelihood that we will soon lock in the melting of the Greenland ice sheet, and with it a 7-meter rise in the sea level.<sup>1</sup> Nor is this the worse case. In fact, if we want a good chance of preventing this sort of catastrophic melting – and a decent likelihood of staying below the widely endorsed 2°C threshold (which would hardly mean that we were “safe”) – then atmospheric greenhouse gas concentrations must be brought rapidly back to or even below 400 ppm CO<sub>2</sub>-equivalent: a goal that will be nearly impossible to reach unless emissions peak within the next 10 years.<sup>2</sup> Implausible as it may seem, this is the trajectory that the science is forcing us to accept. To achieve this, however, we will have to be far more aggressive than even the most ambitious of the current formal EU and US proposals.<sup>3</sup>

Second, we confront the climate crisis, and the consequent need for an emergency mobilization, in a profoundly divided world characterized by both staggering levels of poverty and enormous wealth, in which seemingly momentous booms and busts alter this reality only by degrees. More to the immediate point, this is a world in which the most critical building blocks of basic poverty alleviation – clean cooking fuels, safe water, food sufficiency, and even health services – can be delivered only by expanding access to energy services, which seems inexorably to imply the increased use of fossil fuels and the consequent rise in carbon emissions. The only proven path from poverty to prosperity is via a development process that entails dramatic increases in per-capita carbon emissions. This path, alas, must be closed. Indeed, any future scenario in which this path is taken by even a significant fraction of the world’s poor is a future in which dramatically rising carbon emissions make a mockery of the rhetoric of sustainability.

This leads us, inevitably, to the intersection of the climate crisis and the development crisis, and to the core of the climate challenge: *The world’s wealthy minority has left precious little space for the poor majority. So little space that, even if industri-*

*alized country emissions were suddenly and magically halted, the dramatic emission reductions demanded by the climate crisis would still require the developing countries to urgently decarbonize their economies, and to do so while they were still combating endemic poverty.*

This conclusion – a direct consequence of the implacable mathematics of our vanishing emissions budget – is not only the core of the physical challenge, but also the secret of today's half-hearted negotiations and, finally, the crux of the international climate-policy impasse.

If we are to have any chance at all of overcoming this impasse – if an emergency program is to have any hope of being embraced – we must take care that it does not threaten to lock in today's vast disparities of wealth and income. Rather, we must show that such a program can drive down global emissions, even while ambitious development goals are met and surpassed, and that this can take place even as the impacts of the now inevitable warming intensify the development burden and undercut efforts to alleviate poverty.<sup>4</sup> To this end, a true climate mobilization must slash the emissions of the already wealthy and, at the same time, prevent the development of the poor from bringing about an unbounded rise in emissions – *and it must do so without stifling their aspirations for livelihood and dignity.*

Here, we should be very blunt: As long as there is no acceptable effort-sharing proposal on the table – one that ensures that a global emergency mobilization can proceed without stifling development in the South – developing-world negotiators must be forgiven if they fear that a stringent global climate agreement would relegate their economies to a permanent state of underdevelopment.

New strategies that reconcile developmental progress with climate constraints are indeed possible, and now urgently needed. But given the long and often bitter history of international geo-economics, the South can hardly assume that such strategies will painlessly emerge from the climate negotiations as we know them today. Recent history, after all, is one in which high-sounding schemes, celebrated in the halls of global power, seldom resolve, in the villages and megacities, into just and adequate results. Which is why – before throwing their support behind an emergency mobilization – southern negotiators will need to see a coherent framework for sharing its inevitable burdens,<sup>5</sup> one they can trust to lead to poverty alleviation and development – albeit development of a new kind – rather than short-circuiting their drive to join the prosperous world and, in effect, denying them their “right to development.”

Nor do “equal per-capita emissions rights” provide a viable solution. This is so for the simple reason that the global carbon budget is already largely depleted, and that the equal sharing of almost-exhausted resources is not equitable. More precisely, per-capita approaches provide poor nations with carbon budgets that are too small to allow them to meet their legitimate economic aspirations. Given this, it is too late for *emissions rights* of any kind to safeguard *developmental equity*. Which is why – though per-capita allocation has traditionally been resisted by the North – the real hurdles that its supporters confront are in relatively high-emitting, but politically significant, developing countries, including China.<sup>6</sup>

Ultimately, the international climate impasse demands strategies that directly reconcile the twin challenges of climate and development, without trying to employ equal emissions rights as a proxy. Which is to say that the situation demands a climate regime that acknowledges the right to development, and then places that right at its

structural core. The bottom line is that such a regime must secure for the developing nations a viable portion of the scant remaining atmospheric space, and in a manner that allows them to prosper within it.

It is this objective that has driven the design of the Greenhouse Development Rights framework. GDRs is an effort-sharing approach that embodies the right to development as a “development threshold,” below which individuals – by definition poor – are not expected to share the effort of mitigating the climate problem. This threshold reflects a level of welfare beyond basic needs, but well short of today’s levels of “affluent” consumption. People below it have little responsibility for the climate problem and relatively little capacity to invest in solving it. Indeed, they have development as their proper priority, and should not be saddled with the costs of keeping society as a whole within the starkly limited global carbon budget.

People above the development threshold – those who have arguably realized their right to development – face the corresponding responsibility to preserve that right for others. It is they who must share the effort – in proportion to their responsibility for contributing to the problem and their capacity to deal with it – of funding the emergency program. It is they who must bear the costs of not only curbing the emissions associated with their own consumption, but also of ensuring that – as those below the threshold rise toward and then above it – they are able to do so along sustainable, low-emission paths. Not to be forgotten, it is they who must enable the depth and extent of the adaptation that will inevitably be needed.

In all this, “responsibility” and “capacity” are not merely pretty words, featured here because they are so prominently embodied in the Framework Convention’s foundational principle of “common but differentiated responsibility and respective capabilities.” Rather, they are built deeply into the GDRs effort-sharing system, and this for the ultimately pragmatic reason that they specify an adequate foundation for a true emergency climate stabilization program. At the end of the day, the GDRs argument comes down to the observation that the resources needed to support an emergency transition have to come from somewhere, and that it is the world’s wealthy who have the necessary “ways and means.” This is the capacity side of the equation. As for responsibility, we may soon find – with the impacts of climate change falling most intensely on the world’s poor majority – that it counts a great deal, not only morally and politically, but legally and economically as well. Certain kinds of responsibility, after all, have liability as a consequence.

Climate obligations and commitments, of course, have to be aggregated and allocated on a national level. But as it turns out, the only transparent and justifiable way to define and quantify these commitments is in terms that recognize the *intra-national* differences in responsibility and capacity. It is becoming more and more necessary that we do exactly this – for reasons that challenge both the North and the South. The South has unwaveringly insisted that it must prioritize poverty eradication for its poor majority over any investments in climate protection. The North has with equal insistence pointed to the rising southern minority, whose “middle-class” lifestyle is more and more coming to resemble its high-consumption northern model, with its correspondingly high responsibility, high capacity, and thus – why not? – high climate obligations. Each position, to be sure, reflects an incomplete vision of the southern reality. Each is often taken as a self-serving – and sometimes hypocritical – negotiating stance, the reconciliation of which remains impossible as long as the



debates stay at a rhetorical level. The only resolution, we argue, is to impose an empirically based rubric upon the discussion, to unpack the socioeconomic reality and its full intra-national diversity.

Which is why the GDRs framework begins with the individual, and directly examines intra-national income and consumption disparities. By so doing, it highlights the indisputable fact that it is people – not nations or economies – that possess the right to development, and, similarly, that the capacity and responsibility of its individuals is the source of each nation's obligations. All of which is to say that the GDRs approach takes inequality *within* countries as seriously as it takes inequality between countries. To be sure, this intra-national focus will be controversial, but it is also, we believe, the key to breaking out of the North / South trap and, thus, the climate impasse.

In subsequent chapters, we introduce calculations that illustrate a consistent responsibility and capacity-based approach that is explicitly designed to safeguard the right to development. In particular, we calculate a national Responsibility and Capacity Index (RCI) that takes explicit account of the distribution of income and emissions – inequality – within countries. We then use this RCI to quantify national mitigation and adaptation obligations corresponding to an emergency climate mobilization and long-term stabilization program. We demonstrate a critical, even decisive fact: Even if the costs of such a program were large, the world's wealthier citizens could easily bear them. They would not be impoverished by saving the climate. In fact, they could do so with only relatively modest reductions in their luxury consumption. Finally, we discuss the sequencing by which we might move beyond the current state of the climate negotiations, fraught as they are by North-South distrust, and approach a climate regime that's adequate to the climate and development crises we now face.

## 1.1 A reference framework

The Greenhouse Development Rights approach implies a climate regime architecturally different from today's in that it eliminates the Annex I/non-Annex I divide in favor of principle-based differentiation across all countries. This implies a restructuring that today is politically impossible, one that will only become possible once more time – and much more effort – has been spent building confidence among developing countries, to the point where they have real reason to trust that the climate regime will not choke off their development.

Yet this could happen, and we will argue that there is no alternative. Indeed, we will argue that, by bold action, we may yet become serious enough to negotiate a transition into a new regime, one that might actually work. In this context, we will suggest that continuous differentiation, particularly if it demonstrably safeguards a defensible right to sustainable development, may well be the only real option, at least if we intend to build a global regime that is fair enough, and thus robust enough, to support a global emergency climate stabilization program. To support our claim that such a system can be negotiated, we will take encouragement from the European Commission's proposed internal effort-sharing system, which – while primitive and somewhat ad hoc, inadequate with regard to its overall level of ambition, and imposed among a less disparate set of countries than the world as

a whole – nevertheless sets a precedent for approaches like Greenhouse Development Rights.

For the moment though, let us grant that the GDRs framework strains any conception of the politically realistic, at least from the politics-as-usual perspective with which the post-2012 regime is being negotiated. It is much too ambitious; it asks far more of Annex I countries than they have shown any interest in giving; and, not least, it broaches the radioactive issue of non-Annex I differentiation. Does this mean that it lacks all practical relevance? Not at all. GDRs is extremely useful, even today, as a reference framework that marks out a set of essential core elements, which must be part of any potentially successful climate regime. The GDRs framework, in particular, highlights the deep structure of the climate problem, and by so doing illuminates the structure of the necessary solution. It refuses to prejudge solutions based on today's passing standards of political acceptability. Against such a reference, more "realistic" regime proposals can be measured to determine how realistic they actually are, from the only standpoint that really matters: enabling equitable, sustainable development, while providing a real chance of preventing climate catastrophe.

In practice, of course, any viable regime will be more complicated than the framework presented here. It has to be, for it must account for the texture and variety of our extremely complex societies, and at the same time it will be negotiated by human beings with interests and perspectives far smaller than the world they are trying to save. Still, it is our belief, even given all the mechanisms, devices, and institutions appropriate to an actual regime – some public and some private, some market-based and some designed to exert democratic control over markets, some sectoral and some global – that the GDRs framework, explicitly quantifiable as it is, provides an extremely useful standard of comparison. In fact, the very complexity of the evolving institutional matrix is likely to make the GDRs system all the more indispensable as a yardstick, a device for the defensible comparison of proposed efforts. To make any sense of countries' contributions, diverse actions will have to be aggregated and assessed, and then compared to other countries' efforts and to the scale of the global challenge. Are the European Union's proposed targets fair? What about its internal effort-sharing? Are China's proposed actions stringent enough? Does South Korea's target position it as a global leader, or a global laggard? At a time when the negotiations are manifestly lacking in ambition, though not in rhetoric, these are questions that we need to be able to answer.

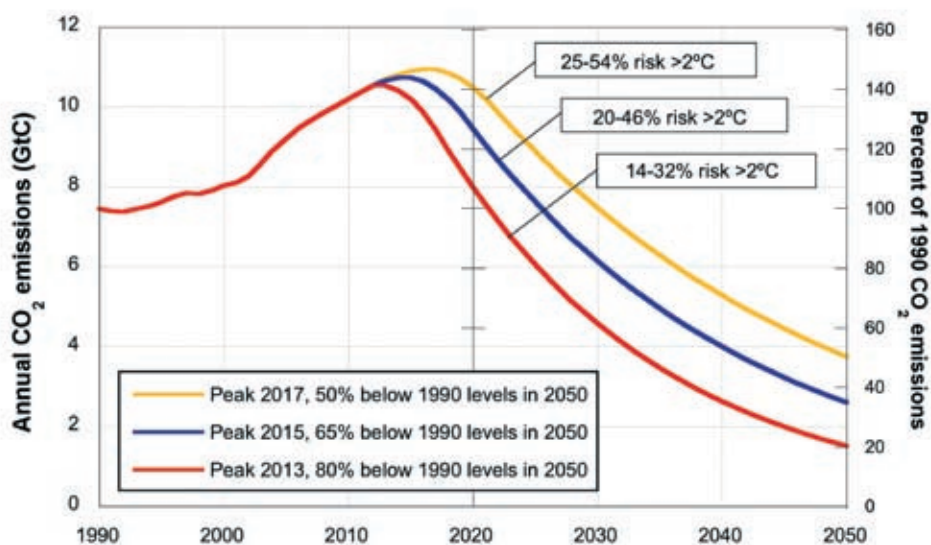
Mutual trust will only be built – and progress toward global mobilization achieved – if countries begin acting in ways that are demonstrably adequate and fair. In this context, the uncompromising emergency pathway that we assert in the face of the 2°C objective, and the allocation of effort that we conclude is necessary to meet it, lays down a standard of comparison against which to gauge the efforts implied by actual proposals, as they emerge. That is the point. The GDRs framework, for all its apparent implausibility, is in fact a useful reality check. As such, we believe, it clarifies what we must do if we seriously intend to break the international climate impasse.



## 2 The urgency

It is not our task to justify the 2°C threshold. There is little doubt that even before the temperature increase reaches that level, our ability to meet critical objectives – food and water security in poor countries, or the preservation of ecological diversity – will be severely challenged. Indeed, the IPCC's recent Fourth Assessment Report makes it clear that, even given only the warming that is already “in the pipeline,” extremely severe consequences are no longer avoidable. While adaptation can help – and indeed is absolutely necessary if we are to reduce the coming damages to manageable levels – it is not by any means sufficient. Extraordinarily ambitious mitigation efforts are also critically necessary. Without them, a warming far greater than 2°C will soon be locked in, and catastrophic impacts will have become all but inevitable.

So it is with some reluctance that we acknowledge that, even assuming an aggressive pursuit of all tolerable<sup>7</sup> mitigation options, we can no longer *ensure* that the warming will stay below the 2°C threshold. Figure 1 is designed to illustrate this situation. It shows three progressively more ambitious global emission reduction pathways,<sup>8</sup> and, following the current understanding of the relevant scientific uncertainties, it shows estimated probabilities that each pathway would actually overshoot the 2°C line.<sup>9</sup>



**Figure 1: Emissions pathways for three emergency scenarios.** The three pathways peak in 2013, 2015 and 2017 and fall to 80 percent, 65 percent and 50 percent below 1990 levels in 2050 respectively. Also shown is each scenario's risk of exceeding the 2°C threshold.

The most stringent of these pathways is, as you can easily see, heroic indeed. It has emissions peaking in 2013 and dropping off by more than 5 percent per year, reaching a level of 80 percent below 1990 levels in 2050. Along the way, CO<sub>2</sub> concentrations peak at about 420 ppm (with CO<sub>2</sub>-equivalent levels<sup>10</sup> reaching about 480 ppm) before they begin to fall. Yet, even with this effort, almost inconceivable in today's political environment, we would still be exposed to an alarming 14–32-percent risk of exceeding 2°C. In the language of the IPCC,<sup>11</sup> it is “likely,” but not “very likely,” to keep the warming below 2°C.

The least stringent of these pathways peaks in 2017 at a somewhat higher level, and falls to 50 percent below 1990 levels in 2050 with reductions of more than 3 percent annually after 2020. Carbon dioxide concentrations peak at about 440 ppm-CO<sub>2</sub> (with CO<sub>2</sub>-equivalent levels reaching about 500 ppm), leaving us with a roughly 25–54-percent risk of exceeding 2°C before 2100.

This least-stringent pathway represents an important benchmark in the current debate, for it marks the border between pathways that scientists can accept as being plausibly precautionary and pathways that “realists” consider politically plausible. NASA scientist James Hansen, for example, warns that “[w]e have to stabilize emissions of carbon dioxide within a decade” or the temperature “will be warmer than it has been for half a million years, and many things could become unstoppable.”<sup>12</sup> There is growing evidence that stabilizing the climate and avoiding catastrophic climate disruption may ultimately require a course that returns emissions to zero<sup>13</sup> and stabilizes atmospheric CO<sub>2</sub> concentrations at a level no higher than 350 ppm.<sup>14</sup>

Thus, unsurprisingly, this least-stringent pathway is only barely consistent with the highest acceptable targets suggested by the Climate Action Network International in a recent submission to the UN process,<sup>15</sup> and with the similarly daunting conclusions of the Scientific Expert Group convened by Sigma Xi for the United Nations Foundation.<sup>16</sup> Yet, at the same time, it is roughly the lowest target deemed economically feasible by the Stern Review, which remains one of the world's most authoritative and oft-cited analyses of climate economics.<sup>17</sup>

All things considered, these three pathways mark a critical band, the one that, if we are serious, we have to aim for. Consider them, then, to define the range of “honest emergency pathways,” and note that, as such, they essentially span the lowest category of modeled scenarios reported in the IPCC's 2007 assessment.<sup>18</sup>

We willingly admit that a 2013 global emissions peak will be seen as unrealistic, that some activists will even judge it unwise or unhelpful to alarm people with such strenuous emission reduction scenarios. Our goal, however, is to increase the balance of honesty in the climate debate. Too often, earnest calls to avoid “dangerous climate change” are accompanied by apparently sanguine recommendations for emissions pathways or reduction targets that have virtually no chance of meeting that goal. Most G8 governments, for their parts, are officially committed to the 2°C target, but nevertheless advocate global reduction targets – like the 50-percent reductions by 2050 recommended in the 2008 pledge of the G8 – that cannot and will not deliver it. The 2006 Stern Review, similarly, enumerated a litany of impacts that can almost certainly *not* be prevented by stabilizing greenhouse gas concentrations within its own recommended range of 450–550 ppm CO<sub>2</sub>-equivalent. Moreover, Stern's 2008 follow-on report only compounds the problem – for while it paints a dire picture of a dangerous future, and goes on to reject 2006's original recommendations as being

too lax, it rejects anything “below 450” and recommends a target in the 450–500 ppm CO<sub>2</sub>-equivalent range. Stabilization at 500 ppm CO<sub>2</sub>-e, by Stern’s own citations, would likely yield a warming of substantially more than 2°C and, indeed, has a likelihood on the order of 20–40 percent of taking us into an extremely inauspicious world in which total warming exceeds 3°C.<sup>19</sup>

We reject such an approach, and we are not alone. The South African government, in particular, has distinguished itself by reiterating that “an increase in global average temperature above 2°C poses a danger to all of us, but in particular the poor,” and going on to articulate emission reduction goals (including a national emissions peak by, “at the latest,” 2025) that it intends to be consistent with the 2°C target.<sup>20</sup> By so doing, it proved that political courage still exists. South Africa, after all, is very much a developing country, and suffers from serious shortages of low-carbon energy. If it can stand for honesty, then so can others, even in the face of a tide of voices that tell us that 2°C is no longer within reach.

Not that it will be easy. At this point, 2°C means doing everything. The global emissions peak must come soon, and post-peak declines must be steep. But these are the costs of protecting the people, and preserving the ecosystems, which will be destroyed by greater degrees of warming. For just these reasons, and despite the fact that a warming of 2°C cannot by any plausible means be reckoned to be either safe or acceptable, we take it as our goal, and choose the lowest of our three pathways – which we will refer to as the “2°C emergency pathway” – as our reference. We do so because, of the three, it has the lowest risk of exceeding 2°C, and, although the social and technological transformations implied by the two less stringent cases would be somewhat less abrupt, they will be no less profound. Besides, our results will not change significantly unless we relax to a pathway that is far weaker, and far more dangerous.

Emergency action demands heroic efforts. Nevertheless, such efforts are justified because we still have a chance of holding the 2°C line. Already-existing technologies – if implemented and disseminated with war-mobilization urgency – can quickly win us huge emission reductions, and buy us the time we need to develop newer technologies and adopt lower-impact lifestyles. But we cannot afford any more delays, not even those associated with “realism,” which seems today to demand that each small increment of progress be made to appear economically unthreatening and politically “win-win.” The truth is that, given the speed at which we now have to move, there are going to be costs, and losers, and it is past time to admit it – and plan for it. Costs, after all, can be fairly shared, and losers can be supported and compensated.

To be sure, climate protection may in the end bring not “costs” but renewal and opportunity on a vast scale. We might be smart, and lucky, and rapid mitigation might actually, in aggregate, be cheap. It might even provide so much economic stimulus that overall costs would be negative.<sup>21</sup> But, it might not, and, in any event, immediately profitable opportunities would undoubtedly be accompanied by many much more costly measures. There is no plausible scenario in which the transition would be uniformly frictionless and profitable. The problem is that so much time has been wasted, and that each day we waste more, and this despite having already reached a level of urgency that demands costly measures like the early retirement of carbon-intensive capital. Given this, and given particularly the social, sectoral, and political dynamics that would attend any emergency mitigation program, its costs may in the

end be quite large. To those must be added the costs of adaptation – as essential as mitigation in any emergency mobilization, and quite possibly even more costly.

Conventional wisdom, alas, tells us that the world's wealthier citizens cannot be expected to pay more than a trivial amount for climate change, and even less if the payments go to people and projects in other countries. In fact, given today's extremely limited "willingness to pay," the costs of a true emergency program may appear now to be politically unsupportable even if the overall costs of mitigation turn out to be quite low.

Nonetheless, the situation demands an emergency mobilization, and if the costs of such a program are greater than our current willingness to pay, they are still affordable. This means that hope is still legitimate, though only in the context of an international political and economic accord that can engender real global cooperation. Because at the end of the day, it is cooperation that will be the most crucial ingredient of the frighteningly sharp "peak and decline" trajectory that we must now work toward. Thus, in the next chapter, we will explore the background conditions – in particular, the divisions between the wealthy and the poor that undergird both the development crisis and the climate crisis – that must be recognized and internalized if international cooperation, of the kind and on the scale that we need, is going to be possible.



*The coal fired power plant in the background symbolizes the responsibility of industrialized countries for climate change, whereas the wind turbines represent their capacity to tackle it.*

### 3 Human development and climate protection

Even as we grow increasingly terrified by a sense of impending climate catastrophe, many of the world's people are necessarily preoccupied with another, more immediately pressing crisis: that of poverty. Much can and has been said about this crisis – scandalously high infant mortality rates, horrific though easily preventable disease as a miserable fact of life and death, physical insecurity, denial of opportunity and the right to a productive, fulfilling and dignified life; all within a wider world of extreme affluence and middle-class wealth. We shall not attempt to repeat it here.

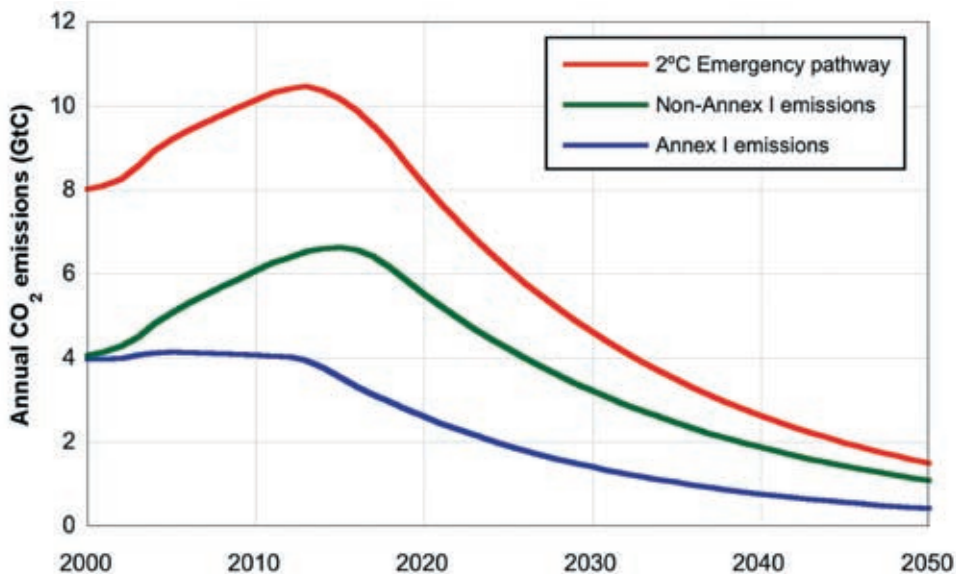
But there are things that must be said about poverty – and therefore inequality and wealth – and the climate crisis. First, and critically, there is no road to “development,” however conceived,<sup>22</sup> that does not greatly improve access to energy services. Yet, as today's economies are structured, and given the technologies now available, the expanded access to energy services that is universally required for pro-poor development implies increases in CO<sub>2</sub> emissions that are entirely incompatible with a precautionary climate policy. Thus the environment / development dilemma: There is simply not enough “environmental space” remaining for today's poor to develop along the same paths – or anything like the same paths – as those that were taken by the already wealthy, or relatively wealthy, members of what we will call the “global consuming class.”

It is no mystery where all this environmental space has gone. The roughly 15 percent of the world's population that lives today in the roughly 40 high-income countries uses about half the world's energy, produces about half the world's CO<sub>2</sub>, and consumes about half the world's goods and services. Further, the world's wealthy, as they rose into this resource-intensive state, consumed so great a fraction of the carbon budget that, today, we are unavoidably faced with the grim task of allocating an entirely inadequate remainder.

Thus our current predicament: If we are to keep within the scant remaining carbon budget, global emissions must quickly peak and then precipitously decline. Yet, given anything like today's business-as-usual technologies, if the poor majority's energy consumption were to reach even half the per-capita level of the world's wealthy minority, then global CO<sub>2</sub> emissions would essentially double. Herein lies the essential tension between the aspirations of the world's poor – and even the minimal demands of basic human development – and, on the other side, the climate challenge. Any climate regime that ignores it is doomed to failure.

Figure 2 attempts, by means of three pathways, to decisively illustrate the overall challenge. The story it tells is the story of the future, and it is one that is as simple as it is implacable. Think of it as a story that involves a bit of science, a bit of hopeful conjecture, and a bit of simple arithmetic.





**Figure 2: The South's Dilemma.** The red line shows the 2°C Emergency Pathway, in which global CO<sub>2</sub> emissions peak in 2013 and fall to 80 percent below 1990 levels in 2050. The blue line shows Annex I emissions declining to 90 percent below 1990 levels in 2050. The green line shows, by subtraction, the emissions space that would remain for the developing countries.

The red (upper) pathway is the science, which is to say that it represents the emergency emission reductions pathway that the science tells us we must achieve if we are to avoid a true climate catastrophe. This pathway, the most stringent of the three shown in Figure 1, is the one that gives us the most reasonable likelihood of keeping the warming below 2°C. It illustrates an emissions future – an extraordinarily ambitious one – that has emissions peaking in 2013 and then declining 80 percent by mid-century. Yet even this pathway, which would require an unprecedented global mobilization and extensive technological and social changes, implies considerable climate risks, for it would leave us with a roughly 20–35-percent probability of exceeding 2°C of warming. Stringent though it may be, it is not by any means “safe.”

The blue (lower) pathway is a hopeful conjecture. It supposes a future in which the wealthy countries embrace their responsibility to dramatically cut their domestic emissions. In particular, it supposes that all Annex I countries – the United States and Canada, Europe, Russia, and the rest – follow the path that Al Gore has called for in the United States, and proceed to aggressively reduce their domestic emissions to 90 percent (below 1990 levels) by 2050, and indeed to do so entirely within their own borders. Which is to say that the blue pathway represents an extremely ambitious effort that far exceeds the stringency of any of the bills being considered in the US, and even the targets being mooted by the most ambitious EU Member States.<sup>23</sup> It represents an intense and protracted effort that, by the standards of business-as-usual, could reasonably be considered to be not only ambitious but even heroic.

But if the North managed such a feat, what would this imply for the South? Here is where we come to the arithmetic. The green (middle) pathway shows, by simple subtraction, how little of the already small remaining global carbon budget remains

for the South. Which is to say that it illustrates the space within which the South would be constrained to develop, and shows how bracingly small it is.<sup>24</sup> Indeed, even given our extraordinary assumptions about northern domestic reductions, the green pathway peaks and is dropping rapidly even before 2020, and by so doing it illustrates the daunting core of the climate challenge. For it is dropping while the people of the South are, overwhelmingly, still quite poor.

Which is the point. At the end of the day, the reason why the emergency pathway is so ambitious is that, in it, southern emissions peak while most of the South is still struggling out of poverty. Another reason is that, to ameliorate this poverty – to provide the people of the South with the clean cooking fuels they need to escape the epidemic of severe respiratory illness in poor households; to provide them with the electricity they need to treat and pump fresh drinking water; in a nutshell, to provide them with a viable development path – a vast expansion of energy services will be needed. This is true even though the only proven routes to such expanded energy services involve corresponding increases in fossil fuel use and, consequently, CO<sub>2</sub> emissions.

Nor would it make much difference if northern emissions were to drop even more rapidly, or even, for that matter, to zero. To be sure, the additional environmental space that such a further drop would provide to the South would be welcome, but it would still be small – very small – when compared to the size of projected southern emission increases. The real problem is the top (red) pathway, which, again, represents the challenge of the science, and is thus steep indeed. This is not a problem that will be easily relieved. In fact, logically – and we must state this so that we can set it aside – there is only one alternative to this sort of extremely tight emission budget for the South, and this is *negative* emissions in the North. But while such negative emissions are in principle an option, they are only a distant option<sup>25</sup> which, rather like geoengineering, does not release us from our central dilemma.

All told, the lesson is that, if we are to hold to the 2°C emergency pathway, the North cannot act alone. The South, too, must shift onto an emergency path, and soon. This is the core of the climate challenge, and there is absolutely no point in trying to avoid it. Thus, we will be frank and straightforward: Between now and, at the latest, 2020 – when, by any reasonable scientific assessment, global emissions must have peaked and begun their long decline – incomes in developing countries will hopefully grow substantially. But even assuming optimistic growth rates, southern incomes will still, on average, amount to only a third of current developed-country levels. In other words, the developing world can only look forward to a future in which, though it is still struggling to expand energy services and eradicate endemic poverty, its emissions must nevertheless and simultaneously be rapidly declining.

This same dilemma is even more starkly illustrated in per-capita terms, as below in Figure 3. Here we see that even as the North reduces its per-capita emissions dramatically to meet its “90 percent by 2050” pathway, per-capita emissions in the South must also be sharply constrained, and this despite their reaching merely half the northern level. Consider what this implies for India. Even assuming a steady 5 percent real rate of annual growth (the average over the last 10 years), its per-capita income would still be under \$8,000 in 2020, and it would still be struggling to expand access to energy services, even while its per-capita emissions will need to have shifted to a strongly declining course.<sup>26</sup>

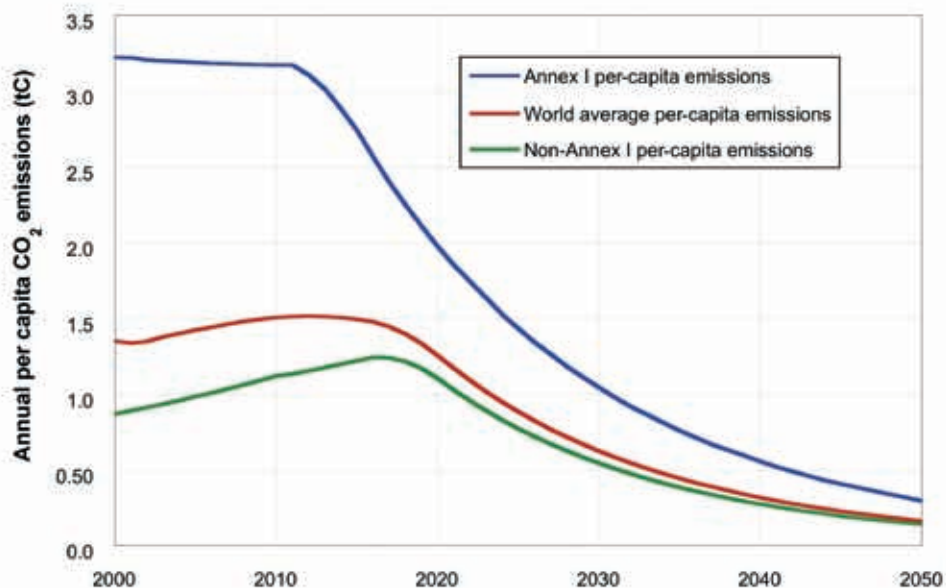


Figure 3: Per-capita emissions in the Emergency Pathway shown in Figure 2.

The point should be clear enough, and sufficient to illustrate why developing countries are so hesitant to commit to the 2°C target. Because if we are to have a real chance of keeping to that target, southern emissions simply must peak by around 2020, and then begin dropping by something like 5 percent a year. But all this seems to leave to the developing nations is a stifling future in which even efforts to modestly expand energy services knock quickly against inexorable limits, without having reached a level of welfare that might allow them to absorb the economic dislocations of the low-carbon transition. What this promises the South, or seems to, is a future in which developmental equity remains forever out of reach.

Fortunately, this is not the only option. But the alternative – as the Bali Action Plan and subsequent negotiations have made quite clear – can only be one in which the world’s wealthy countries both transition to a sharply lower emissions path and enable a similar transition in the South. The question is how this can happen in practice. Or, more precisely: What manner of climate regime can enable such a rapid global emissions decline, while at the same time enabling the nations of the South to continue, and step up, their fight against poverty?

### 3.1 The right to development

The answer, at least in part, is that if we are to successfully pursue an emergency climate stabilization program, our agenda must expand beyond climate stabilization. A global climate regime with any promise of success must also embrace the right to sustainable human development, and it must do so explicitly and convincingly. This right must be declared and protected, despite even the pressures of the climate crisis. Any emergency program that does not do so will flounder and fail.

By development, we do not mean economic growth as such, and we certainly do not wish to imply that economic growth should be privileged above the protection



of the climate. We are referring specifically to human development, a difficult notion that we may perhaps define as the satisfaction of fundamental needs in a manner that frees people from the vulnerability and deprivation of poverty and makes possible a decent level of security and well-being. The challenge lies in safeguarding the right to such development even while pursuing an emergency campaign to rapidly decarbonize the entire global economy.

Incidentally, it is still possible to pursue sustainable human development, in good faith and on a global scale. The situation is not yet so dire, nor the scale of the needed response so overwhelming, that we are forced to make genuinely draconian decisions that compromise anyone's basic welfare. In this, perhaps, we are simply lucky. Our world is a rich and resourceful one in which, despite the climate crisis and despite even the broader environmental crisis, good options still remain in which our economies and communities can thrive. The challenge is to find effective ways to embrace those options, and if this means investing a significant fraction of the gross world product (GWP) – one percent or three percent or even five percent – to enabling the low-carbon transition, then what of it? We can afford such an investment, and it would be a good investment indeed. It is not actually that great a cost. Not at least compared to the alternative.

This was Nicholas Stern's point,<sup>27</sup> and it bears repeating – it is just the beginning of the tale. For there is no economic law that tells us that, having made the transition to a low-carbon path, we would not find it to be at least as profitable, at least as full of opportunity, as this one. We all know this by now, but the point, it seems, must be repeated. There is no economic law that precludes rational public policies, or that demands that destructive subsidies continue, or that insists that economic statistics continue to be warped and deformed by a nonsensical blindness to human and natural well-being. There is no law, indeed, that mandates that even wealthy countries – having committed themselves to a climate transition that made real demands – would not subsequently discover that they benefited enormously from the effort, and this even if it meant a small slowing in the rate of conventionally measured economic growth.

The point here – one that must not be lost – is that we waste far more resources in building, maintaining, and adapting to ill-conceived infrastructure than we would need to not only decarbonize the entire global economy, but to do so in a manner that simultaneously meets all basic human needs. Having stipulated this, we can return to our central claim: that any effective climate regime must preserve the right to sustainable human development.

There are two aspects to this claim. First, there is the political imperative to embrace human development. For even as we seek a path to an emergency climate response, southern negotiators will insist – with strong ethical and political justification – that their priority must be lifting up their poor, and that the effort to mitigate greenhouse gas emissions must not interfere with their ability to do so. They will assert this, moreover, even in the face of strong and accumulating evidence that even globally non-catastrophic climate changes will still cause immense local climate damages, undermining many of the development gains that poor communities have thus far managed to achieve. Not that this evidence is much at issue, or that southern negotiators deny it, but they nevertheless argue that mitigation simply cannot be their top priority.

We do not pretend that this argument is always made in good faith, or that southern negotiators are wholly free of tactical motives. But, nonetheless, in this most important regard, their hands are tied. The development needs of their countries are desperate and pressing, and their people – and by this we mean the poor as well as the elites – are unlikely to prioritize low-carbon development if doing so means paying a premium for energy services while so many among them have not even achieved basic levels of, say, food security. This is especially so while the North still pursues a global policy environment – trade policies, investment policies, intellectual-rights policies, technology policies, and development policies in general – that is equivocal and often entirely antithetical to the goal of a rapid climate transition. Moreover, as a matter of simple realism, southern negotiators will likely remain focused on macroeconomic growth as a route to poverty reduction for the many (as well as, of course, riches for the few) and any climate regime that even appears to threaten such growth will be an extremely tough sell. This, moreover, will probably remain the case even as the impacts of climate change worsen and become more obvious, for even then the opportunity costs of mitigation expenditures, which could otherwise go to more conventional social welfare programs, will be an issue.

The second, perhaps even more pressing aspect of the claim that *any effective climate regime must preserve the right to sustainable human development* is a simple and extremely practical one. Simply put, there are so many inter-linkages between the climate and human development challenges that, as a practical matter, we can only hope to solve the climate problem if the lives of the poor majority are visibly improving at the same time. These connections, though manifold and complex, can be briefly outlined with respect to both mitigation and adaptation. In the former case, an emergency program would require dramatic technological transformation, amounting to a wholesale reinvention of the global energy infrastructure on the basis of low-emission technologies. In the South, this reinvention would require large-scale investment in training and education, as well as creating the institutional capacity to adopt, develop, and implement revolutionary solutions, all while simultaneously meeting the growing needs of expanding populations and economies. A true emergency climate stabilization program would also require far-reaching changes in agricultural and land-use practices, which currently account for as much as one-third of southern greenhouse-gas emissions. These changes are possible, but only if there is a real commitment to the grassroots empowerment that is essential if any genuinely positive future is to emerge for the poor communities that are now dependent on land-clearing for subsistence farming, fuel wood harvesting, grazing, and timber extraction.<sup>28</sup> The point is that this dependence must be broken, but this cannot happen without a new focus on, and new investment in, human development. Indeed, such investment is fundamental to any rapid transition, which depends not only on next-generation energy technologies, but also on literacy programs for poor women, not only on new agronomic technologies, but also on universal neonatal healthcare.

As far as adaptation is concerned, the importance of human development is even clearer. Adaptation to climate change clearly requires a level of “resilience” that is far beyond the grasp of the billions of people that are still mired in poverty. We know this despite being unable to anticipate the precise impacts that climate change will impose on the poor, let alone describe the exact mechanisms that will be necessary to counter-balance those impacts. After all, poor households and communities endure

a range of stresses, many of which are being exacerbated by climate change, and together they create a syndrome of vulnerability. Thus, adaptation calls for investments that create options and reserves. It requires improved access to finance and technology, but just as importantly it demands social capital and enfranchisement. In other words, it requires more than narrow, climate-focused adaptation measures. So that, while it might help to provide an agricultural household with a more drought-resistant variety of a staple crop, such a crop will not alone enable them to weather the next drought. They will have far better chances if there is also a literate family member, if they can borrow a small amount of capital from a local financial institution, if they enjoy relatively intact social networks, if they can hold policymakers accountable. As Amartya Sen famously said, famines do not happen in democracies.

But here is a proviso. Though these arguments are strongly rooted in an ethos of justice and solidarity, the Greenhouse Development Rights approach is not fundamentally an appeal to morality. Its real justification is a realist one. The GDRs framework, or something like it, will be necessary if we are to break the global impasse and rise to the demands of the climate crisis, and this for two simple reasons: The North cannot stabilize the climate without the full commitment of the South, and the South cannot make that commitment if doing so would even threaten to undermine its development. In practice, this means that the situation is dangerously close to deadlock, and that a global alliance to stabilize the climate can only arise, and survive, on terms that honor the poor world's right to development. The wealthy countries must not only cut their own emissions, deeply and soon, but also do whatever is necessary to help the poor leapfrog into a low-emission, high-adaptation future.

### 3.2 A development threshold

Greenhouse Development Rights suggests a framework for such an alliance, by way of this simple but critical postulate – even in our environmentally-constrained world, all humans possess a right to development. By this right we imply not a right to economic growth as such, but rather the right to a modest yet dignified level of well-being. We define this level by way of a development threshold, below which individuals must be allowed to focus their energies and resources on meeting the demands of daily life. This means that they should not have to bear the costs of the climate crisis, on either the mitigation or the adaptation sides. Those above the threshold, on the other hand, must indeed help to shoulder these efforts. It is they, after all, who have the capacity to do so, as it is they who bear the overwhelming share of the responsibility for the threatened climate, and this is so regardless of whether they happen to live in the North or in the South.

The level at which such a development threshold would best be set is a matter for debate, but the relevant principles are clear, as is the goal. The development threshold should differentiate the global poor, who have pressing and legitimate unmet needs, from the “global middle class,” which has reached a level of consumption that yields an appreciable contribution to the climate problem, and has similarly acquired enough capacity (discretionary income) to bear at least a bit of the costs of managing that problem.

Defining the development threshold in a concrete and quantitative sense is, not surprisingly, tricky. The most straightforward option is to define it in terms of an income

level, though this option suffers a number of obvious problems. Income, after all, is a simplistic and one-dimensional indicator that quite inaccurately reflects sustainable human development. It prioritizes a certain mode of development – economic growth – while obscuring the importance of human rights, political enfranchisement, liberty, social capital and community resilience, health, education, environmental and physical security – all of which are essential to a decent standard of human well-being. Nevertheless, we will stick for now with this purely economic indicator, for three principal reasons. First, income is highly correlated with important indicators of well-being, and this particularly at the income levels that span the low- and middle-income countries, where there is an indisputable linkage between income and basic indicators such as infant mortality, life expectancy, malnourishment, and educational attainment. Second, income does indeed reflect the capacity to pay for mitigation and adaptation, especially once a country is wealthy enough for basic needs to be met. Third, income is a helpful proxy for consumption, and hence for the distribution of carbon emissions within a country, and hence for responsibility.

How then, should we set the development threshold? Our claim is that a “dignified level of human development free from the privations of poverty” implies a line higher than a “poverty line,” that it implies perhaps 125 percent of a poverty-line income. This particular level is, of course, somewhat arbitrary, but its appropriateness is supported by the many other contexts in which such a level is taken to define the upper boundary of “exempt” or “lifeline” income. These include starting points for income tax calculations, eligibility thresholds for social services, and criteria for defining “economically vulnerable” or “near-poor” populations. Thus, while it might be an underestimate, we’ll take it as a plausible and indicative figure, and as a good starting point for discussion. In any event, the principle it is meant to illustrate is clear, and the latitude for meaningful negotiation is not extremely broad.

So, what is a sensible “global poverty line?” If anything is certain, it is that it is not the typical figures of \$1 per day or \$2 per day.<sup>29</sup> Indeed, such low figures obscure the real meaning of poverty, and the real nature of the poverty crisis. The \$1 a day line, more precisely, is a “destitution line,” and the \$2 a day line an “extreme poverty line.” Moreover, this is obvious. A person’s income can grow much higher than \$2 a day and still leave them facing pervasive exposure to the plagues of poverty: malnutrition, high infant mortality, low educational attainment, high relative food expenditures. A defensible global poverty line, on the other hand, must reflect the income level at which these plagues begin to disappear, or at least become exceptions to the rule. It must, certainly, exceed the point at which the Millennium Development Goals have been largely met. All of which is to raise empirical and statistical questions that we will not dwell on here.

Instead, we will draw upon existing analyses that clearly indicate that a meaningful global poverty line would be well above the standard extreme poverty line. After a detailed investigation of the empirical evidence, economist Lant Pritchett concluded that “[i]f the poverty line were defined as the level of income at which people typically achieve acceptable levels of the Millennium Development Goal indicators (such as universal primary school completion), it would be set at about [\$16] a day,” in PPP terms.<sup>30</sup>

Taking \$16/day, or, equivalently, \$6,000 (PPP) per year as the global poverty line, we thus set our indicative development threshold at a level 25 percent higher, or at

\$7,500 a year. This is well above the global median income (of about \$3,500 in 2005), and somewhat below the global average income (of about \$8,500). It might reasonably be called a “global middle class” income level (not to be confused with the significantly higher rich-world middle-class standard), and indeed it corresponds fairly well with the income level at which various analysts have placed the bottom boundary of the lower middle-class in China and India.<sup>31</sup> We think that, in terms of the trade-off that we actually face – at what point should poorer people begin to help pay the costs of the climate transition, so that wealthier people can pay less? – it draws the line in just about the right place.

This is not to say that poverty and hardship do not persist above an income level of \$7,500 per year. Nor that a higher development threshold could not be strongly defended. But for the purposes of clarifying the principles that the development threshold is meant to embody, and thus enabling us to illustrate the implications of the GDRs framework for national climate obligations, we will take \$7,500 a year as our indicative development threshold, as we will take those people whose incomes are above it – be they lower middle-class or middle-class or wealthy – to be members of the global consuming class. (Note that the technical appendix contains a sensitivity analysis that demonstrates the implications of higher and lower development thresholds.)

Crucially, we reckon the development threshold as an individual – not national average – threshold. Countries with per-capita incomes below \$7,500 a year always have subpopulations with higher incomes, and smaller subpopulations with far higher incomes, and vice versa. The more unequal a country, the more this is the case. Thus, we stress that it should be poor individuals, not poor nations, who are excused from bearing climate-related obligations. Individuals with incomes above the development threshold – even if they live in countries with average incomes below the threshold – should be accountable for their fair share of the global climate effort, otherwise they can “hide behind the poor” in their own country.<sup>32</sup> In the realm of global treaties, commitments must, of course, be assigned at the level of nations, not individuals, but they should nevertheless be reckoned in accordance with the obligations of their individual inhabitants. There is no contradiction here, and no violation of “sovereignty” – indeed, in a world of sovereign nations composed of disparate individuals, this is an entirely reasonable approach.

The core proposition here – that the consuming class in developing countries has no greater claim on the remaining environmental space than do its peers in wealthy countries – will of course be controversial. Taken seriously, it challenges the conventional wisdom that there is a unified “South,” composed in meaningful degree by nations and peoples with overwhelmingly common interests. Nevertheless, the realities here are quite visible, and can no longer be denied. One striking illustration: “Worlds collide in India over global warming” – an article that appeared in the *Financial Times* during 2007’s G8+5 meeting.<sup>33</sup> Its central point – indeed its central warning – was that Mukesh Ambani, the world’s 14th richest man, is now busily building himself a 60-storey glass palace in Mumbai. The key statistic: This “home,” which sports a helipad, a pool, parking for 168 luxury cars, and quarters for an army of staff, is estimated to cost half a billion US dollars. The key quote: “Such self-indulgence should be a reminder that the G8 is dealing with not one India when it comes to climate change, but two: first-world India and third-world India.”

To be sure, Warren Buffet and Bill Gates<sup>34</sup> are richer than Mukesh Ambani. But the point remains. The developing world, despite its millions of desperately poor people, contains a substantial and growing class of people that are reveling in northern-style luxury consumption – some of it quite absurd in its conspicuousness. Just as obviously, this wealthy class has both a non-negligible degree of responsibility for the climate problem and the capacity to help solve it.

More particularly, intra-national inequality must be taken into explicit account if we want to meaningfully calculate, and compare, the capacities of wealthy countries such as the United States with those of emerging but still developing countries such as China and India. Indeed, attempts to do so without properly considering inequality – without exempting the incomes and emissions of people below a development threshold, and counting those of people above it – are logically and politically absurd. As if the small incomes of impoverished peasants should be taken to increase Chinese or Indian capacity to mitigate emissions in a global energy regime they in no way benefit from. As if Mr. Ambani's billions should be ignored.

Not that all cases are as clear cut. The “global middle class” holds a more ambiguous position than either Mukesh Ambani or Bill Gates, and the precise location, and even the nature, of the development threshold may be quite fairly debated. But the main point is obvious. Recognizing inequality within countries is as unavoidable as recognizing inequality between countries – if, that is, our goal is an effort-sharing system that actually makes ethical and political sense. There is just no way around it. Any climate protection regime that even implicitly asks poor or middle class people in wealthy countries to put their shoulders to the wheel, while at the same time exempting wealthy people in poor countries from the same effort, simply does not have a chance. Nor, just as crucially, does any system that asks wealthy and middle class people in poor countries to bear a weight that is defined, by convenient fiction, as if their poor were part of the problem. They are not.

### 3.3 Effort sharing in the greenhouse

Fundamentally, the GDRs framework is a rich / poor effort-sharing framework designed to support an emergency climate mobilization while, at the same time, protecting the right to sustainable, pro-poor development. It proceeds by allocating the costs of the mobilization among the people with income levels above the development threshold – irrespective of whether they live in wealthy or developing countries – while allowing those below that threshold to attend to their more pressing economic priorities.

The keys here are the two notions that lie at the core of most effort-sharing discussions: capacity and responsibility. Critically, the claim that effort-sharing should be based on a systematic treatment of responsibility and capacity is not new, and is reflected in most, if not all, contemporary proposals. Thus, the various “multi-stage” proposals tend to exempt poor countries from any quantified (or, more importantly, cost-bearing) obligations, and to divide countries into distinct classes defined by measures of income and emissions.<sup>35</sup> Not only are these moves intuitively sensible, but they are consistent with the principle of “common but differentiated responsibilities and respective capabilities” enshrined in the UNFCCC itself.



What distinguishes the GDRs approach is not its reliance on responsibility and capacity, but rather its refusal of the “annexes” approach – which has tended to harden the northern and southern blocs and thus exacerbated the international impasse in the negotiations – in favor of the use of principle-based indicators of responsibility and capacity, defined with respect to a well-defined development threshold.

### 3.3.1 Defining capacity

Capacity reflects wealth. For our purposes, it reflects the portion of national wealth that can reasonably be tapped to respond to the climate crisis. But all wealth is not equal. Its definition must be reconciled with the right to development, which is to say that capacity must be calculated, and the obligations of the climate program shared, in a manner that takes proper account of income distribution within nations.

To see this, assume that the emergency program were to be funded through a global tax (for this, in a strong sense, is what a global effort-sharing system amounts to). Now consider an overly simple example: a “flat” capacity tax in which a country’s capacity is defined as its total income (GDP). In this case, a country’s share of the total global cost of mitigation and adaptation would be exactly equal to its share of total global income. Straightforwardly, if the total “global bill” for the 2°C emergency program (adaptation as well as mitigation) came to 1 percent of the total global income (the GWP), then this bill would be covered if each country paid 1 percent of its national income.

But “flat taxes,” when used within countries to raise domestic revenue, are almost uniformly rejected as unfair. The poor are generally seen as deserving lower tax rates because, the poorer you are, the more of your income you spend on “necessities,” and the richer you are, the more of your income you spend on “luxuries.” So if a dollar in taxes has to be taken from someone, it is fairer to take it from someone who will then have to reduce their luxury consumption than from someone who would have to reduce their consumption of necessities. In other words, the consumption of the poor has a greater moral priority than the consumption of the rich. For this reason, tax systems are generally progressive, which is to say that they are based on “tax schedules” that exempt income below some specified minimum threshold from the tax base. Also, the marginal tax rate on income above this threshold typically increases as income rises, increasing the progressivity of the overall system. But, importantly, the exemption alone is enough to ensure that such a distribution of the tax burden is at least somewhat progressive.

An obvious and simple way to introduce the same progressive effect into a global effort-sharing system is to define national capacity as the amount by which a country’s average per-capita income exceeds some minimal level. Further, if this level is set at the development threshold, as defined above, it would explicitly reflect a right to development, by ensuring that the portion of a country’s GDP that fell below the development threshold would be exempt from being “taxed” to pay for the global emergency mobilization. After all, to the degree that a country’s GDP lies below the development threshold, one can reason that it is likely to be paying for necessities that contribute directly to subsistence and development, rather than for luxuries. The logic of such an approach is akin to that of the southern negotiators who have, in the

past, successfully argued that developing countries should be granted an exemption from any obligation to pay for climate mitigation.

This per-capita argument, however, is fast losing its moral force, and for the entirely justifiably reason that it ignores both the “North within the South” and the “South within the North.” The former is particularly relevant here, as the media, the corporate world, and the public around the world are all focusing increasingly on the rising consuming class in the developing world, which has proven itself to have some very important attributes in common with its brethren in the North, attributes it does not share with the poor majorities within its own countries. This consuming class is now understood as a formidable force, affecting the global prices of oil and food, and the increasingly globalized trends in consumer goods and the middle class lifestyle. In other words, by focusing on average per-capita income, the traditional argument obscures income disparities within countries, which are in many ways as significant, or even more significant, than income disparities between countries. Excluding these disparities from formal discussions of burden-sharing no longer means that they are invisible, it rather means that such discussions are poorly informed by reason and data, and passing instead into the domain of exaggeration and speculation.

What to do? Our approach is to define capacity in a manner that accounts for income disparities within countries. To define it, that is, as individual income in excess of the development threshold, summed across all the individuals in a country, from the poorest peasant to the wealthiest tycoon. Ultimately, since this is all toward the end of a global climate agreement between nations, capacity will be defined – and the costs of the climate transition allocated – on a national basis. But the point here is that, unless capacity is calculated in a manner that accounts for intra-national inequality, it will not meaningfully reflect the development status – the wealth and poverty – of nations.

### 3.3.2 Defining responsibility

Responsibility, of course, is the central concept behind the “polluter pays” principle, and, like capacity, it has a strong common-sense resonance. The notion of national “responsibility for greenhouse gas pollution” is intuitively – and correctly – understood in terms of the greenhouse gases that nations have emitted. As such, the baseline definition of responsibility must be in terms of cumulative emissions, though there are obviously complications in defining and measuring it unambiguously.

Some of these are serious. There are, for example, the disjoint but overlapping responsibilities of people and nations. When a man moves from country A to country B, does his past responsibility travel with him? What if a country splits in two? What if it is pillaged, or overtaken by another? Do a country’s citizens have responsibility for the actions of its leaders? What – and this is a pertinent case – if a country suffers (or suffered) from illegitimate leadership and a lack of effective democracy?

Then there is the matter of time. From what point should historical emissions count toward a nation’s responsibility? The potential risks of global warming were first identified by Svente Arrhenius in 1896, were included in some university curricula in the 1940s, and were recognized in studies by the Johnson Administration in the United States in the 1960s. So, though it is commonplace to suggest that “responsibility” for greenhouse pollution should start in 1990 – when the first report of the

IPCC made the risks widely and publicly evident (and this is the figure we use in our indicative calculations) – it is also clear that some people, including some advisers to the president of the United States, have known about the risks for a much longer time.

The question of knowledge links directly to that of intention. Initially, nations had a default policy of inaction, one that arose from simple ignorance and was entirely excusable. Over time, however, this ignorance was attenuated. Warnings accumulated; dangers were mooted but brushed aside. We shifted to a policy of active inaction, of denial disguised as “risk-management.” This policy was, of course, based on short-term and sectoral interests – and, in certain notable cases, on carefully conceived corporate propaganda campaigns – and on the desire to continue emitting, profiting, and consuming as usual, until at some point it became demonstrably obvious that rapid emissions cuts were critically necessary, and further delay was courting disaster. Once that shift had occurred, we could no longer claim innocence, for we were then making the sometimes explicit, sometime implicit decision to accept the consequences of delayed action. We would continue to enjoy our easy ways, or – as might be argued by a neoclassical economist – we would delay the day of reckoning until we were more technologically advanced, and also richer, so that the costs of action would be lower and more bearable.

More issues arise when we try to choose a metric of responsibility. Bear in mind that we are actually concerned with two different impacts of greenhouse gas pollution – first, the exhaustion of the available “sinks,” which has radically reduced the future opportunities of others to use those sinks, and second, the harm caused by greenhouse gas pollution. We must, in both cases, deal with complex links between emissions and impacts, and of course multiple gases. Even if we were concerned only with CO<sub>2</sub> emissions, we could choose to measure them, alternatively, as cumulative emissions over time: as the fraction of historical emissions that remain in the atmosphere, as the fraction of realized temperature change attributable to those emissions, or as the long-term contribution to expected temperature change. There are many issues here, and some are particularly controversial – the proper treatment of CO<sub>2</sub> emissions from deforestation,<sup>36</sup> and the emissions that are “embodied” within internationally traded commodities<sup>37</sup> both come to mind. All told, there is nothing simple about the proper definition of national emissions.

In the face of such complexities, countries tend to prefer definitions that favor their particular short-term interests. The critical question, though, from a “right to development” perspective, is not how best to calculate emissions, but whether all emissions are created equal. Should we count “subsistence” and “luxury” emissions in the same way?<sup>38</sup> Should CO<sub>2</sub> emissions from cooking and heating or methane emissions from subsistence rice agriculture be treated the same way as CO<sub>2</sub> from jet travel or CFCs from air conditioners? We argue that they should not, that these different types of emissions are of fundamentally different natures, that, briefly, survival emissions do not imply responsibility, whereas luxury emissions do. We argue, moreover, that the recognition of this difference is critical to any climate protection framework that aims to protect a meaningful right to development.

We argue, specifically, that safeguarding the right to development means allowing people to strive toward a decent level of economic development – the level defined by the development threshold – without being encumbered by the costs of the climate

mobilization. This translates, in terms of calculating indicative levels of national responsibility, into the exemption of any emissions that derive from consumption below the development threshold.

Finally, as we did with capacity, we argue that the economic disparities within nations imply that responsibility must be conceived in a manner that recognizes the right to development as a right of individuals, not a right of countries. We all know that even poor countries with overall low per-capita levels of consumption and emissions have residents who are members of the high-emitting consuming class. Their emissions must be counted toward the country's responsibility, and hence its obligations.

### 3.3.3 Allocating obligations

Obligations, finally, must be defined in a manner that combines capacity and responsibility. However this is done (and our indicative version is presented in the next chapter), the underlying principle is clear. No national obligations should arise from the economic activities of individuals at low levels of development, as reckoned in terms of either wealth or emissions. Only when people cross the development threshold and enter the consuming class should their economic activities affect the obligations of the nation in which they live.

As it happens, most of the consuming class lives in the industrialized countries. Given our view that a true emergency program will have significant costs, the GDRs framework allocates large obligations to industrialized countries – obligations that significantly exceed any levels that might currently be considered “realistic.” But note that it also assigns obligations to developing countries, and that, even though it specifies these obligations entirely by reference to the responsibility and capacity of their middle and upper classes, this assignment clearly violates a second, almost universally shared presupposition of today's climate politics: that developing countries cannot be asked to incur any mitigation costs. We hope that, in so doing, we have at least shown ourselves willing to be unrealistic on both sides of the great divide.<sup>39</sup>

## 4 Quantifying the GDRs framework

In the preceding chapters, we described the urgency of the climate crisis and its implications for an emergency climate mobilization, and we drew conclusions about the nature of the global effort-sharing system that will be needed to support such a mobilization. In this one, we introduce, step by step and quantitatively, Greenhouse Development Rights as just such a system. So recall what we have claimed: that GDRs is a *reference framework* that lays out problems that must be solved by any viable climate regime and, more particularly, one that allows us to examine both the fairness and adequacy of any given climate policy proposal. If this is true, then the GDRs analysis highlights stark – and we would claim inescapable – conclusions about who will have to pay to resolve the climate crisis.

The core of the GDRs framework is the right to sustainable development, from which we derive an effort-sharing system that combines a measure of *responsibility* (historic contributions to greenhouse gas pollution, excluding emissions associated with meeting basic necessities) with a measure of *capacity* (broadly, the ability to pay for mitigation and adaptation, without sacrificing necessities). Crucially, these are defined in a manner sensitive to inequality *within* countries, which is to say that the GDRs framework treats nations as collections of economically unequal individuals. By so doing, it calculates national shares of the global mitigation and adaptation obligation in a manner that, we believe, is consistent with the UNFCCC's broad principle of “common but differentiated responsibilities and respective capabilities.”

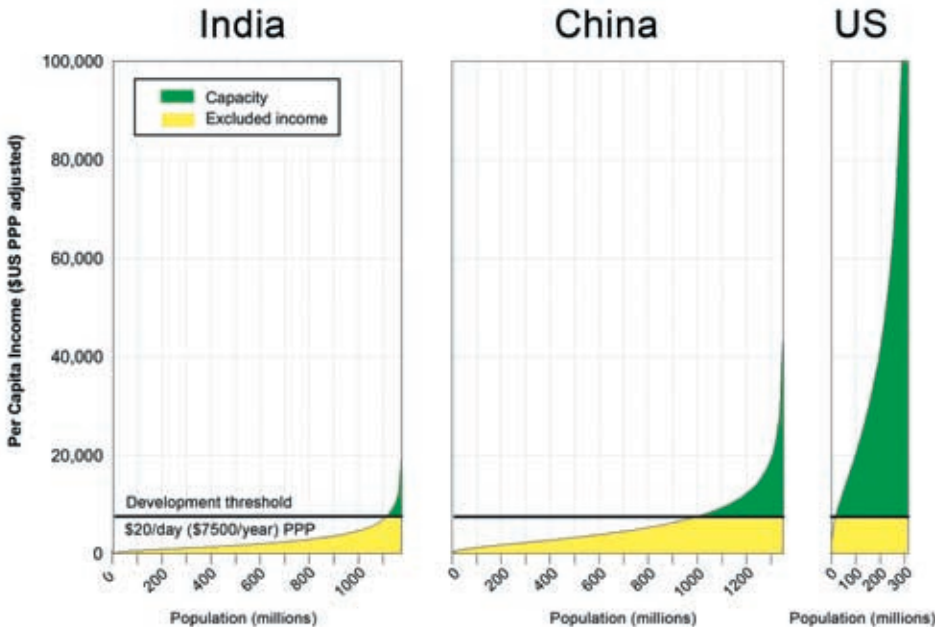
We do not claim that the quantification we provide here is the only conceivable one, and indeed other researchers have already proposed and analyzed alternatives. We welcome further thoughts on critical questions, such as where the development threshold should be set or whether it should be conceived of differently, whether responsibility should be defined differently, or whether the emission trajectory could be better characterized. On all these questions and more, reasonable people can disagree. Indeed, responsibility and capacity-based approaches that are quite different altogether have been proposed.<sup>40</sup>

Having said this, we would add that our particular quantification is by no means arbitrary. It is rooted in a practical analysis of the relevant equity principles, is based on well-vetted data sources, and is consistent with the principles it is intended to capture. We claim, in particular, that our quantification is fundamentally reasonable, and that it robustly indicates the *scale* of defensible national obligations. As such, it helpfully illustrates the qualities that are core to any climate regime that safeguards a coherently defined right to development.

# 4.1 Steps to a responsibility and capacity indicator

## 4.1.1 Calculating capacity

It is relatively straightforward to quantify capacity in a manner that accounts for intra-national disparities in income, and, as discussed, to do so with respect to a development threshold. Moreover, the results are illuminating. For example, Figure 4, below, compares three key countries – India, China, and the United States – showing for each an estimated income distribution based on the national per-capita income, projected to 2010, and the Gini coefficient (a measure of national income inequality).<sup>41</sup> These charts array each person along the x-axis from poorest (on the left) to wealthiest (on the right), and plot their income, measured in US dollars per capita (PPP adjusted), on the y-axis. This income distribution helpfully illustrates a few key concepts. (Note that since the charts are scaled so that the length of the x-axis is proportional to population, the areas of the different sections – for example, the green section representing capacity – can be directly compared in absolute terms.)



**Figure 4: Capacity: income above the development threshold.** These curves approximate income distributions within India, China, and the United States. Thus, the green areas represent national incomes above the (\$20 per person per day, PPP) development threshold – our definition of national capacity. Chart widths are scaled to population, so these capacity areas are correctly sized in relation to each other. Based on projected 2010 data.

Note first the development threshold, which is shown as a horizontal line at \$7,500 that crosses the income distribution line at a point that splits the population into a poorer portion (to the left) and a wealthier portion (to the right). The precise point at which the line crosses that threshold depends on the national income and



its distribution across inhabitants of the country in question, but since any nation includes at least some people earning less than \$7,500/year and some earning more, the lines always cross. This crossing makes it easy to compare both the heights of wealth and the depths of poverty in different countries. These charts also graphically convey each country's *capacity*, which we define as the income that the wealthier portion of the population has above the development threshold. This we depict as the green area bounded below by the threshold and above by the income distribution curve. All in all, this approximation of capacity is a rough but defensible representation of the national income that could legitimately be called upon to support a climate mobilization.

Consider India, shown in the left panel. By our estimate, nearly 6 percent of the Indian population earn incomes above the \$7,500 development threshold. These are the members of that burgeoning “Indian middle class” that has so captured the attention of the media. In terms of sheer numbers, they comprise a large and growing consuming class, one that is roughly the size of the population of the consuming class in, say, the United Kingdom or France.<sup>42</sup> But this is where the similarity ends. For these Indian consumers have a much lower aggregate income, and India's income in excess of the \$7,500 development threshold is less than one-sixth as large as the “over the threshold” income in these much richer countries. Plainly, in India as in other low-income countries, total national capacity – the ability to pay for development, adaptation, or mitigation, or for that matter luxury consumption – is dwarfed by the national “development need”: the income shortfall that would have to be filled to raise the entire population to the development threshold. Yet, just as plainly, India and other poor countries contain large (in absolute terms) middle classes and even a subclass of truly rich people (though these latter are so few as to be effectively invisible in these low-resolution charts).<sup>43</sup>

The center panel shows China, which presents a very mixed picture. On the one hand, China has much more “capacity” than India, both in absolute terms and relative to its “development need.” So, for example, the claim that shortages of investment capital (rather than consumption choices or institutional priorities) limit efforts at human development (and thus that few resources are available for climate mitigation) is not actually very credible. On the other hand, *more than 75 percent of the Chinese population, and 70 percent of China's income, are still below the \$7,500 threshold*, so its capacity, though fairly high in absolute terms, is still small relative to its development need. In this critical sense, China is not a wealthy country.

Finally, on the right, we see the United States. Here, graphically, is an image of wealth. The “development need” of the small number of people with incomes under the threshold is entirely dwarfed by the “capacity” of the rest, however you choose to name or categorize them. Which is not to say that this need is in any way irrelevant, or tangential to our concerns. Indeed, the continued existence of injustice and vulnerability within the wealthy world (think of New Orleans) is a critical political and ethical challenge to any international effort-sharing regime, in the precise sense that rich-world obligations must not be met at the expense of the rich-world poor. In any case, the financial capacity of Americans with incomes above the development threshold (the only income that counts toward the calculation of capacity) is extremely large, both absolutely and in relation to the national development need. Indeed, a good fraction of the US population has incomes so high that they are literally “off the chart.”

These charts largely speak for themselves, but one point, at least, should be made quite explicit. Even though GDRs attributes capacity to both poor and wealthy countries, its implications are quite different in these two cases. Poor countries, as befits their small relative capacity, have small relative obligations, which can be discharged entirely through domestic action. Wealthy countries will not generally have such an option, for as we will show, their obligations tend to be too great to be discharged with domestic action alone.

One consequence of the GDRs approach is that countries with the same population and the same average income do not necessarily have the same capacity, because a more unequal national income distribution will raise it. Consider two countries, “Fairland” and “Unfairland,” both with a population of one million people. In both, the per-capita income is \$5,000, but Fairland has a completely equal distribution of income (everyone makes \$5,000), while in Unfairland, 99 percent of the population has an income of \$1,000 and the other 1 percent has an income of \$401,000. Now, clearly, the wealthy 1 percent of Unfairland’s population has far more discretionary income, and is far more able to support discretionary efforts (like, say, a climate mobilization) than the poor 99 percent, for such support only means small reductions in their luxury consumption. Indeed, they are more able to pay than any of the people of Fairland, where the people are all – when compared to Unfairland’s rich – relatively poor. Which is to say that, all else being equal, the more rich people there are in a country the less sacrifice is required for a capacity-based levy (dare we call it a tax?) to raise the same amount of revenue.<sup>44</sup>

Using the method described above, Table 1 shows the capacity for low-income, middle-income, and high-income countries (as per the World Bank’s categories),<sup>45</sup> along with the share of global income, the share of global population, and the fraction of the population over the \$7,500 development threshold in each group. Much can be read from this table, but note in particular that less than 2 percent of the people in low-income countries and 25 percent of the people in middle-income countries have incomes over the development threshold, and that the “capacity” of these countries (which together contain almost 85 percent of the global population) is only 23 percent of the global total.

	Low- income	Middle-income	High-income	World
Income 2010 (\$ trillion PPP)	2.3	27	39	68
Share of global income (percent)	3.4	40	57	100
Share of population 2010 (percent)	21	63	15	100
Per capita income 2010 (\$ thousands PPP )	1.6	6.2	36.5	9.9
Capacity (\$ trillion PPP)	0.1	9	31	40
Share of global capacity (percent)	0.2	23	77	100
Percentage of population over \$7,500	1.4	25	97	31

**Table 1: Characteristics of low-income, middle-income and high-income countries, including income, population, and “capacity” as defined by a \$7,500 development threshold (data projected to 2010).**

### 4.1.2 Calculating responsibility

As noted above, there is no uniquely “correct” or uncontroversial definition of responsibility. We suggest, however, that *cumulative CO<sub>2</sub> emissions from fossil fuel consumption since 1990* is a reasonable one, largely because earlier emissions were usually (though not always) made in ignorance of the harms that they were causing. (We do, however, willingly admit that an earlier start year can be defended. Note also that, all else being equal, an earlier start would decrease the responsibility of the developing countries relative to industrialized countries, which began their intensive use of fossil fuels long in the past.)

A detailed calculation of emissions by income class for each country is beyond the scope of our analysis, although such calculations are possible and have indeed been done for some countries (see, for example, Metcalf (2007) for the United States, Brenner et al. (2007) for China, and Ananthapadmanabhan et al. (2007) for India). For the purposes of our indicative calculation, we make the simplifying assumption that (within any given country) emissions are linearly proportional to consumption, which is in turn linearly proportional to income. (See <http://www.GreenhouseDevelopmentRights.org/Appendices> for technical details, data sources, and calculations.) Given this, we could generate national responsibility graphs exactly analogous to the Figure 4 graphs of national capacity. To show more countries, however, we present in Figure 5 a condensed graph that shows a number of nations and regions, with the total height of each bar reflecting cumulative emissions since 1990 (projected out to 2010). The yellow portion of each bar shows the “development” emissions corresponding to consumption below the development threshold, and the green portion the aggregate responsibility. (These are analogous to the yellow and green portions

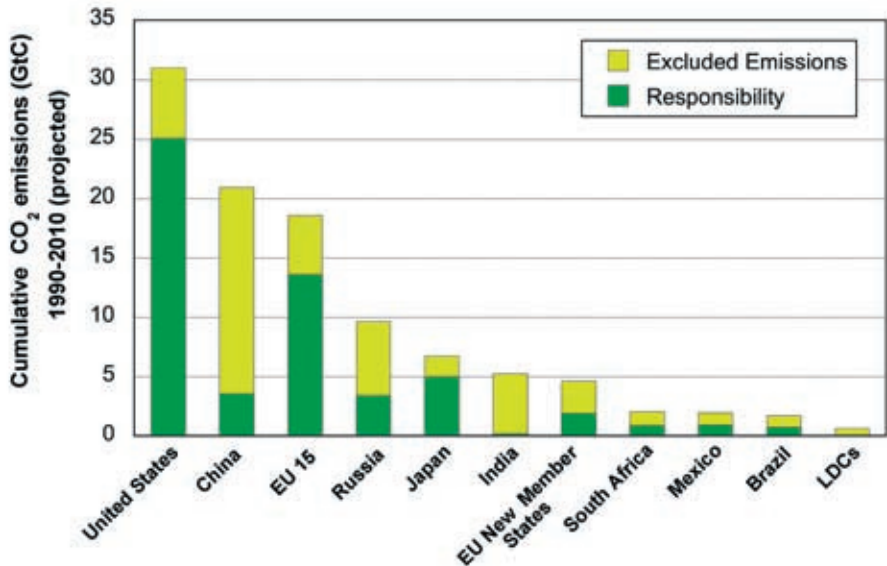


Figure 5. Cumulative CO<sub>2</sub> emissions from fossil-fuel combustion, 1990–2010. Each bar is divided between a green section that shows “responsibility” and a yellow section that corresponds to emissions associated with consumption below the development threshold.

of the graphs in Figure 4, but are not presented as full distributions across national populations.)

By this metric, responsibility is, not surprisingly, higher in wealthy countries, and effectively zero in the poorest countries (including but not limited to the UN “Least Developed Countries”). The United States, for instance, has not only very high total cumulative emissions but high responsibility as well, because a relatively small portion of its emissions are excluded as development emissions corresponding to income below the threshold. Similarly for the EU15 and other industrialized countries. China on the other hand, and India as well, have significant emissions, but only a relatively small fraction counts toward their respective responsibility. Note, for example, that India and Japan have similar levels of emissions, though Japan’s responsibility is, of course, much higher. Note also that the Economies in Transition (EITs), like Russia and the EU New Member States, have little responsibility relative to their total emissions. This nicely illustrates that a framework based on responsibility, capacity, and a development threshold can appropriately account for the fact that these countries – despite being in Annex I and despite their high per-capita emissions – are in fact poorer than many non-Annex I countries.

This raises the question of how capacity and responsibility might be combined into a single obligation indicator that meaningfully specifies fair national shares of the costs of an emergency climate transition. We now turn to that question.

#### 4.1.3 The Responsibility and Capacity Indicator (RCI)

Again, the purpose of this quantitative exercise is to define and calculate a single indicator that properly combines responsibility and capacity and, by so doing, allows us to defensibly assign shares of the global mitigation and adaptation efforts to individual countries. Further, this Responsibility and Capacity Indicator (RCI), following our claim that the right to development adheres to individuals and not nations, must reflect the distribution of income and emissions within countries. When used to calculate national obligations, it should specifically exclude the income and emissions of individuals below the development threshold.

Again, there is no uniquely correct way to do this, but there are more or less reasonable possibilities. Plainly, the RCI must be defined so that, among countries with the same capacities but different responsibilities, the country with greater responsibility has the greater obligation. Just as plainly, among countries with the same responsibility but different capacities, the one with the greater capacity must have the greater obligation.

There are many formulas which have this property. We use one that defines a simple weighted sum of responsibility and capacity, and also allows different weights to be given to each:

$$RCI = a R + b C$$

We specify that  $a$  and  $b$  sum to 1, so that, as the paired weights go from  $a = 1$  and  $b = 0$  at one extreme to  $a = 0$  and  $b = 1$  at the other, the RCI goes from being exactly equal to responsibility ( $R$ ) to being exactly equal to capacity ( $C$ ). For our reference calculations, we set  $a = 0.5$  and  $b = 0.5$ , which weights capacity and responsibility equally, but other weights can certainly be defended on various grounds.<sup>46</sup>

We can now straightforwardly estimate the joint responsibility/capacity indicator for any nation by integrating across all individuals, and then compare it with the global total to calculate each country's share.

GDRs results for representative countries and groups							
	2010					2020	2030
	Population (percent of global)	GDP per capita (\$ US PPP)	Capacity (percent of global)	Responsibility (percent of global)	RCI (percent of global)	RCI (percent of global)	RCI (percent of global)
EU 27	7.3	30,472	28.8	22.6	25.7	22.9	19.6
EU 15	5.8	33,754	26.1	19.8	22.9	19.9	16.7
EU +12	1.5	17,708	2.7	2.8	2.7	3.0	3.0
United States	4.5	45,640	29.7	36.4	33.1	29.1	25.5
Japan	1.9	33,422	8.3	7.3	7.8	6.6	5.5
Russia	2.0	15,031	2.7	4.9	3.8	4.3	4.6
China	19.7	5,899	5.8	5.2	5.5	10.4	15.2
India	17.2	2,818	0.7	0.3	0.5	1.2	2.3
Brazil	2.9	9,442	2.3	1.1	1.7	1.7	1.7
South Africa	0.7	10,117	0.6	1.3	1.0	1.1	1.2
Mexico	1.6	12,408	1.8	1.4	1.6	1.5	1.5
LDCs	11.7	1,274	0.1	0.04	0.1	0.1	0.1
Annex I	18.7	30,924	75.8	78.0	77	69	61
Non-Annex I	81.3	5,096	24.2	22.0	23	31	39
High-income	15.5	36,488	76.9	77.9	77	69	61
Middle-income	63.3	6,226	22.9	21.9	22	30	38
Low-income	21.2	1,599	0.2	0.2	0.2	0.3	0.5
World	100	9,929	100%	100%	100%	100%	100%

**Table 2: Percentage shares of total global population, GDP, capacity, responsibility, and RCI for selected countries and groups of countries. Based on projected emissions and income for 2010, 2020, and 2030. (High-, Middle-, and Low-income Country categories are based on World Bank definitions as of 2006. Projections based on International Energy Agency World Energy Outlook 2007.)**

When viewing this table, keep three basic points in mind:

- 1) Because our measure of capacity excludes the income of poor people, wherever they live, a rich country's capacity will be larger in percentage terms than its share of global income, and a poor country's capacity will be smaller.
- 2) Similarly, a wealthy country's responsibility will be larger than its share of cumulative emissions (fewer of its historical emissions will be excluded).
- 3) An indicator that combines responsibility and capacity to derive an obligation indicator can be expected to yield a result that is between the calculated capacity on the one hand and the calculated responsibility on the other.

One notable feature of our results is that the United States has the largest share of global capacity, the largest share of global responsibility, and the largest share of the combined RCI. This result is unsurprising but extremely important, and it deserves immediate notice: By any reasonable standard of "common but differentiated responsibilities," the largest share of the global climate effort would properly belong to the

United States. It will not be enough for the United States and other high-capacity, high-responsibility countries to embark on rapid programs of domestic reductions, not even if these are extremely aggressive. Their shares of the global effort properly include much of the cost of accelerated global decarbonization, and of the robust adaptation program that will be needed if we are to maintain a workable measure of international solidarity and cooperation. We stress this because – despite the fact that the American people have come to accept the need for concerted action to stabilize the climate, and despite the inclusion of small amounts of foreign adaptation assistance in draft US climate legislation – climate action is still conceived in almost entirely domestic terms. Whereas, as our analysis underscores, the United States has a “dual obligation,” one that has both a domestic and an international side. Indeed, it must be said that, with regard to preparing the ground for a future in which the United States meets its international obligations, the American climate movement has largely failed. The same, perhaps to a slightly lesser degree, is true of Europe as well, and this is a very serious – potentially fatal – problem.

Again, there is no single “correct” way to define responsibility, capacity, or a combined Responsibility and Capacity Indicator. But we are confident that our definition is reasonable, and especially confident that its built-in sensitivity to the distribution of income and emissions within countries is crucially important. It is this sensitivity that takes account of the basic facts of income inequality: In every country, some people have the responsibility for unsustainable levels of greenhouse gas pollution, and the capacity to pay for mitigation and adaptation; in every country, some people have no responsibility and no capacity to pay. Any climate regime that seeks to honor the right to development must acknowledge, and take proper account of, these basic facts.

#### 4.1.4 Quantifying national climate obligations

Having calculated RCIs for different countries, we can now estimate the obligations that would fall to them. How those obligations would actually be discharged is an open question, but we will explore two stylized approaches:

■ The first expresses national obligations in terms of financial contributions to an international fund (or set of funds) through which all mitigation and adaptation is then financed. In this case, the RCI could serve as the basis for determining each Party’s obligatory financial contribution to the fund.

■ The second expresses national obligations in terms of emission reduction commitments and Kyoto-style national targets. In this case, which is more akin to the UNFCCC’s existing structure and processes, the RCI serves as the basis for determining each Party’s total emission reduction commitment (international as well as domestic) under a global cap and trade system.

Different countries will have different levels of comfort with each of these approaches, and different levels of capability to implement them. The GDRs framework is flexible, in that it can accommodate either, or even complex, nation-specific hybrids. Both are discussed, below and in the next chapter.

The first approach – national payments into an international climate fund – might resemble a greatly expanded version of the Multinational Climate Change Fund proposed by Mexico at the Bangkok UNFCCC meeting in April 2008, or the “Financial



Mechanism for Meeting Financial Commitments under the Convention” proposed by the G77 and China. The fund would manage and allocate the financial resources required to achieve the necessary levels of mitigation and adaptation. The RCI would serve as the basis for determining each nation’s obligatory financial contribution to that fund. In the language of the Bali Action Plan, it would provide a basis for assessing the phrases “measurable, reportable and verifiable” and “adequate, predictable and sustainable” international financial support. Each Party’s contribution, as a percentage of the total required funding in a given year, would equal its share of the global RCI obligation (see the rightmost three columns in Table 2).

The first task, if we are to use our RCIs to estimate national mitigation and adaptation costs, is to somehow settle on estimates of the global costs that must be apportioned. The most widely cited numbers are for stabilization between 500 and 550 ppm CO<sub>2</sub>-equivalent, and they estimate the cost to be about 1 percent of GWP (which was US\$ 56 trillion in 2005) annually, although exactly how this number is calculated is often a bit unclear in the literature.<sup>47</sup> Expected costs vary with baseline levels of economic and population growth and with assumptions about the rate at which technologies will advance and the efficiency with which policies will be implemented. In addition, differences in basic definitions (What counts as a cost, and to whom? Should these “costs” be seen as “investments,” and might they even be macroeconomically beneficial?) and modeling assumptions produce different calculated costs, even with the same baseline and policy assumptions.

Our own view combines optimism and pessimism. That is to say, our understanding of the economic models leads us to conclude that the majority of them overstate costs relative to the mitigation objectives that they are actually modeling.<sup>48</sup> However, the 2°C emergency pathway that we are advocating is extremely challenging, and demands rates of emission reductions that are outside the range typically modeled (the lowest stabilization levels reported by the IPCC Fourth Assessment Report’s Working Group III are 445–550 ppm CO<sub>2</sub>-equivalent, whereas our pathway aims to return to 400 ppm CO<sub>2</sub>-e by 2100).

A more detailed discussion of mitigation costs would take us rather far afield, and in the end we would still be forced to conclude that there is enormous uncertainty, and little assurance of any specific upper bound to the costs of a true emergency program. Fortunately, for our purposes here, it is sufficient for us to use “reasonable” numbers, and to stress *that the larger the costs turn out to be, the more crucial it is that they be shared fairly.*

More important still is the fact that *adaptation costs, properly conceived, may turn out to be as large or even larger than mitigation costs.* The effort-sharing literature rarely deals with adaptation costs, though estimates in the region of \$100 billion per year and even higher are being reported. To be sure, there is little basis for confidence in the precision of such figures,<sup>49</sup> as discussions about what kinds of adaptation measures are possible and desirable are just beginning, and there has yet to be any coherent proposal as to what kind and degree of adaptation would be “adequate,” or of how practical proposals might be measured against such a standard. Even more importantly, discussions of adaptation have studiously avoided the highly charged issues of liability and compensation. Yet lurking behind images of fresh new seawalls are increasingly clear understandings of the disaster relief, relocation costs, and unalleviated suffering that will accompany the future climate-change-induced

“impacts” that, frankly, are now altogether inevitable. Considering these factors, and the impacts that will be visited on both developed and developing countries, it is hardly farfetched to imagine global adaptation and compensation costs reaching or exceeding 1 percent of GWP each year.

We will not attempt to resolve the uncertainties here, but will rather proceed by estimating national obligations, as per *each* 1 percent of GWP that we finally accept as part of the total climate effort. Since our concern here is to allocate that total effort – adaptation plus mitigation costs – on the basis of the same indicator, we do not need to estimate them separately.

In Table 3, we show national obligations, following the RCIs shown above and using this 1 percent of GWP cost estimate, for selected countries and regions. (This is done in terms of projected 2020 GWP, so the significant digits of precision should not be taken too seriously.) Again, these estimates of national obligation to pay (the last two columns) based on our indicative calculation of RCI show the costs (including both mitigation and adaptation costs) for each 1 percent of GWP. Total costs may in the end be several percent, and it is also possible to tell stories in which costs would be less than 1 percent, but in any case it is easy to do the arithmetic. If you believe, for example, that the total cost of an emergency global climate stabilization program would be more like 2 percent of GWP, just multiply the numbers in the last two columns by two. Similarly, if you think the total cost is likely to be 0.5 percent of GWP, divide it in half.

	National income (billion \$)	National capacity (billion \$)	National capacity (% GDP)	National obligation (billion \$)	National obligation (% GDP)
<b>EU 27</b>	\$19,327	\$15,563	80.5%	\$ 216	1.12%
<b>EU 15</b>	\$16,752	\$13,723	81.9%	\$ 188	1.12%
<b>EU +12</b>	\$ 2,574	\$ 1,840	71.5%	\$ 28	1.09%
<b>United States</b>	\$18,177	\$15,661	86.2%	\$ 275	1.51%
<b>Japan</b>	\$ 5,071	\$ 4,139	81.6%	\$ 62	1.23%
<b>Russia</b>	\$ 2,905	\$ 1,927	66.3%	\$ 41	1.40%
<b>China</b>	\$13,439	\$ 5,932	44.1%	\$ 98	0.73%
<b>India</b>	\$ 5,814	\$ 972	16.7%	\$ 11	0.19%
<b>Brazil</b>	\$ 2,535	\$ 1,376	54.3%	\$ 16	0.64%
<b>South Africa</b>	\$ 706	\$ 422	59.8%	\$ 10	1.42%
<b>Mexico</b>	\$ 1,744	\$ 1,009	57.9%	\$ 15	0.84%
<b>LDCs</b>	\$ 1,549	\$ 82	5.3%	\$ 1	0.06%
<b>Annex I</b>	\$50,368	\$40,722	80.8%	\$ 652	1.29%
<b>Non-Annex I</b>	\$44,037	\$18,667	42.4%	\$ 292	0.66%
<b>High-income</b>	\$49,279	\$40,993	83.2%	\$ 655	1.33%
<b>Middle-income</b>	\$41,546	\$18,190	43.8%	\$ 286	0.69%
<b>Low-income</b>	\$ 3,579	\$ 206	5.8%	\$ 3	0.08%
<b>World</b>	\$94,405	\$59,388	62.9%	\$ 944	1.00%

**Table 3: GDP, capacity, and obligation, projected to 2020. These figures assume that the total cost of the global climate program is 1% of GWP, or about \$1 trillion in 2020.**

Also, to move beyond the obvious point that expenditures of this size would not be widely welcomed, it is useful to consider what they might appropriately be compared to. Military budgets in particular invite comparison. For example, the US military budget – depending on what is included in its definition – is not less than \$500 billion a year and, if estimated in a reasonable fashion, considerably more, as much as a third of the total US federal budget. All other military budgets are smaller, but they still outweigh the climate costs assumed above. The United Kingdom's official military budget, for example, is about \$51 billion a year, while China's is estimated at \$188 billion and India's at \$114 billion (all these figures are PPP). These are all conservatively estimated figures, and it is interesting to note that the military expenditures of the top 15 spenders amounts to just over 2 percent of GWP (PPP adjusted).<sup>50</sup> Given this, it is fair to say that an emergency program would entail a “Keynesian” effort of about the same size as the global military enterprise, though one that, obviously, has quite a different political inflection.

Finally, it is important to put these figures in the context of continuing global economic growth. As Azar and Schneider,<sup>51</sup> among many others, have pointed out, even costs that seem very large (2 percent of GWP, for example, is well over a trillion dollars) imply only a very small delay in the rate at which people become richer. In a developed country growing at 2 percent per year, a 2-percent national bill would only delay the year by which today's per-capita incomes would have doubled from 2043 to 2044. In a developing country growing at 5 percent annually, a 2-percent national obligation would amount to less than a five month delay in reaching such a milestone, from late 2022 to early 2023.

#### 4.1.5 The effort as a “climate tax”

*National* obligations would presumably be passed down to individuals through a wide variety of policy measures and instruments that we need not discuss in detail here. Suffice it to say that whatever form these take – whether they are market-based or regulatory, whether they increase the price of carbon-intensive goods or provide incentives for low-carbon alternatives – their implied costs will eventually be borne by individuals. Thus, the design of these instruments – and any complementary dividend or “revenue recycling” scheme that is implemented alongside them – will ultimately determine the allocation of costs across individuals, and the system's overall level of progressiveness (or regressiveness), as the case may be.

Below, we will discuss cost distribution as if the entire climate program were funded through a single “climate tax.” We do this not because we think that a tax is the only way, or even the most likely way, to fund a massive climate mobilization. But we do find the simplicity and transparency of the resulting analyses both useful and illuminating.

In order to make the scale of the national obligations implied by the GDRs approach – and their equity implications – more tangible, consider them in terms of an implied average annual “climate tax,” for individuals at various levels of income in the year 2020. In Table 4, for three possible levels of total global cost (0.5 percent, 1 percent, and 2 percent of GWP), we express the GDRs allocation in terms of tax rates, as they would hypothetically be seen by individuals with annual incomes ranging from \$7,500 to \$120,000. Note that, in calculating these implied “tax bills,” we assume

that national obligations are passed down to taxpayers according to their individual RCIs, thus ensuring that effort-sharing within nations exactly parallels effort-sharing among nations.

Of course, a multilateral environmental agreement cannot force this particular allocation of costs, or any other one, onto its signatory states. How national obligations would be apportioned to individuals within countries will necessarily be left as a matter for countries to determine. However, it would be sharply contrary to the spirit of the GDRs system if, at the end of the day, the costs of climate protection were to fall onto those with incomes below the development threshold. The challenges here are great, but they are not specific to Greenhouse Development Rights. Any climate regime must ensure that, at a minimum, it neither worsens the overall fairness of the global economy or the overall well-being of the poor. If it does either, it is ethically unacceptable and, perhaps more importantly, unlikely to work.

Under such circumstances, individuals below the development threshold, who contribute nothing to their nation's obligation, would similarly pay nothing toward

		Total costs: 0.5% of GWP			Total costs: 1.0% of GWP			Total costs: 2.0% of GWP		
Country	income	marginal tax rate	average tax rate	annual tax	marginal tax rate	average tax rate	annual tax	marginal tax rate	average tax rate	annual tax
US	\$5,000	0.00%	0.00%	\$0	0.00%	0.00%	\$0	0.00%	0.00%	\$0
US	\$15,000	0.88%	0.44%	\$66	1.75%	0.87%	\$131	3.50%	1.75%	\$262
US	\$30,000	0.88%	0.66%	\$197	1.75%	1.32%	\$395	3.50%	2.63%	\$790
US	\$60,000	0.88%	0.77%	\$461	1.75%	1.54%	\$921	3.50%	3.08%	\$1,843
US	\$120,000	0.88%	0.83%	\$987	1.75%	1.65%	\$1,974	3.50%	3.30%	\$3,948
Sweden	\$5,000	0.00%	0.00%	\$0	0.00%	0.00%	\$0	0.00%	0.00%	\$0
Sweden	\$15,000	0.39%	0.20%	\$30	0.79%	0.39%	\$59	1.57%	0.79%	\$118
Sweden	\$30,000	0.39%	0.30%	\$89	0.79%	0.59%	\$177	1.57%	1.18%	\$355
Sweden	\$60,000	0.39%	0.35%	\$207	0.79%	0.69%	\$414	1.57%	1.38%	\$828
Sweden	\$120,000	0.39%	0.37%	\$444	0.79%	0.74%	\$887	1.57%	1.48%	\$1,775
World avg.	\$5,000	0.00%	0.00%	\$0	0.00%	0.00%	\$0	0.00%	0.00%	\$0
World avg.	\$15,000	0.69%	0.34%	\$52	1.38%	0.69%	\$103	2.76%	1.38%	\$206
World avg.	\$30,000	0.69%	0.52%	\$155	1.38%	1.03%	\$310	2.76%	2.06%	\$619
World avg.	\$60,000	0.69%	0.60%	\$361	1.38%	1.20%	\$722	2.76%	2.40%	\$1,445
World avg.	\$120,000	0.69%	0.65%	\$774	1.38%	1.29%	\$1,548	2.76%	2.58%	\$3,096

**Table 4: “Climate tax” for various income levels for two representative countries and the world average. The marginal tax rate, average tax rate, and total annual bill are shown, under three different assumptions about the total costs of emergency climate mitigation and adaptation (0.5%, 1.0%, and 2.0% of Gross World Product). Based on emissions projected through 2020.**

fulfilling that obligation. In effect, their “climate tax” would be zero. *Which is to say that in 2020, the roughly two-thirds of the world’s population that still falls below the development threshold (assuming, for simplicity, that intra-national income distributions remain as they are today, though of course they will change) would be exempt from any climate tax, enabling them to prioritize the attainment of a basic level of welfare.* The remaining population (the top third of the global population), which is projected to control 85 percent of the world’s income in 2020, would cover all global mitigation and adaptation costs.

We show three representative cases: a country with high responsibility relative to its capacity (the United States), a country with low responsibility relative to its capacity (Sweden), and world average responsibility. Note that, although each incremental dollar of income or ton of emissions is taxed at the same rate (as in a “flat tax”), the whole system is modestly progressive, since income and emissions below the development threshold are explicitly excluded. Note, too, that when you compare individuals with the same level of income across countries with different levels of responsibility, their overall “tax” is not the same. The tax for individuals at the same income level varies (being higher for the United States and lower for Sweden), reflecting the fact that *this is a capacity- and responsibility-based climate tax, not simply an income tax, nor a carbon tax.*

This analysis, we claim, has two clear implications: that fair effort-sharing is of great pragmatic significance, and, by definition, any fair effort-sharing system must take intra-national income distribution into proper account. For even if the costs of a rapid climate transition are assumed to be quite high (even higher than the case of 2 percent of GWP shown in the above table), and even if these costs are deemed to be solely the obligation of the minority of people with incomes above a \$7,500/year development threshold (less than one-third of the global population today), they would still be quite bearable. The rich and the relatively well-off can afford to shield the poor from the costs of combating climate change, and by so doing to honor a meaningful right to development.

#### 4.1.6 Ranking countries by their “average climate tax”

The goal of the GDR framework is to calculate transparent, principle-based indicators of fair-share obligations under a global climate regime. The individual climate tax introduced above – being both suggestive and useful – is a sign that it does just that. However, “average climate taxes” at the national level, which individual taxes can straightforwardly be aggregated into, are even more to the point.

Table 5 lists such “average climate taxes.” It does so, again, by recourse to a simple expedient in which we estimate total 2010 climate costs at 1 percent of GWP, and it lists nations along with their total share of that cost, *as divided by the number of people above the development threshold.* It makes sense to present a national tax in this way, in terms of what we might call “per-taxpayer obligation,” because the poor – being below the development threshold – contribute no capacity or responsibility to the national total, and thus rightly deserve to be exempted from any national climate tax. The usual procedure would be to express the national tax in “per-capita” terms, but doing so would inaccurately reflect the social truths of unequal income distribution; it would, in effect, allow the rich to hide behind the poor.<sup>52</sup>

Country	Rank	Average obligation per person above the development threshold (\$PPP/cap)	Share of global bill (%)	Cumulative share of global bill (%)
<b>Qatar</b>	1	1,599	0.2	0.21
<b>Luxembourg</b>	2	1,092	0.1	0.28
<b>United Arab Emirates</b>	3	990	0.7	0.96
<b>Singapore</b>	4	933	0.6	1.57
<b>Bahrain</b>	5	895	0.1	1.67
<b>Kuwait</b>	6	832	0.3	2.00
<b>Liechtenstein</b>	7	818	0.004	2.01
<b>United States</b>	8	762	33.1	35.06
<b>Brunei</b>	9	699	0.0	35.11
<b>Trinidad and Tobago</b>	10	604	0.1	35.19
<b>Canada</b>	11	592	2.9	38.12
<b>Norway</b>	12	568	0.4	38.52
<b>Australia</b>	13	541	1.7	40.23
<b>Netherlands</b>	14	481	1.2	41.39
<b>Denmark</b>	15	474	0.4	41.78
<b>Belgium</b>	16	471	0.7	42.51
<b>Germany</b>	17	456	5.5	47.98
<b>Ireland</b>	18	452	0.3	48.28
<b>Finland</b>	19	442	0.3	48.63
<b>Saudi Arabia</b>	20	436	1.4	50.01
<b>Iceland</b>	21	432	0.02	50.03
<b>Austria</b>	22	430	0.5	50.56
<b>Japan</b>	23	419	7.8	58.33
<b>United Kingdom</b>	24	418	3.7	62.06
<b>Switzerland</b>	25	394	0.4	62.50
<b>Greece</b>	26	389	0.6	63.13
<b>San Marino</b>	27	366	0.002	63.13
<b>Bahamas, The</b>	28	363	0.01	63.15
<b>Taiwan</b>	29	363	1.3	64.43
<b>Italy</b>	30	361	3.1	67.51
<b>Cyprus</b>	31	357	0.04	67.55
<b>Czech Republic</b>	32	357	0.5	68.08
<b>Sweden</b>	33	357	0.5	68.57
<b>France</b>	34	355	3.3	71.82
<b>Nauru</b>	35	352	0.0002	71.82
<b>South Africa</b>	36	350	1.0	72.79
<b>Palau</b>	37	337	0.001	72.79
<b>Oman</b>	38	333	0.1	72.90
<b>Estonia</b>	39	324	0.1	72.96
<b>Israel</b>	40	323	0.3	73.29
<b>Spain</b>	41	317	2.1	75.37
<b>Slovenia</b>	42	311	0.1	75.46
<b>New Zealand</b>	43	306	0.2	75.65
<b>Korea, Rep.</b>	44	305	2.0	77.65
<b>Monaco</b>	45	293	0.001	77.66
<b>Seychelles</b>	46	277	0.002	77.66
<b>Antigua and Barbuda</b>	47	273	0.002	77.66
<b>Malta</b>	48	271	0.016	77.68
<b>Portugal</b>	49	259	0.3	78.03
<b>Libya</b>	50	254	0.2	78.18
<b>Jamaica</b>	51	253	0.03	78.21
<b>Poland</b>	52	231	1.1	79.27
<b>Gabon</b>	53	227	0.03	79.29
<b>Russia</b>	54	225	3.8	83.13
<b>Barbados</b>	55	221	0.01	83.14



Country	Rank	Average obligation per person above the development threshold (\$PPP/cap)	Share of global bill (%)	Cumulative share of global bill (%)
Malaysia	56	220	0.5	83.67
Panama	57	218	0.05	83.72
Namibia	58	216	0.01	83.73
Chile	59	215	0.3	84.01
Zimbabwe	60	212	0.05	84.06
Slovakia	61	210	0.2	84.22
Hungary	62	210	0.3	84.52
Equatorial Guinea	63	206	0.02	84.54
Turkmenistan	64	193	0.1	84.59
Venezuela	65	191	0.4	85.00
Mexico	66	190	1.6	86.59
Kazakhstan	67	184	0.2	86.83
Lithuania	68	177	0.1	86.90
Botswana	69	177	0.03	86.93
Argentina	70	177	0.6	87.50
Cook Islands	71	173	0.00	87.50
West Bank and Gaza	72	166	0.00	87.50
Brazil	73	158	1.7	89.20
Ecuador	74	156	0.1	89.29
Uzbekistan	75	154	0.03	89.32
Lebanon	76	154	0.1	89.37
Latvia	77	150	0.04	89.41
Saint Kitts and Nevis	78	147	0.00	89.41
Croatia	79	144	0.1	89.49
Djibouti	80	142	0.001	89.49
Iran	81	140	0.9	90.37
Bulgaria	82	140	0.1	90.49
Turkey	83	139	0.8	91.30
Suriname	84	133	0.003	91.30
Colombia	85	126	0.2	91.53
Belize	86	122	0.002	91.53
Bolivia	87	121	0.03	91.56
Swaziland	88	120	0.004	91.56
China	89	119	5.5	97.06
Uruguay	90	118	0.03	97.09
Romania	91	115	0.3	97.34
Thailand	92	114	0.5	97.84
Costa Rica	93	109	0.03	97.87
Belarus	94	109	0.1	97.97
Dominica	95	108	0.0004	97.97
Macedonia	96	108	0.02	97.99
Mauritius	97	106	0.01	98.00
Dominican Republic	98	105	0.04	98.04
Peru	99	103	0.1	98.17
Saint Lucia	100	103	0.001	98.17
Maldives	101	102	0.001	98.17
Grenada	102	100	0.001	98.17
Tuvalu	103	100	0.0000	98.17
Syria	104	98	0.05	98.22
Niue	105	88	0.000	98.22
Ukraine	106	88	0.2	98.44

**Table 5: Countries ranked by obligation of average “above the development threshold” taxpayer. Annex I countries indicated in red. Additional columns show national percentage of total global obligation, and cumulative share of global obligation of all higher-ranked countries. Data projected to 2010.**

The first point to notice is that this list, which includes 106 countries (as it must if it is to include the 40 countries that are now in Annex I) covers more than 98 percent of the global climate obligation, with the remaining 89 countries (in our dataset) having barely 2 percent of the global obligation. The second thing to note is that the members of today's Annex I are highlighted in red. Of the 98 percent of the global obligation that belongs to these 106 countries, 77 percent belongs to those in Annex I.

Not surprisingly, there is some correlation between membership in Annex I and rank in this table of national fair shares, as Annex I countries do tend to be higher on the list. After all, the creation of Annex I reflected the UNFCCC recognition that people in some nations have much higher obligations than the people in others, and that they should “take the lead.” But while this was a reasonable beginning, the startling thing today is how badly Annex I captures the “fair share” distribution of global obligations, at least when these obligations are calculated, as they are within GDRs, with respect to both a stringent global emissions pathway and a realistic development threshold.

Just how bad is Annex I? It is a key question, for many of the *strategic* questions we now face turn upon the answer, which is, alas, that it is quite bad indeed. This is obvious in the necessity to go through the top-ranked 106 countries if you would include the whole Annex I list (and even if you just rank by per-capita income, you have to go through 95 countries). While some Annex I countries cluster toward the top of the list, *17 of the top 40 countries are not in Annex I*. Moreover, the lowest-ranked 10 countries in Annex I, with about 180 million people (15 percent of the population in Annex I), have only about 60 percent of their population living above the development threshold; the 30 highest-ranked non-Annex I countries – all ranked higher than the 10 lowest Annex I countries – have about 70 percent of their 250-million population living above the development threshold.

How did it come to this? One obvious answer is that these groupings remain as they were in the early 1990s, even though it is quite evident that these lists – frozen snapshots of the past that even then expressed politics nearly as much as they reflected objective indicators – will no longer do. Soon, clearly, the climate regime must push beyond today's Annex I to take account of new realities in which, for example, “newly industrialized” countries such as Singapore and South Korea are far richer than many of the nations within Annex I, especially those of eastern Europe and the former Soviet Union. Nor is this challenge of defining and updating annex membership just a near-term problem. It is a perennial challenge as countries develop and then “graduate” to assume more rigorous obligations. The problem, particularly, is that if graduation is defined as moving from one imprecisely defined annex to another, the “triggers” that signal graduation are necessarily ambiguous. Since, in almost every case, it is in the strong short-term interests of a country to resist graduation, this is a recipe for chronic dysfunction. After all, if newly industrialized countries are to graduate into Annex I, then which ones and when? As they say in Washington: What about China?

But an equally confounding problem is that both Annex I and non-Annex I are lists of countries that have something – but not everything – in common. They only vaguely hint at the appropriate role for each country, in that they are internally undifferentiated. Which is one of the reasons why, back in 1997, when it finally came time to allocate emission reduction targets within Annex I, it was unclear if decisions were being made on the basis of measurable indicators of national circumstance, on the

basis of political history (like those shared by the former Soviet states), or on the basis of negotiating power and political acumen. It is no accident that whenever the origin of Kyoto's emission targets is at issue, discussions invariably come around to "hot air" (read "bribery") and "horse trading."

In 1997, during the Kyoto negotiations, the shortcomings of the annexes approach were tolerable, and probably unavoidable. "Strategic ambiguity," the watchword of the day, was good enough, and it was fine to reflect "common but differentiated" in a simple binary division between developed and developing countries. But the victory of the past has become the challenge of the present – a trap from which the negotiations must now escape, and here clarity is quite important. The problem is not that, as some say, we are «trapped by the Annexes," as if the discontinuity introduced by having two bins was itself the problem. The problem is not whether Singapore or South Korea (or China) should join Annex I. The problem is that developing countries do not want to take on the sorts of commitments that are expected of Annex I, and indeed they have a number of quite reasonable justifications for this reticence. Many of these have to do with trust, and the lack of it, and these are discussed at greater length in Chapter 6. But fundamentally, there is looming tension between climate protection and development, and the fear that once developing countries enter a realm of legally binding targets, their development priorities will quickly lose ground to the imperatives of climate stabilization.

Ultimately, the post-2012 negotiations will have to face up to and resolve these problems, or else fade into irrelevance. Moreover, as the climate crisis bears down upon us, as action becomes urgent and costs manifest, the stakes will only grow higher. Agreements and procedures designed to smooth and rationalize the overall process are badly needed, but unless they are transparent, unambiguous, and based on jointly accepted principles that explicitly safeguard a right to development, they will be fraught and contentious. Possibly fatally so.

All of which is to say very little about the way forward, but only to make a plea for honesty. The most rational solution to these problems is to eliminate the annexes altogether, and to replace them with a differentiation scheme based on a transparent, quantifiable, and defensible definition of national obligation that does not threaten development – and perhaps that is ultimately the direction in which the negotiations will need to go.

Before examining in more detail (in Chapter 6) how such a regime could be reached, we turn next to its even more provocative implications.

# 5 GDRs as a global allocation system

Our goal here is to specify “the right to development,” and to define it with enough ethical-political and quantitative rigor that it can underpin an emergency global effort-sharing system. To that end, we have even gone further, taking reasonable estimates of the cost of mitigation and adaptation and using them to calculate obligations. For all this, however, we have said very little about the mechanisms and institutions through which countries could meet their obligations, or about how any international payments would be productively directed toward their targets.

The key here is that the scale and nature of the required financial and technological cooperation is unprecedented, and that it will call for the expansion and reform of existing institutions, as well as the creation of entirely new ones. Some adaptation funding could presumably be linked to conventional Official Development Assistance (ODA), though not all of it. Some mitigation funding could presumably flow through market-based mechanisms like today’s carbon trading systems, though not all of it. Any number of devices might be called upon: progressive taxes of various kinds, trade-related levies, auctions, rebates, sectoral agreements, multilateral funds, IPR concessions, and so on. Beyond these, new and as-yet unnamed channels for both international resource transfer and accounting would need to be conceived and implemented, inevitably posing an impressive set of challenges: How to scale up rapidly? How to build absorptive and distributional capacity? How to ensure efficiency and avoid waste? How to institute credible and democratic governance?

These questions and others will be hotly debated, and this analysis provides no answers. Suffice it to say that the problems here are inadequately understood and extremely daunting, and that they are not ours alone. In fact, they are shared by any climate regime that purports to actually do something meaningful about mitigation and adaptation. In any case, our intention here is simply to draw attention to the enormity of the international cooperation that the climate problem demands, and to the magnitude of the financial assistance and technological cooperation that it implies for each country. We hope that by doing so we can contribute to a new discussion about international mechanisms, one that is in line with the scale of the actual challenge.

In this chapter, we explore one somewhat concrete option – the implementation of the mitigation side of a GDRs system within an international “cap and auction” or “cap and allocate” system based on tradable allowances,<sup>53</sup> which takes us, inevitably, into areas of bitter controversy.

The institutions of modern economic life are so intimately bound up with the generation and globalization of inequality that even the suggestion that a fair international effort-sharing system can be instituted is controversial – and if such a

system is to be partially market-based, skepticism is particularly warranted. To be frank, emissions trading systems, whatever role they finally turn out to play, have had a rather inauspicious beginning. They have, in particular, shown themselves prone to “capture” by corporations and private traders, and this has in turn legitimated the fear – now extremely widespread – that global emissions trading will function as a device by which wealthy countries, corporations, and individuals can “buy their way out” of inconvenient emissions limitations.

Nevertheless, we think this exploration is warranted, for a number of reasons. First, the mitigation side of any global climate agreement is virtually guaranteed to involve market mechanisms, particularly in the critical years just ahead.<sup>54</sup> Such mechanisms, after all, have tremendous momentum and several large constituencies – including carbon-intensive corporations, CDM project developers and hosts, the World Bank’s Carbon Finance Unit, allowance-starved Annex I countries, and finance-starved developing countries – that fully intend to move quickly into a next and grander phase of carbon trading. In this context, it seems to us vital to examine how global cap and allocate system could, if well-designed and effectively regulated, help to support an emergency climate program.

Second, such a system would make it possible to achieve reductions *cost-effectively* by carrying them out wherever they were least expensive. The importance of such flexibility is well-known, but cost effectiveness will be essential to the success of any true emergency program, and should be emphasized in this context. Indeed, as the desperation of our situation comes to be fully appreciated – amidst the economic and political stresses that must inevitably follow any rapid withdrawal from our fossil-fuel dependence – we will be casting about frenetically for the most affordable devices by which to manage the transition, and the lower the costs, the better the chances that we will keep our resolve.<sup>55</sup>

Third, and even more importantly, a workable cap and allocate system would make it possible to establish national mitigation obligations for countries, in a manner that is independent of the volume of reductions that are physically (and economically) available within their boundaries. Trading, in other words, offers a way to implement a global effort-sharing system in which countries with high capacity and responsibility are obligated to carry out strenuous reductions at home while, at the same time, helping to pay for decarbonization in poorer countries. This is a key point, and we must underscore it, though we gladly add that, in principle, alternatives based on taxes, public funds, and other financing mechanism could do the same. In any case, this chapter explores the implications of an effort-sharing framework with major international transfers, which, trading-based or not, is our central concern.

## 5.1 Cap and allocate (and trade)

How would we use the GDRs Responsibility and Capacity Indicator to distribute permits under a cap and allocate system? The method is fairly straightforward and requires only three conceptually simple steps.

First, it is necessary to estimate the global mitigation requirement. This is the difference between a global reference trajectory constructed as a bottom-up aggregation of *national reference trajectories*, and the 2°C emergency pathway. Graphically,

the “gap” or “wedge” between these two curves reflects the amount of mitigation work that needs to be done globally.

Second, this global mitigation requirement is allocated among countries as per the GDRs effort-sharing framework. That is, it is divided into *national mitigation obligations*, where each country – however rich or poor it may be – is allocated a portion of the global mitigation requirement, in proportion to that country’s national RCI.

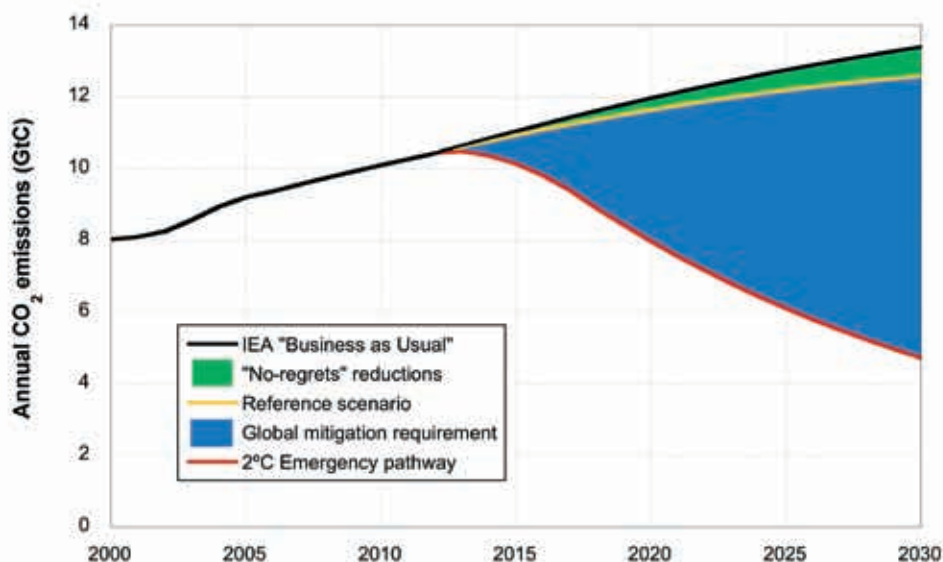
Third, each country is assigned a national emissions allocation equal to its national reference trajectory minus its *national mitigation obligation*. This determines each country’s share of the (rapidly declining) global emissions budget, and makes it possible to assign each country an appropriate allotment of permits (equal to its national emissions allocation).

In the rest of this chapter, we will follow the above steps in order to calculate national reference trajectories, national mitigation obligations, and the resulting national emission allocations for selected countries. But first note this critical point: Depending on how the size of a country’s mitigation obligation compares to its reference trajectory, the country might have 1) an allocation allowing some emissions growth over time, 2) an allocation requiring a rate of emission reductions that could easily be met domestically, or 3) an allocation requiring reductions so substantial that they can *only* be achieved by way of a *dual obligation* that includes *both* aggressive domestic action *and* the financing of further reductions abroad. We will show examples illustrating all three of these cases.

One key clarification is needed, having to do with the national reference trajectories and the global reference trajectory that they add up to. In Figure 6 below, we show global emission trajectories based on two hypothetical projections. The first (the black line at the top of the green wedge) is a “business-as-usual” trajectory, for which we take the recent World Energy Outlook 2007 global energy scenario.<sup>56</sup> It extrapolates business-as-usual trends in energy demand, energy conservation, renewables, fossil fuel subsidies, pollution controls, etc. The second projection (the yellow line at the top of the blue wedge) is a “no-regrets” trajectory, a projection of the global emissions pathway as it would be if available negative- and zero-cost emission reductions were successfully captured. The green wedge, in other words, represents free and profitable reductions, which is why we take its lower edge as our reference pathway. This no-regrets wedge is large, though by no means large enough to bring emissions all the way down to the 2°C emergency pathway (the red line).

We draw our estimate of no-regrets reductions from an influential McKinsey study<sup>57</sup> of global mitigation potential. This study, based on the same WEO 2007 business-as-usual trajectory that we have adopted, identified approximately 1300 MtC per year of negative- and zero-cost mitigation opportunities by 2030. From the perspective of a global effort-sharing framework, these reductions should be treated differently from positive-cost options. Because countries can, in principle, exploit these opportunities to their benefit, one might argue that a country’s no-regrets options should be included in its reference trajectory. Which is to say that, all nations should be responsible for capturing their own no-regrets reductions, and that only further reductions – those that have positive costs – should be considered part of the global mitigation requirement, to be allocated among nations within the broader effort-sharing framework.





**Figure 6. The global “mitigation gap.”** The blue wedge represents the mitigation burden between a global reference trajectory after no-regrets reductions (green wedge) and the 2°C emergency pathway (red line).

However, in practice, one cannot ignore the barriers that prevent countries from achieving all their no-regrets reductions. These barriers are high, and encompass structural, institutional, technological – and even financial – obstacles to otherwise cost-effective options. While some no-regrets options might face barriers that can be overcome domestically, for example through institutional changes and policy reform, others face barriers that might well be insurmountable without external assistance such as concessionary financing and technological cooperation. Recognizing these two fundamentally different situations, the GDRs framework obliges developing countries to achieve only the more accessible fraction of their no-regrets options, and folds the remainder into the global burden. The precise fraction of any country’s no-regrets opportunities that might plausibly be achieved through domestic efforts alone will have to be determined on a country-by-country basis, in a manner that reflects differing national circumstances. For the purposes of this indicative analysis, we crudely estimate that the more-accessible no-regrets opportunities amount to 50 percent of the total for non-Annex I countries. These are included in their national reference trajectories, and the remainder are added to the global mitigation requirement. For Annex I countries, in contrast, 100 percent of estimated no-regrets opportunities<sup>58</sup> are included in the national reference trajectories. This apportioning of the no-regrets opportunities is reflected in Figure 6.

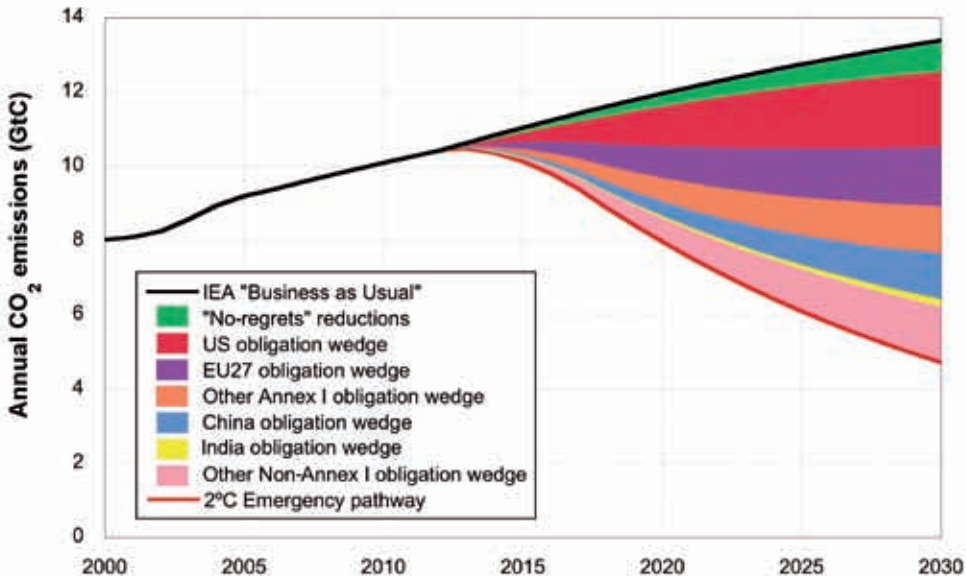
Baselines are, of course, notoriously difficult to define and impossible to accurately forecast. Thus, the negotiations would likely see plenty of gaming over such national reference trajectories and the particular no-regrets options to be included or excluded. But this, please note, is an inevitable feature of essentially all international effort-sharing proposals. In the face of any proposed commitment, negotiators carefully consider the levels of effort implied by their own situations and prospects, and by those of other countries. Either explicitly or implicitly, they assess

any effort relative to the “effortless” case. This will not change. So, explicitly requiring each country to put forward a national reference trajectory, and then subjecting it to the scrutiny of international negotiations, would add transparency to a process that has to this point allowed discussions of national baselines, levels of effort, and underlying principles to occur as a tangled, indecipherable mess.

In any case, taking this definition of the national reference trajectory, Figure 6 shows the global mitigation requirement associated with the emergency program as the blue wedge. Its width, growing through time, reflects the additional annual emission reductions required to hold the 2°C line, relative to a world in which countries successfully capture the more accessible no-regrets opportunities (green wedge). Given our reference projections and our emergency pathway, the global mitigation burden in 2020 would amount to 3.7 GtC of emission reductions, growing to 8 GtC in 2030. This mitigation requirement is then allocated to each nation in proportion to its share of the global RCI, as shown in Table 2 in the previous chapter.

Graphically, the global mitigation burden is shown in Figure 7, divided into different wedges for different countries. These wedges are analogous to the technology-based wedges defined by Pacala and Socolow,<sup>59</sup> but instead of showing technologies and the gigatons of reductions that they are projected to deliver, they show countries and the gigatons of reductions they are obligated to pay for. Thus, in 2020, the United States’ wedge is 29 percent of the total global mitigation requirement of 3.7 GtC, or about 1.1 GtC, while the European Union’s wedge is 23 percent, or about 850 MtC. China, a large and fast-growing lower-middle income country, has just over 10 percent, or about 380 MtC. India, a large low-income country, gets about 1.2 percent, or 40 MtC, which just barely appears as a line between China and other non-Annex I countries.

This gives us the big picture, in a way that allows us to talk, usefully and quantitatively, about individual national situations. For, as we will show below, we can “zoom



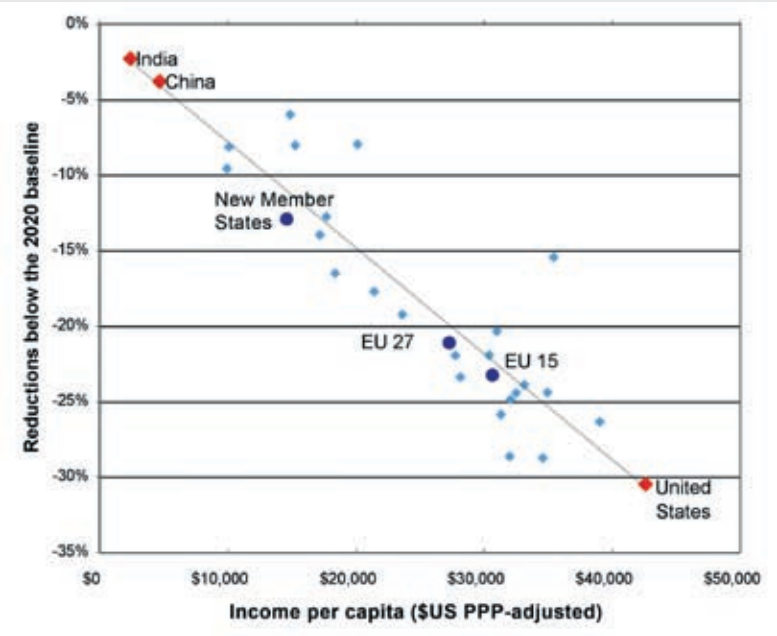
**Figure 7.** Total global mitigation requirement, divided into “national obligation wedges” showing the shares that would be borne by particular nations (or groupings).

in” on a country to look at its mitigation obligation wedge – its share of the necessary global reductions – and compare this wedge to its national reference trajectory. We can also examine the relationship between its plausible rates of domestic emission reductions and the scale of its total mitigation obligation. In some key cases – the high obligation countries of the North – it would be virtually impossible for countries to discharge their total obligations domestically, even if they wished to do so; in these cases we can then estimate the international reductions that they must also fund to fulfill their dual obligation.

Such examinations can be quite striking, for they plainly show that wealthy countries with high RCIs are obligated to deliver reductions far larger than even the ambitious “90 percent by 2050” targets now being discussed (at least by Al Gore and a few others) for Annex I countries. Indeed, for key wealthy countries, reduction obligations exceed even total reference trajectory emissions. So that even if these countries were to reduce their emissions to zero, they would still be obligated to pay for further emission reductions internationally.

This result, though striking, is not surprising. In fact, it exists by design. It is the logical outcome of the fact – for it is a fact – that any framework that actually preserves the right to development must obligate the wealthy nations to rapidly reduce their own emissions at the same time as they pay to accelerate the decarbonization of the developing world. It follows, just as implacably, from an allocation of reduction obligations on the basis of responsibility and capacity. It is the reason that Greenhouse Development Rights works, the way it drives global decarbonization, the means by which it creates the atmospheric space needed by those who are still “under-developed.”

**The European Commission’s effort-sharing proposal – implications for a global system**



**Figure B1: The EC’s burden-sharing proposal, for a reduction target of 20% below 1990 levels by 2020. The approach is extrapolated to include India, China, and the US, which would have reduction obligations, relative to their 2020 emissions baselines, of approximately 2%, 4%, and 31% respectively.**

The European Commission has issued its proposal for effort-sharing within the EU27, based on a reduction target of 20 percent below 1990 levels by 2020. (It has further proposed to increase the target to 30 percent “provided that other developed countries commit themselves to comparable emission reductions and economically more advanced developing countries commit themselves to contributing adequately according to their responsibilities and capabilities.”)

The EC’s effort-sharing proposal is complex and detailed, in large part because it is designed to explicitly introduce equity into the effort-sharing system through special provisions for Member States with lower per-capita incomes. These equity provisions include a reallocation of allowances under the European Emissions Trading System (ETS), and more generous targets for the non-ETS sectors. Figure B1 illustrates the implications, by showing each Member State (as a light blue diamond), positioned so as to indicate its PPP-adjusted income and its reduction obligation relative to its 2020 baseline. There is an unmistakable correlation between the wealth of a state and its expected mitigation effort. Figure B1 also shows that the aggregate obligation of the New Member States (13 percent) is quite a bit less demanding than that of the EU15 (23 percent) (see the dark blue circles). In fact, new-Member-State targets actually allow for growth in

absolute emissions relative to current levels. This reflects the fact that the average income in the EU15 (\$31,000) is more than twice that in the New Member States (\$15,000).

Figure B1 also shows the implications of taking the EU effort-sharing approach as a basis for global differentiation. If we assume that the simple linear relationship between PPP-adjusted per-capita income and emission reduction obligations continues within the EU, then India's implied obligation (with its income of less than \$2,400 per capita) would amount to barely a 2-percent reduction below its 2020 baseline. China (with a per-capita income of \$4,700), for its part, would have a target of slightly less than 4 percent, and the United States' (\$42,600) obligation would be roughly 31 percent.

The EC effort-sharing framework, unfortunately, is complex and somewhat ad hoc, and even if it worked internationally – even if it demonstrably protected the South's right to development – its lack of transparency would prevent it from being acceptable as a principle-based, global effort-sharing framework. Still, it at least approaches the effort-sharing problem in a reasonable way, and for this it is noteworthy.

There is not much further to go before you have an approach that can be applied to the even more diverse array of countries around the globe. Such a system, we claim, will look a great deal like Greenhouse Development Rights, a framework that is designed to be as simple as possible while still capturing the intention behind the UNFCCC's famous principle of "common but differentiated responsibilities and respective capabilities." For GDRs, by incorporating responsibility, captures the necessities of the "polluter pays" principle and establishes incentives for low-carbon development. By incorporating capacity, it respects the obvious truth that climate is an overarching civilizational challenge that will demand major financial resources. By defining both responsibility and capacity with respect to a development threshold, it safeguards a meaningful right to development. Critically, by accounting for intra-national disparities in wealth, it recognizes that that right to development adheres to individuals, not countries, and that the relatively wealthy in poor countries, like their compatriots in the North, quite properly share the common obligation to stabilize and protect the global climate.

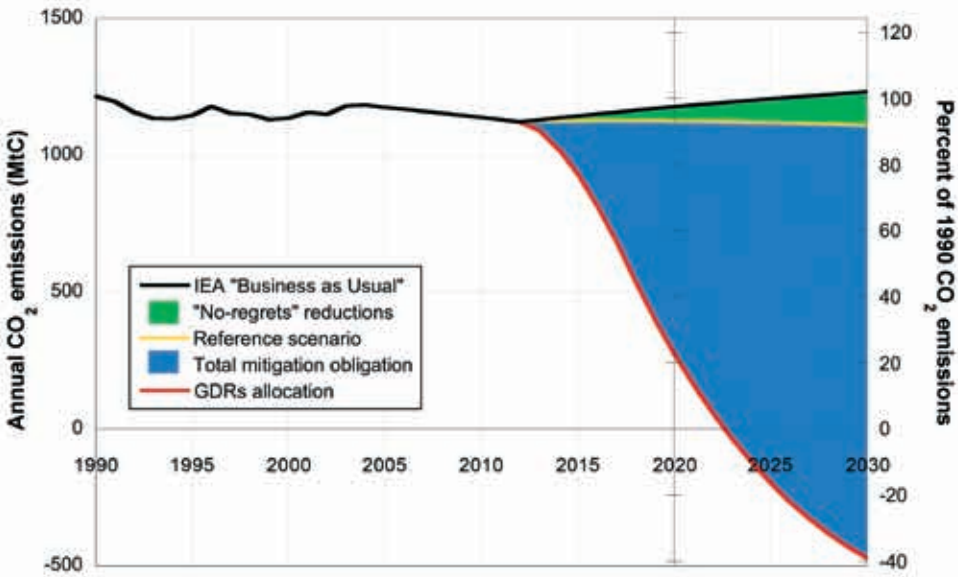


Figure 8: “Mitigation Obligation” chart for the European Union for the period 2010–2030. See text.

The example of the European Union is given above in Figure 8.

The top line, at the top of the green wedge, represents the business-as-usual trajectory (emissions growth as per the IEA energy scenario), while the yellow lower border of the green wedge shows the European Union’s reference trajectory, calculated by subtracting McKinsey’s estimate of no-regrets reductions,<sup>60</sup> which the EU Member States would be obliged to aggressively exploit. The striking bit, though, is the blue wedge. It represents the European Union’s share of the global mitigation requirement, its national reduction obligation, which amounts, under our assumptions, to about 850 MtC (i.e., 23 percent of the total global mitigation requirement of 3.7 GtC) in 2020, rising to almost 1600 MtC in 2030. Thus, the lower border of the blue wedge (labeled “GDRs allocation”) shows the European Union’s emissions allocation, once its aggregate mitigation obligation has been subtracted from its aggregate reference trajectory. (The allocation is here shown as a pathway in time, although it might, in practice, be better projected as a cumulative allocation over one or more “commitment periods”.<sup>61</sup>)

Although this chart looks quite different from the above global “wedges” chart (Figure 7), this is entirely due to the scale of the axes; both show the same European Union mitigation obligation wedge. The real difference is that, this time, this wedge is in the spotlight, and the scale of the European Union’s obligation are much more obvious because they are shown relative to the European Union’s emissions, not global emissions. Given this, the way the “allocation” line drops below zero around 2022 is pretty hard to miss, as is the political implication of this drop – the magnitude of the European Union’s mitigation obligation soon comes to exceed its emissions!

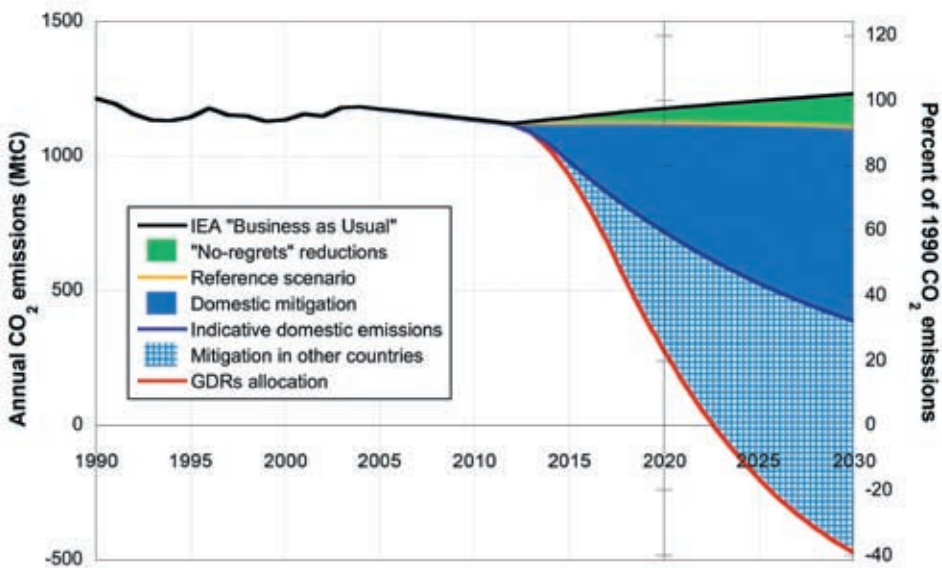
It is notable, in this context, that the GDRs framework makes no intrinsic assumptions about the fraction of a country’s total obligations that must be discharged as domestic reductions, or the fraction that must be discharged internationally. With international purchases managed via a global cap and allocate system, a country



would, in theory, be free to make any portion of its reductions domestically, and the remainder internationally, based on any nationally salient economic or political considerations. In practice, however, some restrictions on high-obligation countries are necessary – a point to which we will return.

Consider a scenario in which the European Union's rate of domestic reductions mirrors the rate of global reductions demanded by the 2°C emergency pathway, which increases to about six percent per year after a 2013 global emissions peak. The implications of this are illustrated below in Figure 9, in which the European Union's mitigation obligation is shown as split in two. One part (the light blue wedge) represents domestic reductions in the European Union, as per this six-percent per-year decline. The second part (the cross-hatched blue wedge) represents additional reductions that the European Union would be responsible for outside its own borders.

One does not have to look too hard at Figure 9 to notice something striking: Even assuming a very rigorous regimen of domestic reductions, the European Union's international mitigation efforts comprise the majority of its obligated reductions.



**Figure 9: The EU business-as-usual trajectory, reference trajectory, mitigation obligation, and emissions allocation. Beyond its no-regrets reductions (green wedge), EU mitigation obligation includes domestic reductions (blue wedge, showing reductions reaching a six-percent annual rate of decline) and international reductions (blue hatched wedge), which together fulfill the EU mitigation obligation.**

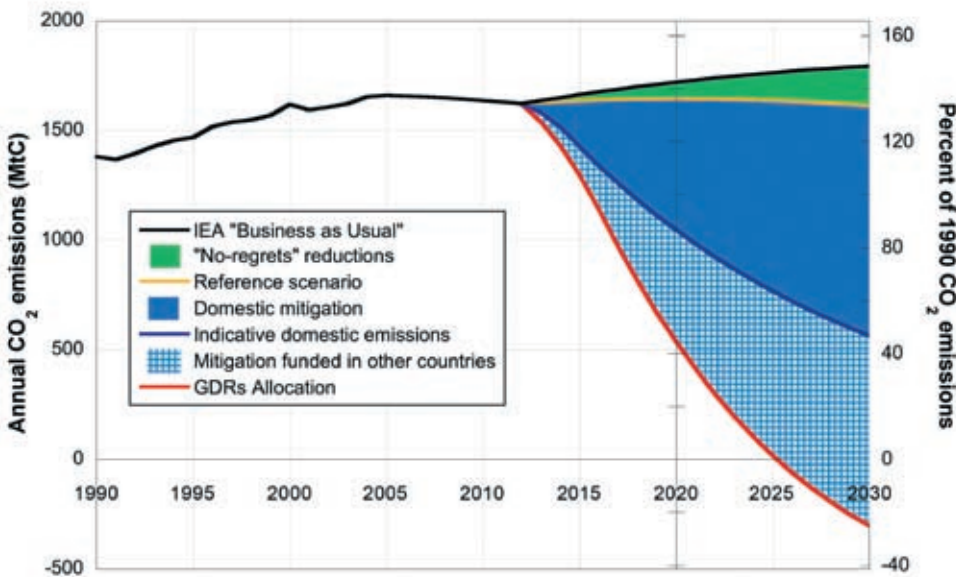
A greater rate of domestic reductions would, of course, reduce the European Union's need to fund international reductions. Conversely, the European Union could, at least in theory, refuse to make any reductions domestically, and instead purchase all its required reductions internationally. This latter approach, however, would be implausible, or irrational (or both) given that domestic reduction opportunities would accumulate unused while the national expenditure on internationally purchased reductions grew more and more taxing. Still, the possibility must be

considered, for it raises the specter that the European Union – or any other wealthy nation – could “buy its way out” of the need to make inconvenient domestic accommodations to the climate crisis. Such a choice would be both ethically problematic and politically dangerous – issues we will return to at the end of this chapter.

What this scenario illustrates – and indeed doing so is a major point of this exercise – is that even quite steep domestic emission reductions would only discharge a fraction of the mitigation obligations that, under a reasonable calculation of national responsibility and capacity, would properly fall upon the wealthy countries. This, again, is striking but not surprising. The underlying premise of the Greenhouse Development Rights framework is that the right to development must be safeguarded, and that doing so requires the world’s wealthier population to both free up sufficient space for the poorer nations and enable their rapid transition into low-carbon economies. The need for the European Union to accept a dual obligation in which it makes steep domestic reductions and also pays for major reductions internationally is merely the logical outcome of this premise.

## 5.2 The example of the United States

In Figure 10 we show a similar calculation for the United States. But rather than a domestic reduction wedge that thickens to 6 percent per year (mirroring the global reduction rate in the 2°C emergency pathway), we show an even more ambitious domestic reduction trajectory – call it Gore’s trajectory – that reduces national emissions to 90 percent below 1990 levels in 2050.



**Figure 10: The US business-as-usual trajectory, reference trajectory, mitigation obligation, and emissions allocation. Beyond its no-regrets reductions (green wedge), US mitigation obligation includes domestic reductions (blue wedge, showing reductions that will bring emissions to 90 percent below 1990 levels by 2050, following Gore) and international reductions (cross-hatched wedge), which together fulfill the US mitigation obligation.**

In this “90 percent by 2050” trajectory, domestic emissions decline by 6.7 percent annually, producing about 600 MtC per year of domestic reductions (not counting no-regrets reductions) in 2020. This reduction rate is greater than those mandated by even the strictest of the bills in play in the US. And again, even these rapid reductions would only satisfy a portion of the United States’ total obligation, the rest of which would have to be met by funding additional international reductions.

Which is as fine an opportunity as any to note that GDRs would substantially reframe the “international offsets” debate. Today, that debate turns on the limits that should, or should not, be placed on the ability of wealthy countries to purchase offshore reductions. The GDRs approach, however, implies that *rich nations have reduction obligations that are, quite properly, larger than their plausible domestic reductions*. The implication is that it is inevitable, and even desirable, for wealthy nations to pay for international reductions, and that the debate should focus not on limiting such payments but rather on ensuring that they are made in as fair and effective a manner as possible (both mechanisms and governance are at issue here). This reflects one of the chief outcomes of the Bali Conferences of the Parties (COP), in which all Parties ultimately agreed not only on the need for developed countries to provide technological and financial support for mitigation actions in developing countries, but to elevate that support to the status of a commitment that is “monitorable, reportable, and verifiable” (MRV).

### 5.3 The example of China

The complement to the situations illustrated above is the one in the developing world, where mitigation obligations are smaller than the roughly six-percent per-year global reductions that would be needed to maintain the 2°C emergency pathway. This situation is well illustrated by the cases of China (Figures 11 and 12) and India (Figure 13).

Here, the business-as-usual trajectory is the extrapolation of China’s emissions growth (as per the WEO 2007 reference scenario), and (as explained above) the no-regrets reductions (the green wedge) are taken as half the size of the McKinsey estimate. China’s mitigation obligation (the blue wedge) is calculated on the basis of China’s RCI, which at about ten percent is projected, in 2020, to be the world’s third largest, after only the United States and the European Union. Notably, we have no reason to believe that this result is in any way unreasonable. Significantly, this obligation could, at least in theory, be discharged entirely within China’s borders.

In Figure 12, below, we see the key to this story – how the GDRs framework drives decarbonization in the South – for it shows the large amount of additional emission reductions (the blue striped wedge) that are realized within China but enabled by countries with higher capacity and responsibility, in fulfillment of their own mitigation obligations, through MRV finance and technology. These reductions are absolutely necessary if these high-RCI countries are going to meet their obligations. They are also absolutely necessary if we are to keep within the 2°C emergency pathway, for China’s emissions are large and growing, and an ambitious program of mitigation in China is essential. To that end, the GDRs approach provides China with a framework within which to access the necessary financial and technological support. In a GDRs regime that is implemented via a system of tradable allocations,

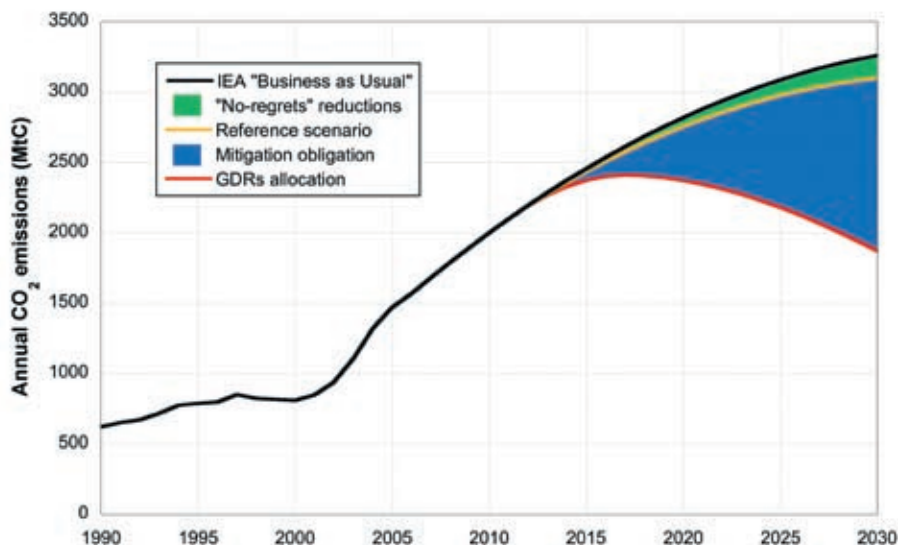


Figure 11: China's business-as-usual trajectory, reference trajectory, mitigation obligation, and emissions allocation. China's mitigation obligation (in addition to its no-regrets reductions) could be fully discharged domestically.

China would sell mitigation opportunities to countries that, in turn, need them to fulfill their own mitigation obligations. In a GDRs regime that was implemented via international funds, the transactions would take different forms, but the net effect – in terms of obligations, payments, and mitigation – would be roughly the same.

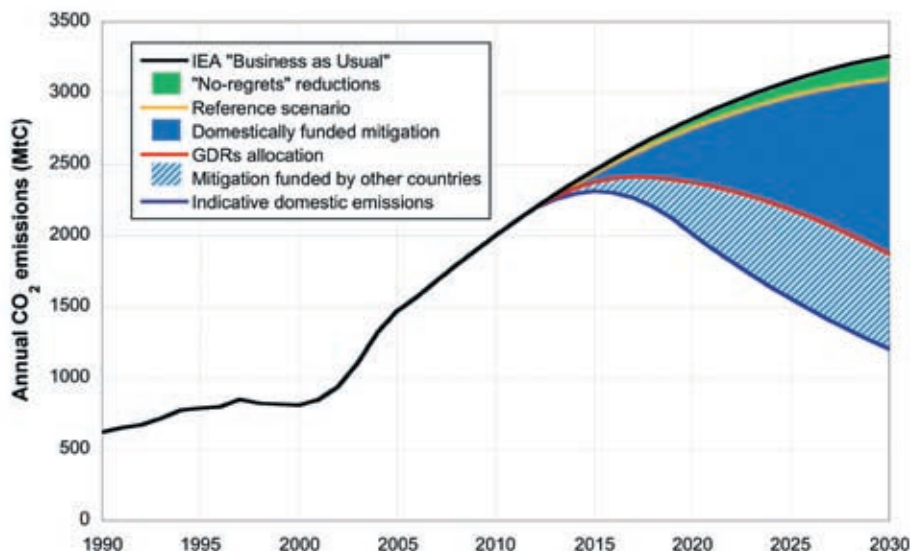
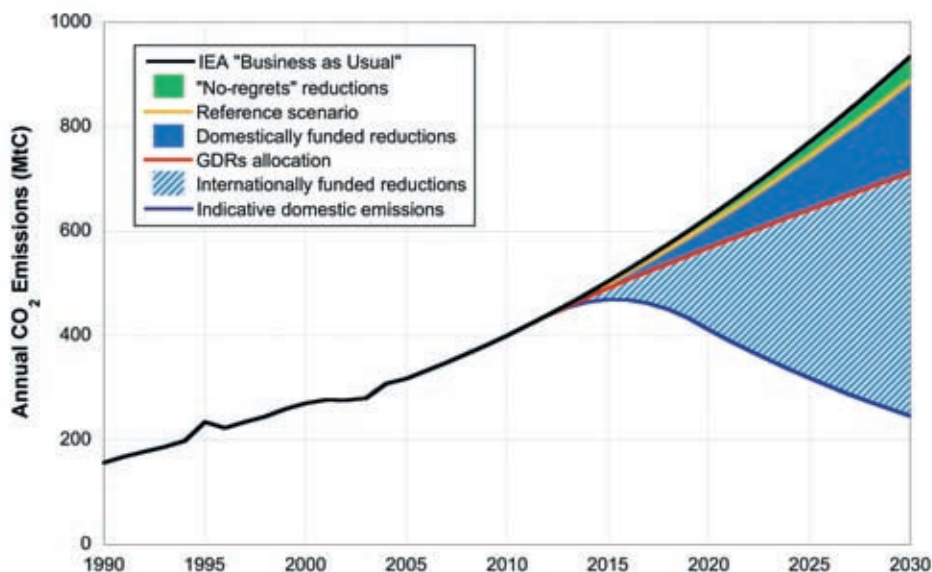


Figure 12: China's emissions including mitigation funded by other countries. The blue striped wedge represents mitigation in excess of China's obligations that are required to reduce China's emissions in a manner consistent with the global 2°C emergency pathway.

## 5.4 The example of India

India's situation is in one sense similar to China's. It is obligated to seize a certain fraction (again, we are assuming here that it is half) of its no-regrets reductions, and to make further modest reductions, corresponding to its share of the global mitigation burden. With a miniscule RCI of 1.2 percent of the global total in 2020, its mitigation obligation is only about 45 MtC per year, which can easily be met domestically.

In contrast, the reductions enabled within India by high-RCI countries fulfilling their mitigation obligations are huge (see the hatched wedge). Again, we see how the GDR framework drives decarbonization in the South – it compels wealthier, higher-



**Figure 13: India's business-as-usual trajectory, reference trajectory, mitigation obligation, emissions allocation, and externally funded mitigation. The blue striped wedge represents mitigation in excess of India's obligations that are required to reduce India's emissions in a manner consistent with the global 2°C emergency pathway.**

emitting countries to provide the technical and financial support to enable major developing-world emission reductions. Unlike China, which is in many ways atypical, the vast majority of reductions in India are enabled by international financial and technology transfers.

## 5.5 The trouble with trading

The prospect of international carbon trading is controversial, and even divisive.<sup>62</sup> But as argued above, some kind of trading may well be inevitable, and – embedded within a fair framework – desirable. Having said this, however, caveats are immediately necessary. Carbon trading systems must be well designed, well implemented, and well regulated. A tough-minded, sustained effort must also be made to ensure that, at the end of the day, they deliver on their promise of generating reductions – *real* reductions – cost-effectively. Cheap but illusory offsets (many of which are

being provided by the Clean Development Mechanism) are not a viable substitute, and CDM is hardly the only trading system suffering problems. The European Union's Emissions Trading System has been crippled – hopefully temporarily – by grandfathering and overgenerous allocations, and private carbon markets are a veritable Wild West of unsubstantiated reductions. All things considered, carbon trading has not been going well, and, at this point, the onus is on the policymakers to prove that they are capable of designing and enforcing market-based systems that can be widely accepted as being both legitimate and useful.

Such systems are possible, and there is no shortage of ideas for how to put them into practice. For example, there is a widespread new appreciation of the potential of auctioning systems, which in both the international<sup>63</sup> and domestic spheres<sup>64</sup> offer a number of major advantages over trading systems in which permits are given away to polluters. They are inherently less likely to be corrupted by lobbying for allowance giveaways and, since they imply a centralized financial authority (the governmental or multilateral body that conducts the auction), they are relatively easy to join with other multilateral institutions – such as, say, a greatly expanded version of the Multi-national Climate Change Fund proposed by Mexico or the Financial Mechanism proposed by the G-77 and China – which will become components of the UNFCCC's financing architecture.

More generally, effective and broadly participatory social and environmental safeguards must be built into all carbon-finance systems – international and domestic. This need is not limited to carbon trading or crediting systems. Any mechanisms that serves to channel large financial flows will be difficult to get right, and however they are structured, a great deal of civil society and governmental involvement and oversight will be necessary if they are to be both fair and effective. So, whatever institutions and mechanisms we finally choose to mediate and manage, the considerable international financial transfers that must, inevitably, be associated with a viable emergency program – whether these are fund-based or tax-based or auction-based or trading-based, whether they are public or private or hybrids of the two, whether they are tied to existing institutions like the World Bank or reformed versions of those institutions or new institutions that the climate regime will call into existence – will carry real risks. In every case, questions must be asked: about how the mechanisms work; about how transparent and accountable they are; about what strings are attached to them, and who is pulling these strings; about social and environmental safeguards; about governance. About who is hurt, and who benefits, and who decides.

All this is critical because, whatever we do, some people will be hurt during the greenhouse transition. Mitigation and even adaptation will have their winners and losers, and the costs to the losers cannot be blithely ignored in the interest of some putative larger good. Indeed, any claims to a larger good must, finally, be judged in terms of affected peoples, and whether they have real opportunities to assert their interests, and to decide how these interests are understood and acted upon.

### 5.5.1 Setting limits

One key justification for emissions trading is that it allows nations to choose how much of their mitigation obligation they will discharge domestically, and how much



internationally. This is extremely relevant, for the fact that countries may have obligations greater than their plausible rates of physical reductions – and possibly even greater than their total emissions – is central to the GDRs framework. It is by exercising their option to meet some of their obligations internationally, by paying for reductions in poor countries, that wealthy countries subsidize global decarbonization and leapfrogging.

But can this option be abused? What if wealthy countries try to “buy their way out” of the climate problem, by purchasing all or even most of their reductions internationally? To some degree, any true emergency program contains a built-in corrective to this problem, since domestic reductions within wealthy countries would rapidly become difficult to pass up as the pressures of the 2°C trajectory bear down and reductions in the South become more costly. But what if this is not a sufficient deterrent? After all, an emergency program will inevitably, at some point, require serious structural adjustments (on top of major technological changes), and would wealthy northerners not be willing to pay quite a premium to avoid such adjustments and preserve their high-carbon lifestyles?

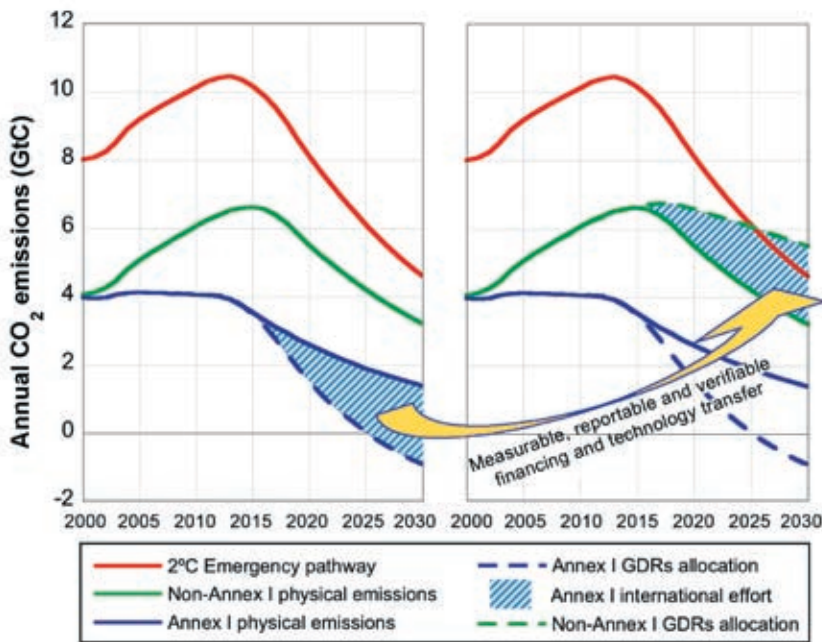
There are several issues here. One has to do with the path dependency of the carbon transition itself, which requires deep infrastructural change to start early and unfold over a long period of time (for example, the development of more compact urban forms to reduce transport requirements). Such changes will not be universally popular, and wealthy countries might indeed seek to dodge the resulting discord by avoiding domestic reductions in favor of purchased international reductions. Such a strategy, however, would be extremely short-sighted. Internationally purchased permits will almost certainly continue to rise in price, and at some point might simply become too scarce to be affordable. At that point, wealthy communities that have failed to take the necessary early, incremental actions would be sorely tempted to default on their obligations under the climate regime. If they do, then the regime – and the emergency program – would be in deep trouble.

A second problem arises from the reality of markets in an unequal world. The idealized view of emission markets assumes that the sellers of permits are acting voluntarily, and perhaps even reaping a handsome profit. In fact, markets of all sorts engage actors with widely disparate levels of power. In this context, it is not always easy to ensure that the permits being sold by the South – or rather the mitigation that generates these permits – arises from the implementation of low-carbon energy services, rather than from the involuntary sacrifice of energy services (and hence welfare) by politically weak communities that are not being sufficiently compensated, or compensated at all.

Finally, politics matters. Under the rigors of an emergency program, high levels of international cooperation and solidarity will be essential, and it is extremely unlikely that these can be sustained if wealthy countries are seen to be buying environmental space in order to prolong their enjoyment of high-emitting lifestyles. Nor is it structurally advisable for them to do so. Since it is unlikely that technological changes alone will be able to deliver the needed rates of emission reductions, the historically wealthy and high-emitting countries will have to help pioneer new kinds of low-impact lifestyles, of a kind that could be scaled up and be at least potentially adoptable by the growing global population. There is no way around it; this is not a story in which legitimacy and perceived justice are mere expendable ingredients.

These various issues suggest that it might be justified, under an emergency program, to compel northern countries to make domestic reductions of at least the same scale as those required globally. That is, that it might be justified to formalize the terms by which countries with dual obligations divide their efforts. There are a variety of way by which such “supplementarity rules” could be constructed, and they are all more or less outside the scope of this argument. But we will say that, while such rules would be sure to offend classically-minded economists, this does not seem, on balance, to be a decisive argument against them. Indeed, given the inauspicious experience with carbon markets so far, the case for such a “regulatory backstop” is strong.

In any event, any climate regime that safeguards the right to development will have to create channels capable of supporting large flows of resources from the wealthy countries to the poor. Such flows will be essential if the required mitigation is to become a reality in time. Hopefully, they can be mobilized in ways that reduce the worst risks of emissions trading (e.g., some combination of auctions and funds). Time will tell. In the meanwhile, we are compelled to admit that, both politically and institutionally, such international transfers will be difficult to achieve, and that, nevertheless, they are absolutely necessary. The world will not change while, at the same time, it stays essentially the same. Any climate regime that functions as just another brick in the wall of economic stratification will be rejected, and justly so.



**Figure 14: The necessity of northern support for mitigation in the South.** Even with extremely rapid domestic mitigation in the North (solid blue line), and even with substantial domestic mitigation in the South, proportional to its capacity and responsibility (the dashed green line), the North must also enable a large additional amount of southern mitigation (the striped wedge) through “MRV support” in order to stay on the 2°C Emergency Pathway.

# 6 Differentiation and sequencing

## 6.1 Escaping deadlock

The climate negotiations are adrift. They are, to be sure, entering a frenetic and unpredictable phase, but they are still, fundamentally, adrift. The breakthrough we require does not seem to be on the horizon, and with the level of North / South distrust high and the economic crisis casting everything into doubt, the dangers are clear. Chief among these, we fear, is a victory so incremental that it amounts to failure – one that appears to take us forward, but ultimately fails to engender the vastly increased resolve that will be required if we are to rapidly alter today's terrifying emissions trajectories.

What is needed is a destination and, equally, a pathway by which to arrive there. So far in this report, we have focused on the first of these – the destination, which we see as a robust (and thus, necessarily, principle-based) effort-sharing framework. Without such a framework, we have argued, the emergency climate mobilization we so urgently need will remain stalled amidst endless disagreement over who should do what, and when, and how. We will be left, as we have been so many times in the past, with only the desperate hope for technological deliverance.

To avoid that fate, we require a simple, transparent, and compelling effort-sharing framework, one that is robust enough to be universally applicable, and to make sense even when comparing wealthy, middle-income, and poor countries, each with skewed – and often highly skewed – income distributions. Such a framework must be built upon the principles of “common but differentiated responsibilities and respective capabilities,” and, crucially, it will have to explicitly preserve a coherently defined right to sustainable development. These are the qualities that a differentiation scheme must have if it is to be more than a mere policy abstraction, if it is to serve as the backbone of a viable climate protection architecture.

The destination is, we believe, clearly captured by the GDRs framework. Not that we presume that our particular quantitative results – relying as they do on the datasets now available, and the assumptions we consider most defensible – are in any sense the last word. Nor, for that matter, will we fight to defend our particular framing – what we have called “costs” can also be called “investments” or “opportunities.” But we do argue that differentiation is absolutely unavoidable, and that – once it is fully deliberated and vetted – a scheme that is broadly like the one outlined here will be needed if we are to avert a protracted series of more or less ad hoc agreements that assign countries semi-arbitrary obligations within semi-arbitrary annexes, and if, most importantly, we are to break the impasse that prevents a global emergency mobilization.

But a sense of the destination is not enough. We also need a way forward. For while ad hoc, tactical incrementalism would be a losing strategy, incrementalism of

some sort is unavoidable. The divide between today's temporizing and tomorrow's mobilization will not be bridged in a single step. But since we must nonetheless take a next step, the question is: What is it going to be? Which is to say that the Copenhagen problem is, essentially, a sequencing problem. Which is to say that the question is: What comes next?

At least we know that it cannot be another step like the one taken in Kyoto, way back in 1997. It is too late, and another step like that – arduous and protracted and small – would leave us in deep trouble. We also know that – fond though we may be of the GDRs analysis and the sense of a destination that it offers us – the path forward will be difficult, and indeed bitterly fought over. What this means, above all, is that we have to attend to the impasse.

The world follows a complex and varied course. It cannot be fully captured by any top-down, principle-based scheme such as GDRs, which is ultimately and inevitably ahistorical. Given this, it is no surprise that the analysis above understates the politics that got us to this impasse, and the political accommodations that will be required to get us beyond it. It neglects, in particular, the trust deficit that plagues North-South relations – one so large and so deep-rooted that it effectively rules out the simplest and most attractive way forward, in which the North and the South each straightforwardly commits to carrying its “fair share” of the climate burden.

To begin with the North, how could this ever be possible, given that it is so deeply suspicious of any agreement that would have it provide large-scale financial and technological support to the South – “measurable, verifiable and reportable” or not? When it questions the South's ability to effectively absorb such support, and to ensure its productive use in fighting climate change? When it remains stubbornly unconvinced that the South is committed to solving the climate problem, and fears the lock-in of an architecture in which the emerging powers of the South forever free-ride on Annex I efforts? When, perhaps most critically, such fears as these provide it with a ready-made menu of justifications for protracting its own free-riding?

In fact, there is very little reason to believe that North to South technological and financial flows of the necessary scale would ever be forthcoming in any regime in which only countries of the North have quantified commitments. The well-off citizens of the North, faced with demanding obligations, will demand in turn that their southern counterparts face parallel, “fair share” efforts of their own, and will make such parallelism a condition of their own full participation in any climate stabilization regime. This is, if not a fact, a hypothesis of such obvious and powerful resonance that it can almost be taken as a fundamental axiom of global climate politics.

The South, for its part, is unlikely to accept such parallel efforts, even if the efforts are defined in a rigorously principle-based way that genuinely safeguards its right to development. Indeed it can also be taken as axiomatic that the deep distrust that pervades the South will not easily yield to even the crushing necessities of the climate crisis. For the South's distrust is rooted in the North's repeated failure to meet its UNFCCC and Kyoto commitments to provide technological and financial support for both mitigation and adaptation, and beyond these, its protracted history of self-interested and even bad-faith negotiations in all sorts of other multilateral regimes (the trade and intellectual property negotiations come particularly to mind). The South fears, in particular, that if it were to accept its fair share of the climate burden, the North's negotiators would simply and immediately take unfair advantage of its flexi-

bility, holding it hostage to its newly made commitments while continuing to dodge its own. This is simply too big a risk to take. Fossil fuels have driven development to this point, and the countries of the South are not about to sign away their right to follow along this proven pathway, not without the North's demonstrated willingness to help chart out, and indeed pave, an alternative course.

## **6.2 A trust-building period**

We can afford no further delay in launching a full-on global emergency climate mobilization. But neither can we yet rally the resolve and cooperation needed to put such a mobilization into place. In this fraught state, there is little choice but to allow ourselves an interim period of what we will call "trust building," though the term – which can be easily though incorrectly taken to imply further delay – is not ideal. Indeed, action and preparation for further action are the only really viable foundations for trust-building, and in any case this transition period should be as short as we can possibly manage, with only the stipulation that it be long enough to build the political foundations of a subsequent era of much more unified and ambitious action.

A trust-building period thus must start as soon as possible – the remaining years of the Kyoto Protocol's first commitment period must inevitably be seen as part of it – and should not drag on farther than, say, an additional three years. That would take us to 2015, which will be very late in the game indeed if we actually intend to bend the global emission curves down rapidly enough to hold the 2°C line.

### **6.2.1 What the North must do to build trust**

The trust we need will not come easily, and both the North and the South will have to take bold steps if there is to be any real hope. The North, in particular, has much to do to convince the world that it is in fact willing to engage seriously in a global effort to protect the climate. To that end, it must unequivocally demonstrate its readiness to reduce its domestic emissions, in support of a strict, precautionary effort to avoid destabilizing the climate. After having entirely neglected its Rio promise to stabilize emissions at 1990 levels by the year 2000, and after the past decade of half-efforts to meet its Kyoto commitments (and, in the case of the United States, of entirely shunning them), the North will have to step it up massively if it expects the rest of the world to likewise engage. In particular, it must demonstrate a willingness to go well beyond no-regrets abatement measures, and ramp up mitigation efforts at a rate that will enable it to rapidly converge upon a genuine emergency emission stabilization pathway.

Second, the countries of the North must commit, and begin to deliver, the technological and financial support needed to accelerate mitigation in developing countries. The CDM is not remotely sufficient in this regard. Not only have too many of its resources gone toward activities that generate no additional mitigation, but even the legitimate fraction has served only as an offset, allowing the North to slacken its own domestic efforts. Investments in reducing emissions from deforestation and land degradation, flexibility on climate-related intellectual property rights (IPRs), institutional capacity-building and policy support are all desperately needed. Through such measures, the North must establish – by unambiguous and practical action – that it is

eager to help the South launch its own transition to a low-carbon development path, and – as it agreed in Bali – it must do so in a manner that is monitorable, reportable, and verifiable.

Third, the North will have to follow through – in more than token ways – on its lingering promises from Rio (especially Article 4 of the UNFCCC) to provide developing countries with adaptation funding that is both “new and additional” and “predictable and adequate.” The North’s willingness to almost entirely ignore these commitments – and in some cases to actively obstruct their fulfillment – has been a source of well-justified bitterness on the part of the South, a bitterness which has only grown as the need for active, ambitiously scaled adaptation efforts has become more evident. If the North fails to start mobilizing resources to support the most urgent of the South’s adaptation needs, it will be an extremely dark portent, an almost certain sign of failure to come.

Fourth, the North must move to create a negotiating environment that is more transparent and less procedurally unequal. The South’s reluctance to negotiate more proactively – assuming instead the defensive posture of indefinitely waiting for the North to “take the lead” – is in no small measure due to the fear that, were it to seriously engage, it would then be outmaneuvered or, even worse, defeated with strong-arm tactics. The priority given to the maintenance of solidarity in the G77/China, in spite of the obvious divergence of interests, is ample evidence of this fear. Thus, the North must initiate a new era of good faith negotiations, which it could open by making substantive investments designed to help the negotiating teams of the South build their analytical and negotiating capacity.

Finally, and as a matter of realism, it is likely that the North will not be able to come forward with enough short-term climate-related actions to effectively signal its readiness to finally act – aggressively and in good faith. In particular, a massive domestic inertia, abetted by its powerful corporate lobbies, hobbles the North’s ability to act with the necessary decisiveness. Given this, if northern governments indeed set out to cut quickly through southern cynicism, they may need to supplement their climate-related overtures with action in linked realms that are traditionally seen as “non-climate-related.” Long-standing southern concerns – such as those related to northern agricultural trade barriers and subsidies, or odious foreign debt – would be good places to look for dramatic unilateral measures by which the North could quickly build trust.

### 6.2.2 What the South must do to build trust

The South, too, must act dramatically to overcome the international trust deficit. This is the case not only in the more affluent of the southern countries, such as Singapore and South Korea, but also in China, which – though suffering a relatively low, average per-capita income – nevertheless has, and is known to have, a significant capacity to act. Such countries must act. Unless they do, no trust-building period can possibly be successful. The question is how they must act, and here we are compelled to emphasize one word above all others: *voluntarily*.

We say this despite even our own calculations, which suggest that an RCI-based reckoning of the South’s obligation is sizable, amounting to perhaps one-quarter of the global total. We do so for the obvious reason that a legitimate trust-building



process simply cannot push legally-binding mitigation commitments onto the non-Annex I countries. The course of the negotiations thus far, and the failure of the North to demonstrably “take the lead,” has made this a simple fact of life. Indeed, the depth of the North / South impasse – a call to realism if ever there was one – compels us to note that, in the extreme case, there may not be a single non-Annex I country of any wealth or size that is prepared to accept legally binding commitments. Nor is this what is asked of them by the Bali agreement, which calls only for “nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner.”<sup>65</sup>

Still, for all this, we can reasonably ask developing countries to begin to put real mitigation measures into effect, and – in countries with significant responsibility and capacity – we can ask that these be of a significant scale. First, the developing world must demonstrate to the North that it is both willing and able to engage with the North’s steps to provide monitorable, reportable, and verifiable technological and financial support from the North, as it arrives. The countries of the North, after all, will be both unwilling and unable to commit to major finance and technology transfer to southern partners, unless they can also demonstrate – to themselves and to the inevitable domestic opponents of such “aid” and “giveaways” – that it will be effective. This will entail much more than the minimal efforts that the South has had to make to host CDM projects. Rather, it will require the South to concretely demonstrate its willingness to effectively engage with MRV support, to move – quickly, comprehensively, efficiently, and transparently – to effectively utilize such support, and to scale up this engagement as needed as the trust-building period expands into the much more challenging period of North-South cooperation that will have to follow.

Second, we believe a trust-building period will require some developing countries to act even beyond the scope of MRV support. Again, these actions would have to be voluntary, and would focus primarily on identifying and exploiting no-regrets options, and on measures that have significant sustainable development co-benefits. But this is not to say that they should not go further, toward additional measures motivated primarily by climate mitigation. Expectations in this regard, however, should be carefully tempered, and must be attuned to each country’s responsibility and capacity. Lest we forget, such expectations can only be calibrated to the North’s own efforts, which will be closely scrutinized by the developing countries and taken as clear markers of the North’s seriousness – about both the climate crisis and laying down the groundwork for a viable response. The critical point is that, while the South’s short-term efforts might not measure up to a strict, RCI-derived accounting of its share of the required global obligation, it might nevertheless accomplish a great deal. The South can actually achieve quite a lot while pursuing its sustainable development objectives, even without relying wholly on northern support.

Indeed, this appears to be the emerging trend. Prominent examples include: South Africa’s commitment to drive toward an emissions peak by 2025 – a commitment that is linked to, but by no means wholly dependent on, support from the North<sup>66</sup>; South Korea’s announced intention to “vigorously support the long-term goal of cutting in half global greenhouse gas emissions by the year 2050” by adopting a voluntary emissions target<sup>67</sup>; India’s National Action Plan on Climate Change,<sup>68</sup> which includes the inspiring goal of ramping up India’s photovoltaic production

capacity to one gigawatt per year; and, crucially, the recent Chinese “white paper” – China’s Policies and Actions for Addressing Climate Change<sup>69</sup> – which announces an extremely broad program of policies and actions that, while not fully implementable without northern support, China nevertheless intends to formalize and to begin moving forward on. Note also that by calling attention to the fact that developing countries are already taking meaningful actions that are not officially recognized, South Korea has proposed that the UNFCCC secretariat establish a “Voluntary Registry” through which such actions can be formally and explicitly documented and recognized.

Finally, the South must demonstrate that it is serious in its oft-professed desire to prioritize poverty eradication and sustainable human development. In this regard, it is important to emphasize that the mitigation efforts that the South would be implementing during the trust-building phase – that is, its no-regrets options, further voluntary mitigation in rough proportion to its RCI-based obligation, and additional mitigation with MRV support – could be pursued in a manner that draws no resources whatsoever from citizens living below the development threshold, and hopefully would even benefit them. Which is to say that the necessary mitigation measures could be implemented without compromising any sustainable development priorities, providing only that countries are willing to pass on the costs to their consuming classes, rather than their poor. Countries that prove unwilling to do just this cannot expect to be taken seriously, if they subsequently insist that “development comes first.”

### **6.3 “Comparability of effort”**

The trust-building period, whatever form it takes, will be a tense one. During it, both the North and South will have to make more than token efforts to limit their emissions, and both will have to adapt to the rapidly emerging political realities of a climate-constrained world. From here on out, ready or not, countries will not only be judged by the opportunities they offer their citizens, by the strengths of their democracies, and the vibrancies of their cultures; they will be judged as well by whether they carry their proper share of the global climate burden.

For the moment, such judgments must err on the forgiving side because, urgent though the situation is, the near future will see only a modest level of ambition – modest at least when compared to the level of ambition that the climate crisis actually warrants. A true global mobilization – unfortunately but unavoidably – will come only after we have successfully met the challenges of the trust-building period.

These, fortunately, are all “critical path” challenges that must in any case be solved, so that a trust-building period does not condemn us to further lost time. What it does demand is the honest realization that the background of the negotiations has shifted. It is no longer a simple matter of countries agreeing, as in Kyoto, to commitments that meet the benchmark of domestic political acceptability. There is now a widespread, extremely watchful expectation that countries contribute in rough accordance with their responsibility and capacity, defined in globally acceptable terms, and there is an increasingly obvious need to measure this “comparability of effort” in a coherent and transparent manner. After all, weak action on the part of countries that should be taking strong action would be extremely corrosive. It would be seen by all as evidence that the consensus for a global solution is failing to materi-

alize. As such, it would harden the natural inclination, shared by all countries, to invest in their own short-term interests rather than preserving the commons. Which is to say that the great shift we now need – from “What is in it for us?” to “How can we help?” – will only be possible in a world where, implicitly or explicitly, the shared background of the negotiations is that fairness is the common goal.

It is not too much to assert that, as we approach Copenhagen, it has become critical to lay the groundwork for a common global understanding of “comparability of effort”. Note also that when we say “global,” it is with the full knowledge that the Bali Action Plan applies the phrase only to Annex I. We do not intend to imply otherwise, but we nevertheless must insist that comparability of effort is exactly what is needed, and that we will all have to take it much more seriously than we have in the past. Which is to say that, after years of loose and largely academic debate about fair global effort-sharing frameworks, we must now become both serious and practical. In fact, during any meaningful trust-building period, practical ways of understanding, assessing, and explaining comparability of effort would have to emerge – visibly and publically – as major building blocks of the future regime. In particular, framework proposals like Greenhouse Development Rights and those based on the UNFCCC’s official equity principles will have to be developed, deliberated, and vetted to the point where they can effectively and legitimately be used as guides to comparability.

We would go so far as to claim that the elaboration of principle-based measures of effort, like the RCI we have introduced above, would itself be an important indicator of success in Copenhagen. We would also claim that if the current round of negotiations succeeds, we will know this in part because a coherent and public conversation about “fair shares” of the global effort will have come into far greater prominence, and given credence in the use of explicit quantitative indicators for assessing performance with respect to those “fair shares.”

Such assessments will have to be flexible. In particular, they will have to accept a variety of types of commitments – some of them softer and more implicit than we might perhaps wish. Among the Annex I countries, of course, commitments should carry the force of law, and take the clear, unambiguous form of legally binding, quantified emission targets. But for the developing world, we will have to allow considerable flexibility, certainly in the near term. We will have to accept a variety of voluntary efforts – from South Africa’s emission targets, to China’s efficiency targets, to India’s solar production targets – as legitimate contributions toward a common “fair shares” effort. While the accounting challenges posed by the need to monitor, report, and verify such diverse efforts would no doubt be greater than those posed by a regime in which there were similar, legally binding emission targets all around, the final outcome in terms of actual emission reductions could be just as good. It could indeed be far better, because unlike the formal, legally binding alternative, a more flexible approach might actually be embraced by the South.

Though flexible in form, developing-country efforts must also reflect some meaningful kind of non-Annex I differentiation, as contentious as this may seem. Nor would this be an unprecedented step. Such differentiation is already suggested by the Bali Action Plan, in terms such as “nationally appropriate” and “in the context of sustainable development.” Note also that it can be *de facto* rather than *de jure*. As much as some Annex I countries may wish for a strict system in which developing countries graduate into Kyoto-style quantified emission targets, it is not necessary.

What clearly is necessary is that differentiation manifests itself in bottom-line reductions that developing countries ultimately achieve via nationally appropriate mitigation actions. Because, ultimately, what all the world will be watching to see is whether the efforts of the key developing countries – voluntary though these efforts may be – bear any defensible relationship to their legitimate share of the global effort, and are in rough proportion to their responsibility and capacity.

The key words here are “rough proportion.” During the trust-building period, we cannot expect the RCI, or any such gauge of effort, to be applied with the force of law. At the same time, the actions of the relatively wealthy and high-emitting countries of the South will be watched very closely indeed. If South Korea, Singapore, and the United Arab Emirates do not appear to be doing at least as much as – or indeed, more than – the much poorer countries of Annex I, such as Ukraine and Belarus, they would obviously be free-riding. Even worse, they would also be undermining any claim that principle-based differentiation is an important ingredient of a robust effort-sharing agreement for the future. In particular, they would be undermining their own claim that the wealthy Annex I countries must finally accept their disproportionate but fair share of the global obligation to act. This, too, cannot be allowed.

All this has implications. It means, particularly, that the populations of the North must somehow be brought to an understanding of the economic division between rich and poor that defines our times, and of what it implies for the near-term structure of the climate regime. In particular, if flexible participation with *de facto* differentiation is to be the vehicle by which the developing countries enter the climate regime, then it will be quite essential that this is understood – across nations and classes and even in the United States – as being just and proper. It is action, and not legal commitments, that matter, and people must learn to make the necessary distinctions. Brave sorts of education campaigns will be essential, campaigns that link climate obligation to development and inequality. We need to move, quickly and aggressively, beyond the world of the Byrd-Hagel Resolution.<sup>70</sup>

This is not all. As Al Gore, quoting Winton Churchill, has emphasized, we are entering a “time of consequences.” At this point, if any nation from which the global community can reasonably expect resolute action continues to temporize, and if – even within a critical, last-ditch international trust-building period, one upon which everything depended – it still refused to make good faith efforts to meet its fair share, there would have to be consequences, and even sanctions, against it. There is no longer any latitude for denial or apology.

All of which leaves us with a conundrum. We call for an “emergency mobilization” but argue that a “trust-building period” must come first. Is this not a contradiction? We do not believe that it is, for – along with many others – we have concluded that at this point, a true mobilization can only begin with a concerted effort to build solidarity and resolve. Still, the situation is fraught and time is very short. The global emission curves must soon be bent sharply downward, to the point that, in the next decade, they have flattened and entered a rapid and sustainable decline. Given this, we only have one chance to get things right. The trust-building period is going to have to end with trust built, and soon. Failure is not an option.

## 7 Last words

It is time now to act in good faith. Many years have passed since ignorance of climate change could honestly be cited as an excuse for inaction. The climate problem is now a climate crisis, and it is time – past time really – to admit it. Prudence no longer means modest, measured, and gradual action. Indeed, the only prudent course left to us is an emergency mobilization.

It is time, in particular, to stop pretending that the climate crisis can be addressed on its own, and that the crisis of development and inequality is another matter. Only a regime that structurally encompasses the right to sustainable development has any real hope of catalyzing the necessary emergency mobilization, and then supporting that mobilization as it becomes a long transition into the post-fossil age. Difficult though it may be to admit it – as the climate agenda is already overwhelming on its own terms – meaningfully recognizing the right to sustainable development inevitably means taking account of inequality within nations as well as inequality between them.

Such inequality is still a taboo subject, at least when it comes to the mainline of climate policy. But the longer we fear this taboo, the greater our risk of not only continued impasse, but also incoherence and irrelevance. This is clear in the “What about China?” gambit that is now so popular in Washington, a gambit that presents Shanghai’s affluent enclaves as if they were the whole of the Chinese nation, and thus allows the American rich to hide behind the Chinese rich. It is clear as well in the rhetoric popular in New Delhi, in which official spokesmen can point to India’s “very, very large number of poor people” as a justification for the suggestion that, as long as India’s average per-capita emissions remain below those of the North, its citizens – including its complement of high-emitting consumers – are in full moral compliance with their mitigation obligations.<sup>71</sup> Let us be clear: With words like this, India matches the US gambit with a better one, in which India’s rich hide not only behind the North’s rich, but behind India’s poor as well.

The way forward out of this macabre dance is to recognize that the right to development adheres not to nations, but to people, that it can only be a right to sustainable development, and that the wealthy – whether they live in Washington or London, Shanghai or New Delhi – share a global obligation to protect the climate. The alternative to this realization is to sit helplessly by as endless negotiations – blithely treating Parties as idealized monolithic nations – come finally to delegitimation and failure.

It must also be said that this is not to claim that the climate regime can solve all the problems of the world. Inequality preceded the climate crisis, and there is little doubt that it will survive past the coming peak in global greenhouse gas emissions. But in a world as bitterly divided as ours, a viable climate regime must at least do no harm, and this means that it must not erect further barriers to the progress of the poor. The virtue of the Greenhouse Development Rights approach is that it heeds this



imperative; indeed, it is because it does so that we can claim that the GDRs approach is in fact realistic, in the new sense demanded by the logic of the greenhouse age. If the cost of this realism is that, in the end, both mitigation and adaptation must be financed via a fairly modest responsibility and capacity “tax” on the consumption of the relatively wealthy (for this, in the end, is what GDRs amounts to), well, what is this but a further realism about our actual conditions of life on this shared, finite planet?

In the meanwhile, do not confuse the expediency of the currently possible with the realism demanded by a 2°C emergency program. Because if we manage to avoid a truly global climate catastrophe, it won’t be by much. And the sooner the architecture of the climate regime – and our own expectations as global citizens – are aligned to match the real structure of the climate problem, the better our chances will be.”



*Delegates gather in the plenary session on the final day of negotiations at the United Nations Climate Change Conference in Nairobi, Friday, 17 November, 2006.*



# Appendix

**Table A1: Percentage shares of total global population, GDP, capacity, responsibility, and RCI for all 195 countries in the GDRs database, plus selected groups of countries. Based on projected emissions and income for 2010, 2020, and 2030. (Projections based on International Energy Agency World Energy Outlook 2007.)**

GDRs results for all countries							
	2010					2020	2030
	Population (percent of global)	GDP per capita (\$ US PPP)	Capacity (percent of global)	Responsibility (percent of global)	RCI (percent of global)	RCI (percent of global)	RCI (percent of global)
Afghanistan	0.53	779	0.00	0.00	0.00	0.00	0.00
Albania	0.05	6,690	0.01	0.00	0.01	0.01	0.01
Algeria	0.52	8,431	0.22	0.14	0.18	0.23	0.27
Angola	0.27	4,005	0.03	0.02	0.03	0.03	0.03
Antigua and Barbuda	0.00	16,763	0.00	0.00	0.00	0.00	0.00
Argentina	0.59	12,406	0.65	0.48	0.57	0.59	0.61
Armenia	0.04	5,302	0.01	0.00	0.01	0.01	0.01
Australia	0.31	33,880	1.42	1.99	1.71	1.54	1.39
Austria	0.12	38,040	0.64	0.42	0.53	0.46	0.39
Azerbaijan	0.13	5,438	0.02	0.02	0.02	0.03	0.04
Bahamas, The	0.01	20,881	0.01	0.02	0.01	0.01	0.02
Bahrain	0.01	38,700	0.06	0.12	0.09	0.10	0.11
Bangladesh	2.43	1,344	0.00	0.00	0.00	0.00	0.01
Barbados	0.00	19,864	0.01	0.01	0.01	0.01	0.01
Belarus	0.14	11,050	0.10	0.09	0.10	0.13	0.15
Belgium	0.16	35,553	0.75	0.73	0.74	0.64	0.54
Belize	0.00	6,626	0.00	0.00	0.00	0.00	0.00
Benin	0.14	1,287	0.00	0.00	0.00	0.00	0.00
Bhutan	0.01	4,632	0.00	0.00	0.00	0.00	0.00
Bolivia	0.15	4,705	0.04	0.02	0.03	0.04	0.05
Bosnia and Herzegovina	0.06	7,433	0.02	0.01	0.02	0.03	0.04
Botswana	0.03	14,327	0.04	0.01	0.03	0.03	0.03
Brazil	2.91	9,442	2.28	1.12	1.70	1.73	1.74
Brunei	0.01	58,065	0.05	0.03	0.04	0.05	0.05

## GDRs results for all countries

	2010					2020	2030
	Population (percent of global)	GDP per capita (\$ US PPP)	Capacity (percent of global)	Responsibility (percent of global)	RCI (percent of global)	RCI (percent of global)	RCI (percent of global)
<b>Bulgaria</b>	0.11	13,219	0.12	0.12	0.12	0.18	0.23
<b>Burkina Faso</b>	0.23	1,096	0.00	0.00	0.00	0.00	0.00
<b>Burundi</b>	0.14	325	0.00	0.00	0.00	0.00	0.00
<b>Cambodia</b>	0.22	1,808	0.00	0.00	0.00	0.00	0.00
<b>Cameroon</b>	0.29	2,185	0.00	0.00	0.00	0.00	0.01
<b>Canada</b>	0.49	38,472	2.62	3.24	2.93	2.67	2.44
<b>Cape Verde</b>	0.01	2,799	0.00	0.00	0.00	0.00	0.00
<b>Central African Republic</b>	0.07	726	0.00	0.00	0.00	0.00	0.00
<b>Chad</b>	0.17	1,566	0.00	0.00	0.00	0.00	0.00
<b>Chile</b>	0.25	13,985	0.35	0.21	0.28	0.30	0.30
<b>China</b>	19.71	5,899	5.82	5.18	5.50	10.36	15.24
<b>Colombia</b>	0.70	6,636	0.30	0.15	0.23	0.24	0.25
<b>Comoros</b>	0.01	1,235	0.00	0.00	0.00	0.00	0.00
<b>Congo, Democratic Republic of the</b>	1.01	281	0.00	0.00	0.00	0.00	0.00
<b>Congo, Republic of the</b>	0.06	3,673	0.01	0.00	0.00	0.01	0.01
<b>Cook Islands</b>	0.00	12,441	0.00	0.00	0.00	0.00	0.00
<b>Costa Rica</b>	0.07	10,083	0.05	0.01	0.03	0.04	0.03
<b>Cote d'Ivoire</b>	0.30	1,817	0.00	0.00	0.00	0.00	0.00
<b>Croatia</b>	0.06	16,734	0.10	0.06	0.08	0.10	0.10
<b>Cuba</b>	0.16	6,582	0.02	0.02	0.02	0.04	0.06
<b>Cyprus</b>	0.01	29,109	0.04	0.04	0.04	0.04	0.04
<b>Czech Republic</b>	0.15	25,498	0.46	0.61	0.53	0.53	0.50
<b>Denmark</b>	0.08	37,863	0.42	0.35	0.38	0.32	0.27
<b>Djibouti</b>	0.01	2,091	0.00	0.00	0.00	0.00	0.00
<b>Dominica</b>	0.00	8,396	0.00	0.00	0.00	0.00	0.00
<b>Dominican Republic</b>	0.15	6,083	0.05	0.03	0.04	0.04	0.05
<b>Ecuador</b>	0.20	7,703	0.12	0.06	0.09	0.10	0.10
<b>Egypt</b>	1.16	5,166	0.16	0.11	0.13	0.18	0.25
<b>El Salvador</b>	0.10	5,770	0.03	0.01	0.02	0.02	0.02
<b>Equatorial Guinea</b>	0.01	18,607	0.03	0.01	0.02	0.02	0.02
<b>Eritrea</b>	0.08	569	0.00	0.00	0.00	0.00	0.00
<b>Estonia</b>	0.02	21,366	0.05	0.07	0.06	0.06	0.06
<b>Ethiopia</b>	1.24	683	0.00	0.00	0.00	0.00	0.00
<b>Fiji</b>	0.01	5,680	0.00	0.00	0.00	0.00	0.01
<b>Finland</b>	0.08	34,163	0.35	0.34	0.35	0.30	0.25
<b>France</b>	0.91	33,953	4.13	2.38	3.25	2.80	2.30
<b>Gabon</b>	0.02	15,822	0.03	0.02	0.03	0.03	0.03

## GDRs results for all countries

	2010					2020	2030
	Population (percent of global)	GDP per capita (\$ US PPP)	Capacity (percent of global)	Responsibility (percent of global)	RCI (percent of global)	RCI (percent of global)	RCI (percent of global)
Gambia, The	0.03	1,165	0.00	0.00	0.00	0.00	0.00
Georgia	0.06	4,619	0.01	0.00	0.01	0.01	0.01
Germany	1.20	34,812	5.61	5.33	5.47	4.71	3.97
Ghana	0.36	1,295	0.00	0.00	0.00	0.00	0.00
Greece	0.16	32,927	0.71	0.55	0.63	0.56	0.48
Grenada	0.00	7,682	0.00	0.00	0.00	0.00	0.00
Guatemala	0.21	4,270	0.03	0.01	0.02	0.02	0.02
Guinea	0.15	1,200	0.00	0.00	0.00	0.00	0.00
Guinea-Bissau	0.03	487	0.00	0.00	0.00	0.00	0.00
Guyana	0.01	3,534	0.00	0.00	0.00	0.00	0.00
Haiti	0.15	1,351	0.00	0.00	0.00	0.00	0.00
Honduras	0.11	3,489	0.01	0.01	0.01	0.01	0.01
Hungary	0.15	21,733	0.35	0.24	0.30	0.31	0.29
Iceland	0.00	38,480	0.02	0.02	0.02	0.02	0.01
India	17.17	2,818	0.66	0.30	0.48	1.18	2.34
Indonesia	3.41	4,146	0.27	0.14	0.21	0.45	0.77
Iran	1.08	11,006	0.86	0.89	0.88	1.13	1.37
Iraq	0.43	3,115	0.02	0.03	0.02	0.03	0.05
Ireland	0.07	39,205	0.36	0.24	0.30	0.26	0.22
Israel	0.11	26,625	0.36	0.31	0.33	0.36	0.36
Italy	0.86	31,315	3.52	2.64	3.08	2.70	2.28
Jamaica	0.04	6,931	0.02	0.03	0.03	0.03	0.03
Japan	1.86	33,422	8.27	7.28	7.77	6.61	5.48
Jordan	0.09	4,763	0.01	0.01	0.01	0.01	0.02
Kazakhstan	0.23	10,544	0.16	0.33	0.24	0.32	0.38
Kenya	0.59	1,456	0.01	0.00	0.01	0.01	0.01
Kiribati	0.00	1,607	0.00	0.00	0.00	0.00	0.00
Korea, Dem. Rep.	0.35	2,339	0.00	0.01	0.01	0.02	0.04
Korea, Rep.	0.72	23,674	2.00	2.01	2.01	1.94	1.84
Kuwait	0.04	50,638	0.31	0.37	0.34	0.37	0.38
Kyrgyzstan	0.08	2,065	0.00	0.00	0.00	0.00	0.00
Laos	0.09	2,280	0.00	0.00	0.00	0.00	0.00
Latvia	0.03	17,098	0.06	0.03	0.04	0.04	0.04
Lebanon	0.06	11,473	0.06	0.04	0.05	0.06	0.07
Lesotho	0.03	1,565	0.00	0.00	0.00	0.00	0.00
Liberia	0.06	311	0.00	0.00	0.00	0.00	0.00
Libya	0.10	14,380	0.13	0.18	0.16	0.17	0.18
Liechtenstein	0.00	86,518	0.01	0.00	0.00	0.00	0.00

## GDRs results for all countries

	2010					2020	2030
	Population (percent of global)	GDP per capita (\$ US PPP)	Capacity (percent of global)	Responsibility (percent of global)	RCI (percent of global)	RCI (percent of global)	RCI (percent of global)
Lithuania	0.05	18,230	0.09	0.05	0.07	0.08	0.07
Luxembourg	0.01	75,197	0.08	0.07	0.08	0.07	0.05
Macedonia	0.03	9,279	0.02	0.02	0.02	0.02	0.02
Madagascar	0.31	900	0.00	0.00	0.00	0.00	0.00
Malawi	0.22	703	0.00	0.00	0.00	0.00	0.00
Malaysia	0.41	14,677	0.59	0.47	0.53	0.70	0.81
Maldives	0.00	5,003	0.00	0.00	0.00	0.00	0.00
Mali	0.20	1,066	0.00	0.00	0.00	0.00	0.00
Malta	0.01	25,250	0.02	0.01	0.02	0.02	0.02
Marshall Islands	0.00	2,551	0.00	0.00	0.00	0.00	0.00
Mauritania	0.05	1,829	0.00	0.00	0.00	0.00	0.00
Mauritius	0.02	11,820	0.02	0.01	0.01	0.02	0.02
Mexico	1.59	12,408	1.78	1.39	1.58	1.54	1.52
Micronesia, Federated States of	0.00	4,176	0.00	0.00	0.00	0.00	0.00
Moldova	0.05	2,894	0.00	0.00	0.00	0.00	0.01
Monaco	0.00	33,806	0.00	0.00	0.00	0.00	0.00
Mongolia	0.04	3,395	0.00	0.00	0.00	0.01	0.01
Montenegro	0.01	10,511	0.01	0.00	0.00	0.00	0.01
Morocco	0.47	4,129	0.04	0.02	0.03	0.04	0.06
Mozambique	0.33	757	0.00	0.00	0.00	0.00	0.00
Myanmar	0.73	1,263	0.00	0.00	0.00	0.01	0.01
Namibia	0.03	5,311	0.01	0.01	0.01	0.01	0.01
Nauru	0.00	6,179	0.00	0.00	0.00	0.00	0.00
Nepal	0.44	1,191	0.00	0.00	0.00	0.00	0.00
Netherlands	0.24	38,906	1.29	1.04	1.16	1.00	0.83
New Zealand	0.06	26,475	0.21	0.17	0.19	0.17	0.15
Nicaragua	0.09	2,518	0.00	0.00	0.00	0.00	0.01
Niger	0.23	606	0.00	0.00	0.00	0.00	0.00
Nigeria	2.31	1,905	0.05	0.03	0.04	0.05	0.07
Niue	0.00	11,677	0.00	0.00	0.00	0.00	0.00
Norway	0.07	52,406	0.54	0.26	0.40	0.34	0.27
Oman	0.04	23,442	0.11	0.11	0.11	0.12	0.13
Pakistan	2.50	2,722	0.02	0.00	0.01	0.03	0.08
Palau	0.00	11,366	0.00	0.00	0.00	0.00	0.00
Panama	0.05	10,425	0.05	0.05	0.05	0.05	0.05
Papua New Guinea	0.10	2,564	0.00	0.00	0.00	0.01	0.01
Paraguay	0.09	4,210	0.02	0.01	0.01	0.01	0.01
Peru	0.42	7,355	0.20	0.06	0.13	0.14	0.15

## GDRs results for all countries

	2010					2020	2030
	Population (percent of global)	GDP per capita (\$ US PPP)	Capacity (percent of global)	Responsibility (percent of global)	RCI (percent of global)	RCI (percent of global)	RCI (percent of global)
<b>Philippines</b>	1.36	3,677	0.13	0.05	0.09	0.16	0.23
<b>Poland</b>	0.55	17,222	0.95	1.16	1.06	1.13	1.12
<b>Portugal</b>	0.16	22,311	0.41	0.29	0.35	0.32	0.28
<b>Qatar</b>	0.01	79,747	0.16	0.25	0.21	0.23	0.24
<b>Romania</b>	0.31	12,042	0.27	0.24	0.26	0.32	0.34
<b>Russia</b>	2.04	15,031	2.73	4.94	3.84	4.31	4.59
<b>Rwanda</b>	0.15	833	0.00	0.00	0.00	0.00	0.00
<b>Saint Kitts and Nevis</b>	0.00	13,731	0.00	0.00	0.00	0.00	0.00
<b>Saint Lucia</b>	0.00	9,666	0.00	0.00	0.00	0.00	0.00
<b>Saint Vincent and the Grenadines</b>	0.00	7,260	0.00	0.00	0.00	0.00	0.00
<b>Samoa</b>	0.00	4,772	0.00	0.00	0.00	0.00	0.00
<b>San Marino</b>	0.00	34,494	0.00	0.00	0.00	0.00	0.00
<b>Sao Tome and Principe</b>	0.00	1,618	0.00	0.00	0.00	0.00	0.00
<b>Saudi Arabia</b>	0.38	23,984	1.09	1.66	1.38	1.53	1.66
<b>Senegal</b>	0.19	1,687	0.00	0.00	0.00	0.00	0.00
<b>Serbia</b>	0.11	10,839	0.07	0.05	0.06	0.07	0.07
<b>Seychelles</b>	0.00	14,778	0.00	0.00	0.00	0.00	0.00
<b>Sierra Leone</b>	0.09	647	0.00	0.00	0.00	0.00	0.00
<b>Singapore</b>	0.07	53,804	0.54	0.69	0.62	0.72	0.78
<b>Slovakia</b>	0.08	19,971	0.17	0.15	0.16	0.17	0.16
<b>Slovenia</b>	0.03	28,879	0.11	0.08	0.09	0.09	0.08
<b>Solomon Islands</b>	0.01	1,955	0.00	0.00	0.00	0.00	0.00
<b>Somalia</b>	0.14	680	0.00	0.00	0.00	0.00	0.00
<b>South Africa</b>	0.71	10,117	0.62	1.32	0.97	1.07	1.21
<b>Spain</b>	0.66	29,527	2.51	1.65	2.08	1.86	1.60
<b>Sri Lanka</b>	0.30	4,709	0.01	0.00	0.01	0.03	0.06
<b>Sudan</b>	0.60	1,855	0.01	0.00	0.01	0.01	0.01
<b>Suriname</b>	0.01	7,714	0.00	0.00	0.00	0.00	0.00
<b>Swaziland</b>	0.02	5,335	0.01	0.00	0.00	0.00	0.01
<b>Sweden</b>	0.14	35,587	0.65	0.32	0.49	0.41	0.33
<b>Switzerland</b>	0.11	39,181	0.60	0.28	0.44	0.37	0.30
<b>Syria</b>	0.31	4,462	0.04	0.05	0.05	0.06	0.08
<b>Taiwan</b>	0.36	29,811	1.38	1.18	1.28	1.56	1.71
<b>Tajikistan</b>	0.10	1,729	0.00	0.00	0.00	0.00	0.00
<b>Tanzania</b>	0.64	1,144	0.00	0.00	0.00	0.00	0.00
<b>Thailand</b>	0.95	9,355	0.59	0.39	0.49	0.78	1.02
<b>Timor-Leste</b>	0.02	2,106	0.00	0.00	0.00	0.00	0.00
<b>Togo</b>	0.10	819	0.00	0.00	0.00	0.00	0.00

## GDRs results for all countries

	2010					2020	2030
	Population (percent of global)	GDP per capita (\$ US PPP)	Capacity (percent of global)	Responsibility (percent of global)	RCI (percent of global)	RCI (percent of global)	RCI (percent of global)
<b>Tonga</b>	0.00	4,613	0.00	0.00	0.00	0.00	0.00
<b>Trinidad and Tobago</b>	0.02	21,490	0.05	0.13	0.09	0.10	0.12
<b>Tunisia</b>	0.15	7,538	0.06	0.03	0.04	0.06	0.07
<b>Turkey</b>	1.12	11,096	0.98	0.63	0.81	0.76	0.71
<b>Turkmenistan</b>	0.08	7,610	0.03	0.07	0.05	0.06	0.08
<b>Tuvalu</b>	0.00	1,754	0.00	0.00	0.00	0.00	0.00
<b>Uganda</b>	0.50	889	0.00	0.00	0.00	0.00	0.00
<b>Ukraine</b>	0.66	7,302	0.16	0.29	0.22	0.35	0.48
<b>United Arab Emirates</b>	0.07	54,020	0.55	0.79	0.67	0.69	0.70
<b>United Kingdom</b>	0.90	34,953	4.23	3.23	3.73	3.21	2.67
<b>United States</b>	4.54	45,640	29.73	36.38	33.05	29.11	25.47
<b>Uruguay</b>	0.05	11,015	0.04	0.02	0.03	0.03	0.03
<b>Uzbekistan</b>	0.41	2,366	0.01	0.04	0.03	0.04	0.05
<b>Vanuatu</b>	0.00	3,940	0.00	0.00	0.00	0.00	0.00
<b>Venezuela</b>	0.42	11,018	0.37	0.46	0.41	0.43	0.47
<b>Vietnam</b>	1.29	2,749	0.02	0.01	0.01	0.04	0.09
<b>West Bank and Gaza</b>	0.06	1,619	0.00	0.00	0.00	0.00	0.00
<b>Yemen</b>	0.36	2,391	0.00	0.00	0.00	0.00	0.00
<b>Zambia</b>	0.18	1,328	0.00	0.00	0.00	0.00	0.00
<b>Zimbabwe</b>	0.20	3,674	0.05	0.04	0.05	0.05	0.05
<b>High-Income</b>	15.48	36,488	76.91	77.94	77.43	69.38	61.11
<b>Middle-Income</b>	63.32	6,226	22.88	21.91	22.39	30.33	38.43
<b>Low-income</b>	21.20	1,599	0.21	0.16	0.18	0.28	0.46
<b>Annex I</b>	18.71	30,924	75.77	77.96	76.87	69.03	60.89
<b>Non-Annex I</b>	81.29	5,095	24.23	22.04	23.13	30.97	39.11
<b>EITs</b>	5.81	12,381	6.09	8.69	7.39	8.41	8.95
<b>LDCs</b>	11.67	1,274	0.11	0.04	0.07	0.10	0.12
<b>EU 15</b>	5.81	33,754	26.11	19.76	22.94	19.91	16.67
<b>EU +12</b>	1.49	17,708	2.69	2.80	2.75	2.97	2.96
<b>EU 27</b>	7.30	30,472	28.79	22.57	25.68	22.88	19.63
<b>World</b>	100.00	9,929	100.00	100.00	100.00	100.00	100.00



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## ENDNOTES

- 1 By “aggressive realist scenarios” we mean, for example, the recommendations of the Scientific Expert Group (2007) or the Stern Review (2006), both of which put 450 ppm CO<sub>2</sub>-equivalent as their lowest recommended stabilization target. Yet both acknowledge (citing, e.g., Meinshausen 2006) that 450 ppm CO<sub>2</sub>-equivalent has, at best, even odds of keeping below 2°C warming, and something like a 20-percent likelihood of exceeding 3°C warming. As James Hansen and colleagues (2006, 2007), among others, have warned, the destabilization of the Greenland Ice Sheet is possible even before global mean warming reaches the 2°C level, potentially causing up to 7m of sea level rise over the coming centuries or, possibly, much more quickly. Although there are many other potential impacts that would count as regionally or even globally catastrophic, the threat of destabilizing the ice sheets seems, for obvious reasons, to be a critical justification for urgent precaution.
- 2 See Meinshausen (2006), or Baer and Mastrandrea (2006). Or see J. Hansen, M. Sato, et al. (2008).
- 3 Even if Annex I countries reached 80 percent below 1990 levels by 2050 through exclusively domestic reductions and, at the same time, non-Annex I emissions converged to equal them (in per-capita terms), global emissions would still be inconsistent with any high likelihood of staying below 2°C. Worse, in most “realist” proposals, steep Annex I reductions are not assumed to be exclusively domestic, but rather to be met, in large part, with purchased offsets.
- 4 The disproportionate impact of climate change on poor people and developing countries due to both specific climatic impacts and greater vulnerability is well documented in the report of Working Group II of the IPCC’s Fourth Assessment Report. This point – that climate impacts threaten to reverse much of the progress that has been made in development and poverty alleviation – is much more specific. See, for example, “Up In Smoke” (Simms et al. 2004) and the subsequent related reports from the New Economics Foundation (<http://www.neweconomics.org>).
- 5 The terms “effort-sharing” and “burden-sharing” are almost synonymous. We say “effort” when possible, because an effort is not as onerous as a burden, and because the term also denotes “opportunity.” Indeed, there are all sorts of opportunities in the climate crisis; making an effort to maximize them does not seem too much to ask.
- 6 Per-capita approaches are strongly identified with the “Contraction and Convergence” approach. This is as it should be, for C&C was the first real “equity reference framework,” and as such, it has done a great deal to publicly establish the need for just, global effort-sharing as an essential aspect of an emergency climate stabilization program. It has acquired, and deserves, a great deal of respect and support – indeed, we used to be C&C supporters ourselves. But the simplicity that is one of its great virtues is also one of its greatest weaknesses. More particularly, in its focus on equality of emission rights, it loses sight of the end to which emission rights can only be a means – sustainable human development for all, even in a world that is profoundly constrained by the prior overuse of the now-scarce atmospheric commons. Our analysis has convinced us that, under stringent mitigation targets, C&C cannot deliver this essential developmental equity, and it is in response to this requirement that we have elaborated the GDRs framework. C&C fails to deliver developmental equity for two fundamental reasons. First, it fails to account for the historical advantage acquired by the developed countries, who enjoyed decades of unrestrained emissions. Second, it fails to account for the wide range of variation in national circumstances, particularly among developing countries but also among high-emitting “industrialized” countries, many of which (like Russia) are now quite poor.



Supporters of C&C have variously argued that these drawbacks are sufficiently minor and that they can be ignored, or that modifications can be made to C&C's basic allocation scheme to improve its effectiveness on these issues. We considered these arguments carefully and over a long period of time, and concluded that it would be far better to take the South at its word, and to work toward a viable global climate stabilization framework with "the right to development" at its foundation, rather than the "equal per-capita emissions rights" that C&C (implicitly) posits as its proxy. Our argument in a nutshell is that this "developmental equity," instead of emissions equity, must be the organizing principle of a viable climate framework. We have elaborated these criticisms in a framework comparison for the Heinrich Böll Foundation (Baer and Athanasiou 2007).

- 7 The choice between tolerable and intolerable mitigation options is not a straightforward one. People will disagree about the merits – and demerits – of nuclear power, industrial biofuels, sequestration strategies, financial architectures, lifestyle changes, and of course geoengineering. Other options (energy efficiency comes to mind) are less controversial and will remain so. The point here is simply that some options will be considered intolerable by some people, and some nations, and that the debates here are fated to be extremely important.
- 8 The three scenarios are based on CO<sub>2</sub> emissions only, including both fossil fuel emissions and land use emissions. Each scenario begins with historical fossil fuel emissions through 2005 and estimated land use emissions of 1.5 GtC/yr from 1990 through 2005. The characteristics of the three pathways are shown in the table below. Non-CO<sub>2</sub> emissions are assumed to fall such that the radiative forcing from non-CO<sub>2</sub> GHGs declines by 50 percent between 2010 and 2050 (from 1 Wm<sup>-2</sup> to 0.5 Wm<sup>-2</sup>). CO<sub>2</sub> and CO<sub>2</sub>-equivalent levels and the risk of exceeding 2°C are calculated using the MCCM (Monte Carlo Climate Model) described by Baer and Mastrandrea (2006). For much more detail, see the online technical appendices at <http://www.GreenhouseDevelopment-Rights.org/Appendices>.

	Emissions peak year	Annual emissions rate at peak year	2050 CO <sub>2</sub> emissions relative to 1990	Maximum rate of reductions	Chance of exceeding 2°C	Estimated peak concentration ppm (CO <sub>2</sub> /CO <sub>2</sub> -eq)
Pathway 1	2013	10.5 GtC	80% below	5.6%/yr	14–32%	420/480
Pathway 2	2015	10.7 GtC	65% below	4.4%/yr	20–46%	430/490
Pathway 3	2017	10.9 GtC	50% below	3.6%/yr	25–54%	440/500

- 9 Because the probability distributions for key parameters such as climate sensitivity and the behavior of the carbon cycle are not well defined, the probabilistic methodology takes as an input subjective expert opinion about the uncertainty of various parameters. This method accounts for the fact that a range of reasonable assumptions can be made about key parameters, by reporting the calculated risk as a range (in which the upper and lower bounds reflect the spread in the scientific opinion.) For a discussion of the issues and the model used in these calculations, see the online technical appendices, or Baer and Mastrandrea (2006).
- 10 There is no universal definition of "CO<sub>2</sub>-equivalent levels." The Stern Review recently established the precedent of only referring to the equivalent concentration levels of the Kyoto gases, and the 480 ppm CO<sub>2</sub>-equivalent figure given for this pathway is calculated on this basis for the purpose of comparison. However, more precisely CO<sub>2</sub>-equivalent levels should include all radiative forcings, positive and negative, as that is what produces the overall impact on the climate system. The largest additional forcing is the negative forcing from aerosols. In our model, aerosol forcings reduce the net radiative forcing to about 430 ppm CO<sub>2</sub>-e at the peak.

- 11 According to the terminology used by the IPCC to describe subjective probability judgments, virtually certain means greater than 99 percent probability, extremely likely means 95 to 99 percent probability, very likely means 90 to 95 percent, likely means 66 to 90 percent, more likely than not means 50 to 66 percent, about as likely as not means 33 to 66 percent, unlikely means 10 to 33 percent, very unlikely means 5 to 10 percent, extremely unlikely means 1 to 5 percent, and exceptionally unlikely means less than 1 percent. See IPCC (2007) Box TS.1, 23.
- 12 James Hansen, "Climate Change: On the Edge," *The Independent*, February 17, 2006. The details of Hansen's analysis can be found in Hansen et al. (2006).
- 13 Matthews and Caldeira (2008).
- 14 Hansen et al. (2008).
- 15 Climate Action Network International (2007).
- 16 Scientific Expert Group (2007).
- 17 Note, however, that the Stern Review focused on stabilization scenarios, while our scenarios are projected to reduce concentrations after their peak. In practice, our ability to reduce after peaking will depend not only on our resolve and technical capability but also on carbon cycle feedbacks that are difficult to predict.
- 18 See the IPCC's Fourth Assessment Report, Summary for Policy Makers of the report of Working Group III, Table SPM-4.
- 19 Stern (2008) cites in particular the estimates of climate sensitivity from Murphy et al. (2004) of the Hadley Centre in the UK, which are on the higher side of published estimates, though certainly reasonable, with a median estimate of 3.4°C, compared to the "best estimate" of 3.0°C from the IPCC's Fourth Assessment Report.
- 20 "Government Outlines Vision, Strategic Direction and Framework for Climate Policy," Media Statement by Marthinus van Schalkwyk, Minister of Environmental Affairs and Tourism, Government of South Africa, 28 July 2008, <http://www.environment.gov.za/HotIssues/2008/LTMS/LTMS.html>
- 21 See, for example, Barclay Capital's Equity Gilt Study 2007, which argues for the optimistic case with these words: "If ever the time were ripe for such an energy revolution, it is now. And like all historical adoptions of general purpose technologies, the process should prove immensely stimulative to economic growth. Oddly, the climate change policy debate is couched in terms of the cost to GDP growth. Even the proponents of policy shifts tend to assume a negative effect on growth. This stance is underselling the actual impact of an energy revolution. All of the historical changes in energy supply – from dung to wood to coal to oil – were stimulative for the economy concerned. Every major technological change was accompanied or followed by faster economic growth." We accept this argument, but believe that it tells far less than the whole story.
- 22 A great deal can be said about "development." Much, in particular, can be said about the "sustainable development" – or, if you prefer, the "just and sustainable development" – that is the preferred alternative to "development as usual." We will, however, say little on either of these topics, for our goal is neither to repeat well-established criticisms of development (for an influential and still relevant overview, see Sachs 1992) or to explore the burgeoning, and critical, literature of "development alternatives." Rather, it is to insist that, however such alternatives take shape, they will demand greatly improved and democratized energy services, and that it is pointless to pretend otherwise.
- 23 As of June of 2008, the British government is under huge pressure to commit, in its forthcoming Climate Change Bill, to a reduction target of at least 80 percent. This pressure is consequent to a decision made by Foreign Secretary David Miliband at the summer negotiations in Bonn, where he signed the communiqué with South Africa calling for all industrialized countries to reduce emissions by 80–95 percent by 2050. It was a brave move, but keep in mind that such a target, even if adopted, is likely to include offsets.

- 24 With so little global emissions space left, there are few degrees of freedom available to create more space for the South. The North could perhaps cut emissions by even more than 90 percent – perhaps 100 percent – reducing emissions to zero by 2050, or even earlier: say 2025. But it would not change things very significantly, insofar as it would not open up that much more environmental space for the South. Besides, relaxing the blue pathway – taking yet greater risks of exceeding 2°C – only makes a difference if it is relaxed so much as to give up on preserving a reasonable likelihood of keeping warming below 2°C.
- 25 This scenario might become possible with “negative emission” mitigation options, such as biomass-based power coupled with carbon capture and sequestration (Azar et al. 2006), which extract carbon dioxide from the atmosphere. (Coal-based power coupled with sequestration could have relatively low, but not negative, emissions.) This could open the door to pathways with higher probabilities of preserving the 2°C line than the most stringent of our emergency pathways. In theory, it could also open the door to pathways that slightly delay the necessary emissions peak. In practice, however, such pathways would require us to bank on debatable assumptions: that we would eventually find these unproven technologies to be feasible, that we would implement them at a sufficiently large scale to reverse our earlier delay, that we would deploy them rapidly enough to avoid a climate catastrophe in the meantime. It is one thing to hope that these will prove true, and thus improve our chances of keeping within 2°C. It is quite another to assume that they will prove true, and then use that assumption to justify a sluggish response now. For this reason, we choose to take these options off the table for the purposes of our discussion.
- 26 Based on World Bank data (per-capita growth rates and per-capita income through 2006). Note that this figure is in PPP terms, and converts to an even lower income level in a local developing-country currency than if it were converted at market exchange rates.
- 27 Stern argued, more precisely, that spending 1 percent of GWP would save us damages equivalent to between 5 and 20 percent. This cost estimate, however, was associated with a concentration target in the range of 500 to 550 CO<sub>2</sub>-equivalent, which is far more likely to yield 3°C than 2°C of warming, as Stern himself admits.
- 28 This is not to imply that poor people are responsible for all or even most land-clearing, as opposed to national or international elites; only that land-use emissions must be dramatically reduced, whatever their purpose.
- 29 All dollar figures in this paper are given using 2005 US dollars, converted on a purchasing power parity (PPP) basis.
- 30 According to Pritchett (2003), the use of this line “is justifiable, more consistent with international fairness, and is a better foundation for the World Bank’s organizational mission of poverty reduction.” See also Pritchett (2006). We adjust Pritchett’s figure of \$15/day in 2000 US dollars to \$16.3/day in 2005 US dollars, or \$5,944/year.
- 31 On a PPP basis, \$7,500/yr equates to just over 25,000 yuan/yr, which is the per-capita income level for China’s middle-income stratum, as identified in analyses by the Chinese Academy of Social Sciences (Lu 2002), and a report by the BNP Paribas Peregrine bank (People’s Daily Online 2004). In India, \$7,500 equates to just over 100,000 rupees, which is approximately the individual income level corresponding to a threshold for the lower middle-class in analyses by McKinsey Global Institute (2007) and a threshold for an undifferentiated middle class category in analyses by the National Center for Applied Economic Research (NCAER 2005). (As is typically done, individual income thresholds are compared to household thresholds by assuming a square-root dependency of expenditures on household size).
- 32 Ananthapadmanabhan et al. (2007).
- 33 Jo Johnson, “Worlds Collide in India over Global Warming,” *Financial Times*, June 7, 2007.
- 34 In addition to Buffet and Gates, the March 2008 *Forbes* list of billionaires puts two others ahead of Ambani. One is telecom tycoon Carlos Slim, who, as a Mexican, is a citizen of a country that is not ranked in even the top 50 in terms of per-capita national income. The other is Lakshmi Mittal, an Indian (like Ambani) and thus a citizen of a country not ranked in the top hundred.

- 35 The Brazilian proposal famously allocated obligations, albeit only within Annex I, on the basis of responsibility for global temperature change.
- 36 Plainly, deforestation causes a large fraction of the emissions from tropical countries today. Yet, most northern countries were largely deforested centuries ago for the same reasons – for timber, fuel-wood, and agriculture. By one calculation that we have done, per-capita emissions from land-use change in the United States reached 10 tons of carbon (not CO<sub>2</sub>!) per-capita in the mid-19th century. But these forests are now regrowing, perhaps fertilized by increased CO<sub>2</sub> concentrations, and even being claimed as carbon sinks. Clearly, a fair treatment of land-use emissions will require consideration of these issues.
- 37 Accounting for carbon embodied in internationally trade can have non-trivial implications for the calculation of a country's cumulative emissions, and hence responsibility. Peters and Hertwich (2008a, 2008b) have estimated that carbon embodied in trade comprised more than 20 percent of global CO<sub>2</sub> emissions in 2005. They find that most industrialized countries (26 out of the 35 Annex B countries they analyzed) are net importers, most developing countries are net exporters, and that accounting for traded carbon would increase aggregate emissions of industrialized countries by 5.6 percent and decrease emissions of developing countries by 8.1 percent. For many countries, accounting for net carbon exports would not dramatically change the estimate of their responsibility. For some, however, the difference would be significant. China's net exported emissions were equal to 17.8 percent of its domestic emissions in 2005 (with exported emissions equaling 24.4 percent of its total domestic emissions and its imported emissions equal to 6.6 percent of domestic emissions), which is greater than the domestic emissions of, say, France.
- 38 This distinction between luxury and subsistence emissions has been popularized by Anil Agarwal and Sunita Narain (1991; see also Agarwal, Narain, and Sharma 1999) of India's Centre for Science and the Environment, and by the philosopher Henry Shue (1993).
- 39 Benito Müller (2002) is quite good, and equally brief.
- 40 Criqui and Kouvaritakis (2000) defined an effort-sharing system based on a "CR Index" (capacity and responsibility index) that combined current per-capita emissions and per-capita income. Also, the South-North Dialogue proposal (Climate Protection Programme 2004) used capacity, responsibility, and a measure of "mitigation potential" to group countries in their multistage framework. Another approach that is similar to ours in spirit, but significantly different in details, has been developed by Oxfam (2007). Another approach that looks in detail at intra-national distribution of responsibility, using methods similar to those used here, is that of Chakravarty et al. (2008).
- 41 We approximate the income distribution with a log-normal function, which is characterized by two country-specific parameters: the mean per-capita income and the Gini coefficient. For an explanation, see the technical appendix. For a justification of the use of lognormals for income distributions, see for example Lopez (2006).
- 42 This estimate is consistent with those produced by other analyses, e.g., NCAER (2005) and McKinsey (2007).
- 43 Note that the fact that the chart appears to reach a maximum income level at about \$20,000 does not mean that there are not people in India with higher incomes. It is rather that the average income of the highest 1 percent is still fairly low. (Also, the lognormal estimate of income distribution that we use is less accurate at the "tails" of the distribution – see our online technical appendices.)
- 44 This observation might seem counterintuitive to readers who note that Unfairland has not only more capacity than Fairland, but also more development need. Actually, this fact merely underscores the importance of sharing the national effort equitably among citizens; that is, sharing it among the wealthy citizens who have the capacity to pay it. The capacity-based tax will not be a burden on the poor of Unfairland so long as it is not passed down to them, but rather absorbed by the wealthy of Unfairland, on whose capacity it is based. Should the wealthy of Unfairland transfer some of their income to the poor, their "capacity" taxed for climate policy would be reduced by that amount.

- 45 The World Bank defines countries by income class using per-capita income in market exchange rate terms, not purchasing power parity. The official classes (in 2006 dollars) are low income (below \$905), lower-middle (\$906–\$3,595), upper-middle (\$3,596–\$11,115), and high (over \$11,116). We combine lower-middle and upper-middle income groups. In PPP terms, the borders are on the order of \$2,000, \$7,000, and \$15,000. Although the table projects income to 2010, we use the 2006 classification. For a list of countries, see the online Appendices (<http://www.GreenhouseDevelopmentRights.org/Appendices>).
- 46 This is different from our formula in the first edition, in which we multiplied Capacity and Responsibility and weighted Capacity slightly higher. The change makes the results slightly more transparent but does not change them much for most countries. See <http://www.GreenhouseDevelopmentRights.org/Appendices>, the online technical appendices, for details.
- 47 Cost estimates are all over the place. Methodologies for estimating them vary widely, and are particularly problematic when it comes to estimating the costs of adaptation. Here, the most widely cited figures vary from \$50 billion / year (Oxfam 2007) to \$171 billion / year (the high end of the range of the UNFCCC Secretariat's widely cited 2007 background paper). These numbers are particularly uncertain because, in addition to uncertainties related to the scale of projected impacts, they also reflect a lack of consensus about the appropriate working definition of adaptation.

Some mitigation cost models simply calculate the reduction in GWP vs. a reference baseline in (say) 2050, while others estimate a marginal and average cost of emission reductions and a total amount of reductions, using them to calculate a total cost. Importantly, cost estimates vary greatly with the ambition modeled. For example, the UNFCCC Secretariat (2007) argues that "global additional investment and financial flows of \$380 billion will be necessary in 2030," but this is only to return emissions to 2007 levels. More interestingly, the IPCC's Fourth Assessment Report estimated the costs of 2030 stabilization in the 445–535 CO<sub>2</sub>-equivalent range as being something less than 3 percent of GWP.
- 48 For example, many economic models assume that as energy prices rise with carbon prices, central banks will respond with anti-inflationary measures, causing significant losses in GDP. There are many reasons to think such measures would be inappropriate. For further discussion, see, for example, DeCanio (2003).
- 49 The global adaptation need will be even more challenging to calculate than a global mitigation shortfall, for the scope of adaptations reflect choices that are fundamentally social and not economic in nature. But this challenge is by no means unique to the GDRs approach. Any approach that takes the notion of "polluter pays" seriously, requires a cost assessment. To a first order, this assessment can be envisioned as an evolution and generalization of the process that is already underway to develop National Adaptation Plans of Action. See also section 5 of UNFCCC Secretariat (2007).
- 50 GWP was about \$46 trillion and military expenditures are \$1.2 trillion in 2006 (or approximately 2.5 percent). See [http://www.sipri.org/contents/milap/milex/mex\\_trends.html](http://www.sipri.org/contents/milap/milex/mex_trends.html) and [http://en.wikipedia.org/wiki/World\\_economy](http://en.wikipedia.org/wiki/World_economy).
- 51 Christian Azar and Steve Schneider (2002) point out that in a world of continuing economic growth at 2 or 3 percent annually, even a 5 percent decrease in GWP in 2050 implies only a delay of two years or so in becoming twice as wealthy. Presumably, most people – especially those with incomes above the development threshold – would not hesitate if asked whether they would go without raises for two years in order to preserve the planet for their grandchildren.
- 52 For more on this pivotal concept, see Ananthapadmanabhan et al. (2007).
- 53 We used the term "cap and allocate" as shorthand for "cap and allocate and trade." It refers to any principle-based allocation of tradable allowances to countries, under a global cap, and is intended to distinguish such systems from systems – and there are many – that use allowance giveaways to continue patterns of historical inequity by formalizing rights to something (close to) historical emissions. Think of phase 1 of the EU's ETS.

- 54 Adaptation is, at its core, a problem of resilience and adaptive capacity, and thus a development challenge that cannot plausibly be addressed by market-based institutions. So while modeling the mitigation side of a global climate regime as an allocation system makes good sense, and while market institutions are certain to play a role in the mitigation regime, adaptation investments must, for fundamental reasons, be implemented through democratically controlled funds that rely heavily on the involvement of civil society.
- 55 Of course, it is important to note that in a global carbon market, equivalent permits would all trade at the global price, and thus the incentive to make the cheapest possible reductions, results in rents (profits) to those who can make the reductions and sell the credits.
- 56 IEA (2007).
- 57 Enkvist et al. (2007).
- 58 The estimate is crude – each country is assigned a share of the global no-regrets potential proportional to its share of global reference emissions. A better estimate would similarly require a detailed bottom-up analysis that was sensitive to national circumstances.
- 59 Pacala and Socolow (2004).
- 60 Note that we have simply allocated to the European Union a share of the estimated global no-regrets reductions proportional to its share of global emissions – no “bottom up” calculation has been done here.
- 61 The business-as-usual and no-regrets trajectories would presumably be updated over successive commitment periods to account for technological advances, changes in capacity and responsibility, and other relevant changes.
- 62 See, most exhaustively, Lohmann et al. (2006).
- 63 The Norwegian auctioning proposal is gaining quite a bit of traction, though, as of this writing, it has been released in only a preliminary form (see the slides at [http://unfccc.int/files/meetings/ad\\_hoc\\_working\\_groups/lca/application/pdf/norway.pdf](http://unfccc.int/files/meetings/ad_hoc_working_groups/lca/application/pdf/norway.pdf)) as a proposal for auctioning a small fraction of Annex I allowances to support adaptation. It is likely that the proposal will evolve further in the months ahead, and there is no inherent reason why it must remain limited to a small fraction of total Annex I allowances.
- 64 In the United States, for example, “cap and auction” has emerged as an alternative to both generic “cap and trade” and carbon taxes. Indeed, with Barack Obama’s announced support for 100 percent auctioning, it has become a major part of the US mechanisms and institutions debate. One good place to follow this debate is <http://www.capanddividend.org> – a site that supports the “recycling” of domestic auction revenues directly to the citizenry via “dividend checks.” This is not an unproblematic position for a number of reasons, one of which is the legitimacy of other calls on those revenues, both domestically and internationally. But at the same time, the Cap and Dividend proposal highlights the need for progressive institutions of domestic carbon finance. There is a major debate in this area that is outside the scope of this report.
- 65 Bali Action Plan, Decision 1/CP.13, para 1(b)(ii).
- 66 See [http://www.environment.gov.za/NewsMedia/MedStat/2008Jul28\\_2/28072008-2.html](http://www.environment.gov.za/NewsMedia/MedStat/2008Jul28_2/28072008-2.html) for details.
- 67 See Remarks by H.E. LEE Myung-bak, President of the Republic of Korea, on the occasion of the G8 Extended Summit in Toyako, July 9, 2008, [http://www.korea.net/news/issues/issueDetailView.asp?board\\_no=19358](http://www.korea.net/news/issues/issueDetailView.asp?board_no=19358)
- 68 India’s National Action Plan on Climate Change, issued by the Prime Minister’s Council on Climate Change, <http://pmindia.nic.in/Pg01-52.pdf>
- 69 China’s Policies and Actions for Addressing Climate Change is available at [http://www.china.org.cn/government/news/2008-10/29/content\\_16681689.htm](http://www.china.org.cn/government/news/2008-10/29/content_16681689.htm). It itemizes quite a large number of avenues for action, all of which could be immediate scaled up. Many of them would require the (MRV) support of the North, but some of them, clearly, could and should be effectively pursued quite unilaterally, and to China’s unambiguous benefit.



- 70 The Byrd-Hagel Resolution is the statement passed by a 95–0 vote of the United States Senate shortly before Kyoto warned that “the United States should not be a signatory to any protocol to, or other agreement regarding, the United Nations Framework Convention on Climate Change of 1992, at negotiations in Kyoto in December 1997, or thereafter, which would ... mandate new commitments to limit or reduce greenhouse gas emissions for the Annex I Parties, unless the protocol or other agreement also mandates new specific scheduled commitments to limit or reduce greenhouse gas emissions for Developing Country Parties within the same compliance period....”
- 71 For more details on India's current positioning, see the statement of Prime Minister Dr. Manmohan Singh, released on June 30, 2008, on the occasion of the release of the Indian Climate Change Action Plan, (<http://www.pmindia.nic.in/lspeech.asp?id=690>): “Climate Change is a global challenge. It can only be successfully overcome through a global, collaborative and cooperative effort. India is prepared to play its role as a responsible member of the international community and make its own contribution. We are already doing so in the multilateral negotiations taking place under the UN Framework Convention on Climate Change. The outcome that we are looking for must be effective. It must be fair and equitable. Every citizen of this planet must have an equal share of the planetary atmospheric space. Long term convergence of per capita emissions is, therefore, the only equitable basis for a global compact on climate change. In the meantime, I have already declared, as India's Prime Minister, that despite our developmental imperatives, our per capita GHG emissions will not exceed the per capita GHG emissions of the developed industrialized countries. This should be testimony enough, if one was needed, of the sincerity of purpose and sense of responsibility we bring to the global task on hand.” For the quote above, see Peter Foster, “India Snubs West on Climate Change,” UK Telegraph, December 6, 2006.

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«Negotiations for a shared vision ... must be based on an equitable burden-sharing paradigm that ensures equal sustainable development potential for all citizens of the world and that takes into account historical responsibility and respective capabilities as a fair and just approach.»

*Leaders of the G-5 (Brazil, China, India, Mexico, and South Africa), (Sapporo, Japan, July 8, 2008)*

«Countries will be asked to meet different requirements based upon their historical share or contribution to the problem and their relative ability to carry the burden of change. This precedent is well established in international law, and there is no other way to do it.»

*Al Gore, (New York Times Op-Ed, July 1, 2007)*

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